
To: Relevant departments of CCS Headquarters, All CCS Branches, Service Suppliers

Notice on the issuance of implementation of the requirements of suppliers engaged in survey using Remote Inspection Techniques (RIT) for survey of ships and offshore units' structure

In order to meet the industry's demand for the approval of new suppliers, CCS has revised the Guidelines for Management of Approval of Suppliers and Personnel Qualification regarding to the requirements for the suppliers engaged in survey using Remote Inspection Techniques (RIT) for survey of ships and offshore units' structure, which is detailed in the attachment. In addition to meeting the above requirements, the service suppliers which intend to apply for such supplier approval should also meet the requirements of Chapter 1 General of Part 1 of the above-mentioned Guidelines published by CCS.

This technical notice is published on CCS website (www.ccs.org.cn), and relevant new requirements will be effective from October 15, 2024. Please contact Classed ship in service Department of CCS Headquarters for any inquiry in this regard (E-mail address: cdwork@ccs.org.cn).

Attachment: Suppliers engaged in survey using Remote Inspection Techniques (RIT) for survey of ships and offshore units' structure

Chapter 16 Suppliers engaged in survey using Remote Inspection Techniques (RIT) for survey of ships and offshore units' structure

16.1 Application

16.1.1 This Chapter applies to suppliers engaged in survey using Remote Inspection Techniques (RIT) for the following survey items of ships and offshore units' structure:

(1) Suppliers engaged in using Remote Inspection Techniques (RIT) for Close-Up Survey of ships and offshore units' structure.

(2) Suppliers engaged in using Remotely Operated Vehicles (ROV) for in-water Close-Up Survey of the internal compartments. Such suppliers shall firstly comply with the requirements of Chapter 3, Part 1 of this Guidelines and hold the approval of in-water survey.

(3) Suppliers engaged in above-water thickness measurement and/or non-destructive testing using RIT of metal structures of ships and offshore units. Such suppliers shall firstly comply with the requirements of Chapter 2 and/or Chapter 10 of Part 1 of this Guidelines and hold the approval of above-water thickness measurement of metal structures and/or above-water non-destructive examination of metal structures.

16.2 Definitions

16.2.1 Close-Up Survey: A Close-Up Survey is a survey where the details of structural components are within the close visual inspection range of the surveyor i.e. normally within reach of hand.

16.2.2 Remote Inspection Techniques (RIT): RIT is a means of survey that enables examination of any part of the structure without the need for direct physical access of the surveyor (refer to IACS Rec.42). Remote inspection techniques (RIT) may include the use of:

- (1) Unmanned aerial vehicle (UAV);
- (2) Drones;
- (3) Unmanned robot arm;
- (4) Remotely Operated Vehicles (ROV);
- (5) Climbers;
- (6) Other means acceptable to CCS.

16.3 Personnel

16.3.1 The supplier is to train its supervisor and operator to apply the remote inspection technology and to ensure that their capability and competence are verified by CCS. The supervisor and operator shall have training records of the following knowledge:

- (1) Marine and/or offshore nomenclatures.
- (2) The structural configuration of relevant ships types and offshore units, including internal structure; the minimum Rule requirements for the structure of relevant ships types and MOUs, the

recognition of structural deterioration (including corrosion, buckling, cracking and deteriorated coatings) and use of the reporting system.

(3) The remote inspection equipment and its operation.

(4) Survey plans for examination of hull spaces of various configurations, including appropriate flight plans if using a UAV.

(5) Thickness measurement (TM) and non-destructive examination (NDE) in accordance with a recognized National or International Industrial NDE Standard (if applicable).

(6) Requirements for close-up inspection and thickness measurement of ship and/or offshore unit structures (if applicable).

(7) When using UAVS for services, CCS “Guidelines for Using UAV for Survey” and/or related operational guidelines.

According to the requirements of Chapter 2, Part 1 of this Guideline, thickness measurement personnel who have completed the training of above-water thickness measurement of metal structures of ships and/or offshore units may be exempted from relevant thickness measurement trainings according to the training certificate.

For suppliers engaged in using RIT for survey and located in Hong Kong, Macau, Taiwan and overseas, the training certificate of “suppliers engaged in using remote inspection technology for survey of ships and MOU structures” issued or accepted by QSCS certified classification societies is acceptable to CCS.

