سازمان بنادر و دریانوردی

دستورالعمل اجرایی برگزاری دوره آموزشی و آزمون های شایستگی دریانوردی سمت

افسر اول بر روی کشتیهای با ظرفیت ناخالص ۳۰۰۰ یا بیشتر - سفرهای نامحدود

The code of practice for conducting Chief Mate on ships of Gross Tonnage (GT ≥ 3000) engaged on Unlimited Voyages Training Course and Competency Assessments

کد مدرک: P6-W118

شماره بازنگری	تاریخ بازنگری	شرح تغییرات (علت و محل)	تهیه کننده	تأیید کننده	تصویب کننده
۰۲	۱۳۹۳/۰۵/۲۷	براساس بازنگری کلی کنوانسیون STCW 78, As Amended	رئیس اداره استانداردهای دریانوردان نصرت اله علی پور	مدیر کل امور دریانوردان حسین میرزایی	معاون امور دریایی سید علی استیری

فهرست مندرجات

مقـــدمـــه

سازمان بنادر و دریانوردی در راستای اجرای وظایف و اختیارات قانونی ناشی از ماده ۱۹۲ قانون دریایی جمهوری اسلامی ایران مصوب شهریور ماه ۱۳۴۳ و بند ۱۰ ماده ۳ آئین نامه تشکیل سازمان بنـادر و دریانوردی مصـوب بهمـن ماه ۱۳۴۸ کمیسیون هـای خاص دو مجلس که صدور هـر گونه سند یـا گواهینامه و پروانه مربوط به کشتی ، فرماندهان، افسران و کارکنان کشتیها را در صلاحیت این سازمان قرار داده و در راستای رعایت مفاد کنوانسیون بین المللی استانداردهای آموزش، صدور گواهینامه و نگهبانی دریانوردان (STCW- as amended) مصوب مرداد ماه ۱۳۷۵ مجلس شورای اسلامی ایران و با عنایت به مقرره II/2 کنوانسیون و بخش II/2 - الف آیین نامه مربوطه ، این "دستورالعمل اجرایی برگزاری دوره آموزشـی و آزمونهای شایستگی دریانوردی سمت افسـر اول بر روی کشتیهای با ظرفیت ناخالـص ۳۰۰۰ یا بیشتر (GT≥3000) - سفرهای نامحدود " را تدوین نموده و پس از تصویب هیأت عامل سازمان قابـل اجرا می باشد.

یادداشت: قانون تغییر نام سازمان بنادر و کشتیرانی به سازمان بنادر و دریانوردی در تاریخ ۱۳۸۷/۰۲/۱۰ به تصویب مجلس شورای اسلامی رسید.

۱–هدف از تدوین

هدف از تدوین این دستورالعمل ارائه حداقل نیازمندیهای برگزاری دوره آموزشی و آزمونهای شایستگی دریانوردی سمت افسر اول بر روی کشتیها ی با ظرفیت نا خالص ۳۰۰۰ یا بیشتر (GT≥3000) - سفرهای نامحدود می باشد.

۲– دامنه کاربرد

این دستورالعمل برای کلیه مراکز آموزشی مورد تایید سازمان و مجری برگزاری دوره آموزش سمت افسر اول بر روی کشتیهای با ظرفیت نا خالص ۳۰۰۰ یا بیشتر (GT≥3000) - سفرهای نامحدود می باشند، کاربرد دارد.

۳–تعاریف

اصطلاحات استفاده شده در راستای اهداف این دستورالعمل دارای معانی ذیل می باشند.

۳–۱ دستگاه نظارت مرکز (Central Monitoring Office):

به معنای اداره یا بخشی که وظیفه صدور مجوز فعالیت آموزش دریانوردی و نظارت بر مراکز آموزشی را بر عهده دارد. دستگاه نظارت در ستاد سازمان ، اداره استانداردها ی دریانوردان می باشد. مدیر کل امور دریانوردان نیز جزء دستگاه نظارت مرکز بوده و می تواند صدور مجوز فعالیت آموزش دریانوردی و نظارت بر مراکز آموزش دریانوردان را تایید نماید.

۳–۲ گواهینامه شایستگی دریانوردی (Certificate of Competency):

به معنای گواهینامه صادره طبق مفاد بند ٥,٤ این دستورالعمل برای فرماندهان، افسران و کاربران مخابرات می باشد و دارنده‌ی قانونی آن محق به خدمت در سمت و عمل به وظایف مربوطه در سطح مسئولیت مشخص شده در آن است.

۳–۳ افسر اول (Chief Mate):

به معنای افسر عرشه ای است یک درجه پایینتر از فرمانده که بر اساس مفاد مربوطه این دستورالعمل واجد شرایط بوده و در مواقع عدم توانایی فرمانده، مسئولیت فرماندهی کشتی را بر عهده می گیرد.

۳–۴ دستورالعمل (Code of Practice):

به معنای مجموعه قوانین، مقررات ملی و الزامات مندرج در این دستورالعمل است که توسط اداره کل امور دریانوردان تدوین و به تصویب هیات عامل سازمان رسیده است.

۳-۵ شرکت کشتیرانی (Company):

به معنای مالک کشتی، هر شخصی مانند مدیر، یا اجاره کننده دربست کشتی است، که مسئولیت عملیات کشتی از طرف مالک کشتی بر وی فرض شده است، و با قبول چنین مسئولیتی، کلیه وظایف و مسئولیت‌های محول شده بر شرکت توسط این دستورالعملها را بر عهده گرفته است.

۳-۶ کنوانسیون (Convention):

به معنای کنوانسیون اصلاح شده بین المللی استانداردهای آموزشی، صدور گواهینامه و نگهبانی دریانوردان (STCW-78 as amended) می باشد.

۳-۷ گواهی طی دوره (Course Completion Certificate or Documentary Evidence):

به معنای گواهی است که مرکز آموزشی مورد تایید سازمان به فراگیر پس از گذراندن موفقیت آمیز دوره مربوطه ارائه می دهد.

۳-۸ ظرفیت ناخالص کشتی (Gross Tonnage):

به معنای ظرفیت ناخالص حجمی محاسبه شده شناور بر اساس مقررات مربوطه می باشد.

۳-۹ آئین نامه ی امنیت کشتی ها (ISPS Code):

به معنای آئین نامه بین المللی امنیت کشتی ها و تسهیلات بندری است که در تاریخ ۲۰۰۲ میلادی طی قطعنامه شماره ۲ کنفرانس دولتهای متعاهد به کنوانسیون بین المللی ایمنی جان اشخاص در دریا ۱۹۷٤ (SOLAS) به تصویب رسیده و ممکن است توسط سازمان بین المللی دریانوردی براساس اصلاحیه های بعدی تغییر یابد.

۳-۱۰ سطح مدیریتی (Management Level):

به معنای سطحی از مسئولیت اطلاق می گردد که مرتبط با وظایف مدیریتی فرمانده، افسر اول، افسر سرمهندس و افسر مهندس دوم در کشتیها می باشد و همچنین آنها را ملزم به حصول اطمینان از انجام مطلوب وظایف محوله بر روی کشتی در حیطه مسئولیت هایشان می نماید.

۳-۱۱ فرمانده (Master):

به معنای شخصی است که عهده‌دار فرماندهی کشتی می باشد.

۳-۱۲ گواهینامه سلامت پزشکی (Medical Fitness Certificate):

به معنای گواهینامه ای است که توسط پزشک معتمد سازمان طبق دستورالعمل مربوطه و جهت متقاضیانی که از نظر پزشکی از سلامت برخوردار باشند، صادر می گردد.

۳-۱۳ کشتی تجاری (Merchant Ship):

به معنای هر نوع شناوری است (به استثنای شناورهای خدماتی، سکوهای متحرک فراساحلی، صیادی و یا نظامی) که در امر جابجایی کالاهای تجاری، مسافر و بار تسهیلات مربوط به کالاهای تجاری بکار گرفته می شود.

۳-۱۴ ماه (Month):

جهت محاسبه خدمت دریایی هر ماه متشکل از ۳۰ روز می باشد.

۳-۱۵ سازمان (Ports & Maritime Organization):

به معنای سازمان بنادر و دریانوردی جمهوری اسلامی ایران می باشد.

۳-۱۶ مقررات (Regulations):

به معنای مجموعه مقررات مندرج در کنوانسیون و آئین نامه می باشد.

۳-۱۷ خدمت دریایی (Seagoing Service):

به معنای مدت زمان دریانوردی بر روی کشتی است که می بایست مرتبط با صدور و یا تجدید گواهینامه های شایستگی و یا مهارت در یانوردان می باشد.

۳-۱۸ گواهی خدمت دریایی (Seagoing Service/ Documentary Evidence):

به معنای تأییدیه خدمت دریایی دریانوردان جهت شرکت در دوره های آموزشی، آزمونهای دریانوردی و صدور گواهینامه های دریانوردی می باشد که علاوه بر ثبت در شناسنامه دریانوردی، توسط شرکت کشتیرانی/ مالک کشتی و یا اتحادیه مالکان کشتیها به صورت فرم کامپیوتری (computer sheet)، نامه اداری شماره شده و یا فرم تعریف شده (به ضمیمه این دستورالعمل) قابل ارائه می باشد.

۳-۱۹ کشتی دریا پیما (Seagoing Ship):

به معنای کشتی است به غیر از آنهائیکه منحصراً در آبهای سرزمینی، نزدیک یا مجاور آبهای پناه گاهی و یا مناطق مشمول مقررات بندری ، تردد میکنند.

۳-۲۰ آئین نامه ی کنوانسیون (STCW Code):

به معنای آئین نامه ی استانداردهای آموزش، صدور گواهینامه و نگهبانی دریانوردان که طی قطعنامه ی شماره ۲ کنفرانس سال ۱۹۹۵ میلادی تصویب و ممکن است توسط سازمان بین المللی دریانوردی بر اساس اصلاحیه های بعدی تغییر یابد، می باشد.

۳-۲۱ مرکز آموزشی(Training Center):

به معنای دانشگاه، شرکت، موسسه یا هر ارگانی که بر اساس مجوز اخذ شده از سازمان در زمینه آموزشهای دریانوردی فعالیت می کند.

۳-۲۲ سفرهای نامحدود (Unlimited Voyages):

به معنای سفرهای بین المللی که محدود به سفرهای نزدیک به ساحل نباشد.

۴- مسئولیت‌ها

٤-۱ مسئولیت بازنگری این دستورالعمل بر عهده دستگاه نظارت مرکز می‌باشد.

٤-۲ مسئولیت تایید اصلاحیه ها به این دستورالعمل بر عهده اداره کل امور دریانوردان می‌باشد.

٤-۳ مسئولیت تصویب اصلاحیه ها به این دستورالعمل برعهده معاون امور دریایی به نیابت از هیات عامل سازمان می باشد.

٤-٤ مسئولیت اجرای کامل دوره آموزشی بر اساس عناوین اعلام شده بر عهده مرکز آموزشی می باشد.

٤-٥ مسئولیت نظارت بر حسن اجرای این دستورالعمل در مراکز آموزشی دریانوردی بر عهده دستگاه نظارت مرکز می باشد.

۵- روش اجرا :

۵-۱ هدف از برگزاری دوره آموزشی

هدف از برگزاری این دوره آموزشی ، آماده نمودن فراگیران برای کسب توانمندی های مندرج در ستون ۱ از جدول بخش II/2 – الف می باشد.

۵-۲ طول دوره

۵-۲-۱ طول دوره حداقل ۷٦۹ ساعت و بر اساس ٦۱۷ ساعت نظری (تئوری) ، ۱٦ ساعت عملی و ۱۳٦ ساعت تمرین می باشد.

۵-۲-۲ حداکثر مدت زمان آموزش روزانه برای هر فراگیر ۸ ساعت می باشد.

۵-۳ تعداد شرکت کنندگان در دوره

۵-۳-۱ حداکثر فراگیران شرکت کننده در هر دوره ۲۰ نفر می باشد.

۵-۳-۲ در صورت افزایش حداقل فضا، تجهیزات و امکانات کمک آموزشی مرتبط بر اساس دستورالعمل صدور مجوز و نظارت بر اجرای دوره ها در مراکز آموزشی دریانوردی و پس از اخذ تاییدیه از دستگاه نظارت ذیربط، تعداد شرکت کنندگان در دوره می تواند حداکثر تا ۳۰ نفر افزایش یابد.

۵-۴ شرایط ورود به دوره

۵-٤-۱ دارا بودن حداقل سن ۱۸ سال

۵-٤-۲ دارا بودن گواهینامه سلامت پزشکی معتبر بر اساس دستورالعمل مصوب سازمان

۵-٤-۳ دارا بودن گواهینامه شایستگی افسر دوم بر روی کشتیها ی با ظرفیت نا خالص ۵۰۰ یا بیشتر (GT≥500) سفرهای نامحدود؛ و

۵-٤-٤ دارا بودن حداقل ۱۸ ماه خدمت دریایی بر روی کشتیهای با ظرفیت ناخالص ۵۰۰ یا بیشتر (GT≥500) سفرهای نامحدود در سمت افسر ناوبر مسئول نگهبانی پس از اخذ گواهینامه.

۵-۵ دانش، درک و مهارت مورد انتظار

۵-۵-۱ توانایی برنامه ریزی سفر دریایی، هدایت و راهبری کشتی (ناوبری)

۵-۵-۲ توانایی تعیین موقعیت کشتی و کنترل صحت موقعیت تعیین شده با دیگر تجهیزات کمک ناوبری

۵-۵-۳ توانایی تعیین و اعمال خطاهای قطب نما

۵-۵-٤ توانایی هماهنگ نمودن عملیات تجسس و نجات

۵-۵-۵ توانایی برقراری و انجام نگهبانی ایمن

۵-۵-٦ توانایی برقراری ناوبری ایمن با بکارگیری از تجهیزات کمک ناوبری به منظور کمک در ارائه تصمیم گیری مناسب

۵-۵-۷ توانایی حفظ ایمنی دریانوردی از طریق استفاده از ECDIS و سیستمهای ناوبری مربوطه به منظور کمک در ارائه تصمیم گیری مناسب

۵-۵-۸ توانایی پیش بینی وضعیت آب و هوا و همچنین شرایط جوی اقیانوس

۵-۵-۹ توانایی عکس العمل و پاسخ به علائم اضطراری در دریا

۵-۵-۱۰ توانایی عملیات و مانور با کشتی در کلیه شرایط

۵-۵-۱۱ توانایی کاربری سیستم کنترل از راه دور رانش کشتی و دیگر سرویسها و سیستمهای مرتبط موتور

۵-۵-۱۲ توانایی برنامه ریزی ، نظارت بر بارگیری ، بارچینی ، مهار و تخلیه کالا و همچنین اقدامات ایمنی در نگهداری کالا در سفرهای دریایی

۵-۵-۱۳ توانایی در حمل کالاهای خطرناک با کشتی

۵-۵-۱٤ توانایی در کنترل تراز طولی(تریم) ، تعادل و فشارهای وارده بر روی کشتی

۵-۵-۱۵ توانایی در پایش و کنترل انطباق با قوانین ومقررات جهت اطمینان از:

- ایمنی جان افراد در دریا
- حفاظت از محیط زیست دریایی

۵-۵-۱٦ توانایی در حفظ ایمنی و امنیت خدمه و مسافران

۵-۵-۱۷ توانایی در تهیه طرح های اضطراری و کنترل خسارت وارده بر کشتی

۵-۵-۱۸ توانایی در سازماندهی و مدیریت خدمه

۵-۵-۱۹ توانایی در سازماندهی و ارائه مراقبتهای پزشکی بر روی کشتی

۵-۵-۲۰ توانایی بررسی و گزارش نقایص و صدمات وارده به انبار کالا ، درب انبارها و مخازن آب شور

۵-۵-۲۱ توانایی حفظ و نگهداری قابلیت دریانوردی شناور

۵-۶ عناوین دروس ، ریز مواد درسی و آزمون

عناوین دروس و جدول نمایانگر تعداد سؤالات ، مدت ، نوع ، حدنصاب قبولی و مواد درسی آزمونهای شایستگی دریانوردی برای داوطلبین سمت " افسر اول بر روی کشتیهای با ظرفیت ناخالص ۳۰۰۰ یا بیشتر (GT≥3000) - سفرهای نامحدود " به شرح ذیل می باشد.

۱-۶-۵ جدول نمایانگر تعداد سؤالات، مدت، نوع، حد نصاب قبولی و مواد درسی آزمونهای شایستگی سمت افسر اول بر روی کشتیها ی با ظرفیت نا خالص۳۰۰۰ یا بیشتر (GT≥3000) – سفرهای نامحدود

ردیف	نام آزمون	تعداد سؤالات	مدت (ساعت)	نوع آزمون	حدنصاب قبولی (درصد)	مواد درسی (ماده ۲-۶-۵)	ملاحضات
۱	ناوبری ساحلی ، سطحی	۵	۲/۵	کتبی	٪۷۰	1.1.1-1.1.2-1.2.1.2-1.6.4-1.6.5-	
۲	هواشناسی	۵	۲/۵	کتبی	٪۵۵	1.6.1-1.6.2-1.6.3-	
۳	عملیات روی کشتی	۵	۲/۵	کتبی	٪۵۵	2.1.1-2.1.3-2.1.4-2.1.5-2.1.6-2.1.7-2.1.8-2.1.9-2.1.10-2.2.1-2.2.2-2.3.1-2.3.2	
۴	تعادل و ساختمان کشتی	٦	۳	کتبی	٪٦۰	2.1.2-3.1.1.1-3.1.1.2-3.1.1.3-3.1.1.4-3.1.1.5-3.1.1.6-3.1.1.7-3.1.2-3.1.3	تعادل ۳ سئوال ٦۰ نمره – ساختمان ۳ سئوال ٤۰ نمره
۵	تجارت و حقوق دریایی	۵	۲/۵	کتبی	٪۵۵	3.2.1	
۶	شفاهی/ عملی/ شبیه ساز	–	–	شفاهی/ عملی/ شبیه ساز	–	1.1.3-1.4.1-1.5.1-1.5.2-1.7.1-1.7.2-1.7.3-1.7.4-1.7.5-1.7.6-1.7.7-1.8.1-3.3.1-3.3.2-3.3.3-3.3.4-3.3.5-3.4.1-3.4.2-3.4.3-3.4.4-3.5.1-3.5.2-3.5.3-3.5.4-3.5.5-3.5.6-3.6.1	در زمان آزمون شفاهی به همراه داشتن شناسنامه دریانوردی الزامی می باشد

در آزمون شفاهی / عملی / شبیه ساز علاوه بر مواد درسی مربوطه، ممکن است برحسب مورد سؤالاتی از سایر مواد درسی پرسیده شود.

۲-٦-۵ حداقل مواد درسی دوره آموزش سمت افسر اول بر روی کشتیهای با ظرفیت نا خالص ۳۰۰۰ یا بیشتر- (GT≥3000) سفرهای نامحدود در بخش انگلیسی این دستورالعمل می باشد.

۵-۷ امکانات مورد نیاز جهت برگزاری دوره

جهت برگزاری دوره آموزشی علاوه بر فضای آموزشی قید شده در " دستورالعمل صدور مجوز و نظارت بر اجرای دوره ها در مراکز آموزشی دریانوردی "مصوب سازمان ، تجهیزات کمک آموزشی مشروحه زیر نیز مورد نیاز می باشد:

۵-۷-۱ سالن /کلاسها می بایست مجهز به سیستم تهویه و نورکافی و وسایل سمعی و بصری و امکانات مورد نیاز برای تدریس باشد (وسائل کمک آموزشی شامل: میز نقشه ، وایت بورد/ تخته سفید، کامپیوتر و دستگاه ویدئو پروژکتور چند رسانه ای، پرده ویدئو پرژکتور)

۵-۷-۲ کتابخانه مجهز به کتب تخصصی مورد نیاز تدریس و اطلاعات جامع دیگر در خصوص دوره (تعداد مناسب کتب مرجع مانند : آلمانک، نوریس، جداول جزر و مد و غیره).

۵-۷-۳ سالن /کلاس نقشه (Chart Room) مجهز به امکانات و تجهیزات مورد نیاز برای تدریس مواد درسی کار بر روی نقشه و ناوبری ساحلی(Chart Work Facilities) برابر با تعداد فراگیران دوره.

