



STUDY GUIDE

Marine Welding Inspection

Preparation for certification as a Certified Senior Welding Inspector for Marine Section (CSWIM)

To be used together with the e-book and the Moodle platform

Welding Greek Institute

Edition 1.0 • Issued to enrolled candidates • Not for circulation

Contents

Part	Title
Part 1	How to use this guide
Part 2	The programme, and how it is built
Part 3	The platform, the e-book and the study cycle
Part 4	Study plan and workload
Part 5	Chapter by chapter: what you must know Chapters 1 to 12, with Annex 1A
Part 6	The optional modules
Part 7	The certification examination
Part 8	After certification
Appendix	Progress tracker



Part 1 How to use this guide

This guide is the map of the programme. It does not teach anything itself. What it does is tell you, for every chapter, what you are expected to know by the end of it, in what order to use the three things you have been given, and how all of it connects to the examination you will sit at the end.

Read Parts 1 to 4 now, before you open the first chapter. Then work through Part 5 one chapter at a time, in the order the chapters are numbered. Read Part 7 at least a month before your examination date, and preferably at the start, so that you know from the first day what you are working towards.

What you have been given

Item	What it is, and what it is for
The e-book	The full text of the programme. Everything you hear on the platform is developed here in detail, with the tables, the figures and the reasoning. This is the document you study from, and the one you will go back to during the examination revision.
The Moodle platform	The delivery environment: the learning outcome videos, the teaching videos, the 3D sequences and the end-of-chapter tests. It sets the pace and records your progress.
This study guide	The order of work, what each chapter demands of you, and what happens after the training ends.

One rule above all others

The platform and the e-book are not two versions of the same thing, and neither one is complete on its own. The videos give you the shape of a subject in the time it takes to watch them. The e-book gives you the detail, the figures and the documents. A candidate who watches the videos and does not read the chapter will fail the examination. A candidate who reads the chapter and does not watch the videos will spend far longer on it than necessary.

How the guide is written

Every chapter in Part 5 is set out the same way, so that you know where to look:

- What this chapter is its type, what it builds on, and how long it runs.
- What it covers the subjects in the chapter, in the order the chapter takes them.
- What you must know the handful of things that must be in your head, not in your notes. These are the items most likely to decide an examination question or a finding on a ship.
- Learning outcomes the formal statements, taken from the e-book, of what you can do at the end of the chapter. These were written against Bloom's taxonomy and they are the specification against which the chapter, the comprehension questions and the examination were all built.
- How to study it anything specific to that chapter.

Part 2 The programme, and how it is built

The modular system

The Institute delivers all of its training on a modular, capacity-building system. Each module assumes what the one before it established, and adds to it rather than repeating it. This programme sits at the top of that structure.

Nine of the fifteen units in this programme are therefore delta chapters. A delta chapter states, at the start, what carries over unchanged from the base course and what does not, and then teaches only the difference. Chapter 5 says it plainly: the arc, the equipment, the shielding gases, the consumable designations, the polarity, the heat input calculation and the calibration are the same in a shipyard as in a workshop, and none of it is repeated.

If you have not done the base training

The delta chapters assume you already hold the fundamentals of welding technology: the processes and equipment, basic metallurgy, imperfections and acceptance levels, and the WPS, WPQR and welder qualification chain. If you do not, take the WELD ENTRY programme first. Attempting the delta chapters without that base is the single most common reason for a candidate to fall behind and stay behind.

The units of the programme

Twelve core chapters, one annex and two optional modules. The hours are teaching hours on the platform; they are not the time the chapter will take you.

Unit	Title	Type	Hours
1	The Marine Framework and the Roles	New material new material, no base course equivalent	2
2	Terminology, Ship Structure and Drawings	New material new material, no base course equivalent	3
3	Loads and Stresses in the Hull	New material new material, no base course equivalent	2 †
4	Marine Materials and their Approval	Delta on base Module 2, Basic Metallurgy	2
5	The Processes as Used in the Yard	Delta on base Module 1, Welding Processes and Equipment	1,5
6	Corrosion in the Marine Environment, and Coating Inspection	Delta on base course Module 2 for the mechanism; new material for the rest	2,5
7	Acceptance and Failures against Marine Criteria	Delta on base Module 4, Quality	2,5
8	Non-Destructive Testing in the Marine Sector	Delta on base Module 4	2,5
9	Corrosion Allowances and Thickness Measurement	New material	2,5
10	Safety, Enclosed Spaces and Hot Work	New material	2
11	Repairs and In-Service Inspection	New material	1,5
12	Ethics, Impartiality and Reporting	New material	1,5
Annex 1A	ShipRight Construction Monitoring	Annex to Chapter 1	1 †
Module A	Welding of Piping and Pressure Systems	Optional	1,5 †
Module B	Gas Carriers and Gas-Fuelled Ships	Optional	1,5 †

† Indicative. Where the e-book does not state a teaching time for a unit, the figure above is the Institute's planning value and may be adjusted for your cohort.

The twelve core chapters run to about 25 teaching hours. That is the time the material is presented to you. The study time is set out in Part 4 and it is several times larger.

What the programme is not

- It is not a qualification to work on gas containment systems, on piping and pressure systems beyond the boundary described in Module A, or on anything else the modules expressly exclude. Each module says so in its own words, and you are expected to be able to say so too.
- It is not a naval architecture course.
- It does not replace the certification of a non-destructive testing operator, a coating inspector or a welder. Those are separate schemes, and two of them are a prerequisite for your own certification see Part 7.



Part 3 The platform, the e-book and the study cycle

Every chapter is delivered the same way, and you should work through every chapter in the same six steps. Do not vary the order. Each step is built on the one before it, and the last step is the one that tells you whether the chapter worked.

