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Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation

Fifty-sixth session
Geneva, 12–14 February 2020
Item 10 of the provisional agenda
Mutual recognition of boatmasters' certificates and harmonization of professional requirements in inland navigation

Revision of resolution No. 31: Standards for the approval of simulators

Note by the secretariat*

Mandate

1. This document is submitted in line with the Proposed Programme Budget for 2020, part 5, Regional cooperation for development, section 20, Economic Development in Europe. Programme 17, Economic Development in Europe (A/74/6 (Sect. 20) and Supplementary).

2. At its fifty-fourth session, the Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation decided to consider updating the Recommendations on Minimum Requirements for the Issuance of Boatmaster's Certificates in Inland Navigation with a view to their Reciprocal Recognition for International Traffic (resolution No. 31, revised) and asked the secretariat to hold consultations with the European Committee for drawing up standards in the field of inland navigation (CESNI) on this issue (ECE/TRANS/SC.3/WP.3/108, paras. 37-38).

3. In 2018, CESNI adopted a set of standards for qualifications in inland navigation professional requirements, called the European Standard for Qualification in Inland Navigation (ES-QIN).** Annex I to this document contains the newly adopted standards for technical and functional requirements applicable to vessel-handling simulators and radar simulators and annex II – standards for the administrative procedure for the approval of vessel-handling simulators and radar simulators*** which could be used as the basis for updating resolution No. 31.

* This document was scheduled for publication after the standard publication date owing to circumstances beyond the submitter's control.

** www.cesni.eu/en/documents/es-qin-2018.

*** See ES-QIN, Part III.

Annex I

Standards for technical and functional requirements applicable to vessel-handling simulators and radar simulators (Resolution CESNI 2018-II-14)

1. Technical and functional requirements for vessel handling and radar simulators in inland navigation

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
1	Inland navigational radar installation	At least one inland navigational radar installation with the same functionalities as a type approved inland navigational radar installation according to ES-TRIN[1] has to be installed on the simulator.	It has to be verified if the installation has the same functionalities as the type approved inland navigational radar installation.	x	x
2	Communication system	The simulator shall be fitted with a communication system comprising an alternative internal telephone link and two independent inland waterway radio communication systems.	It has to be verified if the simulator is fitted with communication systems	x	x
3	Inland ECDIS	At least one Inland ECDIS has to be installed on the simulator.	It has to be verified if the installation has the same functionalities as an Inland ECDIS.	x	
4	Exercise area	The exercise area contains at least a representative river with side arms or canals and harbours	Visual inspection of the area	x	x
5	Sound signals	Sound signals can be given using foot pedals or buttons.	It has to be verified if foot pedals or buttons function correctly.	x	x
6	Night time navigation lights panel	Night-time navigation lights panel is installed on the simulator.	It has to be verified if night time navigation lights panel functions correctly.	x	x
7	Mathematical models for craft	At least three mathematical models of representative types of craft with different methods of propulsion and loading conditions including one	It has to be verified if the three mandatory models are available.	x	

[1] the European Standard laying down Technical Requirements for Inland Navigation Vessels.

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
		small craft which could be a tug, one medium-sized craft (e.g. 86 m length) and one large craft (e.g. 110 or 135 m length).			
8	Mathematical models for craft	At least one mathematical model of representative type of craft (e.g. 86 m length).	It has to be verified if the mandatory model is available.	x	
9	Number of available target craft[2]	The simulator shall include target craft of at least 5 European Conference of Ministers of Transport (CEMT) classes.	It has to be verified if the required number and variety of target craft is available.	x	x
10	Operator station	The operator shall be able to communicate on all very high frequency (VHF) channels. The operator has to be able to monitor the use of the channels.	It has to be verified if the operator can communicate on all VHF channels and if the operator can monitor the use of all channels.	x	x
11	Various exercises	There shall be a possibility to create, store and run various exercises, which shall be manipulable while running.	Different operations shall be performed.	x	x
12	Separable exercises	During examination of more than one applicant, the applicants' exercises shall not interfere with the examination of another applicant.	The exercise shall be replayed for each applicant.	x	x
13	Craft’s bridge functions and layout	The wheelhouse section shall be designed for radar navigation by one person as set out in ES-TRIN 2017/1.	It has to be verified if the bridge layout and equipment functions correspond to the applicable technical requirements for inland waterway craft. It has to be verified if the wheelhouse is designed for one-person steering operations.	x	x
14	Steering station (bridge/cubicle)	Steering stations resemble those aboard inland craft as regards form and dimensions.	Visual inspection.	x	x
15	Operator station	1. There shall be a separate room in which operator(s) and examiner(s) can be seated, where the examiner must be able to perceive the radar image of the applicant.	Visual inspection of the operator station and functionality check.	x	x

[2] A target craft is fully controlled by the simulator and may have much simpler motion behaviour as an own craft.