۵-۷-٤ فیلم های آموزشی مرتبط در خصوص دوره.

۵-۷-۵ مدل کره زمین، مدلهای مختلف بویه های دریایی ، ماکت و مدلهای مختلف شناورها با علائم شناسایی شناورها در روز و شب، ماکت و مدلهای اسکله و حوضچه برای تمرین قوانین راه و پهلو گیری و جدا سازی از اسکله ، ماکت کشتیها که شماتیک جرثقالها و دیگر تجهیزات عرشه را نشان دهد.

- Cut-away three-dimensional models showing the structure of parts of the ship.
- Photographs, drawings and plans illustrating various types of ship and constructional details.
- A floating ship stability demonstration model and a flotation tank. The model should be capable of demonstrating the effects of adding or removing masses, shifting masses, suspending masses and free liquid surface.
- Copies of approved stability information books and computer loading programmes from ships.
- Schematic model of a product tanker, tanks and pump-room, showing piping and valves.
- Schematic model of a crude carrier, tanks and pump-room, showing piping and valves.
- Photographs, drawings and plans to illustrate different types of ship.
- Examples of cargo plans for various types of ship.

۵-۷-٦ سالن آشنایی با وسایل مختلف مورد استفاده در کشتیها (Instrument Room) شامل:

Magnetic Compass, Binnacle with Magnetic Compass/ Accessories and Sighting Devices, Gyro Compass and Pelorus.

۵-۷-۷ دستگاه Weather , NAVTEX دستگاه , GPS دستگاه , VDR/S-VDR , BNWAS , AIS , LRIT, facsimile receiver (جایگزین نمودن نرم افزار مناسب برای شبیه سازی دستگاههای مندرج در این بند و یا استفاده از کشتی های مستقر در بندر با تجهیزات مربوطه جهت تشریح بصورت بازدید، و با اخذ تائیدیه از دستگاه نظارت صادر کننده مجوز مورد قبول می باشد).

۵-۸ شرایط مدرسین و مربیان دوره

۵-۸-۱ مدرسین و مربیان دوره های آموزشی مندرج در این دستورالعمل می بایست علاوه بر گذراندن دوره مدرسی مورد تأیید سازمان دارای حداقل مدارک و تجارب مشروحه زیر باشند:

۵-۸-۱-۱ مدرسین:

۵-۸-۱-۱-۱ دارای گواهینامه شایستگی معتبر فرماندهی بر روی کشتیهای با ظرفیت ناخالص GT≥3000سفرهای نامحدود با حداقل ۱۲ ماه خدمت دریایی در این سمت.

۵-۸-۱-۱-۲ دارندگان گواهینامه شایستگی معتبر افسر مهندس الکترونیک (ETO) با حداقل ۱۲ ماه خدمت دریایی در این سمت می توانند مدرس موضوع سیستمهای کمک ناوبری الکترونیکی باشند.

۵-۸-۱-۱-۳ دارندگان گواهینامه شایستگی معتبر افسر سر مهندس بر روی کشتیهای با قدرت موتور KW≥3000 سفرهای نا محدود با حداقل ۱۲ ماه خدمت دریایی در این سمت (سرمهندسی) می توانند مدرس موضوع اصول مهندسی کشتی و سیستمهای کنترل باشند.

۵-۸-۱-۲ مربیان:

۵-۸-۱-۲-۱ دارای حداقل مدرک تحصیلی فوق دیپلم دریایی (ناوبری) با حداقل ۲ سال خدمت دریایی باشند.

۵-۹ ارزیابی و صدور گواهینامه

۵-۹-۱ در صورت موفقیت فراگیران در ارزیابی های حین و یا پایان دوره، گواهی طی موفقیت آمیز دوره مربوطه توسط مرکز آموزشی مورد تایید و مجری برگزاری دوره صادر می گردد.

۵-۹-۲ سپس فراگیران می توانند درخواست حضور در آزمون های شایستگی و مهارت دریانوردی سازمان را بر اساس مفاد بند ۵-۶-۱ این دستورالعمل ارائه نمایند؛ و

۵-۹-۳ نهایتا اداره امتحانات و اسناد دریانوردان سازمان برای آن دسته از شرکت کنندگان که آزمون های مربوطه را با موفقیت طی نموده باشند و حائز دیگر شرایط لازم باشند، گواهینامه مرتبط بر اساس دستورالعمل صدور، تمدید و تجدید گواهینامه های دریانوردان صادر می نماید.

۵-۱۰ شرایط تمدید / تجدید گواهینامه

گواهینامه های شایستگی و مهارت دریانوردی بر اساس مفاد دستورالعمل صدور ، تمدید و تجدید گواهینامه های دریانوردان تمدید و یا تجدید می گردد.

۵-۱۱ روش تأیید دوره

تأیید دوره بر اساس مفاد مندرج در دستورالعمل صدور مجوز و نظارت بر اجرای دوره‌ها در مراکز آموزش دریانوردی صورت می پذیرد.

۶-سوابق

کلیه سوابقی که نشان دهنده رعایت موارد مندرج در این دستورالعمل باشد.

۷-مراجع

۷-۱ کنوانسیون اصلاح شده STCW و آیین نامه مربوطه

۷-۲ مدل کورس سازمان بین المللی دریانوردی (IMO) شماره ۷/۰۱

۷-۳ دستورالعمل صدور ، تمدید و تجدید گواهینامه های دریانوردان

۷-٤ دستورالعمل صدور مجوز و نظارت بر اجرای دوره ها در مراکز آموزشی دریانوردی

۸- ضمائم

ندارد.

PMO

The code of practice for conducting Chief Mate on ships of Gross Tonnage (GT ≥ 3000) engaged on Unlimited Voyages Training Course And Competency Assessments

P6-W118

Revision No.	Date of revision	Comment on revision	provider	approving amendments authority	endorsing amendments authority
02	18.AUG.2014	STCW Convention, as amended	N. Alipour, Head of Seafarers' Standards' Directorate	H. Mirzaei, Director General of Seafarers' Affairs	S.A.Estiri, PMO's Deputy for Maritime Affairs

هیات عامل سازمان بنادر و دریانوردی

Introduction

Ports and Maritime organization (P.M.O) of the Islamic republic of Iran in performing its duty and in exercising its prerogative resulting from article 192 of the Islamic republic of Iran maritime code, 1964 and paragraph 10 of article 3 of P.M.O manifesto, 1970 enabling it to issue any document, certificate or license for ships, masters, officers and other ship personnel and also in accordance with the provisions of the international convention on standards of training, certification and watch keeping for seafarers (STCW), 1978, as amended adopted by the Islamic consultative assembly in 1996 and taking into account regulations II/2 of the mentioned Convention and section A-II/2 of the STCW Code, develops this "code of practice for conducing Chief Mate on ships of Gross Tonnage (GT≥3000) engaged on unlimited voyages training course and competency assessments" which is applicable after endorsement by the board of executives of Ports & Maritime Organization.

NOTE: The title of Ports and Shipping Organization changed to Ports and Maritime Organization dated 29.04.2008 through parliamentary act and approved by Islamic council assembly.

1-Objective

The objective of this code of practice is to specify the minimum requirements for conducting Chief Mate on Ships of Gross Tonnage GT≥3000 engaged on Unlimited Voyages training course and competency assessments.

2-Scope of application

This code of practice is applicable to all approved training centers that conduct Chief Mate on Ships of Gross Tonnage GT≥3000 engaged on Unlimited Voyages training course.

3-Definition

For the purpose of this Code of Practice, unless expressly provided otherwise:

3-1 Central Monitoring Office

Central monitoring office which is responsible for approving and monitoring training courses is the Seafarer's standard directorate of the PMO.

3-2 Certificate of Competency (COC)

Means a certificate issued and endorsed for masters, officers and GMDSS radio operators in accordance with the provisions of chapters II, III, IV or VII of the STCW Convention and entitling the lawful holder thereof to serve in the capacity and perform the functions involved at the level of responsibility specified therein.

3-3 Chief Mate

Means the officer next in rank to the master and upon whom the command of the ship will fall in the event of the incapacity of the master.

3-4 Code of Practice

Means all national rules, regulations and requirements specified in this document which have been drafted by the PMO's General Directorate of Maritime affairs and endorsed by the PMO's board of executive

3-5 Company

Means the owner of the ship or any other organization or person such as the manager, or the bareboat charterer, who has assumed the responsibility for operation of the ship from the ship owner and who, on assuming such responsibility, has agreed to take over all the duties and responsibilities imposed on the company by these Codes of practices.

3-6 Convention

Means international convention on standards of training, certification and watch keeping for Seafarers, 1978, as amended.

3-7 Course Completion Certificate or Documentary Evidence

Means a certificate issued through the training center, after successfully completion of training program by the applicants

3-8 Gross Tonnage

Means the volume of all enclosed spaces of a vessel calculated in accordance with relevant regulations.

3-9 ISPS Code

Means the International Ship and Port Facility Security (ISPS) Code adopted on 12 December 2002, by resolution 2 of the Conference of Contracting Governments to the International Convention for the Safety of Life at Sea (SOLAS), 1974, as may be amended by the Organization.

3-10 Management Level

Means the level of responsibility associated with serving as master, chief mate, chief engineer officer and second engineer officer on board a seagoing ship, and also ensuring that all functions within the designated area of responsibility are properly performed.

3-11 Master

Means the person having command of a ship

3-12 Medical Fitness Certificate

Means a certificate issued by the PMO's recognized medical practitioner to the candidates who found to be medically fit.

3-13 Merchant Ship

Means any ship (other than servicing vessel, mobile offshore platform, fishing and naval ships) used for carriage of cargoes, passenger and/or provisions

3-14 Month

Means a calendar month or 30 days made up of periods of less than one month.

3-15 PMO

Means Ports & Maritime Organization (PMO) of the Islamic Republic of Iran

3-16 Regulations

Means regulations contained in the annex to the STCW Convention

3-17 Seagoing service

Means service on board a ship relevant to the issue or revalidation of a certificate or other qualification.

3-18 Seagoing Service / Documentary Evidence

Means approved sea going service required to be presented for participating in a training course, maritime examination and issuance of certificate. These documentary evidence should be inserted in CDC and authenticated by company or ship owner or ship owner's associations and in addition be presentable in a form of computer sheet, official letter or other forms as defined in the annex to this code of practice.

3-19 Seagoing Ship

Means a ship other than those which navigate exclusively in inland waters or in waters within, or closely adjacent to, sheltered waters or areas where port regulations apply.

3-20 STCW Code

Means the seafarers' training, certification and watch keeping (STCW) code as adopted by the 1995 conference resolution 2,as it may be amended by the international maritime organization.

3-21 Training center

Means maritime university/center/ directorate/ department/company and/or any organization conducting maritime training course approved by PMO

3-22 Unlimited Voyages

Means voyages not limited to the near coastal voyages.

4 Responsibilities

4-1 Central monitoring office is responsible for revising this code of practice.

4-2 General Director of Seafarers' Affairs is responsible for approving amendments to this code of practice.

4-3 Deputy of maritime affairs is responsible to endorse amendments to this code of practice on behalf of PMO's board of executive.

4-4 Training centers are to conduct training course in accordance with this Code of practice.

4-5 Central monitoring office is responsible for supervising the implementation of this code of practice in training centers.

5 Procedures:

5-1 course objective

The objective of this training course is to prepare trainees to achieve competencies set out in the column 1 of table A-II/2 of the STCW Code.

5-2 course duration

5-2-1 A minimum of 617 hours theoretical, 16 hours practical and 136 Hours exercises for each trainee (total of 769 hours).

5-2-2 Maximum daily contact hours for each trainee are 8 hours.

5-3 number of trainees

5-3-1 the maximum number of trainees in each course is 20.

5-3-2 the number of trainees may be increased to 30 when the relevant facilities, teaching aids and class-room space are increased as per criteria set out in the code of practice for approving and monitoring training courses and is approved by the relevant monitoring office.

5-4 Course entry requirement

The course trainees should, at least;

5-4-1 be not less than 18 years of age;

5-4-2 holding valid medical fitness certificate, issued in accordance with the provisions of the relevant code of practice;

5-4-3 Holding Second Officer certificate of competency for merchant vessel on ships with GT ≥ 500, unlimited voyages; and

5-4-4 having at least 18 months seagoing service on merchant ships with GT ≥ 500, unlimited voyages in the rank of officer in charge of navigational watch, after obtaining the Second Officer certificate of competency on ships with GT≥500, unlimited voyages.

5-5 Expected Knowledge, Understanding and Proficiency

5-5-1 Proficiency in planning a voyage, conducting navigation and maneuvering;

5-5-2 Proficiency in determining position and controlling accuracy of position obtained by other navigational aids;

5-5-3 Proficiency in obtaining and applying Compasses error;

5-5-4 Proficiency in coordinating Search and Rescue Operation;

5-5-5 Proficiency in maintaining a safe navigational watch;

5-5-6 Ability in maintaining a safe navigational watch by use of navigational aids for assist in command decision making;

5-5-7 Ability to maintain safety of navigation by use of ECDIS and other navigational aids for assist in command decision making;

5-5-8 Knowledge of meteorological information, navigational warnings and information;

5-5-9 Knowledge of responding to a emergencies and distress signal at sea;

5-5-10 Proficiency in manoeuvring and handling a ship in all conditions;

5-5-11 Proficiency in manoeuvring and operating engine;

5-5-12 Knowledge of monitoring the loading, stowage, securing and unloading of cargoes and their care during the voyage;

5-5-13 Knowledge of carriage of dangerous goods;

5-5-14 Knowledge of methods of controlling ship stability and stress to the ship;

5-5-15 Proficiency in monitoring and controlling compliance with legislation to ensure, Safety of life at sea, Protection of the marine environment;

5-5-16 Ability in contribution to safety and security of personnel and ship and passengers;

5-5-17 Proficiency in preparing contingency plan and damage control plan;

5-5-18 Ability in leadership and team working skills;

5-5-19 Proficiency in organizing medical assistance for ship personnel;

5-5-20 knowledge of inspecting and reporting defects and damage to cargo spaces, hatch covers and ballast tanks;

5-5-21 Ability in maintaining the sea-worthiness of the ship;

5-6 Course syllabi and competency assessment

5-6-1 Competency assessment details

No.	Title	Number of Question	Time (hours)	Type	Pass mark	Subjects (5-6-2)	Remarks (if any)
1	Coastal Navigation	5	Maximum 2.5 hours	Written	70%	1.1.1-1.1.2-1.2.1.2-1.6.4-1.6.5-	
2	Meteorology	5	Maximum 2.5 hours	Written	55%	1.6.1-1.6.2-1.6.3-	
3	Shipboard Operation	5	Maximum 2.5 hours	Written	55%	2.1.1-2.1.3-2.1.4-2.1.5-2.1.6-2.1.7-2.1.8-2.1.9-2.1.10-2.2.1-2.2.2-2.3.1-2.3.2	
4	Ship Stability & Ship Construction	6	Maximum 3 hours	Written	60%	2.1.2-3.1.1.1-3.1.1.2-3.1.1.3-3.1.1.4-3.1.1.5-3.1.1.6-3.1.1.7-3.1.2-3.1.3	Ship Stability 3 questions and 60 marks & Ship Construction 3 questions and 40 marks
5	Business & Law	5	Maximum 2.5 hours	Written	55%	3.2.1	
6	Oral	-	-	Oral/practical/simulator	To the discretion of assessor	1.1.3-1.4.1-1.5.1-1.5.2-1.7.1-1.7.2-1.7.3-1.7.4-1.7.5-1.7.6-1.7.7-1.8.1-3.3.1-3.3.2-3.3.3-3.3.4-3.3.5-3.4.1-3.4.2-3.4.3-3.4.4-3.5.1-3.5.2-3.5.3-3.5.4-3.5.5-3.5.6-3.6.1	At the time of oral examination seaman book must be presented

In Oral/practical/simulator assessment question from written assessments may also be asked.

5-6-2 Course minimum syllabi

Function: 1. Navigation at the management level

Competence: 1.1 Plan a voyage and conduct navigation

1.1.1 Voyage planning and navigation for all conditions by acceptable methods of plotting ocean tracks, taking into account, e.g.:

- **Restricted waters**
- **Meteorological conditions**
- **Ice**
- **Restricted visibility**
- **Traffic separation scheme**
- **Vessel Traffic Service(VTS) areas**
- **Area of extensive tidal effects**

.1 Voyage planning and navigation for all conditions 12hrs (T) + 0hrs (P) + 12hrs (E).

Knowledge of;

- That charts, course cards and other voyage planning documentation, i.e. navigation notebooks, accurately detail the plan and are prepared in accordance with industry practice.
- That positions, distances and ETAs or average speed required calculations completed using mercator sailing, great circle sailing, composite great circle sailing and limited latitude sailing are accurate.
- That there is adequate fuel, water and provisions on board for the voyage.
- That all watchkeeping officers are fully briefed and familiar with the voyage plan.
- That watchkeeping officers understand the circumstances in which they may deviate from the initial plan and the requirement to update the plan where this occurs.

Ability to;

- determine key parameters for the voyage to be planned and briefs officers appropriately
- fully appraises all information that may be relevant to the voyage, including information from:
  - Routeing and pilot charts
  - Ocean Passages of the World
  - Sailing Directions
  - Charts
  - IMO Routeing Guide
  - Lists of Lights
  - Lists of Radio Signals
  - Tidal and Tidal Stream Information
  - Loadline, insurance and charter party parameters
  - Port Information
  - Notices to mariners
  - Navigation Warnings
  - Meteorological information
  - Vessel condition, draught, trim and handling characteristics
- plan voyages from berth to berth using strategies and contingency plans in order to deal with various factors, such as:
  - encountering restricted visibility
  - expected meteorological conditions
  - navigational hazards and no go areas

- making landfall
- accuracy of position fixing required in critical areas
- encountering or navigating in ice
- areas of restricted/confined/pilotage waters
- traffic separation schemes en-route
- expected traffic density
- operational requirements in terms of passage time and fuel consumption
- areas of extensive tidal effects
- ensuring adequate fuel, water and provisions
- ensuring the safety of the personnel, property and the environment
- ship reporting requirements in vessel traffic service (VTS) and other reporting areas
- vessel condition, draught, trim and handling characteristics

.2 Navigation and monitoring of the voyage 6hrs (T) + 0hrs (P) + 6hrs (E).

Knowledge of;

- Plan and establish parameters and guidance to watchkeeping officers to ensure that the navigation and monitoring of the voyage is appropriate for the area being navigated, with particular regard to navigation in areas of:
  - restricted waters
  - meteorological conditions
  - ice
  - restricted visibility
  - traffic separation schemes
  - vessel traffic service (VTS) areas
  - areas of extensive tidal effects
- That the vessel's position is monitored using two or more independent position determination systems appropriate to the area.
- That the vessel's position is determined at appropriate intervals and monitored continuously.
- That the execution of the voyage plan is monitored and that any required alterations are appraised, evaluated and approved where these are outside the authority of the watchkeeping officer.

.3 Log books and voyage records 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That proper log and voyage records are maintained in accordance with maritime shipping acts and other laws and regulations (National and International Regulations).

1.1.2 Routeing in according with general provisions on ship's routeing

. 1 Routeing 6hrs (T) + 0hrs (P) + 6hrs (E).

Ability to;

- Select ocean and coastal routes that appropriately consider:
  - mandatory or recommended requirements including the IMO Routeing Guide
  - distance
  - average passage speed and fuel consumption
  - availability of position monitoring
  - safety of life, property and the environment

- Select appropriate routes using:
  - weather routeing information received from shore based providers
  - weather routeing techniques using synoptic and prognosis information observed and received from ashore

1.1.3 Reporting in accordance with the general principles for ship reporting systems and with VTS procedures

.1 Ship reporting systems 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The general principles for various ship reporting systems
- The general principles for reporting as per VTS procedures
- The reporting requirements for particular reporting and VTS systems
- Make reports in accordance with published procedures and criteria

Competence: 1.2 Determine position and the accuracy of resultant position fix by any means

1.2.1 Position determination in all conditions

.1 By celestial observations 4hrs (T) + 0hrs (P) + 6hrs (E).

