

Subject

Rules concerning computer-based systems  
(IACS UR E22 (Rev.3) related)

# **ClassNK**

## ***Technical Information***

No. TEC-1316

Date 26 January 2024

To whom it may concern

IACS UR E22 (hereinafter referred to as "UR E22") is unified requirements relating to computer-based systems used on vessels, which has recently been amended and adopted as UR E22 (Rev.3) to better clarify the requirements, specific to each of the phases of design, development, commissioning, and maintenance.

ClassNK has amended Rules to involve incorporating UR E22 (Rev.3) into Rules/Guidance for the Survey and Construction of Steel Ships, Part X that have been newly established (scheduled to come into effect in July 2024). Contemporaneously with the amendments, existing Part D, Chapter 18, Annex 18.1.1 of the Rules and Guidance for the Survey and Construction of Steel Ships, which specifies the requirements pursuant to UR E22 (Rev.2), has been deleted.

In this connection, the Rules for the Survey and Construction of Steel Ships, Part X is available on ClassNK website for download. To obtain a copy, please log into the [ClassNK MyPage](#), click on [Rule Amendments for Technical Rules], find [Amendments to Rules for the Survey and Construction of Steel Ships 2023 Edition and other documents], and click the file [Issued on 22 December 2023].

The purpose of this TEC-1316 (hereinafter referred to as "this TEC") is to disseminate information on what actions need to be taken by the manufacturers, shipyards, and vessel owners (including operators) pursuant to the new rules on the computer-based systems that will be used onboard any vessels whose construction contract date is on or after 1 July 2024, to which UR E22 (Rev.3) will apply.

For all vessels whose construction contract date is on or after 1 July 2017 but is before 1 July 2024, UR E22 (Rev.2) continues to apply. For details, please refer to ClassNK Technical Information No. TEC-1235.

(To be continued)

#### NOTES:

- ClassNK Technical Information is provided only for the purpose of supplying current information to its readers.
- ClassNK, its officers, employees and agents or sub-contractors do not warrant the accuracy of the information contained herein and are not liable for any loss, damage or expense sustained whatsoever by any person caused by use of or reliance on this information.
- Back numbers are available on ClassNK Internet Homepage (URL: [www.classnk.or.jp](http://www.classnk.or.jp)).

1. Outline of the rules concerning computer-based systems (relating to the Rules for the Survey and Construction of Steel Ships, Part X, Chapters 2 and 3)

(1) Roles of each organization

As set forth in Part X, Chapter 3, the organizations involved in the design, development, manufacture, installation, operation, etc. of computer-based systems used on vessels are classified into the three types as set forth below based on their roles.

- System suppliers ..... The manufacturers usually fall under this category.
- Integrators during vessel construction .. The shipyards usually fall under this category.
- Integrators after vessel delivery ..... The organizations that own/manage vessels (vessel owners) usually fall under this category.

Hereinafter in this TEC, *system suppliers* are referred to as *manufacturers*, *integrators in the vessel construction/commissioning phase* as *shipyards*, and *integrators after vessel delivery* as *vessel owners*, for easier comprehension.

Note 1: In TEC-1235 which is based on UR E22 (Rev.2), an integrator is defined as an engineering party a business operator that integrates and supplies various equipment and systems to vessels on which Integrated Automation System (hereinafter referred to as "IAS") and other complex superior systems known as "integrated systems" are installed, which assumes that integrators were involved only in cases where such integrated systems are installed.

Meanwhile, UR E22 (Rev.3) defines an *integrator* as *an organization coordinating interaction among system suppliers*, clarifying the necessity of the integrator role across all vessels, regardless of whether any advanced systems such as IAS are installed on them.

Please therefore pay adequate attention to the points as set forth below in this TEC, which reflect the changes resulting from the aforementioned revision.

- The requirements will no longer be distinguished based on the *integrated system* classification.
- *Integrators* will be defined for each of the following two phases.
  - (i) *Integrators during vessel construction*: Organizations responsible for the design, ordering, management, installation, etc. of computer-based systems that are installed on a vessel.
  - (ii) *Integrators after vessel delivery*: Organizations responsible for the operation, maintenance, etc. of computer-based systems after vessel delivery.

(To be continued)

## (2) Categorization of computer-based systems

The categories of computer-based systems that are defined based on the impact of their malfunction are provided in [Table 1](#) below (excerpted from Table X 3.1 of Part X of the Rules for the Survey and Construction of Steel Ships). The shipyard in each instance needs to decide which category each of the computer-based systems should be classified as that will be installed on the vessel, and prepare a *List of system categorizations* ([3.\(2\)\(a\)](#); see the sample in [Attachment 1.](#)). The shipyard needs to notify each of the manufacturers of the computer-based systems which categories their systems have been classified as. Meanwhile, each manufacturer that has been notified that its system is either category II or III, which is now designated as a system supplier, need to obtain approval by ClassNK on its computer-based system (as per [1.\(3\)\(i\)](#)).