16.3.2 The operators carrying out the inspection shall be certified according to the recognized national requirements or an equivalent industrial standard (e.g. YYY level) and have had at least one year’s experience as an assistant carrying out inspections of ship and/or MOU's structure (including participation in a minimum of five different assignments). The operators of those RIT which require, according to the international and national legislations, to be licensed for their use shall hold valid documentation issued by the appropriate Bodies. UAV pilots are to be qualified and licensed in accordance with applicable national requirements and/or an equivalent industrial standard accepted by CCS. Operators shall fully understand the performance parameters, scope of application, and usage limitations of RIT equipment.

16.3.3 In addition to meeting the requirements for operators in 16.3.2, supervisors shall be certified according to the recognized national requirements or an equivalent industrial standard (e.g. YYY level) and shall have a minimum of two years’ experience in survey of ship and/or MOU's structure. Supervisors shall fully understand the performance parameters, scope of application, and usage limitations of RIT equipment.

16.3.4 The supplier shall ensure that the number of operators and supervisors is commensurate with the established business scale and the quantity of on-site operation, recording, preparation and audit reports. At least one RIT supervisor and one RIT operator should be provided for on-site service. When using remote inspection technology for above-water thickness measurement and/or non-destructive examination of metal structures, RIT supervisors and

operators shall meet the relevant requirements of Chapter 2 and/or Chapter 10, Part 1 of this Guideline. The supervisors (technical personnel in charge) and operators shall be approved by CCS and hold corresponding thickness measurement training certificates/non-destructive examination personnel certification certificates. When using ROV for in-water close-up survey of internal compartments, RIT supervisors and RIT operators shall firstly meet the relevant requirements of Chapter 3, Part 1 of this Guideline and hold the corresponding ROV qualification certificate.

16.4 Equipment

16.4.1 The following shall be available for RIT:

(1) Remotely operated platform with data capture devices capable of operation within an enclosed space;

(2) Means of powering the platforms with sufficient capacity to complete the required inspections, including spare batteries (if applicable);

(3) Data collection devices which may include function of capturing in high definition both video images and still images;

(4) Illumination;

(5) High definition display screen with live high definition feed from inspection cameras (if applicable);

(6) Means of communication;

(7) Data recording (if applicable);

(8) Equipment for carrying out thickness gauging and/or non-destructive examination, as relevant to the work to be performed, the requirements of Chapter 2 or/and Chapter 10, Part 1 of this Guideline shall be complied.

16.4.2 Apart from the requirements of Chapter 3.4.1 of Part 1 of this guideline, Suppliers engaged in using ROVs for in-water close-up survey of internal compartments shall be equipped with at least two sets of equipment that meet the following requirements:

(1) Remote Operated Vehicle (ROV) that meets the requirements for in-water inspection of internal compartments;

(2) The accuracy of positioning and navigation equipment of ROV shall meet the requirements of in-water close-up survey of internal compartments;

(3) Control equipment and software that meet the various functions of ROV.

16.4.3 Suppliers engaged in using UAVs for above-water close-up survey and/or thickness measurement of metal structures of ships and MOUs shall be equipped with at least two sets of UAVs that meet the following requirements.

16.4.3.1 Safety performance

(1) UAVs that carry out survey in spaces where light intensity is insufficient and GPS signals are weak or lost shall be capable of flying and hovering stably in this environment. The UAV can stably approach the inspected structure.

(2) UAVs shall have automatic collision evasion or certain anti-collision capability. The UAVS shall not cause damage to the structure and its coating.

(3) When powered by battery, UAVs shall have power warning and low power alarm function, and shall be capable of forced landing or returning when the battery is running low.

(4) When using tethered power supply, UAVs shall be equipped with spare batteries to enable forced landing or flight return, and have the cable plug anti-disengage device.

(5) Where there is risk of loss of communication, UAVs shall have one of the functions of automatic hovering, forced landing or returning.

(6) UAVs are to be equipped with warning lights, with different colors indicating the status of the UAVs.

(7) UAVs and their flight control systems shall not affect normal operation of electrical and electronic equipment onboard ships and offshore units.

(8) UAVs shall have wind resistance capacity required by surveys.

