

Subject

Amendment to the ClassNK Rules and Guidance related to computer based systems

ClassNK

Technical Information

No. TEC-1145

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To whom it may concern

ClassNK has informed the requirements related to computer based systems by ClassNK Technical Information TEC-1114 issued on 16 June 2017.

After issuing of the Technical Information, ClassNK reviewed the contents of the Technical Information and has issued TEC-1145 alternatively.

The ClassNK Technical Information TEC-1114 is revoked by this Technical Information.

IACS UR E22(Rev.1) specifies requirements related to composition and function of computer based systems used for machinery systems such as monitoring systems.

These requirements have already been incorporated to Rules and Guidance of NIPPON KAIJI KYOKAI (hereinafter referred as "the Society").

Since the necessity for security measures which reduce risks specific to computer based systems such as computer viruses has been increasing in recent years, IACS discussed way to clarify requirements and adopted UR E22(Rev.2) in June 2016, which specifies responsibilities of stakeholders, security measures for software (SW) and hardware (HW) and quality management for said systems.

Accordingly, relevant requirements in the Society's Rules and Guidance were amended and what concerned organizations shall address are informed.

[Summary of Rules]

These rules apply to SW and HW for automatic or remote control systems. Additional test or type approval* may be required for the SW and the HW up to effect of their failures. The effect is defined with three categories and the requirements under each category are applied accordingly. Furthermore, responsibilities and roles of owner, system integrator and supplier to comply with the rules are set out. In particular, system integrator is a new assigned stakeholder and shall take a responsibility of integrating systems. However, in case where any system integrator is not assigned, shipyard shall take the roles during construction.

1. System Categories

Computer based systems shall be assigned category III, II or I in accordance with 2.3 and Table 2.1 of Annex D18.1.1, Part D of the Guidance for the Survey and Construction for Steel Ships.

(To be continued)

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Table 2.1 System categories in Annex D18.1.1, Part D of
the Guidance for the Survey and Construction for Steel Ships

| 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 or 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 vessel 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 |

While the concept of these categories has already been incorporated into the rules, machinery and systems to which the rules are applied are added due to the amendments.

Examples of systems assigned category III or II are shown in the Notes of the Table.

Further, following machinery and systems are generally assigned category III or II.

Category III

| System | Examples of detailed machinery and system |
|---------------------------------|---|
| Main propulsion systems | Engine control system, Engine remote control system, Main boiler control system, CPP control system, Electric propulsion control system |
| Steering system control systems | Steering system, Azimuth thruster |
| Electric power systems | Generator engine control system, Electric power converter (for electric propulsion ship, etc.) |
| Safety systems | Fire detection and fighting system, Flooding detection and fighting system, Internal communication system, System involved in operation of life saving appliances equipment |
| Other systems | Dynamic positioning system, Drilling system |

Category II

| | |
|---------------------------------------|--|
| Liquid cargo transfer control systems | Cargo control system (e.g. cargo control console, cargo valve remote control system, cargo machinery emergency shut-down system), Reliquefaction system, Inert gas generator (including nitrogen generator), Oil discharge monitoring and control system |
| Fuel oil treatment systems | Viscosity control system, Fuel oil purifier |

(To be continued)

| | |
|---|--|
| Stabilization and ride control systems | Fin stabilizer, Jetfoil |
| Alarm and monitoring systems for propulsion systems | Engine alarm and monitoring system (including data logger) |
| Other systems | Ballast transfer valve remote control system, Oily water separator, Oil content meter, Waste oil incinerator, Sewage treatment plant, Aux. boiler control system, Ballast water treatment system, SOx/NOx scrubber, NOx exhaust gas recirculation system |

The above machinery/systems are examples and the other computer based systems not listed above may be subject to the rules. Therefore, as for the other machinery/systems, system category is to be confirmed to the Society individually.

2. Roles of Stakeholder

In the amended rules, each stakeholder shall be assigned as owner, system integrator or supplier and their responsibilities, roles, etc. are generally set out. As for details of the roles and the stakeholder to be assigned, contents mentioned in 2.1. to 2.5. shall be followed in principle.