Ability to;

- Determine parameters for position monitoring on ocean passages using celestial observations of the sun and stars, uses appropriate techniques, frequency and is completed accurately.
- Verify that celestial techniques are correctly applied by watchkeeping officers.
- Assess the accuracy of position monitoring using celestial techniques.
- Use a celestial body to determine the direction of a position line through an observer and a position through which it passes.
- Apply the calculated zenith distance to the true zenith distance of the body to find the intercept and the intercept terminal point through which to draw the position line (Marcq St. Hilaire also known as: Intercept method).
- Obtain the longitude of the observer and the direction of the position line through an observer using a celestial body (Longitude by Chronometer Method).
- Apply the true zenith distance of a celestial body when it is on the observer's meridian to the declination of the body, to obtain the observer's latitude (Latitude by Meridian Altitude).
- Obtain the corrections, from pole star tables in the nautical almanac and applies them to the altitude of Polaris to find the latitude of the observer.
- Find the true azimuth of Polaris from the tables and the direction of the position line.
- Classify stars by apparent magnitude.
- Choose stars suitable for observation in the twilight period.
- Identify stars by means of a star chart, a star finder and by calculation using Sidereal Hour Angle (SHA) and declination of the star.
- Find the position of the observer at the time of the final observation, given two or more position lines with the courses and distances run between the observations using simultaneous / staggered observations.

.2 Terrestrial observations, including the ability to use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting fix . 8hrs (T) + 0hrs (P) + 8hrs (E).

Knowledge of;

- How errors may occur in position fixing, and explains how to minimize the probability of errors.

Understanding of;

- The Mercator sailing formula.

Ability to;

- Select and apply the most appropriate techniques for position monitoring using terrestrial observations in any area being navigated.
- Verify that the position is determined at appropriate frequencies and monitored continuously using terrestrial observations and techniques where these are possible.
- assess the accuracy of position monitoring using terrestrial techniques, particularly considering:
  - the limitations and errors of the technique used
  - information from charts, notices to mariners and other publications
- Use the Mercator formula to calculate course and distance between two positions
- Use the Mercator formula to calculate the final position, given the initial position, course and distance.
- Calculate initial course and distance of a great-circle track.
- Calculate the position of the vertex.
- Calculate intermediate positions on the great circle and the course at these points.
- Calculate the distance and time to sail per 10 changes of course.
- Calculate composite sailing.
- Transfer a great circle to a Mercator chart.
- Use appropriate charts, notices to mariners and other publications to assess the accuracy of the resulting fix.

Demonstrates

- The use of gnomonic charts for plotting the great circle between two points.

- How erroneous position lines influence the positions.
- The use of a chart catalogue.
- The correcting of charts using information from notices to mariners.

.2.1 Chart work exercise 4hrs (T) + 0hrs (P) + 6hrs (E).

Ability to;

- Converting true course to compass course and vice versa.
- Magnetic and gyro compass error by transit bearing.
- Converting compass bearing to true bearing.
- Position by cross bearing.
- Position by bearing and distance off the charted object.
- Position circle by radar distance off a charted object.
- Position line by bearing.
- Direction of course made good by 3 bearings using one object only .
- Position line by horizontal angle.

- Position line by vertical angle.
- Angle on bow.
- Beam distance off.
- Transferring position lines.
- Running fix.
- Course and distance made good with tidal stream or current.
- Course to steer allowing for tidal stream or current.
- Actual set and rate of current between two positions.
- Leeway due to wind, course to steer allowing for leeway.

.2.2 Tides 4hrs (T) + 0hrs (P) + 4hrs (E).

Knowledge of;

- General theory of tide.
- Basic methods of predicting tides, non-astronomical component of sea level and other irregularities of the tide.
- Simplified harmonic method of tide prediction, zero level of the chart and demonstrate use of tidal stream charts.

Ability to;

- Use tide tables and determine height and time for high and low water in standard and secondary ports, predicted height of water at a given time in a tabulated port, the predicted time for a given tide level.

.3 Use modern electronic navigational aids with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction to obtain accurate position fixing 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the most appropriate electronic systems and electronic navigation aids are used for position monitoring in any area given the information the system may provide and the limitations, errors and accuracy of the available system.
- That each electronic navigation aid used is set up and operated effectively.
- Assess the accuracy of position monitoring using electronic navigation aids.
- Ensure that the vessel position is determined at appropriate frequencies and monitored continuously using the most appropriate electronic navigation aids available and this is cross checked with terrestrial or celestial observations where these are possible.

.3.1 Loran-C 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The operating principle of Loran-C.
- The meaning of Group Repetition Interval (GRI).
- The principles of time difference used in the Loran-C system.
- How position fixing is achieved using Loran-C.

Familiarity with;

- The importance of coding delay.
- The errors of Loran-C, including;
  - Ground wave propagation error
  - Sky wave error
  - Lattice error
  - Synchronisation error
  - Envelope to cycle discrepancy
  - Receiver error

.3.2 Enhanced Loran (eLoran) 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The operating principles of e-Loran and that it is a terrestrial navigation system.
- That e-Loran is an independent, dissimilar, complement to Global Navigation Satellite Systems (GNSS).
- That the principal difference between e-Loran and traditional Loran-C is the addition of a data channel on the transmitted signal.
- That the e-Loran will allow GNSS users to retain the safety, security, and economic benefits of GNSS, even when their satellite services are disrupted.
- That each user's e-Loran receiver will be operable in all regions where an e-Loran service is provided and e-Loran receivers shall work automatically, with minimal user input.
- That the core e-Loran system comprises of modernized control centers, transmitting stations and monitoring sites.
- That e-Loran transmissions are synchronized to an identifiable, publicly-certified, source of Coordinated Universal Time (UTC) by a method wholly independent of GNSS.
- That e-Loran users' receivers operate in an all-in-view mode. That is, they acquire and track the signals of many Loran stations (the same way GNSS receivers acquire and track multiple satellites) and employ them to make the most accurate and reliable position and timing measurements.
- That an important bonus of using e-Loran – something GNSS cannot provide – is the e-Loran compass. How, when the receiver is used with an H-field (Magnetic Loop) antenna it can be employed as an automatic direction finder taking bearings on the transmitting stations. From these, the receiver calculates the ship's heading, generally with an accuracy of better than 1°, and independent of the ship's movement.
- The limitation of the e-Loran system receiver.

.3.3 Global Positioning System (GPS) 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The principle on which the Global Positioning System (GPS) operates.
- The configuration of satellite orbits and the periods of the satellite vehicles (SVs).
- What is meant by 'pseudo-random noise' codes (PRN codes) - describes briefly the two codes which are transmitted - explains why two frequencies are used.
- Why an extremely stable clock is essential in the SV, while a less stable one is acceptable in the receiver.
- How pseudo-ranges are measured by matching the received code with the same locally generated code.
- Why the measurement is not a true range.

Familiarity with;

- That at least four SVs at a usable elevation should be visible to the receiving antenna at any point on the earth's surface at any time.

- That SV positions are accurately controlled from the ground Master Control Station.
- That the Master Control Station also provides data, which are sent to the SVs, stored and later transmitted as a data frame to receiving stations for use in calculating position.
- That civilian sets will probably work on one frequency, using the 'course and acquire' code (C/A code) only.
- That simultaneous pseudo-ranges to three SVs are sufficient to fix the position of the earth's surface and determine the receiver clock error from GPS time but four are required to obtain height.
- The main sources of error in the determined position.
- That the system is expected to have an accuracy of about 100 meters (95% probability).
- That measured Doppler shifts can be processed to provide speed and direction outputs.

.3.4 Differential GPS (DGPS) including other satellite navigation systems 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The use of differential GPS.

- The principle on which the Differential GPS work.
- The two methods by which the DGPS station can transmit the corrections.
- That the system is expected to have an accuracy of 3 – 5 meters.
- Describes the Regional Satellite Navigation Systems such as China's BeiDou (COMPASS) Navigation Satellite System, India's Indian Regional Navigational Satellite System (IRNSS), Japan's Quasi-Zenith Satellite System (QZSS) and France's Doppler Orbitography and Radio positioning Integrated by Satellite (DORIS).
- The limitation of the DGPS receiver.

.3.5 Global Navigation Satellite System (GLONASS) 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That GLONASS (Global Navigation Satellite System) is a space-based three-dimensional positioning, three-dimensional velocity and time system, which is managed for the Government of the Russian Federation by the Russian Space Agency.

- The working principle of GLONASS.
- The GLONASS 3 plane versus the GPS 6 plane satellite constellation and the differing inclinations of 65 degrees and 55 degrees respectively.
- The advantage of the receiver capable of operating on both GLONASS and GPS - "combined GPS/GLONASS receiver equipment".
- That GLONASS system utilizes a global datum based on the Soviet Geocentric Coordinate System 1990 (SGS 90).
- The limitation of the GLONASS system receiver.

.3.6 Galileo **1hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That Galileo is the European satellite navigation system, designed as a wholly civil system, operated under public control and is a 2nd generation Global Navigation Satellite System (GNSS).
- That Galileo comprises 30 medium earth orbit (MEO) satellites in three circular orbits.
- That each orbit has an inclination of 56° and contains nine operational satellites plus one operational spare.
- The concept of Galileo, where each satellite will have two types of atomic clocks, 4 in total (2 rubidium frequency stranded and 2 passive hydrogen maser) - critical to any Sat-Nav system and a number of other components.
- That this information is used to calculate the position of the receiver by triangulating the difference in received signals from multiple satellites.

Familiarity with;

- That this geometry ensures that a minimum of six satellites are in view to user worldwide with a position dilution of precision (PDOP) ≤ 3.5 .
- That Galileo transmits 10 navigation signals and one search and rescue (SAR) signal.
- That the atomic clocks provide an accurate timing signal for a receiver to calculate the time that it takes the signal to reach the target.
- That the Galileo receiver equipment provides a warning within 5 seconds of loss of position or if a new position based on the information provided by the Galileo constellation has not been calculated for more than 1 second for conventional craft and 0.5 seconds for high-speed craft.
- That the Galileo uses Galileo Terrestrial Frame System (GTRF) datum, which is a realization of the International Terrestrial Frame Reference (ITRF) system and differs from WGS 84 by less than 5 cm worldwide.
- That some Galileo receiver equipment also has the capability to process the Galileo Safety of Life Service.
- The limitation of the Galileo system receiver.

.3.7 Automatic Identification System (AIS) **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That the Automatic Identification System (AIS) is a Very High Frequency (VHF) radio broadcasting system.
- That the AIS transfers data over VHF, via a VHF Data Link (VDL), which enables AIS equipped vessels and shore-based stations to send and receive identification information.
- That the principle of AIS is to allow automatic exchange of shipboard information from the vessel's sensors - inputted, static, dynamic and voyage related data - between one vessel and another and between a vessel and a shore station(s).
- The two types Class A and Class B of AIS.
- The working of the AIS, how the AIS uses a Time-Division Multiple Access (TDMA) scheme to share the VHF frequency, also known as the VHF Data Link (VDL).
- That the VHF Data Link (VDL) is divided into time slots that are repeated every 60 seconds and that each AIS unit sends a report to one of the time slots, while at the same time AIS units in range listen to all the timeslots and read the reported information.

- That the Officer of the Watch (OOW) should always be aware that other ships and, in particular, pleasure craft, fishing boats and warships, and some shore stations including Vessel Traffic Service (VTS) centers, might not be fitted with AIS and the OOW should always be aware that AIS fitted on other ships as a mandatory carriage requirement, might, under certain circumstances, be switched off, based on the Master's professional judgment.
- That the AIS, once activated, will continuously and autonomously broadcast the vessel's position and all the static, dynamic and voyage related information as required by the IMO performance standards.
- That the different information message types classified as "static", "dynamic" or "voyage related" are used as AIS messages and are valid for different time periods, thus requiring different update rates.
- That Ship's speed and manoeuvring status are used as the means of governing update rates for "dynamic" messages and ensuring the appropriate levels of positional accuracy for ship tracking.
- That a similar process is applied to the content of ship information messages ("static" and "voyage related") to ensure that the more important message data being communicated is not encumbered with static or low priority information.
- The information included in static data and the associated transmission intervals.
- That "Static" information is entered into the AIS on installation and need only be changed if the ship changes its name or undergoes a major conversion from one ship type to another.
- The information included in dynamic data and the associated transmission intervals.
- That "Dynamic" information is automatically updated from the ship sensors connected to AIS.
- The information included in voyage related data and the associated transmission intervals.
- That the "Voyage related" information is manually entered and updated during the voyage.
- The functionality of safety and security related messages.
- The functionality of AIS aids to navigation.
- The integration of AIS with other navigational aids.
- Advantages of AIS, especially on radar shadow effects, however being aware that the very close proximity of buildings and bridges, sometimes known as the "urban canyon" effect, can cause difficulties for AIS transponders in heavily built-up areas.
- The precautions to be exercised when AIS is used as an aid for collision avoidance.
- Disadvantages of AIS, such as, AIS information is ground-stabilized and if overlaid on sea-stabilized display of radar the navigational information could differ.
- That when using electronic chart to display AIS targets, the datum of electronic chart might be different from the datum of the AIS positioning.

Familiarity with;

- That the international requirement for the carriage of AIS as ship-borne navigational equipment on vessels is detailed within Chapter V (Safety of Navigation) Regulation19, of the revised SOLAS Convention.

- That the information received from the AIS can then be displayed on an electronic chart, computer display or compatible radar and the information received can help situational awareness as well as provide a means to assist in collision avoidance.
- That the principal functions of the AIS are to facilitate:
- Information exchange between vessels within VHF range of each other increasing situational awareness.
- Information exchange between a vessel and a shore station, such as a VTS, to improve traffic management in congested waterways.
- Automatic reporting in areas of mandatory and voluntary reporting.
- Exchange of safety related information between vessels, and between vessels and shore station(s).
- That there are two dedicated frequencies used for AIS – AIS 1 (161.975 MHz) and AIS 2 (162.025 MHz).

- That the AIS should always be in operation and it is recommended that the AIS is not switched off during port stays because of the value of the ship information to port authorities whether at sea or in port; if the Master believes that the continued operation of AIS might compromise the ship's safety or security, the AIS may be switched off; however, the equipment should be reactivated as soon as the source of danger has disappeared.
- That "Short safety related messages" are sent as required and are independent of timing.
- That the AIS aims to achieve positional accuracies of 'better than 10 meters' when associated with DGNSS correction signals and that this compares favorably with radar, which as a function of frequency, pulse repetition rate, and beam width, will often only achieve positional accuracy in the range 30 to 50 meters.

.3.8 Long Range Identification and Tracking (LRIT) **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That the purpose of LRIT is to improve maritime safety, security, assist with search, and rescue (SAR) purposes.
- That the LRIT system consists of the ship-borne LRIT information transmitting equipment, the Communication Service Provider(s), the Application Service Provider(s), the LRIT Data Centre(s), including any related Vessel Monitoring System(s), the LRIT Data Distribution Plan and the International LRIT Data Exchange.
- That the availability of information from LRIT transmissions is restricted to contracting IMO member states and administrations and it is not available to third parties or other ships.
- That the ship-borne LRIT equipment is:
  - Capable of automatically transmitting the ship's LRIT information at 6 hour intervals to an LRIT Data Centre without human intervention on board the ship;
  - Capable of being configured remotely to transmit LRIT information at variable intervals;
  - Capable of transmitting LRIT information following receipt of polling commands;
  - Interface directly to the ship-borne global navigation satellite system equipment, or has internal positioning capability;
  - Supplied with energy from main as well as emergency source of electrical Power;
  - Tested for electromagnetic compatibility taking into account the recommendations developed by International Maritime Organization (IMO).
- That the position report from the ship is sent to a Data Centre via an Application Service Provider (ASP) utilizing a Communication Service Provider (CSP) and Position reports are automatically sent every six hours to the Data Centre and additional position reports may be requested by increasing the position reporting up to each 15 minutes or "polling" for an immediate position report by entitled Governments.
- The difference between LRIT and AIS is that, whereas AIS is a broadcast system, data derived through LRIT will be available only to the recipients who are entitled to receive such information; regulatory provisions will include safeguards concerning the confidentiality of data.

Familiarity with;

- The Data transmitted from the LRIT are:
  - Ship's identity;
  - Ship's position (Latitude and Longitude);
  - Time and date of transmission (associated with the GNSS position).
- That the following ships are required to transmit LRIT messages:
  - Passenger ships (including high-speed craft);
  - Cargo ships (including high-speed craft) of 300 gross tonnage and up;

- Mobile offshore drilling units.

- That the ship-borne equipment should transmit the LRIT information using a communication system, which provides coverage in all areas where the ship operates.
- That there is no interface between LRIT and AIS.
- That SOLAS contracting Governments will be entitled to receive information about ships navigating within a distance not exceeding 1000 nautical miles off their coast.
- The limitations of the LRIT system.

.3.9 Integrated Navigation system (INS) and Integrated Bridge system (IBS) **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That Integrated Navigation system (INS) 'supports safety of navigation by evaluating inputs from several independent and different sensors, combining them to provide information giving timely warnings of potential dangers and degradation of integrity of this information'
- The three categories of INS as defined by IMO, namely:
  - INS (A), which as a minimum provide the information of position, speed, heading and time, each clearly marked with an indication of integrity.
  - INS (B), which automatically, continually and graphically indicates the ship's position, speed and heading and, where available, depth in relation to the planned route as well as to known and detected hazards.
  - INS(C), which provides means to automatically control heading, track or speed and monitor the performance and status of these controls.
- That the Integrated Bridge Systems (IBS) is 'a combination of systems which are interconnected in order to allow centralized access to sensor information or command/control workstations, with the aim of increasing safe and efficient ship's management by suitably qualified personnel'.
- The limitations of the systems.

Familiarity with;

- That Integrity monitoring is an intrinsic function of the INS and that in the INS the integrity of information is verified by comparison of the data derived from two or more sources if available.

- That in Integrity monitoring by the INS, the integrity is verified before essential information is displayed or used and Information with doubtful integrity should be clearly marked by the INS and not used for automatic control systems.
- That IBS recommendation apply to a system performing two or more operations, namely: passage execution; communication; machinery control; loading, discharging and cargo control; and safety and security.

Competence: 1.3 Determine and allow for compass errors

1.3.1 Ability to determine and allow for errors of the magnetic and gyro compass.

1.3.2 Knowledge of the principles of magnetic and gyro compass.

.1 The principle of the magnetic compass and their correction.

1.1 The parts of the magnetic compass and their function **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

The requirements of SOLAS chapter V - Regulation19, in regard to the requirements for the carriage of magnetic compasses.

- That ships must also be fitted with a pelorus, or other means, to take bearings over an arc of 360° of the horizon and a means for correcting heading and bearings to true at all times.
- The parts of the magnetic compass and explains their function.
- The operating principle of Transmitting Magnetic Compass (TMC).

Understanding of;

- The performance standards for magnetic compasses.

1.2 The errors of the magnetic compass and their correction 10hrs (T) + 0hrs (P) + 6hrs (E).

Knowledge of;

- The importance of keeping a record of observed deviations.
- Deviations and prepares a table or graph of deviations.
- The conditions which give rise to each of the coefficients.
- The use of the approximate coefficients A, B, C, D and E.
- Why coefficients A and E may exist at a badly sited compass.
- The non-magnetic causes of an apparent coefficient A.
- That coefficient B results partly from the ship's permanent magnetism and partly from induced.
- That induced magnetism may also contribute to coefficient C in a badly sited compass.
- How the deviation associated with the coefficient permanent B varies with magnetic latitude.
- How the deviation associated with the coefficient induced B varies with magnetic latitude.
- Why the deviation due to permanent magnetism should be compensated by permanent magnets and that due to induced magnetism by spherical soft iron correctors, where possible.
- The causes of heeling error and how it varies with heel, course and magnetic latitude.
- The correction of heeling error and why the correction does not remain effective with change of magnetic latitude.
- How the soft iron spheres increase the mean directive force towards magnetic north and that the value of lambda with the spheres in place is called the ship's multiplier.
- The vertical force instrument and its use in correcting heeling error.
- Methods of obtaining a table of deviations.
- Analyse a table of deviations to obtain approximate coefficients.
- That anything which could affect the deviation of the compass should be stowed in its sea-going position before correcting it.
- The adjustment of the compass by the analysis and/or tentative methods and obtains a table of residual deviations.(students require the competence to supervise the adjustment of the compass by a licensed compass adjuster)
- That the corrections of the Magnetic Compasses are carried out by compass adjusters, certified by Competent Authorities.
- How heeling error may produce an unsteady compass on certain headings after a large change of magnetic latitude and how to deal with it.
- Why a large coefficient B may appear after a large change of magnetic latitude and how to correct it.
- How sub-permanent magnetism gives rise to retentive error.