Table 1. System Categories (excerpt from Table X3.1, Part X of the Rules)

Category	Failure effects	Typical system functionality
I	Those systems whose failure will not lead to dangerous situations for human safety, vessel safety or a threat to the environment.	Monitoring, informational and administrative functions
II	Those systems whose failure could eventually lead to dangerous situations for human safety, vessel safety or a threat to the environment.	Vessel alarm, monitoring and control functions that are necessary to maintain the vessel in its normal operational and habitable conditions
III	Those systems whose failure could immediately lead to dangerous or catastrophic situations for human safety, vessel safety or a threat to the environment.	<ul style="list-style-type: none"> <li>- Control functions for maintaining vessel propulsion and steering</li> <li>- Vessel safety functions</li> </ul>

Note 2: **In order for ClassNK to verify the validity of all computer-based systems' categories, the shipyards are each requested to submit a *List of system categorizations* to ClassNK as early as possible in the design phase (before the manufacturers submit their drawings for approval to ClassNK). If ClassNK determines any system categories to be clearly inappropriate, it may request risk assessment to prove the validity of the categories in question.**

## (3) Approval of computer-based systems

For its approval of computer-based systems that are classified as category II or III, ClassNK mainly carries out "review of the submitted documents such as the quality plans, etc.", "presence at various tests", and "confirmation of their quality management (inspection of quality plans and records, including change management)".

The flowcharts provided in [Figures 1](#) and [2](#) below indicate the actions of, and interactions between, the organizations involved in the approval process, during the vessel construction (involving the manufacturer and the shipyard) and after vessel delivery (involving the shipyard and the vessel owner).

(To be continued)

Note 3: *FAT (Factory Acceptance Test)* is shop test for applicable computer-based systems before being installed on board based on 3.4.2-7. of the Part X of the Rules for the Survey and Construction of Steel Ships

*SAT (System Acceptance Test; onboard test)* is the test that involves bringing and installing the applicable computer-based systems onboard and verifying whether all their functions operate properly in accordance with their specifications (equivalent to equipment-specific testing).

*SOST (System Of Systems Test; onboard test of system of systems)* is the test that involves installing the applicable computer-based systems onboard, connecting all the systems as they will finally be in actual operation, and verifying whether all their functions are coordinated properly without any issue (equivalent to overall integration testing).

(i) Requirements for manufacturers

The requirements that apply to each manufacturer and the role are as set forth below.

- (a) Each manufacturer needs to prepare documents such as *Quality plan (and quality manual)*, *System description (system's specification and design)*, *Environmental compliance*, *FAT program*, and *Change management procedure* (the documents as set forth on [3.1](#) (except [\(e\)](#))) (and submit them to ClassNK Machinery Department). Each manufacturer needs to produce its computer-based systems based on pursuant to the approved *Quality plan (and quality manual)* ([3.1\(a\)](#)).
- (b) Prior to shipping its computer-based system, each manufacturer needs to conduct FAT according to the approved *FAT program* ([3.1\(d\)](#)) in the presence of ClassNK surveyor. During this FAT, ClassNK surveyor will also check each manufacturer's quality management (inspection of quality plans and records, including change management).
- (c) After the FAT, each manufacturer needs to prepare a *FAT report* ([3.1\(e\)](#)) (and submit it to ClassNK survey office). After completing its review or approval of the submitted documents, successful FAT, and quality management verification, ClassNK survey office will issue to each manufacturer a *Vessel-specific certificate* on its computer-based system.
- (d) Each manufacturer needs to deliver its computer-based systems along with the *Vessel-specific certificate*.