2.1 System Integrator (before delivery)

It is defined that system integrator is responsible for the integration of systems and products into the system and providing the integrated system. Before delivery of vessels, system integrator shall be assigned in case where several systems intercommunicated and controlled one another are to be integrated or one integrated system controlling several systems is existing (e.g. fuel gas control system on LNG carriers (fuel gas return valve control system, GCU/main boiler fuel gas control system, etc.)), and owner or shipyard nominates some organization as system integrator (e.g. manufacturer of integrated system) as found necessary. Otherwise, suppliers (manufacturer in general) shall provide/install their own systems on board.

Assigned system integrator shall manage suppliers of system/machinery and address followings:

- To confirm if systems/machinery are type-approved and require suppliers to obtain type approval and submit necessary documents
- To submit documents and test procedures listed in the attached table
- To carry out onboard testing in final integrated environment
- To take over necessary documents, information, etc. to owner (e.g. list of computer based systems and risk assessment report as requested by owner)

2.2 Shipyard

In general, shipyard should be owner before delivery of vessel and make contract with each supplier. Further, shipyard is requested to make a list of computer based systems upon confirming to suppliers and submit it to the Society. Category of each machinery/system is also specified in the list after discussing with each supplier and machineries/systems assigned category I are included.

(To be continued)

In case where system integrator (before delivery) is not assigned by owner, shipyard is to take the role of system integrator and address followings:

- To confirm if systems/machinery are type-approved and require suppliers to obtain type approval and submit necessary documents
- To submit test procedure and carry out onboard testing in final integrated environment (in case where several systems intercommunicated and controlled one another are to be integrated, one integrated system controlling several systems is existing, etc.)
- To take over necessary documents, information, etc. to owner (e.g. list of computer based systems and risk assessment report as requested by owner)

2.3 Supplier

As mentioned in Part 1., machinery/systems to which the rules are applied are added such that machinery/systems for which type approval or product test at shop has not been required may newly obtain type approval or pass product test.

Suppliers of system/machinery assigned category III or II finally shall address followings:

- To apply for type approval
- To submit documents and test procedures listed in the attached table
- To carry out shop test in the presence of the Surveyor
- To carry out simulation test before final integration on board (simulation test to check safe interaction with all other systems is to be carried out before integration on board (at shop or on board))

As for machinery/systems assigned category I, the above are not required and no additional action is necessary.

In the rules, it is specified that the exact category is dependent upon the risk assessment for all operational scenarios. Therefore, regardless of examples in Part 1., in case where supplier considers that system/machinery is to be assigned category I upon analysing detailed control system, failure effect, etc., risk assessment report to determine category is to be submitted. In case where the risk assessment report is accepted by the Society, no additional action is necessary. Further, the risk assessment report is to be submitted in case where machinery/system is to be provided with NK class vessel for the first time and it is not necessary to be re-submitted for following NK class vessels in case where control system and risk assessment result for machinery/system as well as relevant machinery/system are unchanged up to differences of specification for each vessel.

2.4 System Integrator (after delivery)

As for integrated system in which several systems are intercommunicated and controlled one another as mentioned in Part 2.1, in case where any computer system is completely replaced or major control system is modified, contents of former risk assessment/function test may be invalid. In such case, system integrator assigned by owner shall manage suppliers of system/machinery and address followings:

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- To submit documents and test procedures listed in the attached table (as requested by the Society)
- To carry out onboard testing in final integrated environment

System integrator (after delivery) may be assigned occasionally in each case of system replacement/modification or may not be assigned.

In case where system integrator (after delivery) is not assigned by owner, suppliers shall submit documents in accordance with the replacement/modification procedure approved before installation and carry out replacement/modification works.

2.5 Owner

While shipyard should be owner before delivery of vessel as mentioned in Part 2.2, shipowner shall be owner after delivery. Shipowner is to take over necessary documents, information such as list of computer based systems and risk assessment report from shipyard or system integrator (before delivery) and assign system integrator (after delivery) as found necessary.

3. Omission of Document Submission

In case where same machinery/systems are installed on several vessels and a document to be submitted has no revision from that previously submitted for type approval or former individual product approval, only application for omission of document submission may be acceptable from second vessel.

In case where a document has an only minor revision, the application for omission of document submission with documents specifying the revised parts may be acceptable.

