

Proposal to modernise the Methodology of Teaching, Assessment/ Examination

ETO - STCW III/6 CoC			
Competency/ Module: Switchgear and Protection of High Voltage Systems			
Knowledge, understanding and proficiency	Recommendation of working group regarding the outcome and objective.	Rationale	Action required
Outcome1: Explain the need for protection devices in high voltage systems	Keep	Relevant	None
1.1 Requirements of protection	State the requirements of this outcome	Currently the regulations and testing requirements for protection devices are taught but this is not clearly stated within the outcome, it should be.	Include reference to the regulations and testing of the protection devices. How often are these tested? How are they tested? When are they tested?
1.2 Overcurrent and earth fault	State the requirements of this outcome	Currently the consequences, monitoring and classification of faults are taught but this is not clearly stated within the outcome, it should be.	Include the consequences of O/C or earth fault on HV. How is HV earth fault monitored/ trip circuits? Classification of short-circuited Fault. Classification of Open Circuit Faults.
1.3 Protection Current transformers, Voltage transformers and Summation transformers	Keep	Relevant	None
1.4 Surge protection	Keep	Relevant	None
1.5 Arc Flash Protection	State the requirements of this outcome	Currently the zones and types of protection systems are taught but this is not clearly stated within the outcome, it should be.	Include the zones and types of protection systems.
Outcome 2: Explain distribution substation feeder protection schemes	Contextualise	It is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is	Include where these systems would be used on board (e.g., Bridge, deck gear

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		essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	(cranes), deck machinery (winches) and of course, Engine room, as relevant)
2.1 Operation and application of an IDMT overcurrent and earth fault protection scheme	Contextualise	It is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.	Include the following topics in the context of high voltage systems: <ul style="list-style-type: none"> - Relays classification based on functions: Directional Over current, Distance, Over voltage, Differential, Reverse Power. - Relays with movable coils. - Induction relays.
2.2 Operation and application a unit protection scheme	Keep	Relevant	None
2.3 IDMT calculations for a series circuit	Keep	Relevant	None
2.4 Application of digital communications within a distribution substation	Keep	Relevant	None
Outcome 3: Explain construction, operation and application of switchgear	Keep	Relevant	None
3.1 Fuses	Keep	Relevant	None
3.2 Circuit breakers	Keep	Relevant	None
3.3 Switches	Keep	Relevant	None
3.4 Isolators	Keep	Relevant	None
3.5 High Rupturing Capacity (HRC) Fuse	Add	HRC are covered in other ETO modules. However, we must add this outcome to provide an understanding of their use in high voltage systems.	Add the outcome, "High Rupturing Capacity (HRC) Fuse"
3.6 Lightning Arresters	Add	Currently Lightning Arresters are taught but this is not clearly stated within the outcome, but it should be.	Add the outcome, "Lightning Arresters"

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3.7 Manufacturer's Instructions on troubleshooting and fault finding on specific equipment	Add	Students must be able to use a modern approach to troubleshooting and fault finding.	Add the outcome, "Manufacturer's Instructions on troubleshooting and fault finding on specific equipment"
Outcome 4: Explain operation and application of protection schemes	Keep	Relevant	None
4.1 Spur protection	Keep	Relevant	None
4.2 Distance protection	Keep	Relevant	None
4.3 Transformer protection	Keep	Relevant	None
4.4 Embedded generation protection	Keep	Relevant	None
4.5 Bus bar Fault	Add	Bus Bar faults are covered in other ETO modules. However, we must add this outcome to provide an understanding of their use in high voltage systems.	Add the outcome, "Bus bar Fault"
4.6 Types of protection	Add	Bus Bar protections schemes are covered in other ETO modules. However, we must add this outcome to provide an understanding of their use in high voltage systems.	Add the outcome, "Types of protection"
Proposal submitted by:	Any other outcomes for this competency, above and beyond STCW which would be needed due to use of modern technology and impact of future fuels onboard:		
	Objective	Reason Why	Action required
Cadet Training and Modernisation Working Group	Analyse power system faults	An academic module to be included within the ETO syllabus, which is currently only in the Marine Engineering syllabus.	Add the Engineering Module, "7b. Electrical Distribution Systems" to the ETO syllabus.

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<p>Cadet Training & Modernisation Working Group</p>	<p>Include Human Element Factors throughout the syllabus</p>	<p>To provide seafarers with a contextualised understanding of the Human Element in the maritime industry, showing how they can put theory into practice in the work they carry out at sea.</p>	<p>Raise awareness throughout the Cadet's training of the areas in which human element factors will have an impact. Recommendations on where this can be included have been noted throughout the entire syllabus. Not every template has Human Element Factor recommendations but please do add any you feel may have been missed.</p>
<p>Cadet Training & Modernisation Working Group</p>	<p>Include Data Science skills throughout the syllabus</p>	<p>Data Science Skills (Comprehension, Analysis, Presentation, etc...) are already required within much of the syllabus. A further, specific focus on these skills needs to be taught where relevant.</p>	<p>A specific topic will need to be introduced to improve Cadets' Data Science skills. Practical application of data science skills should be highlighted throughout the syllabus. Not every template has Data Science recommendations but please do add any you feel may have been missed.</p>
<p>Cadet Training & Modernisation Working Group</p>	<p>Ensure all outcomes are contextualised to help Cadets understand what they are learning in relation to what they will experience at sea.</p>	<p>While some outcomes are intrinsically linked to work carried out at sea, some need to be contextualised to show how they apply to work on board. Where this is the case, it is important to make sure Cadets clearly understand how the outcome relates to work at sea and it is essential to make sure that this context is given with reference to current and future seagoing technologies and practices.</p>	<p>Where outcomes do not specifically cover a topic which relates to work carried out at sea, more must be done to contextualise the outcome and make it relevant to the maritime industry, giving specific shipping examples of how the outcome may be applied in a modern shipping context. Not every template has contextualisation recommendations but please do add any you feel may have been missed.</p>