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
		2. The wheelhouse and operator space must be separate from each other. They shall be as much soundproof as possible. 3. The operator must be able to operate at least two VHF channels at the same time. 4. The operator must be able to clearly identify which radio communication channel the applicant is using.			
16	Briefing/Debriefing station	Possibility for replay at an operator or debriefing station.	Assessment activities have to be monitored.	x	x
			Own craft[3]		
17	Degrees of freedom	The simulator shall be able to visualize the motion in six degrees of freedom.	The degrees of freedom implemented in the simulator can be evaluated by observing the visualization system or by instruments. Therefore, the following manoeuvres are carried out using small craft which usually move more distinctively and faster than bigger ones. If the horizon is swinging when looking forward during navigating along curves, the roll motion is implemented. If the craft's bow raises and drops with strong longitudinal accelerations, the pitch motion is implemented. If the echo sounder display changes when running at higher speeds at constant water depth, the heave motion is implemented. This test implies the modelling of the squat effect.	x	
18	Degrees of freedom	The simulator shall be able to simulate the motion in three degrees of freedom.	The degrees of freedom implemented in the simulator have to be evaluated.		x

[3] An own craft is an object in the simulator which is fully controlled by a human being and provides a visual representation of the scenario.

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
19	Propulsion system	The simulation of all components of the propulsion system is carried out close to reality and considers all relevant influences.	The propulsion system has to be tested by acceleration and stopping manoeuvres during which the performance of the engine (in terms of reaction to throttle) and craft (in terms of maximum speed and time behaviour) can be observed.	x	x
20	Control devices	The control device behaves close to reality regarding the rudder rate of turn and considers the most important influences.	To test the quality of the simulation of control devices, different investigations can be carried out. Limitations are given where it is not possible to evaluate the behaviour without protocols of state variables. Reaction: The control device is used in forward and backward motion. It is observed if changes of the craft's direction are initiated. Rudder rate of turn: The control device is used and the rate of turn is observed on the display. It can be measured if the rate is realistic.	x	x
21	Shallow water effects	The effect of limited water depth on the power demand and the manoeuvring behaviour is modelled correctly in terms of quality.	Two types of tests are proposed which allow judging the quality regarding the consideration of the shallow water influence: Running straight ahead: on different water depths the achieved maximum speed is measured, standardized with the speed on deep water and plotted versus the parameter draught by water depth (T/h). The comparison with existing data from model tests gives information about the quality of the shallow water influence in the simulation. Turning circle: by running a craft at constant power and a rudder angle of 20° on lateral unrestricted water, the values of speed, drift angle, rate of turn and turning circle diameter of a stationary turning craft can be recorded on stepwise reduced water depth. Plotting this date versus T/h allows determining how drift angle, rate of turn, speed and the diameter change with the water depth.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
22	Influence of current	At least two current measuring points on the craft exist so that the current yaw moment can be calculated.	Tests are planned to check the existence of the performance characteristic and its consideration in the simulation: An own craft without propulsion is put into a river with existing current. It is observed whether the craft is taken by the current. Besides, it is checked whether it is accelerated up to the current speed. If the current follows the river direction, it will be checked further whether the craft slightly rotates. A trial with the port entrance from a river with current shows, to what extent the simulator realistically calculates a yawing moment generated by the inhomogeneous current.	x	x
23	Influence of wind	The wind influence generates forces in the horizontal plane according to the actual wind speed and direction. The wind also generates yaw and roll moments.	To check the quality level of the wind influence, different tests can be carried out. To be able to easily detect these effects, relatively high wind speeds are to be chosen. Execute the test as follows: conduct a test for both head-wind and side-wind in two different wind speeds in an area with no influence but wind. Start the wind and notice the behaviour. Stop the wind and notice the behaviour again. Start with a non-moving craft.	x	
24	Bank effect	The lateral force and yaw moment tend to change with distance to the bank and speed in a proper manner.	For checking the bank effect in the simulator an exercise area is needed which provides an embankment or wall on one side. The following tests have to be carried out: The craft is running parallel along the wall. It is checked, whether the straight motion is affected and if the craft is attracted by the wall and if the bow turned away from it. The distance to the bank or wall and the speed of the craft are varied and it is observed how the effects change.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
25	Craft-craft interaction	Craft are interacting with each other and realistic effects are computed.	For an entire check of the craft-craft interaction an exercise with two own craft shall be started on the simulator in a lateral unrestricted water. If this is not possible, the test may also be carried out using a traffic craft as the other craft. For a good assessment of the results, the craft shall start in parallel courses at a relatively small lateral distance. For both overtaking and encountering it will be checked to which extent the own craft shows attraction and rotation. The water depth is reduced. It shall be checked, if the interaction effects increase. The distance between the craft shall be increased to find out, if the effects decrease. The speed of the other craft shall be increased. The functional relation between passing craft effect and encountering speed shall be checked.	x	
26	Squat	Both dynamic sinkage and trim are modelled in dependency of the speed, water depth and draught.	This feature is best tested in an area with lateral unrestricted water and constant water depth. A trial run has to show if the feature “squat” can be checked using echo sounders. Different values for the under keel clearance at bow and stern show whether the craft trims. With increasing speed the functional relation between squat (difference between under keel clearance during standstill and motion) and craft speed is checked. It is tested whether the squat increases at constant speed but decreasing water depth.	x	
27	Canal effect	Consideration of the current back flow. The back flow is not linear to the craft speed.	Back flow is a physical effect brought in the simulator as a resisting force executed on the craft. To test this, a craft is put in a narrow canal, the craft runs steady with	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			constant power. The speed is then measured. The power is increased and the speed is measured. The test is repeated in open water with the same constant power (two levels) is applied. The expected effect is: The speed in the narrow canal is less than in open waters at the same power setting. On a larger power setting, the speed difference is bigger than on a lower power setting.		
28	Lock effect	In a lock the craft experiences the same effects as in a canal. The lock causes an additional effect due to a displacement flow caused by the craft with a large blockage factor entering the lock (the piston effect).	The test for the canal effect shows the back flow. This test does not have to be repeated. The piston effect can be demonstrated by: Take the craft into the lock at a relatively high speed. The craft shall experience additional resistance after entering the lock (slow down). When the propulsion is stopped the reversing forces shall still be available and the craft shall reverse slightly. Start in the lock, set propulsion to a fixed setting. The craft will leave the lock, experience a resisting force due to the piston effect. After leaving the lock (the craft free of the lock) the resisting force shall stop, shown by a sudden increase in speed that can be noted.	x	