4. Omission of Performance Test

As to shop test for computer based system newly required in accordance with the amendments of the Rules and Guidance, omission of its performance may be considered in case where documents showing that used computer based system and connected machinery/equipment are same (manufacturer and model) as those for which shop tests were previously carried out or control system (computer program)/test results are unchanged regardless of the connected machinery/equipment are submitted.

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Table. Documents to be submitted

| Document | Contents and Notes | Stakeholder in charge |
|--|---|---|
| (For approval) | | |
| Quality plan | <p>System integrator and supplier are to operate a quality system regarding SW development and testing and associated HW such as ISO 9001 and submit quality plan including followings:</p> <p>(a) Description regarding responsibilities, system documentation, configuration management and competent staff</p> <p>(b) Description regarding relevant procedures and organizations set in place for followings in SW and associated HW lifecycle</p> <ul style="list-style-type: none"> -To acquire related HW/SW from suppliers (including manufacturing and purchasing) -To write and verify SW code -To validate system before integration in the vessel -SW modification and installation on board the vessel (before/after delivery) <p>(c) Documents to be submitted and tests to be witnessed by the Society</p> | System integrator and Supplier |
| Test procedure for functional tests and failure tests in system before installation on board | <p>Functional test of computer based system is to be carried out at shop and followings are to be checked:</p> <ul style="list-style-type: none"> -SW functions are properly executed -SW and HW properly interact and function together -SW systems react properly in case of failure | Supplier |
| Simulation test procedure before installation on board | For integrated system, etc., simulation test to check safe interaction with all other systems is to be carried out before final integration on board (at shop or on board) | System integrator, Shipyard or Supplier |
| Test procedure for onboard final integration test | <p>For integrated system, etc., followings are to be checked in final integrated environment by operating actual machinery/systems:</p> <ul style="list-style-type: none"> -To function as designed -To react safely in case of failures originated internally or by external devices -To interact safely among all computer based systems | System integrator, Shipyard or Supplier |

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| Application and drawings/ documents for type approval | For computer based system, type approval is to be obtained and followings are to be submitted according to the approval status: (a) In case where type approval has not been obtained, application and drawings/document are to be submitted in accordance with 1.2.1, Chapt.1, Part 7 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use (b) In case where type approval has been obtained, copy of certificate is to be submitted | Supplier |
| (For reference) | | |
| Document related to quality system | Documents, etc. related to quality system are to be submitted to confirm followings, which may be included in the quality plan: (a) The quality system is certified as compliant to the recognized standard by an organisation with accreditation under a national accreditation scheme (e.g. copy of certificate for compliance with ISO 9001) (b) General description regarding security policy such as confidentiality of internal information and non-vulnerability against external interference | System integrator and Supplier |
| List of computer based systems | Table showing used computer based systems (system categories are to be specified and systems assigned category I are to be included) as mentioned in Part 2.2. | Shipyard |
| Risk assessment report | Either of following risk assessment reports is to be submitted according to system category, etc.: (a) Risk assessment report to determine system category (in case where category I can be assigned for machinery/system for which category III or II is to be assigned according to the examples in Part 1.) (b) Detailed risk assessment report for individual system (category III/II) (c) FMEA report to support containment of failure test procedure (if requested) | Supplier |
| | Additional risk assessment report for integrated system, etc. may be submitted upon analysing risks by integration of each system (if not prepared by suppliers) | System integrator or Shipyard |

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|---------------------|--|-------------------------------|
| SW related document | Documents related to SW including followings are to be submitted: (a)List and versions of SW installed in system (b)User manual (c)List of interfaces among systems (d)List of standards used for data links (not necessary to specify the standard for each link) | System integrator or Supplier |
| | Documents for code writing and test including followings: -Functional description -Evidence of verification (detection and correction of SW errors) -Evidence of functional test | Supplier |

* Type approval is approval in accordance with Chap.1, Part 7 of the Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use, required only for circuit board, casing, etc. of computer based system (including programmable devices) and not required for sensors remotely provided from the system. However, sensors for which environmental tests are to be carried out in accordance with Table 18.7.1-1, Part D the Guidance for the Survey and Construction of Steel Ships are to be type-approved as previously required. In case where all of the environmental tests, etc. required for type approval are carried out for each supplied product and individual approval is obtained, type approval is not required to be obtained in advance.

For any questions about the above, please contact:

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