(ii) Requirements for shipyards

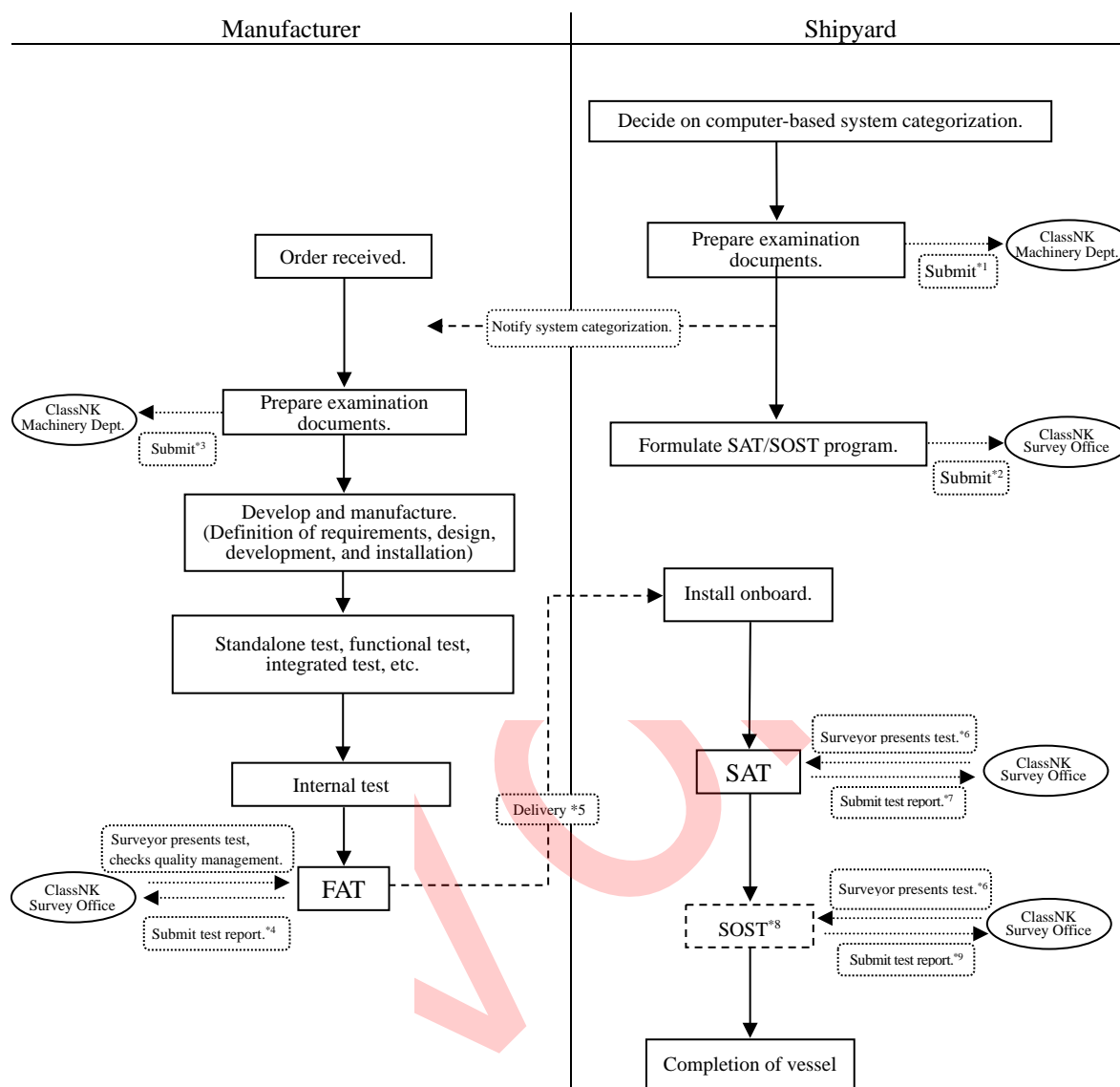
The requirements that apply to each shipyard and the role are as set forth below.

- (a) Each shipyard needs to decide on the Category of each of the computer-based systems that will be installed on its vessel and notify the manufacturers (see [1.2](#)).
- (b) The shipyard needs to prepare a *List of system categorizations* ([3.2\(a\)](#)), *Quality plan* ([3.2\(b\)](#)), *the vessel's system architecture* ([3.2\(c\)](#)), and *Change management procedure* ([3.2\(h\)](#)) (and submit them to ClassNK Machinery Department). The shipyard needs to prepare *SAT program* ([3.2\(d\)](#)), and *SOST program* ([3.2\(f\)](#)) (and submit them to ClassNK survey office).

(To be continued)

- (c) The shipyard needs to install the computer-based systems that have been delivered from the manufacturers, and conduct SAT as well as SOST connecting all the systems as they will finally be in actual operation according to the test SAT/SOST program approved by ClassNK survey office as set forth in (b) above, in the presence of ClassNK surveyor; provided, however, that in case both of the conditions as set forth below are satisfied, SAT may also be treated as SOST:
- 1) if the object of the test is *not* a system wherein multiple equipment/systems are connected and control each other, or a system above which there is a superior system integrating it with other systems (e.g., IAS installed into a gas carrier supervising controls over various functions such as cargo monitoring and handling, gas fuel supply, main propulsion plant control or gas re-liquefaction); and
  - 2) if SAT conducted on object that will be installed on the vessel can verify the system's functional coordination with the rest of the systems to which it will be connected.
- (d) After conducting the SAT and SOST, the shipyard needs to prepare the test result reports [\(3.2\)\(e\)](#) and [\(g\)](#) (and submit them to ClassNK survey office). In this connection, ClassNK surveyor may check the shipyard's quality management (inspection of quality plans and records, including change management) as needed (if any issue resulting from poor quality management, etc. is found during inspection).
- (e) At the time of its delivery of the vessel, the shipyard to hand over the *List of system categorizations* [\(3.2\)\(a\)](#) to the vessel owner.

(To be continued)



\*1: [3.\(2\)\(a\)](#), [\(b\)](#), [\(c\)](#), and [\(h\)](#).

\*2: [3.\(2\)\(d\)](#) and [\(f\)](#).

\*3: [3.\(1\)\(a\)](#), [\(b\)](#), [\(c\)](#), [\(d\)](#), and [\(f\)](#).

\*4: After the FAT report ([3.\(1\)\(e\)](#)) is submitted, ClassNK Survey Office issues its *Vessel-specific certificate*.

\*5: Each computer-based system needs to be delivered to the shipyard along with its *Vessel-specific certificate*. In each instance where a computer-based system is not directly delivered to the shipyard, attention needs to be paid so that its *Vessel-specific certificate* is eventually delivered to the shipyard.