The six steps, for every chapter

1. **Watch the learning outcome video first.** Each chapter on the platform opens with a slide video that sets out the learning outcomes and objectives for that chapter. Watch it before anything else. It is short, and it tells you what you are about to be held to. The same outcomes are printed for you in Part 5 of this guide and again at the start of the chapter in the e-book.
2. **Watch every video in the chapter, in the order given.** Do not skip a video because the title looks familiar from the base course in a delta chapter, the familiar-looking subject is usually the one where something has changed. Where a 3D sequence is provided, watch it at full screen. Take no notes on this pass; just watch.
3. **Read the whole chapter in the e-book.** This is the longest step and the one that does the work. Everything you have just heard is developed here in full, with the tables, the figures, the document references and the reasoning behind each requirement. Read it with the platform closed.
4. **Watch the videos again, quickly.** Second time through, at speed, with the chapter fresh. This pass takes a fraction of the first and it is where the structure of the chapter settles. Anything that still does not make sense on this pass is a gap mark it and go back to the e-book section that covers it.
5. **Answer the comprehension questions at the end of the chapter in the e-book.** Every chapter closes with a set of questions written directly against its learning outcomes. Answer them in writing, from memory, without the chapter open. This is self-examination, not reading. If you cannot answer a question, you have found exactly which outcome you have not met, and the chapter tells you where to go back to.
6. **Take the end-of-chapter test on the platform.** When the test is submitted, the correct answer and its justification are shown to you. Read the justification for every question, including the ones you answered correctly a right answer for the wrong reason will not survive the final examination.

Do not move on with a gap

The programme is cumulative. Chapter 9 assumes Chapters 2, 3 and 6; Chapter 11 assumes 7 and 9; the optional modules assume most of the rest. A chapter you half-understood does not stay half-understood it becomes the reason a later chapter makes no sense at all. If step 5 shows you a gap, close it before you start the next chapter.

Notes, and what to keep

Keep one running document as you go, with four things in it, and nothing else:

- Every designation, category and named term you meet, with its meaning in one line. By Chapter 9 this list is the most useful thing you own.
- Every document, rule, requirement and procedure the programme names, and what question it answers.
- The numerical values the chapters fix: percentages, intervals, tolerances, point patterns, condition categories.
- Your own wrong answers, with the reason. Review this list the week before the examination in preference to anything else.

Where the e-book values are open

In a small number of places the e-book states that a governing instrument was not available when the text was written, and that the specific values are to be obtained and inserted before delivery. This applies chiefly to the two optional modules and to parts of Chapter 10. Where you see such a note, it is not an omission on your part: the structure and the reasoning are what you are examined on, and the numbers are to be taken from the applicable rules for the ship in front of you. Your instructor will tell you which values apply for your cohort.

Part 4 Study plan and workload

The twelve core chapters carry about 25 teaching hours. Expect to spend roughly three hours of your own work for every hour of teaching: watching, reading, self-testing and revising. Plan for 70 to 80 hours in total for the core, plus revision, plus 8 to 10 hours for each optional module you take.

The schedule below is a twelve-week plan at about six hours a week. Compress it if you can give the programme more time, but do not reorder it.

Week	Chapters	Study hours	Note
1	Chapter 1, with Annex 1A	6	Read Part 7 of this guide in the same week
2	Chapter 2	8	The heaviest chapter. Do not rush it
3	Chapter 2 continued, and Chapter 3	6	Chapter 3 is short but it explains Chapter 9
4	Chapter 4	6	
5	Chapter 5, and Annex 1A again	6	The annex reads differently once you know the yard
6	Chapter 6	8	The longest chapter of its kind in the programme
7	Chapter 7	7	
8	Chapter 8	6	
9	Chapter 9	7	Have the shell expansion and midship section with you
10	Chapter 10 and Chapter 11	7	
11	Chapter 12, and any optional module	6	
12	Revision	8	See the revision method in Part 7
If you fall behind Tell your tutor early rather than trying to catch up by skipping the e-book reading. The reading is the part that cannot be compressed. What can be compressed is the second video pass, and, if it must be, the optional modules – they are not examined as separate subjects.			

Part 5 Chapter by chapter

For each chapter below: what it is, what it covers, what you must know, and the formal learning outcomes. Work through them in order.

The learning outcomes are reproduced exactly as they appear in the e-book and in the opening video of each chapter. They are the specification. The comprehension questions at the end of each chapter were written against them, and so was the final examination.



Chapter 1

The Marine Framework and the Roles

Item	Detail
Type	Core chapter new material, no base course equivalent
Builds on	Base course: none. This is the entry point of the marine programme.
Teaching hours	2
Self-check	29 comprehension questions at the end of the chapter in the e-book

What it covers

- The four layers of authority over a ship's structure and what each one issues
- The statutory layer: IMO and the conventions; the flag State, delegation and port State control
- Classification: what it is, what a class certificate does and does not mean, Conditions of Class
- IACS Unified Requirements: how a designation is read, and the W, Z, S and P series
- From the Unified Requirement, through the society's rules and procedures, to the document at the workstation
- The procedure layer (MQPS Books A, J, N, P) and the three dates that live in it
- What is approved before anybody welds, and the evidence you physically look for
- ShipRight Construction Monitoring in outline
- Approval, certification, survey and attendance: four words that are not interchangeable
- Which survey requirement applies to which ship type, and what authority your own finding carries

What you must know

These are the items to have in your head rather than in your notes.

- The four layers, in order, and the instrument each one issues
- How to cite a requirement properly: number, revision, corrigendum, and the date it came into force
- The three dates involved in any citation: rule edition, procedure edition, certificate validity
- Which of the four UR series answers which kind of question
- The four elements that make a marine finding stick, and the one element it must not contain

Learning outcomes

By the end of this chapter you can:

- Describe the four layers of authority over a ship's structure and state what each layer issues.
- State what the IMO does and does not do.
- Explain what a Recognised Organisation is, and distinguish classification work from statutory work.
- State what classification is, what a class certificate does and does not mean, and what a Condition of Class obliges.
- Read an IACS Unified Requirement designation, including its revision and correction, and explain why the number alone is not a reference.
- Name the four UR series used in this course and say what each covers.
- Trace a requirement from a Unified Requirement, through the society's rules and its procedures, to the document at the workstation, and identify the dates involved at each level.
- Name what is approved before fabrication, and state which document sets the requirement for each.
- Describe the ShipRight Construction Monitoring procedure in outline, and state how it changes the examination at a critical location.
- Distinguish approval, certification, survey and attendance.
- Identify which survey requirement applies to a given ship type.
- Identify who you are working for in an engagement, and what authority your finding carries.