Understanding of;

- The approximate coefficients A, B, C, D and E.
- The constants lambda 1 and lambda 2.
- The constant mu.

Familiarity with;

- The equation for the deviation on a given heading in terms of the coefficients.
- The order in which corrections should be made and explains why they are made in that order.
- That deviations may be affected by cargo of a magnetic nature, the use of electro-magnets for cargo handling, or repairs involving hammering or welding of steelwork in the vicinity of the compass.

.2 The principle and errors of gyro compasses.

2.1 The principles of gyro-compass 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The meaning of the term 'free gyroscope' and the properties 'gyroscopic inertia' and 'precession'.
- How a free gyroscope is made north seeking under the influence of gravity control.
- The use of damping in azimuth and damping in tilt to cause settling of the axis and thus produce a gyro-compass.
- Why a gyro-compass that is damped in tilt will settle with its spin axis at a small angle to the meridian, except when at the equator.
- The precession resulting from a torque about axes perpendicular to the spin axis.
- That friction at gimbal pivots produces torque, which gives rise to precession.
- Non-mathematically the apparent movement of a free gyroscope on the earth's surface, given its position and initial attitude.
- The apparent motion of a celestial body in the direction of the gyro-axis to aid the description in the above objective.
- The operating principles of the mechanical/ballistic gyro compass.
- The operating principle of other types of gyro compasses such as Fiber Optic gyro-compass and ring laser gyro-compass and their advantages over the mechanical / ballistic gyro-compass.

Understanding of;

- 'Tilt' as movement of the spin axis in the vertical plane.
- 'Drift' as the apparent movement of the gyroscope in azimuth resulting from the earth's rotation.

Familiarity with;

- That in the absence of disturbing forces the spin axis of a free gyroscope maintains its direction in space.
- That the rate of precession is proportional to the applied torque.

2.2 Gyro-compass errors and corrections 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The meaning of the term 'free gyroscope' and the properties 'gyroscopic inertia' and 'precession.
- How a free gyroscope is made north seeking under the influence of gravity control.
- Why a gyro-compass that is damped in tilt will settle with its spin axis at a small angle to the meridian, except when at the equator.
- How the tilt causes precession in azimuth to the west on northerly headings and to the east on southerly headings in compasses with liquid ballistic control.
- How the correction is made in compasses that employ other methods of detecting tilt -states that ballistic deflection results from changes in the ship's north-south component of velocity.
- The behavior of a liquid ballistic during a change of speed or an alteration of course.

- That the precession resulting from ballistic deflection may be arranged to move the compass to the correct settling position, after allowance for the change in course and speed error, by choosing a suitable period for the compass.
- That the pendulum of a tilt detector will be thrown out of the vertical during a change of course or speed, producing an error in its output.
- That the method used in the above objective is not applicable for compasses without liquid ballistic control since course and speed error is fully corrected for all headings.
- That errors are limited by damping the pendulum and limiting the applied torque for large deflections of the pendulum.
- The effect of rolling on a liquid ballistic for various ships' headings -explains why the movement of the liquid causes an error except on the cardinal headings.
- Tow intercardinal rolling error is reduced to negligible proportions.

Understanding of;

- The performance standards for gyro-compasses.

Familiarity with;

- That the resulting error is known as latitude error or damping error and varies directly as the tangent of the latitude.
- That latitude error can be removed by a manual setting that mechanically moves the lubber line and the follow-up system to show the correct heading.
- That course and speed error is caused by the tilting of the spin axis, resulting from the ship's motion over the surface of the earth.
- That the rate of tilting, in minutes of arc per hour, is equal to the north-south component of the ship's velocity.
- That the velocity error is removed by manual settings of latitude and speed to offset the lubber line and the follow-up system in liquid-controlled compasses.
- That the sensitive element of a gyro-compass is made such that its moment of inertia about any axis is the same, thus preventing any tendency to turn when swinging pendulously as a result of rolling or pitching.
- That intercardinal rolling error does not occur in compasses having no gravitational control attachments to the gyroscope.
- That errors caused by acceleration of the compass during rolling and pitching can be reduced by sitting the master compass low down, near the rotational centre of the ship.

1.3.3 An understanding of systems under the control of the master gyro and knowledge of the operation and care of the main types of gyro-compasses.

.1 Systems under the control of the master gyro and the operation and care of the main types of gyro-compasses in use at sea 2hrs (T) + 0hrs (P) + 0hrs (E).

Familiarity with;

- The main systems under the control of the master gyro.
- The main types of gyro-compass in use at sea.
- The manufacturers' manuals to determine necessary maintenance tasks.

Competence: 1.4 Co-ordinate Search and Rescue operations.

1.4.1 A thorough knowledge of and ability to apply the procedures contained in International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual.

.1 The procedures contained in International Aeronautical and Maritime Search and Rescue Manual (IAMSAR) 4hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- Responsibilities of an SAR organization, coordinator of a SAR, co-ordination of RCC/OSC/CRS and role of CRS in a SAR operation, purpose of IAMSAR, SAR resources.
- Emergency radio communications system and procedures, recording, reporting, abbreviations, look out procedure, surface rescue equipment and methods, method of assisting an aircraft to ditch, reception and interrogation of survivors / air droppable equipment/ set and drift as applied on SAR operation/ use of navigational aids in SAR operations, establishing search areas, search strategy/search patterns.
- Navigational procedures involved with search and rescue, navigational procedures when working with helicopter, navigational procedures including optimum course and speed for two ships to rendezvous for any purpose.

Competence: 1.5 Establish watch keeping arrangements and procedures

1.5.1 Thorough knowledge of content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended.

.1 The International Regulations for Preventing Collisions at Sea, 1972, as amended including annexes.
14hrs (T) + 16hrs (P) + 0hrs (E).

Demonstrates

- A thorough knowledge of the content, application and intent of the International Regulations for Preventing Collisions at Sea, 1972, as amended and The principles and rules of the international association of lighthouse authorities (IALA) maritime buoyage system, system 'A' and 'B'.
- The lights, shapes and sound signals that should be shown or made by own ship in any situation
- The ability to determine risk of collision and to take appropriate action when encountering all types of vessel when in sight of one another by day or night.
- The ability to how to determine the risk of collision and the proper action to take to avoid collision in restricted visibility.
- A safe speed for any situation.
- The ability to take appropriate actions when manoeuvring in narrow channels and traffic separation schemes including encounters with other vessels.
- The ability to maintain situational awareness, determine risk of collision and to take appropriate action in situations of high traffic density both when vessels are in sight and when in restricted visibility.
- The ability to take appropriate action when another vessel is believed not to be taking the action required under the Regulations or where a collision cannot be avoided by the action of this vessel alone.

1.5.2 Principles to be observed in keeping a navigational watch

.1 Thorough knowledge of the content, application and intent of the Principles to be observed in keeping a Navigational Watch 12hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- Appropriate watch keeping arrangements that are adequate for maintaining safe watchkeeping, taking into account the prevailing circumstances and conditions.
- Determines the appropriate composition of the watch for differing situations.
- Posts watch schedules that ensure that rest periods are observed and that watchkeepers are fit for duty for operational conditions
- That the responsibilities and expected actions of the Master when in charge of the navigational watch and the officer of the watch at other times are consistent with the Principles outlined in the STCW Code and that these are clearly understood by these officers, including:
  - calling the Master
  - expectation of action until the Master formally takes control of the watch
  - physical presence on the bridge
  - maintaining an effective lookout
  - not undertaking any duties that interfere with watchkeeping
  - determining if there is risk of collision and the correct application of COLREG
  - monitoring and adjusting the vessel position in a accordance with the voyage plan
  - knowing the handling characteristics of their ship, including its stopping distances
  - using the helm, engines and sound signalling apparatus
  - familiarisation and operational use of all bridge equipment, charts, and publications
  - the checks and tests
  - the actions expected when encountering restricted visibility or distress situations
  - actions when pilots are embarked
  - actions when there is any doubt
- Prepares standing orders for watchkeeping at anchor or underway
- That an appropriate lookout is maintained at all times
- That watch schedules must be posted and accessible
- The contents of the STCW CODE section A- VIII/2, Part 4-1 – Principles to be observed in keeping a navigational watch
- That watch duties should be so arranged to comply with rest periods prescribed in the STCW CODE CHAPTER VIII Standards regarding watch keeping Section A-VIII/1 Fitness for duty.
- That the officer in charge of the navigational watch is the master's representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the International Regulations for Preventing Collisions at Sea, 1972, as amended.
- That the master of every ship should ensure that watch keeping arrangements are adequate for maintaining a safe watch or watches, taking into account the prevailing circumstances and conditions.
- That officers in charge of the navigational watch under the master's general direction are responsible for navigating the ship safely during their periods of duty, when they should be physically present on the navigating bridge or in a directly associated location such as the chartroom or bridge control room at all times.
- That the master, chief engineer officer and officer in charge of watch duties should maintain a proper watch, making the most effective use of the resources available, such as information, installations/equipment and other personnel.
- That the lookout must be able to give full attention to the keeping of a proper lookout and that no other duties should be undertaken or assigned which could interfere with that task.
- That the duties of the lookout and helmsperson are separate and that the helmsperson should not be considered to be the lookout while steering, except in small ships where an unobstructed all-round

view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper lookout.

- All factors to be considered to decide if the officer in charge of the navigational watch can be the sole lookout in daylight.
- All relevant factors to be taken into account by the Master in determining that the composition of the navigational watch is adequate to ensure that a proper lookout can continuously be maintained, including those described in the STCW Code.
- All factors to be taken into account when deciding the composition of the watch on the bridge, which may include appropriately qualified ratings.
- That the officer in charge of the navigational watch should:
  - Keep the watch on the bridge;
  - In no circumstances leave the bridge until properly relieved; and
  - Continue to be responsible for the safe navigation of the ship, despite the presence of the master on the bridge, until informed specifically that the master has assumed that responsibility and this is mutually understood.
- That the officer in charge of the navigational watches should not be assigned or undertake any duties which will interfere with the safe navigation of the ship.
- That in cases of need, the officer in charge of the navigational watch should not hesitate to use the helm, engines and sound signaling apparatus. However, timely notice of intended variations of engine speed should be given where possible or effective use should be made of UMS engine controls provided on the bridge in accordance with the applicable procedures.
- That the officers of the navigational watch should know the handling characteristics of their ship, including its stopping distances, and should appreciate that other ships may have different handling characteristics.
- That the officer in charge of the navigational watch should make sure that a proper lookout is maintained at all times.
- That in a ship with a separate chartroom, the officer in charge of the navigational watch may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but should first ensure that it is safe to do so and that proper lookout is maintained.
- All the checks that should be carried out during the navigational watch by the officer in charge of the navigational watch.
- That the officers of the navigational watch should be thoroughly familiar with the use of all electronic navigational aids carried, including their capabilities and limitations, and should use each of these aids when appropriate and should bear in mind that the echo-Sounder is a valuable navigational aid.
- That whenever restricted visibility is encountered or expected, the officer in charge of the navigational watch should use the radar, and at all times in congested waters, having due regard to its limitations.
- All the circumstances when the officer in charge of the navigational watch should notify the master immediately, which are;
  - If restricted visibility is encountered or expected;
  - If the traffic conditions or the movements of other ships are causing concern;
  - If difficulty is experienced in maintaining course;
  - On failure to sight land, or a navigation mark or to obtain soundings by the expected time;
  - If, unexpectedly, land or a navigation mark is sighted or a change in soundings occurs;
  - On breakdown of the engines, propulsion machinery remote control, steering gear or any essential navigational equipment, alarm or indicator;
  - If the radio equipment malfunctions;
  - In heavy weather, if in any doubt about the possibility of weather damage;
  - If the ship meets any hazard to navigation, such as ice or a derelict; and
  - In any other emergency or if in any doubt.

- That the officer in charge of the navigational watch, should not hesitate to take immediate action for the safety of the ship, where circumstances so require, despite notifying the master immediately in the circumstances considered important for his presence on the bridge.
- That the officer in charge of the navigational watch should give watch keeping personnel all appropriate instructions and information which will ensure the keeping of a safe watch, including a proper lookout.
- That in clear weather the officer in charge of the navigational watch should take frequent and accurate compass bearings of approaching ships as a means of early detection of risk of collision and should bear in mind that such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large ship or a tow or when approaching a ship at close range.
- That the officer in charge of the navigational watch should also take early and positive action in compliance with the applicable International Regulations for Preventing Collisions at Sea, 1972, as amended and subsequently check that such action is having the desired effect.
- That when restricted visibility is encountered or expected, the first responsibility of the officer in charge of the navigational watch is to comply with the relevant rules of the International Regulations for Preventing Collisions at Sea, 1972, as amended with particular regard to the sounding of fog signals, proceeding at a safe speed and having the engines ready for immediate manoeuvre.
- That in addition to the above, the officer in charge of the navigational watch shall:
  - Inform the master;
  - Post a proper lookout;
  - Exhibit navigation lights; and
  - Operate and use the radar.
- That when arranging lookout duty, in hours of darkness, the master and the officer in charge of the navigational watch, should have due regard to the bridge equipment and navigational aids available for use, their limitations, procedures and safeguards implemented.
- That in Coastal and congested waters the largest scale chart on board, suitable for the area and corrected with the latest available information, should be used.
- That fixes in Coastal and congested waters should be taken at frequent intervals, and should be carried out by more than one method whenever circumstances allow.
- That when using ECDIS, in coastal and congested waters, appropriate scale of electronic navigational charts should be used and the ship's position should be checked by an independent means of position fixing at appropriate intervals.
- That in coastal and congested waters the officer in charge of the navigational watch should positively identify all relevant navigation marks.
- That when navigating with pilot on board, despite the duties and obligations of pilots, their presence on board does not relieve the master or the officer in charge of the navigational watch from their duties and obligations for the safety of the ship.
- That when navigating with pilot on board, the master and the pilot should exchange information regarding navigation procedures, local conditions and the ship's characteristics.
- That when navigating with pilot on board, the master and/or the officer in charge of the navigational watch should co-operate closely with the pilot and maintain an accurate check on the ship's position and movement.
- That when navigating with pilot on board, if in any doubt as to the pilot's actions or intentions, the officer in charge of the navigational watch should seek clarification from the pilot and, if doubt still exists, should notify the master immediately and take whatever action is necessary before the master arrives.

1.5.3 Bridge Equipment and Systems

.1 Voyage Data Recorder (VDR) and Simplified Voyage Data Recorder (S-VDR) 4hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- That Voyage data recorder (VDR)and Simplified Voyage Data Recorder (S-VDR) means a complete system, including any items required to interface with the sources of input data, for processing and encoding the data, the final recording medium in its capsule, the power supply and dedicated reserve power source.
- That the purpose of a voyage data recorder (VDR) and Simplified Voyage Data Recorder (S-VDR) is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a vessel over the period leading up to and following an incident having an impact thereon.
- That the Information contained in a VDR and S-VDR is made available to both the Administration and the ship owner and this information is for use during any subsequent investigation to identify the cause(s) of the incident.
- The operation of a VDR and S-VDR, that is it;
  - continuously maintains sequential records of preselected data items relating to the status and output of the ship's equipment, and command and control of the ship
  - Permits subsequent analysis of factors surrounding an incident, the method of recording ensures that the various data items are co-related in date and time during playback on suitable equipment. The final recording medium is installed in a protective capsule and in case of S-VDR of either a fixed or float-free type that meets all of the following requirements:
    - is capable of being accessed following an incident but secure against tampering;
    - for VDR - it maximizes the probability of survival and recovery of the final recorded data after any incident;
    - for S-VDR –it maintains the recorded data for a period of at least 2 years following termination of recording;
    - is of a highly visible colour and marked with retro- reflective materials; and
    - is fitted with an appropriate device to aid location
- The requirements set out in MSC resolution A.861(20) on the fixed type protective capsule for S- VDR.
- That the equipment is so designed that, as far as is practical, it is not possible to tamper with the selection of data being input to the equipment, the data neither itself nor that which has already been recorded, and any attempt to interfere with the integrity of the data or the recording is recorded.
- That the recording method is such that each item of the recorded data is checked for integrity and an alarm is given if a non-correctable error is detected.
- The continuity of operation of VDR and S- VDR.
- The data items recorded in the VDR and S-VDR, which are:
  - date and time
  - ship's position
  - ship's speed
  - bridge audio
  - communications audio
  - radar data, post-display selection (or, for S- VDR only, AIS data if radar data is not available)

  In addition to the above data sets, a VDR should also record:
  - depth under the keel
  - status of all mandatory bridge alarms
  - rudder order and rudder position
  - Engine orders and engine response (rev/min or pitch), including any transverse - thrusters.
  - status of hull openings

- Status of watertight doors and fire doors.
- wind speed and direction

- The Data output interface of VDR and S-VDR, that they provide an interface for downloading the stored data and playbacks the information to an external computer. This interface is compatible with an internationally recognized format, such as Ethernet, USB, FireWire, or equivalent.
- The software for data downloading and playback.
- That the ship owner, in all circumstances and at all times, owns the VDR and its information.
- That in the event of an accident the owner of the ship makes all decoding instructions available as necessary to recover the recorded information and maintains the same.
- The recovery and relevant information of VDR and S-VDR.
- The custody, read-out and access to the VDR and S-VDR information.
- The limitations of the receivers.

1.5.4 Bridge Navigational Watch Alarm System (BNWAS)

.1 Bridge Navigational Watch Alarm System (BNWAS) 4hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- That the carriage requirement of Bridge Navigational Watch Alarm Systems (BNWAS), is set out by SOLAS chapter V/19 and the requirements will be mandatory for new ships and phased-in for existing ships
- That the purpose of BNWAS is to monitor bridge activity and detect operator disability, which could lead to marine accidents
- That this purpose is achieved by a series of indications and alarms to alert first the OOW and, if he/she is not responding, then to alert the Master or another qualified OOW
- That the system monitors the awareness of the officer-on-watch (OOW) and automatically alerts the Master or other qualified OOW if for any reason the OOW becomes incapable of performing watch duties
- That additionally, the BNWAS may provide the OOW with a means of calling for immediate assistance if required
- That the BNWAS should be operational whenever the ship's heading or track control system is engaged, unless inhibited by the Master
- That the system has the following operational modes: Automatic, Manual On and Manual Off
- The operational sequence of indications and alarms:
  - once operational, the alarm system remains dormant for a period of between 3 and 12 min (Td- selected dormant period)
  - at the end of this dormant period, the alarm system initiates a visual indication on the bridge
  - if not reset, the BNWAS additionally sounds a first stage audible alarm on the bridge 15sec after the visual indication is initiated
  - if not reset, the BNWAS additionally sounds a second stage remote audible alarm in the back-up officer's and /or Master's location 15sec after the first stage audible alarm is initiated
  - if not reset, the BNWAS additionally sounds a third stage remote alarm at locations of further crew members capable of taking corrective actions 90 seconds after the second stage remote audible alarm is initiated
  - In vessels other than passenger vessels, the second or third stage remote audible alarms may sound in all the above locations at the same time. If the second stage audible alarm is sounded in this way, the third stage alarm may be omitted
  - states that in larger vessels, the delay between the second stage and third stage may be set to a longer value on installation, up to a maximum of 3 min, to allow sufficient time for back-up officer and /or Master to reach the bridge
  - list and explain the resetting function of the BNWAS, which are as follows;

- it is not possible to initiate the reset or cancel any audible alarm from any device, equipment or system not physically located in areas of the bridge providing proper look out
- The reset function does, by a single operator action, cancel the visual indication and all audible alarms and initiate a further dormant period. If the reset function is activated before the end of the dormant period, the period is re-initiated to run for its full duration from the time of reset
- To initiate the reset function, an input representing a single operator action by the OOW is required. This input may be generated by reset devices forming an integral part of the BNWAS or by external inputs from other equipment capable of registering physical activity and mental alertness of the OOW
- a continuous activation of any reset device does not prolong the dormant period or cause a suppression of the sequence of indications and alarms
- explains that the emergency call facility may be provided on the bridge to immediately activate the second, and subsequently third stage, remote audible alarms by means of an "Emergency Call" push button or similar
- explains that the means of selecting the operational mode and the duration of the dormant period (Td) is security protected so that access to these controls should be restricted to the Master only
- describes the limitation of the system

Familiarity with;

- When BNWAS must be fitted to existing ships.