\*6: If any issue, etc. is found during inspection, ClassNK surveyor needs to check quality management.

\*7: [3.\(2\)\(e\)](#).

\*8: If both criteria 1) and 2) as set forth in [1.\(3\)\(ii\)\(c\)](#) are met, SAT may be conducted also as SOST.

\*9: [3.\(2\)\(g\)](#).

Figure 1. Approval flow by ClassNK on the organizations involved during the vessel construction

(To be continued)

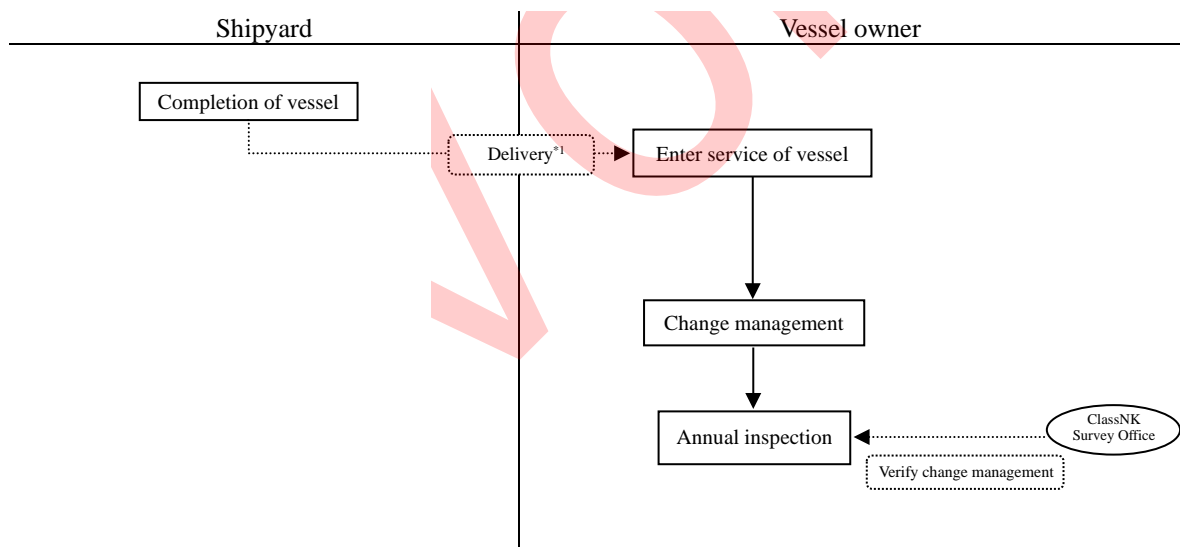
## (iii) Requirements of vessel owners

The requirements that apply to each vessel owner and the role it need to play are as set forth below.

- (a) At the time of vessel delivery, the vessel owner needs to receive from the shipyard the *List of system categorizations* and store and manage it onboard the vessel.
- (b) After the vessel is commissioned, the vessel owner needs to properly conduct change management on the computer-based systems and keep a record of all changes. During each annual inspection, ClassNK surveyor will review the change management procedure and the record of changes made.

In terms of the method of such change management relating to the computer-based systems, the vessel owner may simply add computer-based-system-related items to the maintenance management procedure being implemented on the vessel by the vessel owner. In terms of the change management record's contents, they are not subject to approval by ClassNK. However, it is preferable to include the following items.

- ✓ Purpose of changes
- ✓ Contents of changes
- ✓ Onboard change verification results
- ✓ System version or software version verification



\*1: The *List of system categorizations* (3.(2)(a)) needs to be stored and managed on the vessel.

Figure 2. Approval flow by ClassNK on the organizations involved after the vessel delivery

(To be continued)

2. Handlings concerning exemption of the examination of manufacturer-submitted documents and reduction of ClassNK surveyor's presence at FAT

In principle, pursuant to [1.\(3\)\(i\)](#), the examination documentation needs to be submitted and FAT needs to be conducted on all computer-based systems that are classified as category II or III, in the presence of ClassNK surveyor.

Meanwhile, in each instance where any of the criteria as set forth below is met, the otherwise-necessary document submission may be exempted, and/or the obligation to conduct FAT in the presence of ClassNK surveyor may be reduced.

- Identical system: If it is a computer-based system that is of the same configuration, functions, control specifications and software as a previously approved system that was installed on a different vessel, and is manufactured under the same quality system.
- Type-approved system: If it is a computer-based system on which computer-based system type approval has already been issued pursuant to Part 7, Chapter 8 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.
- Approved manufacturer: If it is a manufacturer that has been approved based on Rules for Approval of Manufacturers and Service Suppliers including computer-based system quality management required by UR E22(Rev.3). In advance of obtaining this approval, the manufacturer needs to have computer-based system type approval.

(1) Exemption of the examination of manufacturer-submitted documents

In each instance where the computer-based system is an *identical system* or a *type-approved system* and it is deemed appropriate by ClassNK, document submission may be exempted by submitting to ClassNK Machinery Department the identical system or type-approved system application form which includes the following information.