29	Grounding	Grounding slows the craft down, it can be heard by a sound but does not lead in all cases to the craft stopping. Grounding is notified to the operator.	An exercise area with an even as well as a softly rising bottom is necessary for the check of grounding. Here, the existence of suitable depth information in the simulator itself is addressed and not the representation in the visualization system. When grounding on a beach it has to be tested whether the craft really stops, and if so whether it stops abruptly or it slows down. During grounding, the change of the horizontal plane of the craft has to be checked with the visualization system.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			Running over a flat bottom at extreme shallow water, it has to be tested whether the craft grounds due to squat while the speed is increased continuously. For all groundings it has to be checked, if this incident is accompanied by a sound.		
30	Grounding Collision craft-shore Collision craft-craft Collision craft-bridge	A grounding, a collision craft- shore, craft-craft, craft or bridge are notified in the simulation to the candidate and the operator.	Visual inspection		x
31	Collision craft-shore	Collisions craft-shore are notified in the simulation at least by a sound. The simulation slows the craft down. The calculation of the collision is carried out using a 2-dimensional shape of the craft.	Only for exercise areas with different objects on the shore the simulation of the collision craft-shore can be tested. By sailing against different objects it can be tested whether the simulator can detect these and react on them. For different objects it shall be tested whether there are certain types, for which no collision reaction occurs. The sound for the collision can be tested with the audio system of the simulator, if available. The observation of the collision in the visualization system shows whether the collision occurs abruptly or if a crumble zone is simulated. A collision with a flat angle at low speed can show whether an elastic push is computed.	x	
32	Collision craft-craft	Collisions craft –craft are notified in the simulation at least by a sound. The simulation slows the craft down. The calculation of the collision is carried out using a 2-dimensional shape of the craft.	Under the precondition that it makes no difference for the own craft whether the other craft it is colliding with is another own craft or a traffic craft, different collisions can be carried out. It is checked which reaction occurs on the simulator during a craft-craft collision for the own craft and whether a sound can be noticed.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			In the instructor station, it is checked with sufficient magnification, if the outlines of the craft are used for the collision detection. It is tested, if the collision occurs exactly at that moment, when the outlines touch each other. It is checked, if there is a precise detection of the collision also for various craft with different shapes.		
33	Collision craft-bridge	Collisions craft-bridge are detected using a static height value (corresponding to a lowered wheelhouse, lowered mast). Collisions are notified in the simulation at least by a sound. The simulation slows the craft down	To examine this achievement, a bridge must exist in the exercise area and Inland Electronical Navigation Chart is used. It is checked whether during the passage of a bridge with not enough clearance a collision occurs and what is the outcome for the further simulation. It is checked whether a safe passage is possible with sufficient reduction of the water level or increase of the draught. This shall also be checked in the visualization system. Different runs are necessary to check the collision point on the ship, if only one exists. In this case it can also be localised whether the bridge causes a collision in the centre line or in the outer boundaries.	x	
34	Lifting wheelhouse	Collision height and eye point shall be adaptable to the position of the bridge. A continuous motion of the lifting wheelhouse shall be available.	A precondition for testing this performance feature is the availability of a typical inland waterway craft, e.g. a craft of 110 m length. The basic availability of this functionality can be checked by the presence of an operating device for the change of the bridge position. The function can be tested on the bridge and it shall be checked, whether arbitrary positions may be chosen and whether the motion is abrupt or with realistic speed.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			By positioning another own craft in the vicinity it may be tested whether this functionality is also available for other craft in the visualization system. It can be observed whether also navigational lights and day signs move according to the motion of the lifting wheelhouse of the second own craft in the visualization system.		
35	Ropes	The visualization system shall display the dynamics of both the craft and the rope (e.g. slack, elasticity, weight and breaking and connections to the bollard points).	an exercise area with a quay wall, mooring with a rope shall be tested. When using the rope, it shall be checked whether the rope connects to certain bollard points. The breaking of a rope shall be checked by trying to stop the craft with a rope from full speed The slack of a rope shall be checked by decreasing force and distance.	x	
36	Anchors	Anchors can be set and hauled in. The water depth and the dynamics of the chain are considered.	In an exercise area with restricted water depth and an own craft with one or several anchors, the anchor function can be examined. It is reasonable, if a constant current with a variable velocity is available. Setting and hauling in of the anchor is only possible if appropriate operating elements exist. It has also to be checked whether there are instruments indicating the chain length. It is checked whether the speeds differ while setting and hauling in. Besides, it has to be also checked whether a suitable sound can be heard. By variation of the water depth it has to be checked, if the water depth has an influence on the anchor function. At low current velocity, it has to be tested whether the craft is oscillating and coming to halt after anchoring.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			At continuous increase of the current, it has to be tested, if the anchor holds the craft. If a single anchor does not hold, it has to be checked, if the craft halts with two anchors when two anchors are used.		
37	Towing (operation between two craft	While towing, the dynamics of both craft and the rope connection are considered.	The exercise area for checking of the towing function can be an open sea area. Besides the towing or towed own craft, another craft (own craft or traffic craft) is necessary. The basic condition for towing can be tested by bringing out a towing line between an own craft and the other craft. If this is not possible, it has to be checked whether at least an alternative method for defining a force coming from a virtual tug is given. It is checked whether the other craft, used as towing assistance, can accelerate the towed own craft and also initiate a yaw motion by a lateral pull. It is checked whether the towing own craft can move the other craft by suitable manoeuvres and stop it and whether the other craft also can be brought into rotation by a lateral pull.	x	
				Traffic craft	
38	Quantity of traffic craft	A minimum of ten traffic craft shall be available.	Test has to show if the required quantity can be inserted in an exercise.	x	x
39	Control of traffic craft	The traffic craft can follow routes with change of course and speed in a realistic way.	The availability of control functions has to be checked by creating a new exercise including traffic craft.	x	x
40	Motion behaviour	Reasonably smooth motion behaviour.	The test procedure on control of traffic craft applies.	x	x