Competence: 1.6 Forecast weather and oceanographic conditions

1.6.1 Synoptic charts and weather forecasting

.1 Synoptic and Prognostic Charts and Forecasts from Any Source 6hrs (T) + 0hrs (P) + 0hrs (E).

Understanding of;

- The use of prognostic charts.
- The information given in shipping forecasts.
- The information received from internet and email.

Familiarity with;

- The isobaric patterns of a synoptic weather chart with interpolation and extrapolation as necessary.
- The geostrophic and approximate surface wind speeds from the chart by use of the geostrophic wind scale.
- The weather associated with specific places within the plots
- The likely movement of pressure systems.

.2 The Range of Information Available Through Fax Transmissions, Internet and Email 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The source of information relating to radio stations, and their transmissions.

Understanding of;

- The information given in surface synoptic and prognostic fax charts.
- The information given in wave charts.
- The information given in ice charts.

- The use of 500 hPa charts in forecasting the progress of depressions.
- The value of personal observations of weather signs, in evaluating weather trends.
- The information received from internet and email.

Familiarity with;

- The information available to the mariner in fax transmissions.
- The information available to the mariner via internet and email.

.3 Weather Forecasting 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Forecast anticipated local weather from synopsis and prognosis information received, the movement of meteorological systems, knowledge of local influences, observation of local conditions and movement of own ship.

1.6.2 Characteristics of various weather systems

.1 Tropical Revolving Storm (TRS) 8hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- With the aid of diagrams typical and possible tracks of TRS.
- The factors associated with the decay of TRS.
- The reasons for the naming of the dangerous semicircle.
- The characteristics of a TRS, i.e. size, wind, pressure, eye, cloud and precipitation sequence.
- The signs which give warning of the approach for the TRS.
- The methods of determining the approximate bearing of an approaching TRS.
- The method of determining in which sector of a TRS the ship is situated.
- The messages required to be sent in accordance with the requirements of SOLAS, when a TRS is encountered, or suspected to be in the vicinity.
- The message required to be sent in accordance with the requirement of SOLAS when a wind of or above storm force 10 is encountered which has not previously been reported.

Familiarity with;

- The definitions adopted by the WMO with respect to Tropical Storms.
- Local nomenclature of TRS.
- Regions and seasons of greatest frequency of TRS.
- The conditions associated with the formation of tropical revolving storms.
- The factors, which affect the future movement of a TRS.
- The correct avoidance procedure when in the vicinity of a TRS.

Ability to;

- Draw a plan of a TRS showing isobars, wind circulation, path, track, vortex or eye, trough line, dangerous semicircle, dangerous quadrant and navigable semicircle (for north and south hemispheres).
- Draw a cross section through a TRS showing areas of cloud and precipitation.
- Given the position and direction of travel of TRS and ship's voyage information, describes appropriate measures to avoid the danger sector of a TRS.

.2 The main types of floating ice, their origins and movements 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The formation of icebergs from floating glacier tongues and from ice shelves, and the characteristics of each.
- The formation of sea ice
- The normal seasons and probable tracks of North Atlantic bergs from origin to decay
- The normal and extreme limits of iceberg travel in the southern oceans during summer and winter.
- The reasons for the decay of icebergs.
- The areas affected by sea ice in regions frequented by shipping.
- The seasonal development and recession of sea ice on the coastlines of the northern oceans, and in the latitude of the normal trade routes.

Understanding of;

- Ice tongue, ice shelf.
- Pack ice and fast ice.
- The outer limits of the area in which icebergs may be encountered in the North Atlantic.

.3 The guiding principles relating to the safety of navigation in Ice 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The limitations of radar as a means of detecting ice.

Understanding of;

- The ranges at which observers may expect to detect ice visually in varying conditions of visibility

Familiarity with;

- The signs, which may indicate the proximity of ice on clear days and nights.
- The precautions to be taken when navigating near ice, and when ice is suspected in the vicinity.

.4 Conditions leading to ice accretion on ship's superstructures, dangers and the remedies available
2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The factors, which may give rise to ice accretion.
- The use of data in the Mariner's Handbook, for estimating the rate of ice accretion.
- The methods of avoiding or reducing ice accretion.
- The reports to be made under International Conventions when ice is encountered

Familiarity with;

- The information to be given in radio messages reporting dangerous ice.
- The iceberg nomenclature in use by the International Ice Patrol.
- The information to be given in radio messages reporting conditions leading to severe ice accretion on ship's superstructures.

1.6.3 Ocean current systems

.1 Surface Water Circulation of the Ocean and Principal Adjoining Seas 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The generation of drift currents by prevailing winds.
- The generation of gradient currents from differences in water temperature and salinity.
- The generation of gradient currents resulting from the indirect effect of wind causing a piling up of water on windward coasts, as in the case of the Equatorial Counter Currents.
- The nature of currents formed by a combination of the above as experienced by western shores of large land masses.
- The general pattern of surface water circulation to the atmospheric pressure distribution.
- The seasonal changes in the above in areas under the influence of the Asian monsoons
- The principal individual currents by name.
- The causes of individual currents where explicitly stated in Meteorology for Mariners.
- The classification of individual currents as warm or cold where appropriate.
- The form in which surface current data is presented in current atlases and on routeing charts.
- The use of this data in passage planning.
- The derivation of the current rose.
- The derivation of the predominant current.
- The derivation of the vector mean current.
- The values of the information given by the current rose, the predominant current and the vector mean current as aids to passage planning.

Understanding of;

- The effect of geostrophic force on surface currents.

Ability to;

- Construct a chart showing global surface water circulation applicable to the above.
- Show the meaning of the term constancy when applied to predominant currents.

.2 Voyage planning principles with respect to weather conditions and wave height 4hrs (T) + 0hrs (P) + 2hrs (E).

Knowledge of;

- Climatological routing.
- Significant wave height.
- The factors affecting wave height and direction.
- The methods employed in forecasting wave heights.
- Optimum (least time) routing.
- The forms of routing in the above objectives.
- The methods of constructing a least time track.
- The relative merits of ship and shore based routing, and their limitations.
- The construction of ships' performance curves.
- The construction and use of a Baillie wind rose.

Ability to;

Selects and use data from Ocean Passages of the World.

Demonstrate

- The use on monthly Routing Charts.
- Familiarity with the forms of climatological, meteorological and current data presented in the Sailing Directions (Pilot Books) and in the Mariner' Handbook.

.3 The formation of sea waves and swell waves 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The role of wind in wave formation.
- The importance of wind force in wave formation.
- The importance of duration of wind causing waves.
- The importance of fetch in the growth of waves.
- Significant wave heights.
- The relationship between sea waves and swell waves.
- The decay of swell waves as they travel from the area of origin.

Ability to;

- Select and uses data from Ocean Passages of the World.
- Use Dorrenstein's nomogram for forecasting.

1.6.4 Calculation of tidal conditions

.1 Ability to calculate tidal conditions 4hrs (T) + 0hrs (P) + 4hrs (E).

Knowledge of;

- The general theory of tides.
- In basic terms the methods of predicting tides.
- The non-astronomical component of sea level.
- Other irregularities of the tide.
- Seismic waves, their origin and areas of prevalence.
- The use of harmonic constant method of tidal prediction.
- The reliability of tidal predictions (awareness of the factors influencing the accuracy and reliability of predictions (e.g. local weather conditions, flooding, local area knowledge, etc).

Understanding of;

- The zero level of the charts.

Familiarity with;

- That the predicted tide level is not an accurate value.

Demonstrate

- The use of tide tables.
- Height and time for high and low water in Secondary ports.
- The predicted height of water at a given time in a tabulated port.
- The predicted time for a given tide level.
- The use of tidal stream charts.
- Use of computer programmes to obtain tidal information.

Ability to;

- Evaluate qualitatively the effect of high or low atmospheric pressure on tide levels.
- Evaluate qualitatively the effect of persistent winds on tide levels and tidal times.
- Evaluate qualitatively the effect of abrupt changes of Weather conditions on tidal levels.

1.6.5 Appropriate nautical publications on tides and currents

.1 Nautical publications and information, which can be obtained via internet and e-mail on tides and currents 2hrs (T) + 0hrs (P) + 4hrs (E).

Ability to;

- Use tidal height calculations in passage planning, with regard to limiting draughts and times of available depth of water.
- Use tidal stream information in passage planning, with regard to effect on course made good, and effect on speed, timing of events.
- Use current information in passage planning, with regard to effect on course made good, and effect on speed, timing of events.
- Use information which can be obtained via internet and email on tides and currents in passage/voyage planning.

Competence: 1.7 Respond to navigational emergencies

1.7.1 Precautions when beaching a ship

.1 Precautions When Beaching a Ship 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The circumstances in which a vessel may be beached.
- Measures, which can be taken to prevent the ship driving further ashore and to assist with subsequent refloating.

Familiarity with;

- That a gently shelving beach of mud, sand or gravel should be chosen if possible.
- That beaching should be at slow speed.
- That, when trimmed heavily by the head, beaching stern first may be advantageous.
- Compares the relative advantages of beaching broadside-on and at right-angles to the beach.
- That wind or tide along the shore will quickly swing the ship broadside-on to the beach.
- That ballast should be added or transferred to counteract a tendency to bump on the bottom.
- That all tanks and compartments should be sounded and an assessment made of damage to the ship.
- That sounding should be taken to establish the depth of water round the ship and the nature of the bottom.

1.7.2 Actions to be taken if grounding is imminent and after grounding

.1 Grounding 2hrs (T) + 0hrs (P) + 0hrs (E).

Familiarity with;

- That, on stranding, the engines should be stopped, watertight doors closed, the general alarm sounded and, if on a falling tide, the engines should be put full astern to see if the ship will immediately refloat.

- That the engineers should be warned to change to high-level water intakes.
- That a distress or urgency signal should be transmitted and survival craft prepared if necessary.
- That all tanks and compartments should be sounded and the ship should be inspected for damage.
- That any discharge or probable discharge of harmful substances should be reported to the nearest coast radio station.
- That sounding should be taken to establish the depth of water round the ship and the nature of the bottom.

1.7.3 Refloating a grounded ship with and without assistance

.1 Refloating 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Measures, which can be taken to prevent further damage to the ship and to assist with subsequent refloating.
- How ballast or other weights may be moved, taken on or discharged to assist refloating.
- The use of ground tackle for hauling off.
- Ways in which tugs may be used to assist in refloating.
- The use of the main engine in attempting to refloat and the danger of building up silt from its use.

1.7.4 Action to be taken if collision is imminent, after a collision or impairment of the watertight integrity of the hull by any cause

.1 Action to be taken if collision is imminent and following a collision or impairment of the watertight integrity of the hull by any cause 2hrs (T) + 0hrs (P) + 0hrs (E).

Familiarity with;

- The duties of the master following a collision.
- That after impact the engines should be stopped, all watertight doors closed, the general alarm sounded and the crew informed of the situation.
- That in calm weather the colliding ship should generally remain embedded to allow the other ship time to assess the damage or prepare to abandon ship.
- That survival craft should be made ready for abandoning ship or assisting the crew of the other ship.
- That a distress or urgency signal should be made, as appropriate.
- That requests for information may be received from coastal States.
- That, if not in danger, own ship should stand by to render assistance to the other for as long as necessary.
- That any discharge or portable discharge of harmful substances should be reported to the nearest coast radio station.
- That the owners should be informed and all details of the collision and subsequent actions entered in the log-book.

1.7.5 Assessment of damage control

.1 Assessment of Damage Control 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Measures to attempt to limit damage and salve own ship.

Familiarity with;

- That damage to own ship should be determined.

1.7.6 Emergency steering

.1 Emergency Steering 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Typical arrangements of auxiliary steering gear.
- How the auxiliary steering gear is brought into action.
- How to change from bridge control to local control in the steering gear compartment.

Familiarity with;

- That, when appropriate, a disabled ship should report to a coastal State that it is a potential hazard to other ships or to the environment.
- Possible course of action which may be taken by a disabled ship.
- The navigational safety message to broadcast and signals to be displayed by a disabled vessel.

1.7.7 Emergency towing arrangements and towing procedures

.1 Emergency Towing Arrangements 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How to approach a disabled vessel and pass the first connection by line-throwing apparatus or other methods.
- How to pay out the towing wire under control.
- Methods of securing the towing wire at the towing ship.
- Why the wire is usually shackled to the anchor cable of the tow.
- The preparations made by the disabled ship.
- How to take the weight of the tow.
- How the towing speed should be decided.
- How to disconnect the tow on arrival at the destination.
- The emergency towing arrangements for all tankers of not less than 20,000dwt.

Familiarity with;

- That permission from the owners or charterers is usually required before towing, except for the purpose of saving life.
- That a coastal State may intervene when a disabled ship presents a potential risk to the environment.
- That early communication should be established between the vessels to agree on the method of connecting the tow.
- That both vessels should have everything prepared and have agreed on communication before the arrival of the towing ship.

- That the tow normally passes a messenger followed by a wire messenger to the towing vessel to haul across the towing line.
- That the towing wire should be protected from chafing at fairleads.
- That wire and cables should be inspected frequently and the nip freshened if any sign of wear or chafe is found.

Competence: 1.8 Manoeuvre and handle a ship in all conditions

1.8.1 Manoeuvring and handling a ship in all conditions

.1 Approaching pilot stations and embarking or disembarking pilots, with due regard to Weather, tide, head reach and stopping distances 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The importance and the procedure of making a passage plan from sea to berth.
- The preparations for picking up a pilot.
- How to reduce speed when approaching the pilot station, taking account of wind and tidal set.
- Why the ship's speed should be reduced to a suitable speed for the pilot boat to come alongside.
- How to make a lee for the pilot boat.

Familiarity with;

- That a second steering-gear power unit should be in operation where possible.
- That steering should be changed to manual in ample time and tested.
- That anchors should be cleared and ready for letting go.
- That extra care should be taken after dropping the pilot until clear of inward ships manoeuvring to embark pilots.

Ability to;

- Plan manoeuvres for the embarking and disembarking of pilots under varying environmental conditions.
- Perform manoeuvres to embark and disembark pilots in varying environmental conditions.

.2 Handling ship in rivers, estuaries and restricted water having regard to the effects of current, wind and restricted water on helm response 8hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That shallow-water effects become more marked as the underkeel clearance decreases.
- The meaning of 'blockage factor' in restricted channels.
- How squat and trim effects increase with blockage factor.
- The reduction in keel clearance resulting from rolling and pitching and heel or list.
- How to round bends in a channel with a current in either direction, taking account of the effect of wind.
- The use of an anchor to assist in rounding a bend.
- How to turn short round in a narrow channel, with or without a wind.
- The use of an anchor to assist turning in a channel.
- The importance of navigating at reduced speed to avoid damage caused by own ship's bow wave or stern wave.
- How a passing ship affects a moored ship.

Understanding of;

- Shallow water as a depth of less than 2 times the ship's draught.
- Squat as the reduction of under-keel clearance resulting from bodily sinkage and change of trim, which occurs when a ship moves through the water.

Familiarity with;

- Shallow-water effects as:
  - Increased directional stability and sluggish response to helm.
  - The speed falls less during turns.
  - A large increase in turning radius.
  - A more pronounced effect from transverse propeller thrust.
  - A possibility that transverse thrust may act opposite to that expected.
  - The ship carries her way longer and responds slowly to changes in engine speed.
  - The trim changes, usually by the head for a full hull form.
  - An increase in squat.
- That the squat in shallow water (ratio of water depth/draught = 2) may be double that in deep water.
- That speed should be moderate in rivers, estuaries, etc. to reduce shallow water effects and to provide reserve power for correcting a sheer.

Ability to;

- Calculates the approximate sinkage due to squat in deep water.
- Uses a squat estimation diagram.
- Plan manoeuvres in rivers, estuaries and restricted water in varying environmental conditions.
- Perform manoeuvres in rivers, estuaries and restricted water in varying environmental conditions.

.3 Application of constant rate of turn techniques **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The circumstances in which a constant rate turn is appropriate.
- How to plan a constant rate turn.
- How to judge the correct execution of a constant rate turn by visual means.
- How radar can be used to assist in monitoring constant rate turn.
- How to determine the wheel over position bearing for a constant rate turn.
- How a constant rate turn is effective in helping a vessel maintain its planned trail.

Ability to;

- Plan turns using constant rate of turn techniques.
- Perform turns using constant rate of turn techniques.

.4 Manoeuvring in Shallow Water including the reduction in under-keel clearance caused by squat, rolling and pitching **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The effect of squat on underkeel clearance, trim and vessel manoeuvring characteristics.
- The changes in dynamic underkeel clearance when manoeuvres are conducted in shallow water in conjunction with turning or the effects of sea and swell.

- The use of the kick-ahead to control the speed and direction of the vessel.
- How a ship will respond to helm before increasing speed when using a kick ahead.
- The danger of taking a sheer in shallow water and what corrective action can be taken.
- How tugs can be used to assist in maintaining slow speed control.
- How anchors can be used to assist in manoeuvring a vessel in shallow water.

Ability to;

- Plan manoeuvres to be conducted in shallow water with and without the effects of sea and swell.
- Perform manoeuvres in shallow water.

.5 Interaction between passing ships and between own ship and nearby banks (canal effect)

4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The interaction between ship and shore.
- The interaction between ships when meeting end-on.
- The interaction between ships in an overtaking situation.
- The particular dangers of interaction when working close by other craft such as tugs.
- The pattern of pressure changes round the hull of a moving ship.
- The interaction between a ship and nearby banks (bank cushion and bank suction).
- The interaction between passing ships.
- How to pass or overtake another ship safely in a narrow channel.
- That shoal patches may give rise to bank cushion or suction, resulting in an unexpected sheer.
- The possible effects on squat, trim and vessel manoeuvring characteristics with different blockage factors and speeds.

Ability to;

- Plan manoeuvres where ship to ship and ship to topography interaction are anticipated.
- Perform manoeuvres where ship to ship and ship to topography interaction are experienced.

.6 Berthing and Unberthing under various conditions of wind, tide and current with and without tugs

12hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The effects of right- and left-handed propellers on manoeuvring.
- The use of twin screws for manoeuvring.
- The advantages and disadvantages of controllable-pitch propellers with regard to ship handling.
- The use of lateral thrusters.
- That lateral thrusters cease to be effective above a certain speed, which has to be determined by trial.
- With reference to ship type and trim, the likely effect of wind on a ship when moving ahead or astern and when stopped.
- How an anchor or anchors may be used to assist in manoeuvring.
- The use of anchors for stopping in an emergency.
- The different ways in which tugs may be made fast and used.
- Fully how to use engine, helm, tugs, anchors and mooring lines to berth and un berth under various conditions of wind and tide at:
  - river berths
  - piers
  - locks

- enclosed docks
- a single buoy
- two buoys
- multibuoy berths
- Mediterranean moorings

- The mooring lines to be used, their leads and methods of securing at the berths listed above.
- That when wind blows against a ship, a force acts almost in the opposite direction to the relative wind direction and the magnitude is proportional to the square of the relative velocity of the wind.
- That knowing the magnitude of the wind force and how it affects the ship is of great importance during berthing / un berthing.
- That the knowledge of above mentioned magnitude, will assist the Master to ;
  - Decide whether the available tugs have sufficient power to hold the ship against a cross wind or to move the ship against a crosswind.
  - Decide whether the thrusters have the necessary power to manoeuvre the ship safely under the prevailing wind conditions.
  - Determine the effect of a longitudinal wind in respect of its effect on the ship's stopping distance.
- That the wind force in tonnes may, with a certain approximation, be expressed by the formula: K(wind) = k * A * V2 Where K= wind force in tones k= Constant depending on the ship and direction of the wind (as an average figure for k, the following constants can be used: k= 0.52 * 10-4 (for a beam wind) and k= 0.39 * 10-4 (for a longitudinal wind) A= Windage area in sq.mtrs V= Relative velocity of the wind in m/sec.
- That normally tugs cannot hold a ship against a cross current, as the power, which is necessary for such an operation, is enormous.
- That the force (K) required to oppose a cross current in deep waters might be determined approximately by the formula: $K = k_{deep} * L * d * V2$ (where K= Current force in tones, k= constant, 0.033 for deep water, L= Vessel length in meters, d= Vessel draft in meters and V = Current speed in m/sec)
- That the force (K) required to oppose a cross current in shallow waters might be determined approximately by the formula: K = 0.033 * f * L * d * V2 (where K= Current force in tones, 0.033 is the constant, f = the shallow water constant modifier derived from a graph,L= Vessel length in meters, d= vessel draft in meters and V = Current speed in m/sec)

Ability to;

- Plan manoeuvres to berth and unberth in varying environmental conditions and with and without tugs.
- Perform manoeuvres to berth and unberth in varying environmental conditions and with and without tugs.