Chapter 2

Terminology, Ship Structure and Drawings

Item	Detail
Type	Core chapter new material, no base course equivalent
Builds on	Base course: none. New vocabulary, and the heaviest single chapter of the programme.
Teaching hours	3
Self-check	34 comprehension questions at the end of the chapter in the e-book

What it covers

- The reference system: baseline, perpendiculars, amidships, frame numbers, and positions as fractions of L
- Direction conventions: forward and aft, port and starboard, inboard and outboard
- The structural hierarchy: plating, secondary stiffening, primary supporting members
- The midship section read member by member, for a bulk carrier and for a double-hull tanker
- Framing systems: transverse, longitudinal and combined, and why the system decides where the work is
- Bulkheads, tanks and compartments, and what a tank boundary commits the structure to
- Structural details and openings: bracket, soft toe, snipe, slot, collar plate, lug, scallop, drain and air hole
- The structural drawing set, and which drawing answers which question
- Reading a scantling notation and a grade marking; as-built, gross and net thickness
- The shell expansion, and the words the survey requirements use for an area worth worrying about

What you must know

These are the items to have in your head rather than in your notes.

- Every member of a midship section, by name, on sight
- Which drawing to open for which question
- The difference between as-built, gross and net thickness, and why it matters which one a drawing shows
- How to write the position of a finding so that another person can find it again

Learning outcomes

By the end of this chapter you can:

- Name the principal dimensions of a ship, and state what the baseline, the perpendiculars, amidships and a frame number are.
- Use the direction conventions correctly: forward and aft, port and starboard, inboard and outboard, above the baseline.
- Distinguish plating, secondary stiffening and primary supporting members, and name the members of a midship section on sight.
- Name the members of a bulk carrier and a double-hull tanker midship section, and state which spaces are cargo spaces and which are ballast spaces.
- Distinguish transverse, longitudinal and combined framing, and state why the framing system determines where the inspection work is.
- Name the bulkhead types and state what a tank boundary commits the structure to.
- Name the common structural details and openings: bracket, soft toe, snipe, slot, collar plate, lug, scallop, drain and air hole, and say why each exists.
- Identify the drawings of a structural drawing set and state what each is used for.
- Read a scantling notation and a grade marking from a structural drawing.
- State the difference between as-built, gross and net thickness, and why it matters which one a drawing shows.
- Read a shell expansion and identify the thickness, grade, strake and joints of a given plate.
- Write the position of a finding so that another person can find it again.

Chapter 3

Loads and Stresses in the Hull

Item	Detail
Type	Core chapter new material, no base course equivalent
Builds on	Base course: none. Nothing here is calculated by the inspector.
Teaching hours	2 (indicative)
Self-check	20 comprehension questions at the end of the chapter in the e-book

What it covers

- The ship as a hull girder; hogging and sagging in terms of load and of the resulting stress
- Still water bending and wave bending, and where each comes from
- Section modulus and the neutral axis, and why steel far from the neutral axis matters more
- What the rule requires of the midship section, and what the material factor k does
- Where along the length the rules require strength to be checked, and why those are the places that crack
- The three levels of loading, and matching a type of damage to the level it belongs to
- The main local loads: sea pressure, cargo and sloshing, slamming, green seas, flooding
- Fatigue as a detail problem rather than a material problem
- Buckling as a failure mode separate from yielding

What you must know

These are the items to have in your head rather than in your notes.

- Why steel changes grade and thickness along the length, and why it stops changing over 0,4 L amidships
- Why a 3 mm misalignment at a hopper knuckle matters more than a 10 mm one elsewhere
- Why identical damage in two different places is not the same finding
- How to place a finding at the right level: hull girder, primary member, or local

Learning outcomes

By the end of this chapter you can:

- Describe the ship as a hull girder, and explain hogging and sagging in terms of load and of the resulting stress in deck and bottom.
- Distinguish still water bending from wave bending, and state where each comes from.
- Explain what the section modulus and the neutral axis are, and why steel far from the neutral axis matters more than steel near it.
- State, in words, what the rule requires of the midship section, and what the material factor k does.
- Name the places along the length where the rules require strength to be checked, and say why those are also the places that crack.
- Distinguish the three levels at which the structure is loaded, and match a type of damage to the level it belongs to.
- Name the main local loads: sea pressure, cargo and sloshing, slamming and bottom forward, green seas on the fore deck, and flooding.
- Explain what fatigue is, why it is a detail problem rather than a material problem, and why a small increase in local stress is a large loss of life.
- Explain why buckling is a separate failure mode from yielding, and where compressive members are.
- Read a structural finding and place it correctly: hull girder, primary member, or local.

Chapter 4

Marine Materials and their Approval

Item	Detail
Type	Delta chapter on base course Module 2, Basic Metallurgy
Builds on	Base course Module 2. The metallurgy carries over unchanged; the designation, the approval and the documents do not.
Teaching hours	2
Self-check	32 comprehension questions at the end of the chapter in the e-book

What it covers

- Two designation systems, and why a marine designation cannot be translated into an EN one
- Reading a hull steel designation: what the grade letter controls and what the strength number controls
- The grade ladder, and how grade is derived from category, material class and as-built thickness
- Weldability, delivery condition and the carbon equivalent in marine terms
- Approval of the works: what a mill approval covers
- Branding, certification, and the three-step identity check between drawing, plate and certificate
- Z quality steel and lamellar tearing
- Welding consumables: the four approval routes, manufacture under guarantee, and what keeps an approval alive
- Diffusible hydrogen as a certified property, and the four things that put hydrogen into a joint
- The other material families, and marine aluminium alloys

What you must know

These are the items to have in your head rather than in your notes.