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
41	Influence of the wind	The traffic craft reacts to a given wind by showing a drift angle.	Wind applied to an exercise has to show a drift angle on the traffic craft changing with the speed and the direction of the wind.	x	
42	Influence of the current	The traffic craft reacts to a given current by showing a drift angle.	Current applied to an exercise has to show a drift angle on the traffic craft changing with the speed and the direction of the current.	x	x
43	Image section and size	The visualization system allows a view around the horizon (360 degrees). The horizontal field of view may be obtained by a fixed view of at least 210 degrees and additional switchable view(s) for the rest of the horizon. The vertical view allows the view down to the water and up to the sky as it would be seen from the regular steering position in the wheelhouse.	Visual inspection of the running simulator.	x	
44	Resolution by frame	The resolution reaches the resolution of the human eye. The frame rate (ideally > 50 fps, at least showing a realistic smooth picture) reveals no jerking.	Resolution has to be checked by visual inspection.	x	
45	Further detailing and display quality	The level of detail of the display system goes beyond a simplified representation. It shows a good view of the navigational area under all circumstances.	The visual model has to be checked by visual inspection.	x	
46	Water surface	Craft induced waves depend on the craft's velocity. Water depth is considered. Wind induced waves comply with wind direction and speed.	The visual inspection has to show whether the craft induced waves change with the craft's speed and whether the wind induced waves change with wind direction and speed.	x	
47	Sun, moon, celestial bodies	Sun and moon follow a 24-hour interval. The positions do not exactly correspond to place and date of the simulation. The night sky may consist of arbitrary stars.	The visual inspection has to show whether the sun, moon and celestial bodies in day, night and twilight situations can be modified	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
48	Weather	Stationary high cloud layers are represented. Furthermore rainfall, haze and fog can be displayed.	The visual inspection shows the required level of detail.	x	
49	Ambient noise	Engine noises are reproduced in a realistic manner.	The engine noises have to be tested in quiet weather and sea conditions by assessing the noises for all engine speeds. It has to be determined if the engine sound is audible and if volume level and sound are appropriate.	x	x
50	External noise sources (e.g. engine noises, audible warning signals and anchor).	Single sound signals are played in a realistic way, but cannot be located acoustically.	As a first step on the wheelhouse of the stationary own craft, all available sound signals are activated one after the other. It is assessed whether the sound signals are realistic regarding sound and volume levels. In a second step, the same sound signals are activated on another craft, whereas the distance to the craft is modified. It has to be examined, if the correct signal sounds and if the volume levels are played in the right way. All operable auxiliary power units (e. g. anchors) on craft's wheelhouse are activated separately. It has to be verified whether the operating status is acoustically perceivable.	x	
51	External noise (sound signals)	Sound signals from target craft shall be hearable.	During an exercise a sound signal from a target craft shall be given.		x
52	Internal acoustic information	Acoustic signals from bridge devices sound realistically, but are played by speakers located on the console of the simulator.	All acoustic signals of all available wheelhouse devices are activated one after the other. It is tested whether the signals are emitted by the devices themselves or by the speakers of the simulator and how far they sound realistic.	x	
53	Listening	The operator is able to listen to all noises from the craft's wheelhouse.	Within the scope of a simulation it has to be tested whether sounds from craft's wheelhouse are transmitted clearly and understandably and if the volume level is adjustable.	x	
54	Recording	Sounds from craft's wheelhouse are recorded synchronously with the simulation.	An exercise is executed including radio communication and sounds. Replay must show a proper audible	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			recording synchronously with the replay of the simulation.		
55	Radar conformity	The angular accuracy for horizontal bearing shall be in accordance with European Technical Specification (ETSI) EN 302 194. Effects related to the vertically limited opening angle are identifiable e.g. when passing bridges.	Conformity “vertical”: simulation of bridge passage with consideration of: the height of the antenna above the water surface at current draught, the radiation angle in accordance with the radar lobe and the trim of the craft, the height of the bridge between lower edge of the bridge and the water surface.	x	x
56	Resolution	The radar simulation shall create a realistic radar image. The radar simulation shall meet the requirements of ETSI EN 302 194 [1].	Proper resolution has to be demonstrated at a distance of 1200 m: two objects with an azimuthal distance of 30 m have to be identified as two separate objects. Two objects at a distance of 1200 m in the same direction with a distance of 15 m between them have to be identified as two different objects.	x	x
57	Shadowing caused by own or other craft	Shadowing corresponds to the trigonometric relations, but do not consider changes of the dynamic position of craft.	The shadowing caused by own craft has to be tested by approaching a buoy and identifying the distance when the buoy is hidden by the craft’s bow. This distance shall be realistic. The shadowing caused by other craft has to be tested by putting two craft in the same direction. When putting a smaller craft behind a larger craft, the smaller craft shall not appear on radar display.	x	x
58	Sea and rain clutter	The adjustment of filters and their effect correspond to the magnitude of real approved devices.	An assessment is done by switching on and adjusting the filters.	x	x
59	False echoes	False echoes are generated. Additionally, the frequency of multiple echoes changes with the distance in a realistic manner.	In an exercise with multiple target craft, false echoes shall be visible. During the test, the observer has to look for interference and multiple echoes.	x	x