- Previous vessel that relevant documents have been approved (reference vessel), or type approval certificate;
- Software versions both targeted vessel and reference vessel or type approval certificate (Please attach version-upgrade history.).
- List of differences in specifications compared to the reference vessel or type approval certificate; and
- Name of documents that exemption from submission is requested

In this connection, please note, however, that under UR E22 (Rev.3), simply having obtained type approval does not qualify for the exemption of the obligation to conduct FAT in the presence of ClassNK surveyor, unlike what ClassNK Technical Information No.TEC-1235 sets forth.

(To be continued)



## (2) Reduction of ClassNK surveyor's presence at each FAT

In each instance where an approved manufacturer conducts FAT for type-approved system, its obligation to conduct FAT in the presence of ClassNK surveyor may be reduced (The presence of ClassNK surveyor for the FAT can be omitted and the FAT can be replaced with the approved manufacturer's self-inspection, except for representative product.). Each manufacturer meeting this criterion should consult with ClassNK survey office in advance of FAT (see [Table 2\(2\)](#)). In this connection, please note that, although ClassNK conventionally has not issued any product certificate that specify the conformity to UR E22 if the presence of ClassNK for FAT is omitted due to the object being an *identical system* or *type-approved system*, under UR E22 (Rev.3), even if the above-mentioned reduction is applied, ClassNK survey office is to issue the *Vessel-specific certificate* after the approved manufacturer's self-inspection. The *Vessel-specific certificate* needs to be submitted to the shipyard at the time of system delivery.

These handlings are summarized in [Table 2](#) below for reference.

Table 2. Handlings on the exemption of manufacturer-submitted document and the reduction of FAT in the presence of ClassNK surveyor for manufacturers

Situation of each computer-based system			Examination of manufacturer-submitted documents	FAT in the presence of ClassNK surveyor
Identical system	Type-approved system	Approved manufacturer		
No.	No.	No.	Required.	Required.
Yes.	No.	No.	Omittable. <sup>(1)</sup>	Required.
	Yes.	No.	Omittable. <sup>(1)</sup>	Required.
	Yes.	Yes.	Omittable. <sup>(1)</sup>	Reducible. <sup>(2)</sup>

- (1) If a manufacturer intends to qualify for such omission, it needs to submit to ClassNK Machinery Department the application form, stating therein the manufacturer's request to be exempted from ClassNK examination of submitted documents due to identical system or type-approved system.
- (2) It means that it is possible to limit to "*rational attendance survey*" rather than ClassNK surveyor's presence at each FAT. The test items and frequency for the surveyor's presence for the *rational attendance survey* should be determined by the ClassNK Survey Department taking into consideration an achievement of the manufacturer's quality system, a reliability of the manufacturing process, a continuous production of the product(s) and an expected quality level of the product(s).

(To be continued)

## 3. Documents to be submitted

## (1) Documents to be submitted by manufacturers

(a) Quality plan (and quality manual)	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items.</p> <ul style="list-style-type: none"> <li>i) The organization's quality policy</li> <li>ii) Definition of the entire organization in the company and definition of the scope of work and responsibility of each organization such as department</li> <li>iii) Definition of each work processes (product development, build-to-order product production, etc.)</li> <li>iv) Document management and work record keeping</li> <li>v) Details of qualifications and management of qualified personnel (qualified personnel system in each work)</li> </ul> <p>In addition, it is required that quality control of the subject machinery/systems is conducted based on the quality assurance system and that they are appropriately designed and manufactured as products. The following work processes need to be defined for the subject machinery/systems.</p> <ul style="list-style-type: none"> <li>vi) Order receipt (finalization of required specifications)</li> <li>vii) Design (design procedure manuals, work standards, approval management)</li> <li>viii) Procurement management relating to hardware (hereinafter referred to as "HW") and software (hereinafter referred to as "SW") (outside contractors, etc.)</li> <li>ix) Production flow and work procedure of HW and SW</li> <li>x) Test program including pass/fail criteria at FAT</li> <li>xi) Change management and SW version management including post-shipment change management</li> </ul> <p>(Supplement)</p> <p>In cases where the work process is different between the basic part (common specifications for all vessels) and individualized part (individual vessel specifications) in SW configuration of the computer-based system, it is necessary to clearly define each work process and prepare a quality plan for each.</p>	
(b) System description (System specification and design)	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items.</p> <ul style="list-style-type: none"> <li>i) Purpose and main functions, including any safety aspects</li> <li>ii) System category, as defined</li> <li>iii) Key performance characteristics</li> <li>iv) Compliance with the technical requirements and the Society's Rules</li> <li>v) User interfaces / mimics</li> <li>vi) Communication and interface aspects <ul style="list-style-type: none"> <li>- Identification and description of interfaces to other vessel systems</li> </ul> </li> <li>vii) Hardware-arrangement related aspects <ul style="list-style-type: none"> <li>- Network-architecture / topology, including all network components like switches, routers, gateways, firewalls, etc.</li> <li>- Internal structure with regards to all interfaces and hardware nodes in the system (e.g. operator stations, displays, computers, programmable devices, sensors, actuators, I/O modules)</li> <li>- I/O allocation (mapping of field devices to channel, communication link, hardware unit, logic function)</li> <li>- Power supply arrangements</li> </ul> </li> </ul>	

(To be continued)

## viii) FMEA

FMEA evaluates the impact to the operation of objects (plant) which are controlled by the machinery/systems in case of an abnormality in a part of or all the computer-based system. The abnormality of the computer-based system itself and peripheral components such as power supplies and external interfaces need to be assumed. FMEA documents need to contain the items as set forth below, along with descriptions of how the evaluations have been conducted properly.