- The three separate things an inspector checks: the works is approved, the piece is branded, the document ties the two together
- The three-step identity check, performed in order
- What manufacture under guarantee is, and when such an approval is cancelled
- The scope boundary of each of the other steel families

Learning outcomes

By the end of this chapter you can:

- Read a hull steel designation and state what each element means.
- Explain what the grade letter and the strength number each control, and relate them to the impact test.
- State why a marine designation cannot be translated directly into an EN designation, and what to do when somebody offers one.
- Explain what "approved works" means and what the mill approval covers.
- Describe what must be branded on a piece of steel and what must appear on the accompanying document.
- Carry out the three-step identity check between drawing, plate and certificate.
- State what Z quality steel is, what lamellar tearing is, and where each is relevant.
- Describe the four routes to an approved welding consumable and what keeps each approval alive.
- Explain what manufacture under guarantee is and the circumstances in which such an approval is cancelled.
- State where a consumable's hydrogen designation comes from, and name the four things that put hydrogen into a joint.
- Recognise the other steel families a marine inspector may meet and state the scope boundary of each.
- State the basic requirements for marine aluminium alloys, the alloy families, the temper conditions and the seawater caution.
- List the things that go wrong with material on a real ship and say which document catches each.

Chapter 5

The Processes as Used in the Yard

Item	Detail
Type	Delta chapter on base course Module 1, Welding Processes and Equipment
Builds on	Base course Module 1 and Module 4. The arc, the equipment and the consumable designations are unchanged.
Teaching hours	1,5
Self-check	35 comprehension questions at the end of the chapter in the e-book

What it covers

- The production sequence, and the process that belongs to each stage of build
- Why the most critical joints are often made in the worst conditions, and what the rules require about it
- One-side welding on a backing: what it buys and what it puts at risk
- Shop primer: how it is approved, and the clause that ties it to the welding procedure qualification
- The marine document layer: welding procedure qualification for hull construction, its scope and exclusions
- Reading a range of approval, including the effect of high heat input
- The welder qualification scheme and its scope limits
- Welding consumables approved by brand and grade, and what is checked at the drum
- Distortion: the three kinds and the four countermeasures, and the constraints on correcting it by heat
- The pre-weld document check at a workstation

What you must know

These are the items to have in your head rather than in your notes.

- That the process is chosen for the stage of construction, not for the joint
- What happens to an existing qualification made to a national or international standard when a fabricator enters marine work
- The primer clause: a qualification made with primer covers welding without it, but not the reverse
- The questions in the pre-weld check, in order

Learning outcomes

By the end of this chapter you can:

- Describe the stages of ship construction and name the welding processes typical of each.
- Explain why the most critical joints are often made in the worst conditions, and what the rules require to be done about it.
- Describe one-side welding on a backing, state what it buys and what it puts at risk.
- Explain what a prefabrication primer is, how it is approved, and how it affects weld quality and the welding procedure approval.
- State what governs welding procedure qualification for hull construction, its scope and exclusions, and how the test is made and witnessed.
- Read a range of approval and say whether a joint is covered, including the effect of high heat input.
- State the scope limits of the welder qualification scheme.
- Say what happens to an existing welding procedure qualification made to a national or international standard when a fabricator enters marine work.
- Explain why welding consumables are approved by brand and grade, and what must be checked at the drum.
- Name the three distortions and the four countermeasures, in the order a yard uses them.
- State the constraints on correcting distortion by heat, and why they are tighter on thermo-mechanically processed steel.
- Run the pre-weld document check at a workstation.

Chapter 6

Corrosion in the Marine Environment, and Coating Inspection

Item	Detail
Type	Delta on base course Module 2 for the mechanism; new material for the rest
Builds on	Base course Module 2 for the corrosion cell. Everything about spaces, coatings and cathodic protection is new.
Teaching hours	2,5
Self-check	42 comprehension questions at the end of the chapter in the e-book

What it covers

- Seawater as an aggressive electrolyte, and what raises and lowers the rate of attack
- The corrosion zones outside the hull, and the mechanisms inside each main space type
- Why a ballast tank is the hardest space in the ship to protect
- The characteristic corrosion of a cargo oil tank, at the deckhead and at the bottom
- General, pitting, edge and grooving corrosion as the survey requirements define them
- Hard protective coatings and corrosion prevention systems
- The coating condition categories GOOD, FAIR and POOR, and what each changes in the survey regime
- The performance standard for protective coatings: what it applies to, what it promises, the values it fixes
- The 90/10 rule, and why an average thickness is not compliance
- Inspection items at each construction stage, who is qualified to carry them out, and the Coating Technical File
- Cathodic protection: sacrificial anode and impressed current systems

What you must know

These are the items to have in your head rather than in your notes.

- Exactly what GOOD, FAIR and POOR each trigger in the survey regime
- The 90/10 rule, and why an average thickness is not compliance
- What the Coating Technical File must contain and where it is kept
- That a coating applied correctly but not recorded cannot be shown to have been applied correctly

Learning outcomes

By the end of this chapter you can:

- Explain why seawater is an aggressive electrolyte, and what raises and lowers the rate of attack.
- Describe the corrosion zones on the outside of a hull and the mechanisms inside the main space types.
- Explain why a ballast tank is the hardest space in the ship to protect, and identify the areas within it that fail first.
- Describe the characteristic corrosion of a cargo oil tank, at the deckhead and at the bottom, and say why they are different mechanisms.
- Define general, pitting, edge and grooving corrosion as the survey requirements define them, and say what each tells you about the history of the space.
- State what a hard protective coating and a corrosion prevention system are.
- Apply the coating condition categories GOOD, FAIR and POOR, and state exactly what each changes in the survey regime.
- State what the performance standard for protective coatings applies to, what it promises, and the principal values it fixes.
- Apply the 90/10 rule, and explain why an average thickness is not compliance.
- Outline the inspection items at each construction stage, and state who is qualified to carry them out.
- State what the coating technical file must contain and where it is kept.
- State the coating requirement for cargo hold spaces on bulk carriers and its exclusions.
- Describe sacrificial anode and impressed current systems, what each protects, and how each is inspected.
- Run a coating and corrosion inspection of a ballast tank and record it usefully.