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
60	Water depth	The bottom topography is described in detail by bathymetric contours and soundings or in any other form in a high resolution, as far as data is available.	When sailing through the area to be inspected, it has to be checked whether the echo sounder shows realistic values.	x	
61	Current	The current can be arbitrary defined by at least 2-dimensional vector fields with a high resolution adapted to the craft size and the area.	The effect of current has to be tested by letting an own craft drifting on a river. The craft shall move with the current in a realistic way.	x	x
62	Tide	Tidal data is given in a coarse spatial or temporal resolution, or both.	The effect of the tide on floating objects can be evaluated by simulating a preferable small floating object without any propulsion or other forces (e.g. from wind or ropes). By changing the time of day, it can be checked whether the tidal current and water level are time dependent and realistic. The water level can be directly seen at the echo sounder, and can be recorded for a full day to be compared with measured or calculated data.	x	
63	Wind	Fluctuations and wind vector fields can be defined and allow local modification.	If an anemometer is “installed” on board the instrument on the bridge shall display the relative wind speed and direction. The influence of different wind fields on the craft dynamics has to be tested.	x	
64	2D/3D models of stationary objects	2D replacements of objects are only allowed for objects far away and are not recognized.	While a craft is moving in the whole simulation area that has to be validated, fixed objects are observed. It can be found, at which distance and in which way the level of detail is reduced and whether 2D-models are used.	x	
65	Level of detail of stationary objects	A good level of detail can let appear realistic objects, although simplifications are recognizable in shape and surface.	The training area to be assessed will be loaded and an own craft is set. It is first necessary to examine whether all navigationally important objects are identified. The scenery must at first glance appear realistic.	x	
66	Day/night models of moveable objects	In the darkness, any object can be illuminated. Navigationally important light sources can emit light at predetermined characteristics.	The training area to be assessed will be loaded and an own craft is set. Simulation time is set to midnight. It has to be tested whether all navigationally important objects are illuminated in the simulation as in reality. Furthermore, it has to be tested whether other objects are illuminated. If the simulator software has this feature,	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
			the instructor switches the lighting of the intended items on and off.		
67	2D/3D models of moveable objects	Two-dimensional objects are only used in the background (large distance) so that they are hardly apparent. Otherwise 3D-models are taken.	The training area to be assessed is loaded and an own craft selected. The training area is navigated completely; at the same time the available moveable objects are used, observed and evaluated to determine whether they have flat surfaces turning to the observer.	x	
68	Level of detail	In case of an improved level of detail realistic objects are presented, though forms and surfaces appear in a simplified way.	An own craft runs within an arbitrarily selected operating area. Assessable moving objects are used. They shall appear in a realistic way.	x	
69	Setting of lights and day signals	The lights and signal shown can be switched individually, i.e. all the lights and signals are separately stored in the database and are positioned according to the requirements of real craft and according to the applicable regulation for the craft used.	In close proximity to a traffic craft an own craft is used in any training area. As far as possible, the operator sets all kinds of day signals and traffic lights aboard the traffic craft. If the simulator allows, a second own craft is used instead of the traffic craft. On the second own craft all kinds of light and day signals are also set. At the steering station of the first own craft it will be checked which light and day signals are visible on both other craft.	x	
70	Day/night models	Light sources can flash according to certain characteristics.	An own craft navigates within an operating area. Simulation time is set to 24:00 h. All assessable moving objects are used. As far as possible, the operator switches on all available light sources installed at the objects for a visual inspection.	x	
71	Radar reflectivity	The echo in the radar picture shall be realistic and dependent of the viewing angle.	It shall be checked, if reflecting objects show a realistic echo.	x	x
72	Echoes caused by waves and precipitation	Sea state echoes are stored for typical wave pattern also covering the range of sea state levels. Echoes by precipitation are shown in a realistic manner.	Sea state echoes have to be tested by introducing different wave heights and directions. Precipitation echoes are checked.	x	x
73	Waves	Sea state and wave direction can be adjusted; the craft moves realistically.	It has to be tested, if the motion of the craft varies according to the sea state. Wave directions and height have to be visible.	x	