(9) UAVs operating in dangerous areas shall be explosion-proof, unless the areas have been tested as being safe from explosion, well-ventilated at all times, and inspected regularly to ensure that there is no re-accumulation of flammable gas, and there is no explosion risk due to the use of UAVs.

16.4.3.2 Data transmission and communication

(1) Data transmission and communication shall be via open wireless band or wire communication.

(2) UAVs shall have strong anti-interference ability. When working in the internal compartments of steel vessels and offshore units, UAVs shall have stable communication and real-time image transmission capability.

16.4.3.3 Data storage

(1) Data type: video, photo, thickness measurement data (when using RIT for thickness measurement services);

(2) Video resolution: no less than 1080P;

(3) Image resolution: no less than 1080P;

(4) Video format: MP4 or other mainstream formats;

(5) Photo format: JPG or other mainstream formats;

(6) Thickness measurement data (when using RIT for thickness measurement services): common data format easy to be stored, read, and exchanged;

(7) Storage mode and capacity: the storage capacity of the airborne storage card or the software system of the UAV ground control station shall be not less than the data volume collected continuously during the maximum endurance time of the UAV, meanwhile, there shall be spare

storage cards or space enough for this survey or continuous operation of not less than 4 hours.

16.4.3.4 Requirements for airborne illumination

UAVs carrying out survey in spaces where illumination is insufficient shall be equipped with suitable airborne lighting equipment to meet survey requirements. The light should generally be flooded to avoid light spots in the image or reflections due to insufficient lights or over-brightness, so that structural details can be seen clearly.

16.4.3.5 Requirements for airborne cameras

- (1) Adapting to environment with insufficient light
- (2) Good anti - shake performance
- (3) Images taken shall be able to show the structural details clearly and truthfully without distortion
- (4) Having real-time photo function

16.4.3.6 Requirements for thickness measurement equipment (when using RIT to measure thickness)

(1) The thickness gauge carried by UAVs shall meet the requirements of Article 2.3 of Chapter 2, Part 1 of this Guideline;

(2) Thickness gauge carried by UAVs shall be able to adjust position via remote control. The probe of the thickness gauge shall be perpendicular to the surface of the structure being measured, and shall be able to continuously measure the thickness of the structure from different directions using the maneuverability characteristics of UAVs and the dynamics of the thickness gauge probe. The measurement direction can be defined as: horizontal (-90° to $+90^{\circ}$), vertical upward, vertical downward, inclined upward (0° to 90°), inclined downward (0° to -90°), inclined rightward (0° to 90°), inclined leftward (0° to -90°), and the composite direction of the above directions in the three-dimensional space;

(3) During thickness measurement, UAVs should maintain a stable flight and operation state, especially in areas disturbed by local air flow, such as narrow /top areas;

(4) During thickness measurement, the probe shall be able to fit the structural surface in a stable manner and shall maintain such fitness for at least 5 consecutive seconds;

(5) The ground control station of UAVs shall be able to display real-time thickness measurement data and corresponding pulse reflection waveform;

(6) UAVs shall be equipped with camera to collect real-time images of the thickness measurement probe and the measured structure, which shall be displayed at the ground control station of UAVs;

(7) UAVs shall be equipped with software to record real-time thickness measurement data and images of the measured structure; such software shall be able to record the cabin/location, structural unit, and component location corresponding to the thickness measurement data.

16.4.4 Suppliers using Climbers for above-water close-up survey and/or thickness measurement of metal structures of ships and MOUs shall be equipped with at least two sets of

Climbers that meet the following requirements.

16.4.4.1 Safety performance

(1) Being able to climb, overcome obstacles and prevent falls during survey, and shall be equipped with sufficient strength and reliable fall arrest rope and/or fall arrest device. Under the operating conditions, climbers shall be prevented from slipping or falling due to damaged coatings, rust scales, oil sludge, cargo residues, silt, etc., or falling when overcoming obstacles;

(2) Anti-collision measures shall be in place to avoid damages to the structure and its coating caused by the Climbers and their walking devices;

(3) When powered by battery, there shall be power warning and low power alarm;

(4) When using tethered power supply, tethered Climbers shall be equipped with spare batteries to enable forced landing or flight return. Cable plug anti-disengage device shall be provided;

(5) In case of power failure, Climbers shall have no risk of falling;