Chapter 7

Acceptance and Failures against Marine Criteria

Item	Detail
Type	Delta chapter on base course Module 4, Quality
Builds on	Base course Module 4. The machinery of acceptance is unchanged; what changes is which document does the specifying.
Teaching hours	2,5
Self-check	29 comprehension questions at the end of the chapter in the e-book

What it covers

- The five sources of an acceptance criterion, and the rule for choosing between them where two overlap
- Quality level, testing level and acceptance level, and why all three must be named
- Production quality, not fitness for purpose: what that sentence stops you concluding
- Construction tolerances under construction monitoring, and the remedial ladder that goes with them
- Tank testing: structural test against leak test, the methods that satisfy each, and the principal values
- When final and temporary coatings may be applied in relation to testing
- Failure in service: fatigue cracking, brittle fracture, buckling and corrosion damage
- Repairs, and what makes one acceptable
- The shipbuilding and repair quality standard: the Standard and Limit ranges, and the two provisions that raise the bar

What you must know

These are the items to have in your head rather than in your notes.

- Which document gives the criterion for the thing in front of you, and which wins where two overlap
- How to use Standard and Limit correctly in a finding
- Why a skewed distribution brought back by remedial work is not compliance
- How to write an acceptance finding that cites the right criterion

Learning outcomes

By the end of this chapter you can:

- Identify which document gives the acceptance criterion for a given feature, and say which applies where two overlap.
- State the quality level generally applied to hull structure and the circumstances in which a higher one is applied.
- Explain the relationship between quality level, testing level and acceptance level, and why all three must be named.
- Explain what "production quality, not fitness for purpose" means and what it stops you concluding.
- State the construction tolerances that construction monitoring imposes and the remedial ladder that goes with them.
- Distinguish a structural test from a leak test, name the methods that satisfy each, and state the principal numerical requirements.
- State when final and temporary coatings may be applied in relation to testing.
- Describe the main categories of in-service structural failure and the locations where each is found.
- Distinguish fatigue cracking, brittle fracture, buckling and corrosion damage in a report.
- Explain the Standard and Limit ranges and use them correctly in a finding.
- State what the fallback quality standard does and does not apply to, and what it says about critical and highly stressed areas.
- Explain why a skewed distribution brought back by remedial work is not compliance.
- Write an acceptance finding that cites the right criterion.

Chapter 8

Non-Destructive Testing in the Marine Sector

Item	Detail
Type	Delta chapter on base course Module 4
Builds on	Base course Module 4. The methods are unchanged; the plan, the approvals and the timing are marine.
Teaching hours	2,5
Self-check	24 comprehension questions at the end of the chapter in the e-book

What it covers

- Which method applies to which joint type and thickness, and the limitations attached to each
- What part of the structure is subject to visual examination, and by whom
- How the NDT plan is produced and approved, and which locations are given priority
- What happens to the extent of testing when an unacceptable level of indications is found
- Timing and surface condition, including the delayed inspection intervals for high strength steels
- The three qualifications required: the firm, the supervisor and the operator, and the minimum level of each
- Advanced methods, and what a procedure qualification for one of them involves
- Quality level, testing level and acceptance level for phased array and time of flight diffraction
- What a report must contain, and why the location identification system matters

What you must know

These are the items to have in your head rather than in your notes.

- The delayed inspection intervals, and the strength levels that trigger each
- The three separate qualifications, and the minimum level for each
- How to identify what has not been examined, which is as much a finding as what has

Learning outcomes

By the end of this chapter you can:

- State which methods are applicable to each joint type and thickness, and the limitations attached.
- Explain what part of the structure is subject to visual examination and by whom.
- Describe how the NDT plan is produced and approved, and name the locations that are given priority.
- State what happens to the extent of testing when an unacceptable level of indications is found.
- State the timing rules for testing, including the delayed inspection intervals for high strength steels.
- Describe the three qualifications required, firm, supervisor, operator, and state the minimum level for each.
- Name the advanced methods and describe what a procedure qualification for one of them involves.
- Relate quality level, testing level and acceptance level for phased array and time of flight diffraction.
- State what a report must contain and why the location identification system matters.
- Plan and check an examination on a ship, and identify what has not been examined.

Chapter 9

Corrosion Allowances and Thickness Measurement

Item	Detail
Type	New material, with no base course equivalent
Builds on	Chapters 2, 3 and 6. You will need the shell expansion and the midship section in front of you.
Teaching hours	2,5
Self-check	35 comprehension questions at the end of the chapter in the e-book

What it covers

- The three thicknesses: as-built, renewal and measured, and where each comes from
- Substantial corrosion: the definition, and what it triggers
- Why the same percentage of loss has different consequences in different members
- How much of the structure is measured, and the standard point patterns
- What a transverse section is for measurement purposes, and what changes on a tanker over ten years of age
- The structure of a renewal criterion, and why it is the worst of several independent checks
- The thickness measurement firm: its certification, its categories and its cancellation
- The firm's written work procedures and equipment
- Remote inspection technique systems for thickness measurement, and the four conditions on their approval
- The surveyor's role during measurement, and the requirements for the report

What you must know

These are the items to have in your head rather than in your notes.

- The definition of substantial corrosion and everything it triggers
- The standard point patterns, applied without looking them up
- The ways thickness measurement is done badly, and what each one hides
- How to record a measurement so that the next person can repeat it

Learning outcomes

By the end of this chapter you can:

- Distinguish as-built, renewal and measured thickness, and say where each comes from.
- Define substantial corrosion, and state what it triggers.
- Explain why the same percentage of loss has different consequences in different members.
- State the general rule for how much of the structure is measured, and apply the standard point patterns.
- Explain what a transverse section is for measurement purposes, and what changes on a tanker over ten years of age.
- Describe the structure of a renewal criterion and why it is the worst of several independent checks.
- State the requirements for the thickness measurement firm, its certification, its categories and its cancellation.
- State what the firm's written work procedures and equipment must cover.
- Describe what a remote inspection technique system for thickness measurement is, and the four conditions on its approval.
- State the surveyor's role during measurement and the requirements for the report.
- Identify the ways thickness measurement is done badly, and say what each one hides.
- Record a measurement so that the next person can repeat it.