No.	*Item*	*Quality level of technical requirement*	*Test procedure*	*Vessel handling simulator*	*Radar simulator*
74	Precipitation	All weather conditions (restriction of visibility, precipitation with the exception of lightning and cloud formation) are available resulting in a coherent picture.	A visual inspection shall be carried out to check whether the visibility may be reduced.	x	
75	Chart display	The Inland ECDIS in information mode has to meet the requirements of the most recent standard published by the European Union or the Central Commission for Navigation of the Rhine (Commission Implementing Regulation (EU) No. 909/2013 or CCNR Inland ECDIS edition 2.3 or its updated edition).	It has to be checked, if the ECDIS software is certified and Inland Electronical Navigation Chart is used.	x	
76	Measuring units	The simulator uses units for European inland waterway navigation (km, km/h).	The displayed units have to be evaluated.	x	x
77	Language options	Language of examination and/or English shall apply.	Language of the instruments has to be checked.	x	x
78	Quantity of exercises	There shall be a possibility to create, store and run various exercises, which shall be manipulable while running.	Different operations shall be performed.	x	x
79	Quantity of own craft	For each bridge a different own craft can be loaded.	Demonstration of separate exercises on multiple bridges (if applicable).	x	
80	Storage data	All simulation values which are necessary to replay the simulation, including video and sound of the performance of the applicant have to be stored.	A simulation run is started and the storage carried out. The simulation is reloaded and reviewed in order to determine whether all relevant data is available from the recorded simulation run.	x	x
81	Storage of displayed examination	There must be an opportunity for replay in the operator room or at a debriefing station. Radio communication shall be recordable.	The exercise shall be replayed.	x	x