.7 Ship and Tug Interaction **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The type of tug, i.e. conventional single or twin-screw tugs fitted or not fitted with nozzles, tractor type tugs and the ASD (azimuth stern drive) tugs.
- The main difference resulting from the location of tug's propulsion and towing point.
- The dangers related to ship-tug interaction.
- The dangers for relatively small tugs when compared with the size of assisted ships in relation to interaction phenomenon.
- The special attention to be paid by the master on the condition of own vessel, i.e. ships in ballast condition or for ships having particular overhanging stern, found generally on large container vessels,

the danger of interaction which is created and the danger of damages that can be caused to the tug's hull and superstructure, during the ship-tug co-operation.
- The tug bow-cushion effect.
- The risk during the ship- tug co-operation of the tug getting sucked under the bow of the ship with risk of capsizing, and the importance of immediate action required by the tug master, by the application of rudder and the use of available power to go full astern, to avoid above.
- Why tractor type tugs are generally found to be less vulnerable in the above-mentioned situation.
- 'Girting' and the dangers associated with it.
- The dangers of ships high speed during ship-tug co-operation.
- The meaning of 'gob rope', and how its use on conventional tugs can improve the situation of 'girting'.
- How the use of such 'gob rope' limits the manoeuvrability of the towing tug.
- The precaution needed to be exercised for the tug's safety, while using the tugs, in respect to;
  - the visibility of ship's bulbous bow
  - short towlines
  - excessive forward speed of the ship or sudden changes in a ship's heading and speed
  - experience and the ability of the crew in releasing tug's towline, when needed
  - underestimating wind and current forces
  - information exchange pilot-shipmaster-tug captain
  - operating bow-to-bow
- The importance of keeping the ship's speed and heading constant when passing or taking a towline.
- The knowledge necessary for a master when ordering the number and total bollard pull of tugs.
- The important criteria of ships' loading conditions when planning for the number of tugs and the tug position along the hull.
- The effectiveness of Tug(s), during ship-tug cooperation, in relation to pivot point, leverage, and tendency of the ship to swing in a particular direction, in the following conditions;
  - when the Ship is stopped and making no way through the water (dead in the water)
  - when the Ship is making headway
  - when the ship is making sternway

Ability to;

- Plan manoeuvres involving tugs to minimise adverse interaction effects and optimise tug efficiency.
- Perform manoeuvres involving tugs to minimise adverse interaction effects and optimise tug efficiency.

.8 Use of propulsion and manoeuvring systems including various types of rudder 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Various types of udders, including;
  - Flap Rudder (commonly known as the "Becker rudder")
  - Rotor Rudder (commonly known as the "Jastram rudder")
  - T- shaped Rudder (commonly known as the "Single Schilling Rudder")
  - Twin Schilling Rudders and explain their advantages with regard to ship handling
- How the use of bow-thrust can be used to assist in manoeuvring.
- How the use of stern-thrust can be used to assist in manoeuvring.
- The use of high-lift rudder systems to improve ship manoeuvrability.
- The use of dynamically positioned vessels and their control systems.
- The use of rudder cycling to reduce head reach in an emergency.

Understanding of;

- The effectiveness of rudder cycling with a crash stop.

Ability to;

- Plan manoeuvres using bow and stern thrusters.
- Perform manoeuvres using rudder cycling to control speed and bow and stern thrusters.

.9 Choice of anchorage; Anchoring with one or two R1 anchors in limited anchorages and factors involved in determining the length of anchor cable to be used 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How to choose an anchorage and lists the factors which influence the choice.
- How to judge that a ship is stopped ready for letting go.
- That positions should be obtained on letting go and again when brought up.
- The use of anchor buoys.

Familiarity with;

- That an anchoring plan should be prepared in advance, showing the direction and speed of approach and the dropping position(s), with check bearings.
- The factors to consider in determining the length of anchor cable to be used as:
  - the nature of the bottom
  - the strength of current or wind
  - the strength and direction of the tidal stream
  - the exposure of the anchorage to bad weather
  - the amount of room to swing
  - the expected length of stay at anchor

Ability to;

- Plan anchorage positions and manoeuvres to anchor the vessel using one and two anchors.
- Perform manoeuvres to anchor the vessel using one and two anchors.

.10 Procedures for anchoring in deep water and in shallow water 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Holding powers of different Anchors.
- The preparation of anchors, including walking the anchor back for anchoring in deep water.
- That when lowering anchor under power, excessive load on the anchor cable could cause damage or wear of the windlass engine and gearing.

.11 Dragging anchor; clearing fouled anchors 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The actions to be taken when the anchor starts to drag.
- How excessive yawing may break the anchor out of its holding and describes measures to control yaw.

How to bring a ship to an open moor.
What is meant by 'foul hawse' and how it occurs.

- How to clear a foul hawse.
- How to clear a fouled anchor.
- How to buoy and slip an anchor.

Understanding of;

- Dragging and explains how to detect it.

.12 Dry-Docking 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Why a slight trim by the stern is the ideal condition for dry-docking.
- The need for adequate statical stability and states when the most critical condition occurs.
- The use of bilge blocks, breast shores and bilge shores and their placement during pumping out.
- Why, as far as possible, tanks should be full or empty.
- That tanks and movable weights should be restored to their original condition before flooding the dock to ensure the same trim and zero list on refloating.
- Why a ship may be left partially waterborne if damage is accessible.
- How an adequate supply of water for fire fighting and a telephone for calling emergency services should be arranged.

Familiarity with;

- The information required by the dry-dock authorities as:
  - length, beam and rise of floor, if any
  - draughts and trim
  - position of bilge keels and appendages such as a
  - bulbous bow
  - whether single or twin screw
  - the weight and disposition of any cargo on board
  - position of any hull damage for inspection or repair
- That a plan showing the position of bulkheads, main structural members and drain plugs is required for the preparation of beds and shores when dry-docking in the loaded condition
- That all tanks should be sounded and the readings recorded when the ship takes the keel blocks
- The precautions to be taken and the preparations to be made before flooding the dock

Ability to;

- Determine that the vessel has adequate statical stability for docking by calculation.
- Plan the distribution of deadweight items to ensure adequate statical stability during docking.

.13 Management and Handling Ships in Heavy Weather, including assisting a ship or aircraft in distress; towing operations; means of keeping an unmanageable ship out of trough of the sea; lessening drift and use of oil 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the most common reason for heavy weather damage is lack of proper route planning taking into consideration the 96 hrs, 72 hrs and 48 hrs forecasts during planning.
- The precautions to be taken before the onset of heavy weather.
- The importance of understanding the enormous stresses encountered by the ship in heavy weather conditions.

- That high wave heights are one of the most common reasons for heavy weather damage.
- The methods of observing the frequency of wave beating and the formula with which it can be calculated (for ships less than 250m in length and for ships whose length exceeds 250m).
- How synchronous rolling can be avoided by an alteration of speed or course to change the period of encounter.
- Synchronous pitching and how to prevent it.
- That Parametric rolling is caused due to changes in parameters of stability which are; Displacement W (constant), Righting lever GZ (variable), W x GZ = righting moment.
- That Parametric roll motions with large and dangerous roll amplitudes in waves are due to the variation of stability between the position on the wave crest and the position in the wave trough.
- That among the measures which the vessel can take to avoid parametric rolling and synchronous rolling are; Vessel must have adequate intact stability, the course and speed of the ship should be selected in a way to avoid conditions for which the encounter period is;
  - close to the ship roll period or
  - The encounter period is close to one half of the ship roll period.
- How excessive speed into head seas can cause severe panting and slamming stresses.
- That heavy pitching also gives rise to high longitudinal stresses, racing of the propeller and the shipping of water.
- That a reduction in speed combined with an alteration of course can reduce the danger of broaching-to and of being pooped.
- How to turn a ship in heavy seas.
- That a ship may be hove-to with the wind on the bow or on the quarter or stopped.
- The circumstances in which each of the methods above may be used.
- Methods of turning a disabled ship's head to keep it out of a sea trough and of lessening lee drift.
- That a ship may drift at an angle to the downwind direction and that its direction of drift will depend upon which side it has the wind.
- How to use oil to reduce breaking seas when hove-to and when manoeuvring in heavy seas.
- Actions to prevent a ship being driven on to a lee shore.
- How to assist a ship or aircraft in distress -describes towing operations.

Understanding of;

- Wavelength, period and period of encounter of waves and swell.
- Rolling period and synchronous rolling.
- 'Pooping' and describes the conditions in which it may occur.
- 'broaching-to' and describes the conditions in which it may occur.

Familiarity with;

- That the use of weather routeing can reduce the number of occasions on which heavy weather is encountered.
- That excessive slamming may be almost unnoticed on the bridge of a very large ship.

.14 Precautions in manoeuvring to launch Rescue Boats and Survival Craft in bad weather 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How to make a lee for launching/recovering rescue and survival craft.
- The effect of speed and the effect of flowlines around the vessel.

Ability to;

Plan manoeuvres to enable launching and recovery of rescue and survival craft.

- Perform manoeuvres to enable launching and recovery of rescue and survival craft.

.15 Methods of taking on board survivors from rescue boats and survival craft 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The methods of manoeuvring the ship and the precautions needed to take on board survivors from rescue boats and survival craft.

.16 Ability to determine the Manoeuvring and Propulsion Characteristics of common types of ships; with special reference to stopping distances and turning circles at various draughts and speeds 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The IMO recommendations for ship manoeuvrability, which are:
  - standards for Ship Manoeuvrability, adopted by Resolution MSC.137 (76) on 4 Decemeber 2002
  - explanatory Notes to the Standards for Ship Manoeuvrability, adopted by MSC/Circ.1053 on 16 December 2002
  - provision and Display of Manoeuvring Information on Board Ships, adopted by Resolution A.601 (15) on 19 November 1987
- How trials of stopping ability under various conditions should be recorded.

Familiarity with;

- In particular to IMO's recommendation, with respect to the turning ability of the ship, that the advance should not exceed 4.5 ship lengths and the tactical diameter should not exceed 5 ship lengths in the turning circle manoeuvre.
- In particular to IMO's recommendation, with respect to the stopping ability of the ship, that the track reach in the full astern stopping test should not exceed fifteen ships length and also keeping in mind, as guided by the recommendation, that this value may be modified by the administration where ships of large displacement make this criterion impracticable but in no case exceed twenty ships length.
- That opportunity should be taken to check and supplement the information in the ship's manoeuvring booklet for intermediate draughts and for various weather conditions.
- That turning circles in shallow water at various manoeuvring speeds should be recorded when possible.
- That details of an accelerated turn in shallow water should be obtained.
- That the effect of wind on the behaviour of the ship should be recorded, in particular:
  - the drifting behaviour when stopped
  - the speed at which steerage is lost in various conditions of loading and wind
  - the behaviour of the ship when making stern way
- Why the minimum operating revolutions of the engine and the resulting speed should be checked.
- That any details of manoeuvring behaviour which would be useful to a pilot or future master should be recorded.
- That STCW Code recommends additional training for masters and chief mates Section B-V/a of large ships and ships with unusual manoeuvring characteristics.

.17 Importance of navigating at reduced speed to avoid Damage caused by Own Ship's Bow and Stern Waves 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Damage to shore due to excessive bow waves and stern waves.
- The effects of passing ships on ships moored alongside.

Familiarity with;

- The precautions that should be taken by ships alongside to minimize the effect of passing traffic.

.18 Navigating in or Near Ice; Practical measures to be taken when navigating in or near ice or in conditions of ice accumulation on board 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That radar may not detect small icebergs and growlers.
- That leads through the ice show well on radar when set to short range.
- Precautions to be taken to avoid damaging the propeller and rudder when manoeuvring in ice.
- How to obtain assistance from an ice-breaker.
- The precautions which should be taken to prevent freezing up of tail-end shafts, deck machinery and services.
- How to heave-to in an ice field.
- The need to keep a look-out, when hove-to at night, for large ice drifting through the pack.
- That soft ice may block seawater intakes.
- The conditions in which ice accumulates on decks and superstructures.
- The dangers resulting from heavy accumulation of ice.
- That a change of course or speed should be made to reduce the shipping of freezing spray.
- That accumulated ice and snow should be cleared away as quickly as possible.
- Methods of clearing decks, rigging and superstructure of ice.

Understanding of;

- The following terms used in ice warnings:
  - solid ice
  - soft ice
  - drift ice
  - pack ice
  - growler
  - iceberg

Familiarity with;

- That all possible information about ice located on or in the vicinity of the intended track should be obtained.
- That information is available from:
  - daily bulletins of the International Ice Patrol in the N. Atlantic
  - ice warnings from countries where ice is a regular problem
  - Hydrographic Office ice charts
  - pilot books
  - facsimile ice charts
  - warnings from other ships in the vicinity
- The master's obligation to report dangerous ice or sub-freezing air temperatures associated with gale-force winds causing severe ice accretion on superstructures.

- That, when ice is reported on or near the course, the master of every ship is bound to proceed at a moderate speed or to alter course so as to go well clear of the danger zone.
- That navigation marks may be removed without warning in coastal areas threatened by ice.
- That no attempt should be made to enter a region of thick ice in a ship not specially strengthened for navigation in ice.
- Precautions to take when entering ice as:
  - estimating the thickness and concentration of ice and assessing whether the ship can safely pass through it
  - avoiding entry to pressure areas (shown by hummocks and rafting)
  - following leads used by previous ships, where possible
  - entering on the lee side of the ice, if practicable
  - entering at right angles to the ice edge, to avoid damage to hull, propeller and rudder
  - approaching at as slow a speed as possible, and increasing the power to maintain headway when the bow contacts the ice
- That it is important to follow the ice-breaker's instructions regarding speed and manoeuvring.
- That fenders should be ready for use when negotiating sharp turns in leads.

.19 Use of, and Manoeuvring in and near, Traffic Separation Schemes (TSS) and in Vessel Traffic Service (VTS) 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The requirements of the International Regulations for prevention of collisions at sea with respect to Traffic Separation Schemes and narrow channels.
- The actions that can be taken to manoeuvre the vessel in case of emergency.
- The information that may be required by VTS officers before entering leaving or manoeuvring within a VTS controlled area.

Ability to;

- Plan manoeuvres in and near traffic separation schemes.
- Perform manoeuvres in and near traffic separation schemes.

COMPETENCE 1.9 Operate Remote Controls of Propulsion Plant and Engineering Systems and Services

1.9.1 Operating principles of marine power plants

.1 Operating principles of marine power plants 16hrs (T) + 0hrs (P) + 0hrs (E).

Familiarity with;

- Diesel Engines;
  - uses generally accepted engineering terms
  - describes the 2-stroke diesel cycle
  - describes the 4-stroke diesel cycle
  - describes the operating principles of marine diesel engine propulsion plant
  - describes the advantages and disadvantages of a slow-speed diesel engine
  - explains the cause of scavenge fires and how they are dealt with
  - describes methods of supercharging
  - describes the fuel oil system from bunker tank to injection
  - describes the lubrication system
  - describes engine cooling-water systems
  - describes the advantages and disadvantages of a medium-speed diesel

- explains the need for gearing with medium-speed diesels
- describes the arrangement of clutch and turning gears
- describes how a diesel engine is prepared for standby
- describes the method of starting, stopping and reversing of a direct propulsion diesel engine
- states that the number of starts is limited by the capacity of the starting air reservoir
- describes the waste heat recovery system of the 2stroke main propulsion engine

- Steam Turbine Systems;
  - describes the turbine, the feed system and the boiler as a system
  - explains the working of an impulse turbine and a reaction turbine
  - describes a steam turbine installation and its gearing
  - distinguishes between and describes open and closed feed systems
  - states that a steam turbine needs a large water-tube boiler
  - describes the main features of a water-tube boiler
  - describes in outline the procedure for raising steam
  - describes the procedure for warming through a steam turbine ready for manoeuvring
  - describes the procedures for manoeuvring when using a steam turbine
- Gas Turbine System;
  - describes the gas turbine system
  - describes the compressor part of the gas turbine
  - describes the combustion chamber or combustor part of the gas turbine
  - describes the turbine part of the gas turbine
  - describes the two main types of compressors
- Propeller and Propeller Shaft;
  - describes the arrangement of thrust shaft, intermediate shafts and tailshaft
  - explains how propeller thrust is transmitted to the hull
  - describes how the propeller shaft is supported between the thrust block and the stern tube
  - sketches and describes an oil-lubricated stern-tube bearing
  - describes how the propeller is secured to the tailshaft
  - defines pitch, slip and efficiency of a propeller
  - calculates the percentage apparent slip from given data
  - calculates the ship's speed, given the engine revolutions per minute, mean pitch and percentage slip
  - describes the arrangement and operation of a controllable-pitch propeller (CPP)
  - states the precautions to take with a CPP before:
    - starting the main engines
    - going to sea
    - entering harbour or confined waters
  - states that changing control positions and the use of emergency hand control pitch and engine revolutions should be exercised
- Bridge Control;
  - describes a control system for the main engine, including control from bridge, machinery control room, engine control local and changeover controls
  - describes bridge control of controllable-pitch propellers
  - describes bridge control of slow speed diesel engines
  - describes bridge control of steam turbines with associated boilers
  - describes bridge control for gas turbines with associated gas generators
  - lists the indicators and alarms provided with bridge control
  - describes the arrangement and operations of lateral thrusters
  - describes the bridge control and indicators for lateral thrusters
  - describes the concept of control systems
  - describes the terminology used in control systems

- explains when is the control system 'fail-safe'
- explains when is the control system 'fail-run'
- explains the meaning of safety interlocks in a control system
- describes the types of controls (open and closed loop)

1.9.2 Ship's auxiliary machinery

.1 Ships' Auxiliary Machinery 12hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Water-tube and fire-tube boilers.
- Auxiliary boilers.
- A waste-heat boiler.
- Exhaust-gas heat exchangers.
- Steam-to-steam generators and explains where and why they are used.
- A boiler fuel oil supply system.
- The effect of dissolved salts in the feedwater and how it is treated.
- What is meant by 'priming'.
- That carry-over of water may cause serious damage to turbine blading and to steam cylinders.

Distillation and Fresh-water Systems

Knowledge of;

- A distillation system.
- The operation of a flash evaporator.
- The treatment of fresh water intended for drinking.
- A domestic water system.

Pumps and Pumping Systems

Knowledge of;

- Pumps as displacement, axial-flow or centrifugal.
- The operation of a reciprocating pump.
- Rotary displacement pumps and states typical applications.
- A screw pump and states possible uses.
- An axial-flow pump and states possible applications.
- A centrifugal pump and states typical applications.
- The need to prime a centrifugal pump.
- The head losses in a pumping system and how they are expressed.
- Net positive suction head and its significance in pump operation.
- A typical bilge system and ballast system for a dry cargo vessel.
- That the engine-room emergency bilge suction is connected to the main circulating pump in the engine-room.

Steering Gear

Knowledge of;

- Ram-type hydraulic steering gear.
- Rotary-vane steering gear.

- How hydraulic power is provided by variable-delivery pumps.
- The IMO requirements for auxiliary steering gear and how they are met by ram-type and rotary-vane steering gear.
- A telemotor control system.
- Electric steering control.
- How the change from remote to local control in the steering-gear compartment is made.
- The requirement for power supplies to electric and electrohydraulic steering gear.
- The requirements for emergency control of the steering gear.
- The IMO requirements for testing steering gear and for drills.