Chapter 10

Safety, Enclosed Spaces and Hot Work

Item	Detail
Type	New material
Builds on	Nothing. This chapter is about you rather than about the ship.
Teaching hours	2
Self-check	22 comprehension questions at the end of the chapter in the e-book

What it covers

- The three classes of atmospheric hazard in a ship's enclosed space, and where each comes from
- Why oxygen deficiency gives no warning, and why rescuers become casualties
- The questions that must be answered before anybody enters an enclosed space
- What the survey requirements oblige the owner to provide: conditions, cleanliness, lighting, access, safety and rescue equipment
- What the attending surveyor is to do when the safety and access provisions are not adequate
- Means of access permitted for close-up survey, including remote inspection techniques
- The conditions under which a tank may be rafted, and the numerical limits that apply
- Hot work: requirements before, during and after, and the two things that most often catch people
- The inspector's own physical and occupational health hazards

What you must know

These are the items to have in your head rather than in your notes.

- The pre-entry questions, from memory, without a permit form in front of you
- What the survey requirements oblige the owner to provide, which is a lever you can use
- How to decline to enter, and say why, in terms the other party can act on

Learning outcomes

By the end of this chapter you can:

- Explain the three classes of atmospheric hazard in a ship's enclosed space and where each comes from.
- State why oxygen deficiency gives no warning, and why rescuers become casualties.
- List the questions that must be answered before anybody enters an enclosed space.
- State what the survey requirements oblige the owner to provide by way of conditions, cleanliness, lighting, access, safety and rescue equipment.
- State what the attending surveyor is to do when the safety and access provisions are not adequate.
- Describe the means of access permitted for close-up survey, including remote inspection techniques.
- State the conditions under which a tank may be rafted, and the numerical limits that apply.
- Describe the requirements for hot work before, during and after, and name the two things that most often catch people.
- Recognise the physical and occupational health hazards particular to your own work in these spaces.
- Decline to enter, and say why, in terms the other party can act on.

Chapter 11

Repairs and In-Service Inspection

Item	Detail
Type	New material
Builds on	Chapters 7 and 9. This is where a marine inspector spends most of a career.
Teaching hours	1,5
Self-check	25 comprehension questions at the end of the chapter in the e-book

What it covers

- The five-year survey cycle, and the separate interval for bottom and docking surveys
- When an in-water survey may be accepted instead of drydocking, and the conditions attached
- The four possible outcomes when damage is found, and who decides between them
- Prompt and thorough repair, and condition of class
- Why a repair needs the same approval chain as new construction
- Cropping and renewal against doublers, and why a doubler is not a permanent repair
- What has to happen before hull repairs are carried out during a voyage
- The survey record system, and why the previous report is part of the scope of this survey
- Alternative and remote survey regimes, and what they change for an inspector

What you must know

These are the items to have in your head rather than in your notes.

- The four outcomes when damage is found, and who owns each decision
- Why a doubler over wasted or cracked structure is not a repair
- That the previous report is part of the scope of the survey you are on

Learning outcomes

By the end of this chapter you can:

- Describe the five-year survey cycle and the separate interval for bottom and docking surveys.
- State when an in-water survey may be accepted instead of drydocking, and the conditions attached.
- State the four possible outcomes when damage is found, and who decides between them.
- Define a prompt and thorough repair, and a condition of class.
- Explain why a repair needs the same approval chain as new construction.
- Distinguish cropping and renewal from a doubler, and explain why a doubler is not a permanent repair to wasted or cracked structure.
- State what has to happen before hull repairs are carried out during a voyage, and what happens if it does not.
- Describe the survey record system and why the previous report is part of the scope of this survey.
- Outline the alternative and remote survey regimes and what they change for an inspector.
- Prepare for and contribute to a survey rather than merely attend one.

Chapter 12

Ethics, Impartiality and Reporting

Item	Detail
Type	New material
Builds on	Every preceding chapter. This is where the work becomes a record.
Teaching hours	1,5
Self-check	19 comprehension questions at the end of the chapter in the e-book

What it covers

- Impartiality as a structural property of an arrangement rather than a virtue of a person
- The three types of inspection body, and the safeguard that applies to the third
- What a firm is required to declare and control in order to manage conflict of interest
- Knowing who you work for, and what that does and does not entitle you to decide
- The pressures that act on an inspector, each recognised by its usual wording
- Writing the finding: the four elements, and stopping before the remedy
- The words that make a report unusable, and what to replace them with
- The graded response when you are asked not to record something
- The limits of your own competence

What you must know

These are the items to have in your head rather than in your notes.

- The four elements of a finding, and the one thing a finding must not contain
- The usual wording of each pressure, so that you recognise it while it is happening
- What you are not qualified to decide, and how to say so

Learning outcomes

By the end of this chapter you can:

- Explain why impartiality is a structural property of an arrangement rather than a virtue of a person.
- Identify the three types of inspection body and the safeguard that applies to the third.
- Name the things a firm is required to declare and control in order to manage conflict of interest.
- Identify who you are working for in an engagement, and what that does and does not entitle you to decide.
- Name the pressures that act on an inspector and recognise each of them by its usual wording.
- Write a finding containing the four elements, and stop before the remedy.
- Recognise and replace the words that make a report unusable.
- Follow a graded response when you are asked not to record something.
- State the limits of your own competence and say what you are not qualified to decide.
- Explain why a record is the whole of the value of the work, and becoming more so.

Part 6 Annex 1A and the optional modules

Annex 1A belongs to Chapter 1 and is studied with it, then read again after Chapter 5. The two optional modules are taken after the core chapters are complete. Neither module is a separate examination subject, and neither one makes you competent to accept work in the sector it describes both say so in their own words, and you are expected to be able to say so too.



Annex 1A

ShipRight Construction Monitoring: how the inspection is carried out

Item	Detail
Type	Annex to Chapter 1 study it with Chapter 1 and again with Chapter 5
Builds on	Chapter 1, and Chapter 5 for the erection work.
Teaching hours	1 (indicative)
Self-check	Covered by the Chapter 1 questions

What it covers

- The Construction Monitoring document family, and what the Construction Monitoring Standard actually controls
- Alignment: the two principles
- The acceptance and remedial ladder, and fit-up
- How the inspection is actually carried out: plan development and approval, block stage, unit erection
- Quality assurance in parallel, recording, and non-destructive examination at critical locations
- Compliance and non-compliance; Phase 3 for the rest of the ship's life
- The working checklist, Parts A to G, and the record sheet
- The things that actually go wrong

What you must know

These are the items to have in your head rather than in your notes.