- Specification of the elemental components and their configurations that are subject to evaluation
- Specification of the criteria for determining pass/fail based on evaluation results (wherein the conditions to be avoided need to be clearly specified)
- Specification of all risks (malfunction modes) that are subject to evaluation, including not only the risks of devices, etc. ceasing their operations but also all potential HW defects, SW malfunctions, power supply interruption, communication system outage, communication data anomaly, I/O data anomaly, etc. specific to each of the elemental components
- Evaluation needs to be conducted on each of all risks in terms of devices' and systems' behaviors upon risk manifestation, their impact on the functions and operations of the devices that are the objects of the aforementioned devices and systems, anomaly detection, and external reporting, in order to verify their conformity to the specifications.

## ix) Related SW architecture

- Functional structure and function assignment to HW
- Functional specification for each SW module
- Internal data structure

If a manufacturer already has prepared the system description that includes all the aforementioned items, it need not prepare new documents. If the system description includes some of aforementioned items but the remained items are not covered therein, the manufacturer may simply add those items to the prepared documents.

Also, if the documents that a manufacturer has separately submitted for approval based on other ClassNK requirements include the aforementioned items, the manufacturer may omit them by simply stating this fact.

## (c) Environmental compliance

Submit to: ClassNK Machinery Department

To meet this document requirement, one of the three types of documents as set forth below needs to be submitted to each of the applicable HW components.

- i) a type approval certificate pursuant to Part 7, Chapter 1 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use issued by ClassNK;
- ii) a type approval certificate equivalent to i) above that is issued by another classification body; or
- iii) an official test report that verifies conformity to each of the tests (environmental tests) as set forth in Part 7, Chapter 1 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use.

*Applicable HW components* needs to only include the CPU, I/O, communication I/F, HMI, and other HW components that comprise the computer-based systems themselves. Therefore, it is not necessary to include any other constituent devices, etc. in the scope of environmental compatibility tests.

However, please note that each device, etc. that is subject to environmental tests pursuant to other Rules besides the Rules for the Survey and Construction of Steel Ships (Part X, 2.2.1-4.(2)) needs to be put through such tests to verify their environmental compatibility, regardless of whether it is deemed as an *applicable HW component*, for which the document as set forth in i) above needs to be obtained (as ii) and iii) are not acceptable in this case).

For instance, if a device is subject to environmental tests pursuant to Part D, Table 18.7.1-1 of the Guidance for the Survey and Construction of Steel Ships, i) is required even if it is not deemed as an *applicable HW component*.

(To be continued)

(d) FAT program	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items.</p> <ul style="list-style-type: none"> <li>i) Checking SW versions</li> <li>ii) Test methods (functional tests) for verifying that all SW functions operate properly</li> <li>iii) For each of the functional tests as set forth in ii) above, test conditions, methods, and pass/fail determination criteria need to be specified for all individual functions comprising the system.</li> <li>iv) Test methods for verifying all SW's and HW's functions and controls are properly coordinated</li> <li>v) Test methods (failure mode tests) for verifying that SW's responses to all failure modes are appropriate.</li> <li>vi) The failure modes as set forth in v) above need to include all failure modes that are examined under viii) FMEA of (b) System description above. All intended scenarios (detection, alarms, and countermeasures) of failure occurrences need to be confirmed according to the FMEA.</li> </ul>	
(e) FAT report	Submit to: ClassNK survey office
<p>These reports need to contain the pass/fail result from each of the test items as set forth in ii), iv), and v) of (d) FAT program above, along with a list of all SW programs (including their versions) that were installed on the system during the tests. The report needs to also bear the signature of the ClassNK surveyor that presented at the tests.</p>	
(f) Change management procedure	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items; provided, however, that these Change management procedure may also be integrated into the Quality plan (and quality manual) as set forth in (a) above.</p> <ul style="list-style-type: none"> <li>i) Each applicable system's and SW component's version and version verification</li> <li>ii) SW components' master files and management methods</li> <li>iii) Analysis of impacts that may result from changes <ul style="list-style-type: none"> <li>The followings need to be included. <ul style="list-style-type: none"> <li>(1) Levels of importance of changes, and the scope of their impacts</li> <li>(2) Impacts on existing documents</li> <li>(3) Necessary verification and testing</li> <li>(4) Whether it is necessary to notify changes to other stakeholders</li> <li>(5) Whether it is necessary to obtain approval from other stakeholders prior to implementing changes</li> </ul> </li> </ul> </li> <li>iv) Contents of SW change</li> <li>v) Change records <ul style="list-style-type: none"> <li>The followings need to be included. <ul style="list-style-type: none"> <li>(1) Purpose of each change made</li> <li>(2) Contents of each change/correction made</li> <li>(3) Analysis of impact by changes</li> <li>(4) New system's or SW version's settings</li> <li>(5) Test results (pre-release on-vessel tests)</li> </ul> </li> </ul> </li> <li>vi) System change examination and verification procedures <ul style="list-style-type: none"> <li>Examination of each change implemented after on-vessel installation needs to include the followings. <ul style="list-style-type: none"> <li>(1) Correct functioning of each implemented change</li> <li>(2) Confirmation that no negative impacts are caused to other functions and performance by each implemented change</li> </ul> </li> </ul> </li> </ul>	