(6) In case of failure, Climbers shall be able to return or to be recovered;

(7) Shall be equipped with warning lights, indicating status of the Climbers with different colors of the warning lights;

(8) Climbers and their climbing control systems shall not affect normal operation of electrical and electronic equipment onboard ships and offshore units;

(9) Climbers operating in dangerous areas shall be explosion-proof, unless the areas have been tested as being safe from explosion, well-ventilated at all times, and inspected regularly to ensure that there is no re-accumulation of flammable gas, and there is no explosion risk due to the use of Climbers

(10) The Climbers shall have self-cleaning function;

(11) The Climbers shall have braking function or slow down and stop functions;

(12) Climbers with a permanent magnet wheel shall be equipped with a magnetic detection device and a device that can be conveniently removed from their structures. The devices referred to in this Article may be self-contained devices and need not be part of the Climbers.

16.4.4.2 Data transmission and communication

(1) Data transmission and communication shall be via open wireless band or wire communication;

(2) Climbers shall have strong anti-interference ability. When working in the internal compartments of steel vessels and offshore units, Climbers shall have stable communication and real-time image transmission capability

16.4.4.3 Data storage

(1) Data type: video, photo, thickness measurement data (when using RIT for thickness measurement);

(2) Video resolution: no less than 1080P;

(3) Image resolution: no less than 1080P;

- (4) Video format: MP4 or other mainstream formats;
- (5) Photo format: JPG or other mainstream formats;
- (6) Thickness measurement data (when using RIT for thickness measurement) : common data format that is easy to store, read, and exchange;
- (7) Storage mode and capacity: the storage capacity of the onboard storage card or the software system of the ground control station of the Climber shall be not less than the data volume collected continuously during the maximum endurance time of the Climber, meanwhile, there shall be spare storage cards or space enough for this survey or continuous operation of not less than 4 hours.

16.4.4.4 Requirements for onboard illumination

(1) Climbers carrying out survey in spaces where illumination is insufficient shall be equipped with suitable onboard lighting equipment to meet survey requirements. The light should generally be flooded to avoid light spots in the image or reflections due to insufficient lights or over-brightness, so that structural details can be seen clearly.

16.4.4.5 Requirements for onboard cameras

- (1) Adapting to environment with insufficient light;
- (2) Good anti-shake performance;
- (3) Images taken shall be able to show the structural details clearly and truthfully without distortion;
- (4) Having real-time photo function

16.4.4.6 Requirements for thickness measurement equipment requirements (when using RIT to measure thickness)

(1) The thickness gauge carried by Climbers shall meet the requirements of Article 2.3 of Chapter 2, Part 1 of this Guideline;

(2) Thickness measurement equipment onboard Climbers shall be able to adjust position via remote control. The probe of the thickness gauge shall be perpendicular to the surface of the structure being measured, and shall be able to continuously measure the thickness of the structure from different directions using the maneuverability characteristics of Climbers and the dynamics of the thickness gauge probe. The measurement direction can be defined as: horizontal (-90° to +90°), vertical upward, vertical downward, inclined upward (0° to 90°), inclined downward (0° to -90°), inclined rightward(0° to 90°), inclined leftward (0° to -90°), and the composite direction of the above directions in the three-dimensional space;

(3) During thickness measurement, Climbers shall maintain a stable working state;

(4) During thickness measurement, the probe of the onboard thickness gauge shall be able to fit the structural surface in a stable manner, and shall maintain such fitness for at least 5 consecutive seconds;

(5) The ground control station of Climbers shall be able to display real-time thickness measurement data and corresponding pulse reflection waveform;

(6) Climbers shall be equipped with camera to collect real-time images of the thickness measurement probe and the measured structure, which shall be displayed at the ground control station of Climbers;

(7) Climbers shall be equipped with software to record real-time thickness measurement data and images of the measured structure; such software shall be able to record the cabin/location, structural unit, and component location corresponding to the thickness measurement data.