Annex II

Standards for the administrative procedure for the approval of vessel-handling simulators and radar simulators (Resolution CESNI 2018-II-15)

1. Procedure for the approval of simulators used in examinations referred to in points (a) and (b) of Article 17(3) of Directive (EU) 2017/2397

1. The entity using simulators to assess competences, shall present to the competent authority of the Member State a request for approval.

(a) specifying which assessment of competence, the simulator is to be authorized for i.e. practical examination for obtaining a certificate of qualification as a boatmaster (vessel handing simulator) or practical examination for obtaining a specific authorization for sailing with the aid of radar (radar simulator), or both;

(b) indicating that the simulator ensures full compliance with the minimum technical and functional requirements as referred to in the relevant standard or standards for simulators.

2. The competent authority shall ensure that the minimum requirements specified in the standard for the functional and technical requirements of simulators are checked according to the test procedure for each item. For this exercise, the competent authority shall use experts independent from the entity conducting the training programme. Experts shall document the compliance check for each item. If the test procedures confirm that the requirements are met, the competent authority shall approve the simulator. The approval shall specify which particular assessment of competence the simulator is authorized for.

2. Notification of the approval and quality standards system

1. The competent authority for the approval of simulators shall notify the approval of a simulator to the European Commission and any international organisation concerned indicating at least the following:

(a) assessment of competence the simulator is authorized for, i.e. practical examination for obtaining a certificate of qualification as a boatmaster (vessel handling simulator) or practical examination for obtaining a specific authorisation for sailing with the aid of radar (radar simulator), or both;

(b) name of the operator of the simulator;

(c) name of the training programme (if applicable);

(d) body awarding the certificates of qualification, specific authorization or practical examination certificates;

(e) date of the entry into force, revocation or suspension of the approval of the simulator.

2. For the purpose of a quality assessment and assurance system referred to in Article 27 of Directive (EU) No. 2017/2397, the competent authorities shall keep the requests specified in Section I.1.(a) and documentation specified in Section I.2.