(To be continued)

## (2) Documents to be submitted by shipyards

(a) List of system categorizations	Submit to: ClassNK Machinery Department
List of system categorizations involving the use of computer-based systems (see <a href="#">Attachment 1.</a> )	
(b) Quality plan (and quality manual)	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items.</p> <ul style="list-style-type: none"> <li>i) Quality policy relating to the computer-based systems</li> <li>ii) Planning, design, and manufacturing systems relating to the computer-based systems, and the specified roles of the departments, etc. involved (scope of operational tasks and responsibilities)</li> <li>iii) Specification of each of the operational processes leading up to project completion, from the definition of system specifications and designing to ordering, on-vessel installation, commissioning, testing, etc.</li> </ul> <p>For each project that entails installing <i>a system wherein multiple equipment/systems are connected and control each other, or a system above which there is a superior system integrating it with other systems</i>, these documents need to be submitted. Submission of these documents may also be requested depending on ClassNK surveyor even when installing the one other than that system.</p>	
(c) Vessel's system architecture	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items and encompass the entire system.</p> <ul style="list-style-type: none"> <li>i) System configuration</li> <li>ii) Purpose and functions of each of the constituent systems</li> <li>iii) Communications and interfaces between the different systems</li> <li>iv) Risk assessment report for the entire system</li> </ul> <p>For each project that entails installing <i>a system wherein multiple equipment/systems are connected and control each other, or a system above which there is a superior system integrating it with other systems</i>, these documents need to be submitted. Submission of these documents may also be requested depending on ClassNK surveyor even when installing the one other than that system.</p>	
(d) SAT program	Submit to: ClassNK survey office
<p>These documents need to contain the following items.</p> <ul style="list-style-type: none"> <li>i) List of all equipment, etc. that will be connected to the system</li> <li>ii) Equipment (systems) subject to testing</li> <li>iii) Test procedure for verifying that the system's main functions operate properly</li> <li>iv) Test procedure for verifying that each inter-system data link function operates properly, including failure detection, if there is any such function involved.</li> </ul>	
(e) SAT report	Submit to: ClassNK survey office
<p>These documents need to state the pass/fail result from each of the test items as set forth in iii) and iv) (if applicable) of <a href="#">(d)</a> SAT program above, along with the specific test results, and a list of all SW programs (including their versions) that were installed on the system during the tests. The report needs to also bear the signature of the ClassNK surveyor that presented at the tests.</p>	

(To be continued)

(f) SOST program	Submit to: ClassNK survey office
<p>These documents need to contain the following items. If the SAT program as set forth in <a href="#">(d)</a> above also cover the specifics of SOST, these documents may be integrated therein.</p> <ul style="list-style-type: none"> <li>i) List of all equipment, etc. that will be connected to the system, and their connection diagram</li> <li>ii) Test procedure for verifying the inter-system functions as set forth below <ul style="list-style-type: none"> <li>- Systems' overall interactive functions</li> <li>- Systems' overall performance capabilities</li> <li>- Each of the inter-system interfaces</li> <li>- Detection of, and response to, inter-system failures</li> </ul> </li> </ul>	
(g) SOST report	Submit to: ClassNK survey office
<p>These documents need to state the pass/fail result from each of the test items as set forth in ii) of <a href="#">(f)</a> above, along with the specific test results, and a list of all SW programs (including their versions) that were installed on the system during the tests. The report needs to also bear the signature of the ClassNK surveyor that presented at the tests. If the SAT program above also cover the specifics of SOST, these documents may be integrated into the SAT report as set forth in <a href="#">(e)</a> above.</p>	
(h) Change management procedure	Submit to: ClassNK Machinery Department
<p>These documents need to contain the following items. These Change management procedure may also be integrated into the Quality plan as set forth in <a href="#">(b)</a> above.</p> <ul style="list-style-type: none"> <li>i) Analysis of impacts that may result from changes The following needs to be included. <ul style="list-style-type: none"> <li>(1) Levels of importance of changes, and the scope of their impacts</li> <li>(2) Impacts on existing documents</li> <li>(3) Necessary verification and testing</li> <li>(4) Whether it is necessary to notify changes to other stakeholders</li> <li>(5) Whether it is necessary to obtain approval from other stakeholders prior to implementing changes</li> </ul> </li> <li>ii) Change records The following needs to be included. <ul style="list-style-type: none"> <li>(1) Purpose of each change made</li> <li>(2) Contents of each change/correction made</li> <li>(3) Verification of SW versions</li> <li>(4) Onboard test results</li> </ul> </li> </ul> <p>For each project that entails installing a system wherein multiple equipment/systems are connected and control each other, or a system above which there is a superior system integrating it with other systems, these documents need to be submitted. Submission of these documents may also be requested depending on ClassNK surveyor even when installing the one other than that system.</p>	
(i) Risk assessment for deciding on the systems category	Submit to: ClassNK Machinery Department
<p>This document may be required only when the categorization of a computer system is deemed by ClassNK to be clearly inappropriate.</p>	