16.5 Documents

16.5.1 The supplier shall have documented operational procedures and guidelines for how to plan, carry out and report inspections; how to handle/operate the equipment; collection and storage of data. These shall include:

(1) Requirements for preparation of inspection plans when UAV are part of the equipment flight plans shall be included;

(2) Operation of the remotely operated platforms;

(3) Operation of lighting;

(4) Calibration of the data collection equipment;

(5) Operation of the data collection equipment;

(6) Two-way communication between the operator, platform, surveyor, other personnel such as support staff and ships officers and crew;

(7) Guidance of the operator to provide complete coverage of the structure to be inspected;

(8) Guidance for the maintenance of the remotely operated platforms, data capture and storage devices and display screens, as applicable;

(9) Requirements for the collection and validation of data;

(10) If data is to be stored, then requirements for location attribution (geo-tagging), validation and storage of data;

(11) Requirements for the reporting of inspections, including the recording of damages and defects found during inspection and repair work.

16.5.2 The supplier shall maintain the following documents:

(1) Records of training;

(2) Operator statutory and regulatory certificates and licenses;

(3) Equipment register for UAVs, Climbers, data collection devices, data analysis devices and any associated equipment necessary to perform inspections;

(4) Equipment maintenance manuals and records / logbook;

(5) Records of calibration;

(6) UAV/ Climber operation logbook.

16.5.3 Suppliers engaged in using remotely operated vehicle (ROV) for in-water close up survey of the internal compartment, in addition to the applicable provisions of Section 3.5.1, Chapter 3, Part 1 of this Guideline, the following shall also be included in the operational

procedures and guidance:

(1) ROV operation and maintenance guidelines;

(2) Means to ensure the positioning and navigation of the ROV within the compartment and guidelines for operation and maintenance of the equipment.

16.5.4 The supplier shall provide documentation explaining the performance parameters, scope of application, and usage limitations for the remote survey equipment and the equipment used for thickness measurement and/or non-destructive examination (if applicable).

16.6 Other requirements

16.6.1 Performance verification of remote inspection equipment

During the initial approval or additional review following changes to RIT equipment, CCS is to conduct verification of RIT equipment and equipment for thickness measurement and/or non-destructive examination (if applicable) in accordance with the requirements in 16.4 to 16.5 of this Chapter. Verification shall include documentation verification and/or on-site verification. The suppliers and/or RIT equipment manufacturers shall provide documents related to remote inspection, including but not limited to: manufacturer certificate or equivalent document, quality testing report or equivalent document, performance parameters, scope of application and specification of usage restrictions, etc. The suppliers and/or RIT equipment manufacturers shall arrange a site to carry out performance verification of RIT equipment.

16.6.2 Operational verification

CCS conducts operational verification for items within the scope of services for which the suppliers have applied for approval. Generally, compartments of typical structures of ships in service may be selected for operational verification.

16.6.3 Suppliers using UAV shall comply with the requirements of the local civil aviation administrations, such as the relevant requirements of the Civil Aviation Administration of China for institutions, pilots, UAVs, flight activities, airspace restrictions, real-name registration and other relevant requirements.

16.6.4 Other requirements for thickness measurements with RIT

(1) Thickness measurement shall be carried on clean surface and under good coating condition. In case there are attachments such as rust, oil sludge, cargo residue and silt on the surface of the structure that affect the accurate acquisition of thickness measurement data, RIT shall not be used for thickness measurement unless the attachments can be removed prior to the measurement.

(2) The thickness gauge probe shall be clean during the service process, and corresponding operation procedures shall be developed;

(3) For each thickness measurement point, the thickness data displayed by the ground control station of the RIT equipment shall remain unchanged for at least 5 consecutive seconds before it can be considered valid.

16.6.5 The supplier shall have data storage devices and retain survey data for at least 5 years,

including videos, images, thickness measurement data, reports, and other files.

16.6.6 The supplier shall obtain verification/witness of the surveyor for all work during the service, who shall also sign the report document. The report document shall be filed.

Appendix 1: List of documents

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No.	Document No./name	Remark
1	IACS UR Z7	
2	IACS UR Z10	
3	IACS UR Z17	
4	CCS GUIDELINES FOR USE OF UNMANNED AERIAL VEHICLES FOR SURVEYS	
5	CCS Guidelines for Thickness Measurement of Hull	
6	CCS Rules for Classification of Sea-going Steel Ships	
7	CCS Rules for Classification of Mobile Offshore Units	
8	CCS Rules for Classification of Offshore Floating Installation	
9	The relevant administrative provisions of the local civil aviation administrations for the "use of UAV for survey of ships and/or MOUs".	