- The difference between a critical area and a critical location
- What may be different about the examination at a critical location compared with the general rule
- That the tolerance which applies is the CMP tolerance, which may be tighter than the general yard standard

Learning outcomes

By the end of this chapter you can:

- Read Annex 1A twice: once with Chapter 1, for the document family and the authority, and once after Chapter 5, for the block and erection work. It reads as two different documents..

Module A

Welding of Piping and Pressure Systems

Item	Detail
Type	Optional module. Prerequisite: the core chapters, and in particular Chapters 5, 7 and 8
Builds on	Chapters 5, 7 and 8. This is a parallel regime, not an extension of the hull chapters.
Teaching hours	1,5 (indicative)
Self-check	21 comprehension questions at the end of the chapter in the e-book

What it covers

- Where the boundary between hull welding and piping and pressure system welding lies, and which requirements draw it
- The main piping systems of a ship, and which of them are safety-critical
- Piping classes: what determines a class and what changes between classes
- The six things that are qualified separately from hull work
- Root protection, and why it matters more in some materials than in others
- The characteristic defects of pipe welding, and the point in the process at which each is decided
- The acceptance regime for a pipe joint, including pressure testing
- Pressure vessels and heat exchangers
- The materials used in marine piping and the corrosion behaviour of each

What you must know

These are the items to have in your head rather than in your notes.

- That a structural crack is a matter for the next survey and a failed pressure joint is a matter for this afternoon
- What you are not competent to accept in this area, and how to say so
- That every numerical value in this module is to be taken from the applicable rules for the ship concerned

Learning outcomes

By the end of this module you can:

- State where the boundary between hull welding and piping and pressure system welding lies, and which requirements draw it.
- Name the main piping systems of a ship and say which of them are safety-critical and why.
- Explain what a piping class is, what determines it, and what changes between classes.
- State the six things that are qualified separately from hull work.
- Describe the characteristic defects of pipe welding and the point in the process at which each is decided.
- Explain root protection and why it matters more in some materials than others.
- Describe the acceptance regime for a pipe joint, including pressure testing.
- Recognise the materials used in marine piping and the corrosion behaviour of each.
- Identify what you are not competent to accept in this area, and say so.

Module B

Gas Carriers and Gas-Fuelled Ships

Item	Detail
Type	Optional module. Prerequisite: the core chapters, and in particular Chapters 3, 4, 8 and 10
Builds on	Chapters 3, 4, 8 and 10. Module A is useful but not required.
Teaching hours	1,5 (indicative)
Self-check	19 comprehension questions at the end of the chapter in the e-book

What it covers

- Why this sector is governed by a separate set of requirements, and what those requirements displace
- The four families of cargo containment, and the secondary barrier requirement of each
- Leak-before-failure reasoning, and what it buys
- Material choice against design temperature, and why toughness governs
- The welding problems specific to nine per cent nickel steel, austenitic stainless steel, aluminium alloy and thin membranes
- Why leak testing is a primary acceptance method for some of the most important welds in these ships
- The secondary barrier, and why its tightness is tested as a system
- The hazards of gas ship spaces, and why they differ from those of Chapter 10

What you must know

These are the items to have in your head rather than in your notes.

- That in this sector "no leak" can be the acceptance criterion for one weld and "no unacceptable indication" for its neighbour
- That this module is an orientation, not a qualification to accept work on a containment system
- That every temperature, designation, test requirement and survey interval is to be taken from the applicable code and rules

Learning outcomes

By the end of this module you can:

- Explain why gas carriers and gas-fuelled ships are governed by a separate set of requirements, and name what those requirements displace.
- Describe the four families of cargo containment and state the secondary barrier requirement of each.
- Explain the leak-before-failure reasoning and what it buys.
- Relate the choice of material to the design temperature, and explain why toughness governs.
- Describe the welding problems specific to nine per cent nickel steel, austenitic stainless steel, aluminium alloy and thin membranes.
- Explain why leak testing is a primary acceptance method for some of the most important welds in these ships.
- Describe the secondary barrier and why its tightness is tested as a system.
- State the hazards of gas ship spaces and why they differ from those of Chapter 10.
- Identify what is outside your competence in this sector.

Part 7 The certification examination

The training ends; the certification is separate. This Part sets out what happens next, what you must have in place before you can be certified, and how to prepare for the examination itself.

Read this now, not at the end

Certification has prerequisites that have nothing to do with how well you do on this programme, and two of them take months to obtain. Check, in your first week, that you meet them. A candidate who completes the training and only then discovers a missing prerequisite has lost a year.

What you are being certified as

The programme prepares you for certification as a Certified Senior Welding Inspector for Marine Section (CSWIM), under the Welding Related Personnel certification scheme operated by the certification body. Certification of persons is carried out under ISO/IEC 17024, which is the international standard for bodies that certify people.

Certification is not awarded by the Institute and it is not awarded for attending the training. It is awarded by the certification body, on the basis of your examination result and your fulfilment of the scheme's prerequisites, which are assessed separately.

Prerequisites for certification

Requirement	What the scheme asks for
Education	A technical higher educational degree, or a merchant shipping degree, or equivalent from technical higher educational training institutes, merchant shipping academies or equivalent.
Professional qualifications	Certificates in at least two of the following: Level II inspector in an NDT method to EN ISO 9712 or ASNT (VT, RT, UT, PT, ET or another method); paint inspector to NACE Level 1 or FROSIO.
Language	Knowledge of English at the level required to understand the scheme documentation and to sit the examination.
Work experience	A Scheduled Activities Report, on the scheme's own form for the marine title, signed by your employer or employers, demonstrating a minimum of 85 % of the scheduled activities for the title.
Fees	Payment of the certification fees is a condition of certification.

The two that catch people

The professional qualification requirement is the one that most often blocks an otherwise strong candidate: you need two certificates, and an NDT Level II or a coating inspector certificate is itself a course and an examination. Start that process now if you do not already hold them.