Generators, Alternators and Electrical Distribution

Knowledge of;

- The operation of a D.C. generator.
- The functioning of shunt- and compound-wound.
- D.C. motors.
- The operation of an alternator.
- The functioning of induction motors.
- The relative advantages and disadvantages of generation and distribution of D.C. and A.C.
- D.C. and A.C. distribution systems.
- The use of circuit-breakers and fuses.
- A navigation light circuit with indicators and alarm, showing an alternative power supply.
- The use of rectifiers.
- The characteristics of lead-acid batteries and of alkaline batteries.
- The maintenance of batteries.
- The safety precautions to be observed for battery compartments - outlines the starting requirements for emergency generating sets.
- The services to be supplied from the emergency generator.
- The supplementary emergency lighting for ro-ro passenger ships.

Refrigeration, Air-conditioning and Ventilation

Knowledge of;

- A vapour-compression-cycle refrigeration plant.
- The use of secondary refrigerants for cooling compartments.
- The co-efficient of performance of a refrigeration plant.
- An air-conditioning plant.
- A ventilation system for accommodation.
- A mechanical ventilation system for ships' holds.

Familiarity with;

- Desirable properties of a refrigerant.
- The properties of commonly used refrigerants.

Stabilizers

Knowledge of;

- The construction and operation of fin stabilizers.

- The arrangement and operation of a flume stabilizer.

Sewage Treatment Plants

Knowledge of;

- The operation of a chemical sewage treatment plant.
- The operation of a biological sewage treatment plant.

Oily-water Separators and Oil Filtering Equipment

Knowledge of;

- The operation of an oily-water separator (producing effluent that contains less than 100 ppm of oil).
- The operation of oil filtering equipment (producing effluent that contains not more than 15 ppm of oil).
- Why oily-water separators, even if well maintained and correctly operated, may not function properly.
- How an oil-content meter functions.
- An oil discharge monitoring and control system.

Incinerators

Knowledge of;

- The functioning of a waste incinerator.

Deck Machinery

Knowledge of;

- The gearing necessary between the prime mover and cable lifters.

Familiarity with;

- That the design and performance of anchor windlasses is subject to approval by a classification society.
- That both winches may be coupled mechanically to provide either a stand-by drive, in case one prime mover should fail, or the power of both prime movers on one windlass, if required.
- The arrangement of vertical anchor capstans with driving machinery below deck.
- A spooling device to distribute the wire evenly on the drum of a mooring winch.
- The working of self-tensioning winches.
- The advantages and disadvantages of steam, electric and hydraulic drive for mooring winches and capstans.
- A cargo winch.
- A slewing deck crane, its motors and its controls.
- The lubrication of deck machinery.

Ability to;

- Sketch and describe a windlass driving two de-clutchable cable lifters and warping drums.

Hydraulic Systems

Knowledge of;

- A live-line circuit supplied by a centralized hydraulic power system.
- Radial-piston and axial-piston variable-stroke pumps.
- How the variable-stroke pump can act as controller and power supply.
- A simple spool valve with shutoff and control of flow direction.
- Ram and rotary-vane actuators.
- A hydraulic accumulator and explains its purpose.

Familiarity with;

- That a hydraulic system consists of an oil tank, pumps, control valves, hydraulic motors and pipework.
- Open- and closed-loop systems.
- That hydraulic systems can provide stepless control of speed for:
  - winches, cranes and other lifting devices
- That cooling of the hydraulic oil is necessary during operation to maintain the correct viscosity of the oil.
- That the oil may need to be heated before starting from cold.
- That cleanliness of the oil is essential for satisfactory operation and that all systems contain filters.
- That air in a system leads to erratic functioning.

1.9.3 General knowledge of marine engineering systems

.1 Marine Engineering Terms and Fuel Consumption 2hrs (T) + 0hrs (P) + 2hrs (E).

Knowledge of;

- What is meant by the efficiency of machine?
- An indicator diagram and the information obtainable from it.
- That, for fuel economy, the actual speed at any stage of a voyage should be as near as practicable to the required average speed.
- How the condition of the hull affects the fuel coefficient and the fuel consumption.
- That keeping the leading edges and tips of propeller blades dressed and polished improves propeller efficiency and reduces fuel consumption.

Understanding of;

- The correct engineering terms when describing and explaining the operation of the machinery and equipment mentioned above
- Mass, force, work, power, energy, pressure, stress, strain and heat and states the units in which each is measured
- Indicated power, shaft power, propeller power and thrust
- The Admiralty coefficient (AC) as:

$$AC = \frac{(\text{displacement})^{2/3} \times (\text{speed})^3}{\text{engine power}}$$

- The fuel coefficient (FC) as:

$$FC = \frac{(\text{displacement})^{2/3} \times (\text{speed})^3}{\text{daily fuel consumption}}$$

- That for a given period of time:

$$\frac{\text{fuel consumption}^1}{\text{fuel consumption}^2} = \left[\frac{\text{displacement}^1}{\text{displacement}^2}\right]^{2/3} \times \left[\frac{\text{speed}^1}{\text{speed}^2}\right]^3$$

- That for a given distance:

$$\frac{\text{fuel consumption}^1}{\text{fuel consumption}^2} = \left[\frac{\text{displacement}^1}{\text{displacement}^2}\right]^{2/3} \times \left[\frac{\text{speed}^1}{\text{speed}^2}\right]^2$$

- That:

$$\frac{\text{Voyage consumption}^1}{\text{Voyage consumption}^2} =$$

$$\left[\frac{\text{displacement}^1}{\text{displacement}^2}\right]^{2/3} \times \left[\frac{\text{speed}^1}{\text{speed}^2}\right]^2 \times \frac{\text{Voyage distance}^1}{\text{Voyage distance}^2}$$

Ability to;

- Given data from the previous performance, calculates:
  - the daily consumption at service speed
  - the bunker fuel required for a voyage
  - the speed for a given daily consumption
  - the reduced speed required to complete a voyage with a given consumption

.2 Arrangements necessary for appropriate and effective engineering watches to be maintained for the purpose of safety under normal circumstances and ums operations. **1hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The general engine room safety that should be observed at all given times.
- The main dangers and sources of risk in an engine room.
- The importance and implementation of risk assessment and risk management in an engine room.
- The safe systems of work and permits to work that should be observed in an engine room.
- The types and importance of wearing personal protective equipment (PPE) while working in an engine room.
- The arrangements necessary for appropriate and effective engineering watches to be maintained for the purpose of safety under normal circumstances and UMS operations.

.3 Arrangements necessary to ensure a safe engineering watch is maintained when carrying dangerous cargo **1hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The arrangements necessary to ensure a safe engineering watch is maintained when carrying dangerous cargo.

Function: 2 Cargo handling and stowage at the management level

COMPETENCE 2.1 Plan and ensure safe loading, stowage, securing, care during the voyage and unloading of cargoes

2.1.1 Application of international regulations, codes and standards concerning safe handling, stowage, securing and transport of cargoes

.1 Plans and Actions Conform with International Regulations 4hrs (T) + 0hrs (P) + 4hrs (E).

Familiarity with;

- That an approved cargo securing manual is required to be carried on board all ships except those engaged solely in the carriage of bulk cargoes.
- The information provided in the cargo securing manual.
- The certificates required for inspection by port state control officers.

Ability to;

- Plan loading to comply with the Loadline Convention in terms of:
  - freeboard,
  - seasonal restrictions
  - zones
  - statical and dynamic stability requirements
  - bunker requirements, and considers
  - expected weather patterns
- Plan loading to comply with the IMO Intact Stability Code.
- Pan cargo stowage and carriage in compliance with the Code of Safe Practice for Cargo Stowage and Securing.
- Use data from the cargo securing manual to plan securing a range of cargo types.
- Plan loading and securing to comply in compliance with the Code of Practice for the Carriage of Timber Deck Cargoes.

2.1.2 Effect on trim and stability of cargoes and cargo operations

.1 Draught, Trim and Stability 6hrs (T) + 0hrs (P) +14hrs (E).

Ability to;

- Given the draughts forward, aft and amidships, calculates the draught to use with the deadweight scale, making allowance for trim, deflection and density of the water.
- Given a ship's hydrostatic data, the weight and the intended disposition of cargo, stores, fuel and water, calculates the draughts, allowing for trim, deflection and water density.
- Calculate changes of draught resulting from change in distribution of masses.
- Calculate changes of draught resulting from change in water density.
- Calculate the quantity of cargo to move between given locations to produce a required trim or maximum draught.
- Calculate how to divide a given mass between two given locations to produce a required trim or maximum draught after loading.
- Calculate the locations at which to load a given mass so as to leave the after draught unchanged.
- Given a ship's hydrostatic data and the disposition of cargo, fuel and water, calculates the metacentric height (GM).
- Calculate the arrival GM from the conditions at departure and the consumption of fuel and water.
- Identity when the ship will have the worst stability conditions during the passage.

- Calculate the maximum weight, which can be loaded at a given height above the keel to ensure a given minimum GM.
- Construct a GZ curve for a given displacement and KG and checks that the ship meets the minimum intact stability requirements.
- Determine the list resulting from a change in distribution of masses.
- Determine the expected maximum heel during the loading or discharging of a heavy lift with the ship's gear.
- Calculate the increased draught resulting from the heel.
- Plan the loading and movement of cargo and other deadweight items to achieve specified draughts and/or stability conditions in terms of required statical and dynamic stability.

2.1.3 Stability and trim diagrams and stress- calculating equipment

.1 Shear Forces, Bending Moments and Torsional Moments 8hrs (T) + 0hrs (P) + 2hrs (E).

Knowledge of;

- The use of typical cargo loading instruments and lists the information obtainable from them.
- That harbour stress limits should not be exceeded during loading, discharging or ballasting operations and that it is not sufficient just to finish within the limits.
- That sufficient information to arrange for the loading and ballasting of the ship in such a way as to avoid the creation of unacceptable stresses should be on board, unless the Administration considers it unnecessary for that ship.

Understanding of;

- The information regarding stress limits provided to the ship.

Familiarity with;

- That the carriage of loading calculators in large ships carrying dry or liquid cargo in bulk is a requirement of the classification societies
- That the maximum permissible values of shear force and bending moment in harbour and at sea are laid down by the classification societies
- That maximum torsional moments are also laid down for some container ships

Ability to;

- Plan the loading and discharge of a ship to ensure that maximum allowable stress limits are not exceeded.

.2 Compliance with the Minimum Freeboard Requirements of the Load Line Regulations

4hrs (T) + 0hrs (P) + 2hrs (E).

Ability to;

- Use the chart of zones and seasonal areas to determine the load lines which apply for a particular passage.
- Plan the loading, discharge, and consumption of deadweight items to determine the minimum departure freeboards and maximum quantities to load in one or more loading ports to ensure that the vessel is not overloaded at any stage of a voyage through multiple loadline zones and seasonal zones.

.3 Use of Automatic Data Based (ADB) Equipment 2hrs (T) + 0hrs (P) + 2hrs (E).

Understanding of;

- Advantages and limitations of analogue and digital stability and loading programmes.

Ability to;

- Provide an understanding of information obtained from ship stress indicators and loading programmes.
- Use of stress indicators and loading programmes in planning for the safe carriage of dry and liquid cargoes.

.4 Knowledge of loading cargoes and ballasting in order to keep hull stress within acceptable limits
4hrs (T) + 0hrs (P) + 2hrs (E).

Knowledge of;

- The importance of devising a cargo stowage plan and loading / unloading plan.
- The stages of development of a safe cargo loading or unloading plan.
- That in any event if the cargo needs to be distributed differently from that described in the loading manual, calculations must always be made to determine, for any part of the voyage, that still water shear force (SWSF), still water bending moments (SWBM) and local loading limits are not exceeded.
- The reason to keep the hull stress levels below the permissible limits by the greatest possible margin.
- That when making a plan for cargo operations, the officer in charge must consider the ballasting operation, to ensure:
  - correct synchronisation is maintained with the cargo operations
  - that the de-ballasting/ballasting rate is specially considered against the loading rate and the imposed structural and operational limits
  - that ballasting and de-ballasting of each pair of symmetrical port and starboard tanks is carried out simultaneously
- The importance to know the exact pumping rates achieved on board their ship to ascertain and ensure the plan are devised and modified accordingly.

Familiarity with;

- That the officer in charge should always refer to the loading manual to ascertain an appropriate cargo load distribution, satisfying the imposed limits on structural loading.

Ability to;

- Plan loading/de-ballasting operation within acceptable stress parameters.
- Plan discharging/ ballasting operation within acceptable stress parameters.

2.1.4 Stowage and securing of cargoes on board ship, cargo-handling gear and securing and lashing equipment

.1 Timber Deck Cargoes 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The dangers of heavy seas breaking aboard and how to minimize that risk.
- The controlling factors for height of cargo at other times.

- The requirements for fencing, for provision of walk-ways and for access to the top of the cargo.
- The requirements when loading to timber load lines.
- When the worst stability conditions during a voyage are likely to occur.
- The rolling period test for the approximate determination of a ship's stability and the limitations of the method.
- The actions to take in the event of the ship developing an angle of loll.

Understanding of;

- The contents of the Code of Safe Practice for Ships Carrying Timber Deck Cargoes with respect to:
  - stowage of sawn timber, logs, cants and wood pulp
  - fitting of uprights
  - lashings and the arrangements for tightening them, including the use of a wiggle wire

Familiarity with;

- That vibration and movement of the ship in a seaway compacts the stow and slackens the lashings.
- That lashings should be inspected regularly and tightened as necessary.
- That inspections of lashings should be entered in the log-book.
- The action to take if cargo is lost overboard or jettisoned.
- The maximum height of cargo permitted on deck in a seasonal winter zone in winter.
- The stability information that should be available to the master.

Ability to;

- Plan the loading and securing of a timber deck cargo.

.2 Procedures for Receiving, and Delivering Cargo 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That bills of lading may sometimes still be are drawn up from mate's receipts and the importance of endorsing mate's receipts for the condition of goods and packages.
- The endorsement of mate's receipts and/or bills of lading for goods in dispute.
- The endorsement of mate's receipts and/or bills of lading for cargoes where the weight and quality are not known to the ship.
- The actions to take when a clean mate's receipt or bill of lading is demanded for cargo which is not in apparent good condition.
- Why letters of indemnity offered in return for clean bills of lading should be refused.
- The documentation which should accompany dangerous goods and is required before loading.
- The procedure for noting protest and extending protest.
- How to deal with empty bags or packages, sweepings and other loose goods.
- The procedure for claiming for damage done to the ship during loading or discharging.
- To whom cargo should be delivered.
- The potential consequences of delivering cargo to the incorrect party or under a letter of indemnity.
- The procedure that should be adopted when requested to deliver cargo against a letter of indemnity.

Familiarity with;

- The period for which the ship is deemed responsible for the cargo under conventions for the carriage of goods and under typical carriage contracts evidenced by bills of lading or charter parties.
- That damaged cargo should be rejected or steps taken to ensure that the damage is recorded and endorsed where appropriate on the bill of lading.

- That containers should have their seals and locks in place when loaded.
- That, if damage to cargo is suspected, protest should be noted before commencing discharging.
- That an independent cargo survey should be arranged when cargo damage is suspected or found on opening hatches.
- That broken or broached packages should be placed in a locker until the contents can be checked and agreed with a representative of the receiver and a receipt obtained for them.
- That cargo spaces should be searched at the completion of discharging to prevent the over carriage of cargo.

.3 Care of Cargo during Carriage 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The precautions to avoid crushing and chafing damage and states which cargoes are most liable to be affected.
- How cargo may be damaged by residues of previous cargo, dirty dunnage or leaking fuel oil tanks
- How cargo can be damaged by dust and the precautions to take when carrying commodities giving rise to dust.
- That any goods containing liquids are liable to leak and describes the stowage required to prevent any leakage damaging other goods.
- That overheating may occur in cargo stowed against engine-room bulkheads, heated double-bottom tanks and deep tanks carrying heated cargoes.
- How to protect cargoes which must be kept from freezing.
- The measures to take to prevent pilferage of cargo during loading, discharging and carriage.
- The damage to cargo which can result from the use of fork-lift trucks and similar machinery in cargo spaces and methods of preventing it.

Familiarity with;

- Which cargoes are particularly liable to damage by ship or cargo sweat and explains how to minimize the risk of sweat damage.
- That many goods can be spoiled by extremes of temperature.
- That high temperatures also occur on the underside of steel decks exposed to tropical sunshine

Ability to;

- Plan the loading and stowage of a hold or holds using a cargo list and reference books to take into account of the carriage requirements of the various cargoes.

.4 Requirements Applicable to Cargo-handling Gear 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The requirements for guarding dangerous parts of machinery.
- The requirements for fencing of openings.
- The requirements for the testing of lifting appliances and loose gear before they are used for the first time.
- The requirements for periodic thorough examination and inspection of lifting appliances and loose gear.
- What is meant by a thorough examination.
- The records and certificates which should be kept in respect of tests, thorough examinations and inspections of lifting appliances and loose gear.

- The marking of safe working loads required on lifting appliances and loose gear.

Understanding of;

- The requirements of ILO Convention 152, the Occupational Safety and Health (Dock Work) Convention, 197g, which apply to ships.
- The terms:
  - competent person
  - responsible person
  - authorized person
  - lifting appliance loose gear

Familiarity with;

- That national laws or regulations should prescribe measures to cover, amongst others:
  - safe means of access to ships, holds, staging, equipment and lifting appliances
  - opening and closing of hatches, protection of hatchways and work in holds
  - construction, maintenance and use of lifting and other cargo- handling appliances
  - rigging and use of ship's derricks
  - testing, examination, inspection and certification, as appropriate, of lifting appliances, of loose gear (including chains and ropes) and of slings and other lifting devices which form an integral part of the load
  - handling different types of cargo
  - dangerous substances and other hazards in the working environment
- That machinery includes mechanized hatch covers and lifting appliances.
- The requirements for the marking of beams and portable hatch covers.
- That only an authorized person, preferably a member of the ship's crew, should be permitted to open or close power-operated hatch covers and equipment such as doors in hull, ramps and car decks.
- That every ship must have a rigging plan and relevant information necessary for the safe rigging of derricks, cranes and accessory gear.

.5 Maintenance of Cargo Gear **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The precautions to be taken when working aloft for the overhaul of cargo gear.

Familiarity with;

- The requirements for the annealing of wrought iron loose gear.

Ability to;

- Prepare plans for the inspection of cargo gear.
- Undertake inspections of cargo gear so that any safety issues associated with machinery, structure, running and standing rigging and associated equipment is identified and addressed before use.
- Maintain the records and plans required for the cargo gear.
- Develop maintenance plans and procedures for the maintenance of machinery, structure, running and standing rigging and associated equipment of cargo gear, including blocks, shackles, wire and fibre ropes.
- Provide instruction to crew and manages the maintenance of cargo gear.

.6 Maintenance of Hatch Covers 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That hydraulic systems should be checked for leakage, especially in 'tween-decks where leaked fluid may damage cargo.
- How to check that compression bars are making complete contact with sealing gaskets.
- That weather tightness may be checked by hose-testing the covers before loading.

Familiarity with;

- That trackways should be cleaned of loose material before closing hatches.
- That the tension of draw chains should be adjusted as required.
- That wheels, gears, racks and pinions and other moving parts should be kept lubricated.
- That side cleats and cross-joint wedge mechanisms should be kept greased.
- That drainage channels should be cleaned out and drainage holes checked on weather-deck hatches.

Ability to;

- Prepare plans and procedures for the inspection and maintenance of hatch covers.

2.1.5 Loading and unloading operations, with special regard to the transport of cargoes identified in the code of safe practice for cargo stowage and securing

.1 Loading, stowage and discharge of heavy weights 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How a load should be spread over an area of deck or tank top by the use of dunnage to avoid heavy point loading between beams and floors.
- The use of shoring in a tween-deck to spread the load over a larger part of the ship's structure.
- Why double-bottom tanks should be full or empty and the ship upright before starting to load or to discharge.
- Methods of securing heavy lifts in the hold or on deck.

Familiarity with;

- That special supports or cradles will need to be built for awkwardly shaped lifts.
- That the ship's stability should be checked to ensure that the resulting list will be acceptable.
- That the weight of the lifting gear should be included in the weight of the lift, both for stability calculations and during consideration of safe working loads.
- That additional stays may need setting up to a mast or kingpost.
- That only experienced winch drivers should be allowed to handle heavy lifts.
- That all movements should be controlled and steady, avoiding rapid stops and starts.