(To be continued)

For any questions about the above, please contact:

NIPPON KAIJI KYOKAI (ClassNK)

Machinery Department, Administration Center Annex, Head Office

Address: 3-3 Kioi-cho, Chiyoda-ku, Tokyo 102-0094, Japan

Tel.: +81-3-5226-2022 / 2023

Fax: +81-3-5226-2024

E-mail: [mcd@classnk.or.jp](mailto:mcd@classnk.or.jp)

Attachment:

1. Example of List of system categorizations



Attachment 1. Example of List of system categorizations to  
ClassNK Technical Information No. TEC-1316

List of system categorizations				Shipyard:				Ship Number:			
Typical Category	Effects						Typical System functionality				
I	Those systems, failure of which will not lead to dangerous situations for human safety, safety of the vessel and/or threat to the environment.						- Monitoring function for informational / administrative tasks				
II	Those systems, failure of which could eventually lead to dangerous situations for human safety, safety of the vessel and/or threat to the environment.						- Alarm and Monitoring functions - Control functions which are necessary to maintain the ship in its normal operational and habitable conditions				
III	Those systems, failure of which could immediately lead to dangerous situations for human safety, safety of the vessel and/or threat to the environment.						- Control functions for maintaining the vessel's propulsion and steering - Vessel safety functions				
Typical Category	System	Detailed Machinery / Systems	Supplier	Type / Model	Software version	Type Approval for Hardware (IACS UR E10)	Type Approval for Software (IACS UR E22)	Usage of Computer	Remarks		
III	Main propulsion systems	Main engine control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	(For example) 'Application for Exemption from Submission of Drawings for computer-based System' will be submitted from manufacturer.		
		Main engine remote control system (This includes remote control system for turbine system)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No			
		Main boiler control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No			
		CPP control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No			
		Electric propulsion control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No			
	Steering system control systems	Steering system, Azimuth thruster control system (Only for steering gear control part)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No			



Typical Category	System	Detailed Machinery / Systems	Supplier	Type / Model	Software version	Type Approval for Hardware (IACS UR E10)	Type Approval for Software (IACS UR E22)	Usage of Computer	Remarks
III	Electric power systems	Generator control system (e.g. Main Switchboard including power management system)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Electric power converter (In case the converter is used for electric propulsion ship, etc.)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Generator engine control system (In case the generator engine is used for electric propulsion system or gas fuel engine system)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Control system for shaft generator (In case the shaft generator is subject for H3.2.1-1 of the Guidance for the Survey and Construction of Steel Ships Part H)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Battery management system (In case the battery is used for 1.3.1-1 of the Guidance for the Survey and Construction of Steel Ships Part H Annex 2.11.1-2)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Energy management system (In case the battery is used for 1.3.1-1 of the Guidance for the Survey and Construction of Steel Ships Part H Annex 2.11.1-2)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
	Safety systems	Safety system for integrated control of fire detection and fighting, flooding detection and fighting, evacuation, lifesaving and etc.			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
	Other systems	Dynamic positioning system (In case the system is subject to Class 2 or Class 3 of IMO MSC/Circ.1580)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	

Typical Category	System	Detailed Machinery / Systems	Supplier	Type / Model	Software version	Type Approval for Hardware (IACS UR E10)	Type Approval for Software (IACS UR E22)	Usage of Computer	Remarks
II	Alarm and monitoring systems for main propulsion systems	Alarm and monitoring system (This includes data logger system)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
	Safety systems	Emergency shutdown system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
	Inert gas system, control, monitoring and safety system for cargo containment system.	Cargo control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Gas combustion unit			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Gas reliquefaction system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Inert gas generator for Cargo			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		N2 generator			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
	Fuel oil treatment system	Fuel transfer system (In cases the functions are integrated into the cargo control and monitoring system)			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
	Other systems	Fuel gas supply control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Ballast transfer valve remote control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Fin stabilizer control system			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
		Control system for wind energy utilization			xxx.xxx.xxx	99A99XX	99CP99XX	Yes / No	
I	Monitoring and information display system, which are voluntarily provided and not required by Regulation and Classification Societies.	CCTV systems			xxx.xxx.xxx	-	-	Yes / No	(For example) No submission is required for category I systems.
		Condition monitoring systems			xxx.xxx.xxx	-	-	Yes / No	(For example) No submission is required for category I systems.
		Shaft horse power meter			xxx.xxx.xxx	-	-	Yes / No	(For example)) No submission is required for category I systems.