The Scheduled Activities Report needs your employer's signature against a list of inspection activities. Obtain the form early, read the list, and make sure the activities you are actually performing at work are recorded as you go. It is far harder to reconstruct two years of activity from memory than to record it as it happens.

The examination

Feature	Detail
Format	Written examination, multiple choice
Number of questions	100
Correct answers	One correct answer per question
Duration	120 minutes
Marking	Equal weight for every question, irrespective of its difficulty. No negative marking a wrong answer costs nothing more than an unanswered one

Feature	Detail
Pass mark	60 % of correct answers
Delivery	Remotely, through a proctoring system. The venue arrangements are set out in the certification body's examination regulation

Two consequences follow directly from that table, and they are worth acting on.

- There is no negative marking, so never leave a question blank. If you do not know, eliminate what you can and answer anyway. An unanswered question is a guaranteed zero; a guess is not.
- Every question carries the same weight, so a hard question is worth exactly as much as an easy one and no more. Do not spend four minutes on a difficult question while three straightforward ones go unanswered at the end of the paper. 120 minutes for 100 questions is 72 seconds each. Move.

What the examination covers, and where you learned it

The body of knowledge for the marine title maps onto the programme as follows. Use this table to direct your revision: if you are weak in one row, you know exactly which chapters to return to.

Scheme subject for the marine title	Where it is taught
Introduction to welding technology; overview of welding processes	WELD ENTRY base modules, and Chapter 5
Basic metallurgy; materials selection criteria for shipbuilding and mechanical use	WELD ENTRY base modules, and Chapter 4
Metal marine constructions and stresses	Chapters 2 and 3
Corrosion in the marine environment	Chapters 6 and 9
Imperfections and failure in welding and materials	Chapter 7
NDT application	Chapter 8
Terminology, parts concept and ship details	Chapters 2 and 1
Code of ethics in inspection; impartiality issues	Chapter 12
Safety in inspection	Chapter 10
Codes and standards: interpretation and use	Chapter 1, and Annex 1A
Planning and control of inspection-related records	Chapters 11 and 12

How to revise

Three weeks out, stop reading and start retrieving. Reading a chapter again feels productive and is the least effective thing you can do at this stage. Work in this order:

1. **Re-answer the comprehension questions for every chapter, from memory, in writing.** There are more than 300 of them across the programme and they are the closest thing you have to the examination's scope. Mark yourself honestly against the e-book.
2. **Rework your list of wrong answers from the chapter tests.** If you kept the list described in Part 3, this is the highest-value hour of revision available to you.
3. **Drill the numbers.** Condition categories, percentages, intervals, point patterns, delayed inspection times, tolerances. These are the questions that are decided in ten seconds or not at all.
4. **Drill the vocabulary.** Every member of a midship section; every named form of corrosion; every document and what it fixes. A question you cannot parse is a question you cannot answer.
5. **Re-read the learning outcomes in Part 5, one chapter at a time, and say the answer aloud for each.** Any outcome you cannot deliver in a sentence is an outcome you have not met.

On the day

- Test the proctoring system, your camera, your microphone and your connection well before the examination, not on the day.
- Have your identification ready and your working area clear, as the examination instructions require.
- First pass: answer every question you are sure of and flag the rest. Second pass: work the flagged ones. Third pass: answer anything still blank, by elimination. Leave nothing unanswered.
- Read the question, not the first plausible option. In this subject the difference between two options is often a single word gross or net, structural test or leak test, approval or certification.

Results, and the decision

- Results are notified by the certification body once they have been formally released, and after the examination number has been matched to the candidate and independently verified.
- The decision on certification is taken by the certification body once your work experience requirement is also satisfied, and in any case no later than twelve months after the examination.
- The certificate is issued and sent within one month of the certification decision.
- If you disagree with a decision of the certification body, there is a formal appeals procedure. Ask the certification body for it.



Part 8 After certification

Item	What applies
Validity	Three years from the date of the certification decision.
Renewal	Apply for recertification three months before expiry, on the certification body's recertification application form.
At three and six years	Paper assessment: evidence of relevant job experience, of maintaining and developing your knowledge, and of visual acuity.
At nine years	Paper assessment and a further examination, to the same requirements as the initial certification.
Job experience	Reasonably continuous work in inspection technology at the appropriate level. A continuous certification period means no break in involvement exceeding twelve months in total across the three years.
Continuing development	At least 18 hours of training or seminars related to welding and inspection technology in each three-year period.
If recertification is refused	The candidate follows the initial certification procedure again.

Start the recertification file on the day you are certified

Keep one folder from the beginning: a running record of the inspection work you do, and the certificate or attendance record for every course, seminar and technical session you attend. Eighteen hours over three years is not demanding, but it is very hard to evidence three years later if nothing was kept. The Institute's own seminars and refresher sessions count towards it.

A closing note

Chapter 12 makes an argument that is worth repeating here, because it is the one that outlasts the examination. An inspector's output is not a weld and not a repair. It is a record. The certificate says that somebody has checked that you know what you are doing; what makes you worth employing is that your findings can be relied on by somebody who was not there, years after you have moved on.

WELDING GREEK INSTITUTE

Appendix Progress tracker

Tick each step only when it is genuinely complete. The fifth column is the one that matters: it is the only step that tells you whether the chapter worked.

Unit	Outcome video	All videos	E-book read	Questions answered	Test passed
Ch 1	☐	☐	☐	☐	☐
Ch 2	☐	☐	☐	☐	☐
Ch 3	☐	☐	☐	☐	☐
Ch 4	☐	☐	☐	☐	☐
Ch 5	☐	☐	☐	☐	☐
Ch 6	☐	☐	☐	☐	☐
Ch 7	☐	☐	☐	☐	☐
Ch 8	☐	☐	☐	☐	☐
Ch 9	☐	☐	☐	☐	☐
Ch 10	☐	☐	☐	☐	☐
Ch 11	☐	☐	☐	☐	☐
Ch 12	☐	☐	☐	☐	☐
Annex 1A	☐	☐	☐	☐	
Module A	☐	☐	☐	☐	☐
Module B	☐	☐	☐	☐	☐

WELDING GREEK INSTITUTE