.2 Care of Cargo during Carriage 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How to stow and secure containers on container vessels/ cellular container ships and on deck on vessels which are not specially designed and fitted for the purpose of carrying containers.
- The stowage and securing of containers and other cargo units in ships other than cellular container ships.

- The contents of the cargo-securing manual and its use.
- The stowage and securing of road vehicles on ro-ro ships.
- Recommended methods for the safe stowage and securing of:
  - portable tanks
  - portable receptacles
  - wheel-based (rolling) cargoes
  - coiled sheet steel
  - heavy metal products
  - anchor chains
  - metal scrap in bulk
  - flexible intermediate bulk containers
  - unit loads
- The guidelines for the under-deck stowage of logs.
- Actions which may be taken in heavy weather to reduce stresses on securing arrangements induced by excessive accelerations.
- Actions which may be taken once cargo has shifted.

Understanding of;

- The content of the Code of Safe Practice for Cargo Stowage and Securing.
- The elements to be considered by the master when accepting cargo units or vehicles for shipment.

Familiarity with;

- That cargo spaces should be regularly inspected to ensure that the cargo, cargo units and vehicles remain safely secured throughout the voyage.

.3 Methods and safeguards when fumigating holds 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Recommendations given in MSC.1/Circ.1264 - Recommendations on the Safe Use of Pesticides in Ships Applicable to the Fumigation of Cargo Holds, contained in the added supplement of the IMSBC code.
- The reasons for the control of pests.
- The methods for the prevention of insect infestation and states the areas to which particular attention should be given.
- How contact insecticides in the form of sprays, smokes or lacquers may be used by the crew for dealing with local infestation.
- The procedures for the fumigation and the handing over of responsibility from the fumigator in-charge to the master.
- The safety checks on gas concentration that should be made throughout the voyage and states that the readings should be entered in the log-book.
- The procedures to follow prior to and on arrival at the discharging port.
- The precautions to be taken during the discharge of cargo until the ship is certified free of fumigants.
- The procedures for the carriage of fumigated freight containers, barges and transport units that are loaded after fumigation without ventilation.
- The methods which may be used for the control of rodents.
- The use of baits by the ship's crew and the precautions to observe.
- That the use of pesticides is regulated by Governments, and their use may be limited by the regulations and requirements of:
  - the country where the cargo is loaded or treated
  - the country of destination

- the country of registration of the ship

- The use of pesticides by the ship's crew and the precautions to observe.
- The measures to be taken if clothing becomes contaminated.

Familiarity with;

- That the control of rodents is required by the International Health Regulations.
- That all persons not directly involved in the application should be evacuated from the areas being treated for a period not less than that recommended by the manufacturer of the pesticide.
- That extensive or hazardous treatments, including fumigation and spraying near human or animal food, should only be undertaken by expert operators.
- That a fumigator-in-charge should be designated by the fumigation company or appropriate authority
- The information about the fumigation which should be supplied to the master.
- That fumigation of empty cargo spaces should always be carried out in port.
- That crew should remain ashore until the ship is certified gas-free, in writing, by the fumigator-in-charge.
- That a watchman should be posted to prevent unauthorised boarding and warning notices should be displayed.
- The precautions to be taken if essential crew members are permitted to return before aeration (ventilation) of the ship.
- That entry to spaces under fumigation should never take place except in case of extreme urgency and lists the precautions to be taken if entry is imperative.
- That fumigation in transit should only be carried out in ships approved for such process by the flag State Administration and that the application should be with the agreement of the port State Administration.
- That fumigation in transit may be:
  - treatment continued during the voyage in a sealed space in which no aeration
  - has taken place before sailing
  - continuation of in-port fumigation where some aeration has taken place but
  - clearance cannot be issued because of residual gas and the cargo space has been re-sealed before sailing
- That precautions are the same in both cases.
- That at least two members of the crew, including one officer, who have received appropriate training, should be designated as the trained representative of the master responsible for ensuring safe conditions after the fumigator-in-charge has handed over that responsibility to the master.
- That the trained representative should brief the crew before a fumigation.
- The training which the designated representatives should have.
- The items which the ship should carry.
- That the master should be informed prior to loading such freight containers, barges and transport units and that they should be identified with suitable warning labels showing the identity of the fumigant and the date and time of fumigation.
- That, if contact insecticides are to be applied to grain during loading, the master should be provided with written instructions on the type and amount of insecticide to be used and on the precautions to be taken.
- The actions to be taken in the event of exposure to insecticides resulting in illness.

2.1.6 General knowledge of tankers and tanker operations

.1 Terms and definition 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

That 'spiked crude' has additional petroleum gas, usually butane, dissolved in it before shipment.

- That vapour pressure of any liquid increases with increasing temperature.
- Why the pressure in a tank is not necessarily the same as the RVP of the oil it contains, even at the standard temperature.
- Why flashpoint cannot be used as an absolute measure of safety.
- The viscosity of a fluid as a measure of its resistance to flow.

Understanding of;

- Petroleum as crude oil and liquid hydrocarbon products derived from it.
- Reid Vapour Pressure (RVP).
- 'Upper flammable limit', 'lower flammable limit' and 'flammable range' and states approximate values for petroleum products.
- The auto-ignition temperature as the temperature at which a flammable material will ignite without initiation by a spark or flame and will continue to burn.
- 'Pour point' as the lowest temperature at which an oil is observed to flow.

Familiarity with;

- That petroleum gases, principally methane, are extracted from crude oils before shipment.
- That 'sour crude' contains appreciable amounts of hydrogen sulphide or organic sulphur compounds.
- That products derived from crude oil include naphtha (gasolines), kerosine, gas oil, diesel oils, lubricating oils, waxes and residual oils such as fuel oil and bitumen.
- That the flashpoint of a liquid is the lowest temperature at which it gives off sufficient gas to form a flammable mixture in a flashpoint apparatus.
- That 'flammable' means 'capable of being ignited and of burning'.
- That viscosity increases as the temperature Decreases.
- That crude carriers in particular have significant residues in tanks which must be accounted for in order to calculate the cargo loaded.
- The limitation of application of wedge calculation.

Ability to;

- Calculate the volume of dry residue as a uniform layer on the tank bottom.
- Calculate the volume of liquid residues as a wedge on the tank bottom.

.2 Contents and Application of the International Safety Guide for Oil Tankers and Terminals (ISGOTT)

4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That ISGOTT provides operational advice to directly assist personnel involved in tanker and terminal operations, including guidance on, and examples of, certain aspects of tanker and terminal operations and how they may be managed.
- That safety measures against pollution and actions to take in case of an accident are agreed before transfer of cargo commences.
- That tanks should be maintained in an inert condition throughout all operations except when entry to tanks for inspection or repair is necessary.
- That the inert gas should have an oxygen content not exceeding 5% by volume.
- That the inert-gas plant will be used to:
  - inert empty cargo tanks
  - supply inert gas during cargo discharging, deballasting, crude oil washing
  - and tank cleaning
  - purge tanks prior to gas-freeing

- top-up the pressure when necessary during a voyage
- That, in the event of a failure of the inert gas system, discharge of cargo or ballast or tank cleaning should be stopped, to prevent air being drawn into the tanks, and operations should only be resumed when a supply of inert gas has been restored.
- The hold and tank arrangements of combination carriers.
- The safety aspects relating to the operation of double hull tankers.
- The change-over from oil to dry bulk cargo and from dry bulk cargo to oil.

Understanding of;

- The content of ISGOTT

Familiarity with;

- That terminal, local or national regulations may also be applicable and should be known by those concerned.
- The general precautions to be taken on tankers regarding:
  - smoking, matches and cigarette lighters
  - naked lights
  - the galley
  - electrical equipment
  - use of tools
  - entry to enclosed spaces and pump-rooms
- Lists the information which should be exchanged between the ship and the terminal before arrival.
- That safety procedures are agreed between the tanker and the terminal and include:
  - means of summoning emergency services
  - availability and use of fire-fighting and other emergency equipment
  - actions to be taken in case of fire or other emergency
  - emergency evacuation of the berth
- That fire-fighting equipment should be ready for immediate use.
- That main engines and other equipment essential for manoeuvring should be ready for use at short notice and the written agreement of the terminal and port authority should be obtained for any work or repairs which would immobilize the ship.
- That detailed loading or discharging plans are agreed between the ship and the terminal.
- That, before starting cargo transfer, the responsible officer and the terminal representative must formally agree that they are ready to do so safely.
- That the terminal should be notified of the intention to use crude oil washing (COW) at least 24 hours in advance.
- That the oxygen content of cargo tanks should not exceed 8% by volume.

.3 Oil tanker operations and related pollution-prevention regulations 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- An inert gas system (IGS) and sketches the distribution of inert gas to tanks
- The reasons for ballasting.
- Why a ship may have only clean or segregated ballast on board upon arrival at a loading port
- How to dispose of dirty ballast.
- How to decant the water contents of the slop tank.
- That a final flushing of cargo pumps and lines to be used for discharge of clean ballast is made to the sea through the oil monitoring and control system.

- That the operation of discharging dirty ballast, decanting the slop tanks and flushing lines must be done when more than 50 nautical miles from the nearest land and outside a special area.
- The reasons for tank cleaning.
- The use of fixed and portable machines for tank cleaning.
- The use of slop tanks during tank cleaning.
- Crude oil washing and the reasons for requiring it in crude oil tankers of 20000 dwt and above.
- Why inert gas is used to purge the tanks of hydrocarbon vapours before introducing air on suitably equipped ships.
- The need to maintain ventilation and to check the atmosphere frequently when persons are working in a tank.
- That the density of oil must be corrected from its actual density to that at the standard temperature.

Understanding of;

- 'Segregated ballast', 'clean ballast, 'dirty ballast', 'slop tank'.
- The procedures for changing ballast at sea.
- Gas-freeing as the replacement of hydrocarbon vapours or inert gas by air.
- The reasons for gas-freeing.
- That the volume of the oil must be corrected from its actual temperature when measured to the standard temperature.
- The difference between mass and weight in air and that one or the other may be required by different administrations.

Familiarity with;

- That the capacity and arrangement of segregated ballast tanks is intended to provide sufficient weight, to provide a satisfactory trim and to ensure full immersion of the propeller for normal conditions of sea passages.
- That on rare occasions weather conditions may be so severe that additional ballast is needed for the safety of the ship.
- That in crude oil tankers equipped with COW the additional ballast would be carried in tanks that have been washed with crude oil.
- That the additional ballast must be treated as dirty ballast.
- The criteria for the discharge of oil from cargo-tank areas of oil tankers.
- That, before loading clean ballast, cargo pumps and lines to be used are flushed with clean water into a dirty ballast or slop tank.
- That only segregated or clean ballast may be discharged within 50 nautical miles of land or inside a special area.
- That an inert atmosphere should be maintained in tanks during tank cleaning in ships fitted with IGS.
- That crude oil washing can only be carried out with fixed washing machines in inerted tanks.
- That the oil residues in the slop tank resulting from tank cleaning and disposal of dirty ballast may be:
  - pumped ashore at the loading terminal
  - retained on board and segregated from the next cargo
  - retained on board and the new cargo loaded on top of them
- That the process of tank cleaning, changing ballast, decanting the water from slop tanks and loading the next cargo over the retained oil is known as the load-on-top procedure.
- That details of cargo operations, ballasting and deballasting, tank cleaning, discharge of water from slop tanks and disposal of residues are entered in the ship's Oil Record Book.
- That a mechanical fixed system is used or portable fans are used.
- That checks are made during gas-freeing with combustible-gas indicators, oxygen meters and toxic-gas detectors.
- That the supply of inert gas to the tank is shut off.

- That the change of volume with temperature of oils is not linear.
- That cargo calculation is carried out as if the oil were at a standard temperature.
- That the cargo calculation is carried out as if the density of the oil was that at the standard temperature.
- That different types of oils have different coefficients of expansion and that there are separate Petroleum Measurement Tables for Crude Oils, Products and Lubricating Oils.

.4 Chemical Tankers 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That dedicated service usually means that the tanker is designed for the carriage of a particular type of chemical and transports the same type of cargo on each voyage.
- That a chemical tanker engaged in parcel trade moves a variety of relatively small lots of chemicals between a number of ports.
- That the Convention requirements are supplemented by recommendations, specifications and Codes adopted by IMO.
- That products are included in the list in Chapter 17 because of their safety hazards or because of their pollution hazards or both.
- That the Bulk Chemical Codes divide tankers into three ship types, Type 1, Type 2 and Type 3, which reflect the hazard ratings of the cargoes which may be carried.
- The following descriptions of tanks:
  - independent
  - Integral
  - gravity
  - pressure
- That mild-steel tanks are normally coated, to protect cargoes from contamination by steel and to make cleaning, gas-freeing and inspection easier.
- That cofferdams and other void spaces may be included in the cargo- tank area to provide segregation of groups of tanks.
- That the heating system may use coils fitted inside the tank or a heat exchanger placed outside the tank.
- With the aid of a drawing, a cargo heating system that uses a heat exchanger placed outside the tank.
- How to use an absorption tube gas detector for measuring the concentration of a gas.
- What is meant by:
  - the threshold limit value (TLV) of a product
  - the odour threshold
- With the aid of a simple drawing, how cargo is routed from the manifold to tanks on a chemical tanker with separate lines for each tank.
- With the aid of a simple drawing, a 'closed circuit' loading operation using a vapour-return line.
- With the aid of a simple drawing, how cargo is routed from tank to the manifold on a tanker with deepwell pumps and separate lines from each tank.

Understanding of;

- A chemical tanker as a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in Chapter 17 of the IBC Code.

Familiarity with;

That modem chemical tankers have evolved from oil product tankers to take account of special carriage requirements and associated hazards

- The most important of the rules governing chemical tankers as:
  - international rules and regulations
  - national rules and regulations
  - classification society rules
- That the sea transport of liquid chemicals in bulk is internationally regulated, as regards safety and pollution aspects, through Conventions adopted by the International Maritime Organization (IMO)
- That the IMO Conventions covering the carriage of chemicals in bulk are:
  - the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, Chapter VII
  - the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the 1978 Protocol (MARPOL 73)78), as amended, Annex II
- That the most important Codes and standards covering the transport of liquid chemicals are:
  - the Bulk Chemical Codes
  - Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code)
  - International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC) Code
  - Standards for Procedures and Arrangements for the discharge of Noxious Liquid Substances (P and A Standards)
- That safety hazards may be one or more of the following:
  - fire hazard in excess of that of petroleum products
  - toxicity
  - corrosivity
  - reactivity with water, air or other chemicals or self-reaction (polymerization, decomposition)
- That, in addition to the survey requirements for any ship, chemical tankers must undergo surveys of the cargo-containment and handling arrangements for the issue of an International Certificate Fitness for the Carriage of Dangerous Chemicals in Bulk
- That a Type 1 ship is intended for the transportation of products considered to present the greatest overall hazards and Type 2 or Type 3 for products of progressively lesser hazards
- That the division into ship types is based on the ship's capability to survive specified damage caused by collision or stranding and the location of the cargo tanks in relation to such damage
- That all materials used for tank construction and associated piping, valves and pumps must be resistant to the cargo carried
- That some ships have stainless-steel tanks for the carriage of cargoes which cannot be contained in mild steel
- That no single coating is suitable for all cargoes and that the coating manufacturers compatibility data must be used when planning a cargo
- That the heating medium may be steam, water or thermal oils
- That there is suitable protective clothing on board which must be worn by all personnel engaged in loading or discharging operations
- That, for certain cargoes, there must be respiratory and eye-protection equipment for every person on board for emergency escape
- That equipment for evaluation of atmospheres in tanks and other enclosed spaces is provided for:
  - detection of flammable gases
  - measurement of oxygen content
  - measurement of concentration of toxic gas
- That the atmosphere in tanks and enclosed spaces must be considered dangerous unless appropriate checks prove otherwise
- That information about cargoes to be handled is essential to the safety of the vessel and crew
- That information for each product may be found on cargo data sheets contained in safety guides or provided by the manufacturer or shipper

- That, if sufficient information necessary for the safe handling and carriage of a cargo is not available, the cargo must not be loaded
- That information necessary for the safe carriage of a cargo includes:
  - a full description of the physical and chemical properties, including reactivity,
  - necessary for its safe containment
  - action to take in the event of spills or leaks
  - countermeasures against accidental personal contact
  - fire-fighting procedures and fire-fighting media
  - procedures for cargo transfer, tank cleaning, gas-freeing and ballasting
  - details of the stabilizer or inhibitor added to those cargoes, which require one (on the manufacturer's certificate, in the absence of which the cargo should be refused)
- First Aid procedures, including the use of specific antidotes for poisons
- That tanks are normally subject to thorough inspection and testing for cleanliness before loading
- That samples are taken from the lines and tanks during loading for purposes of quality control
- That visual and audible high-level alarms and a tank overflow control system are required for many chemicals
- That personnel involved in unloading should check the information in the relevant data sheets and take all necessary precautions, including the wearing of appropriate protective clothing
- That, prior to discharging, samples from tanks and lines are analysed to check if the product has been contaminated on board during the passage
- That, in tanks containing cargoes that present a major fire hazard, inert gas or nitrogen is used to maintain a small positive pressure during unloading, to prevent air from entering the tanks

Ability to;

- Illustrate, by means of sketches, the location of tanks for each type of ship.
- Illustrate typical tank arrangements by means of simple sketches.

.5 Tank Cleaning and Control of Pollution in Chemical Tankers 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The use of slop tanks to hold cargo residues and tank washings.
- With the aid of a simple drawing, the cycle of a tank-washing system from the seawater inlet to the slop tank.

Familiarity with;

- That different cargoes require different tank-cleaning procedures.
- That most tank cleaning can be done with hot or cold seawater or fresh water, or by ventilation alone, although a few cargoes require special solvents.
- That fixed or portable tank-washing machines are used.
- Lists phases in a tank-cleaning operation as:
  - prewash
  - main wash
  - fresh water rinse
  - gas-freeing
  - drying
  - inspection and testing

That Annex II of the MARPOL 73/78 Convention contains regulations for the control of pollution by noxious liquid cargoes carried in bulk or tank washings from such cargoes.

- That as per the amendments of Annex II of MARPOL, which entered into force on 1 January 2007, a revised annex a new four-category pollution category system for noxious liquid substances; the previous A, B, C and D category system has become X,Y Z and OS.
- That every chemical tanker is required to have a Certificate of Fitness (CoF) indicating that it is certified to carry certain products. The issuance of a CoF will also require a revised Procedures and Arrangements (P&A) Manual.
- That each ship which is certified for the carriage of noxious liquid substances in bulk must be provided with a Procedures and Arrangements (P and A) Manual that has been approved by the Administration and a Cargo Record Book.
- That the master must ensure that no discharges into the sea of cargo residues or residue/water mixtures containing substances of Category X, Y, Z or OS take place unless they are made in full compliance with the P and A Manual.
- That carrying out operations in accordance with the ship's P and A Manual ensures that the pollution regulations are complied with.
- That pollution-prevention procedures during cargo transfer, ballasting and tank cleaning should include keeping a watch on:
  - levels in cargo, slop or ballast tanks
  - hoses or loading arms
  - pumps, valves, gaskets, connections and hatches
  - spill pans and scuppers
  - alarms and instrumentation
  - co-ordination of operational signals
  - water around vessel
- That personnel on watch should be present at all times during operations and regularly carry out the inspections mentioned in the above.
- That entries should be made in the Cargo Record Book, on a tank-to- tank basis, of:
  - loading
  - internal transfer of cargo
  - unloading
  - mandatory prewash in accordance with P and A Manual
  - cleaning of cargo tanks
  - discharge into the sea of tank washings
  - ballasting of cargo tanks
  - discharge of ballast water from cargo tanks
  - accidental or other exceptional discharge control by authorized surveyors

.6 Gas Tankers **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The following terms used in the IGC Code:
  - boiling point
  - cargo area
  - cargo containment system
  - gas carrier
  - gas-dangerous space or zone
  - gas-safe space
  - hold space
  - interbarrier space
  - MAR VS
  - primary barrier

  - secondary barrier tank dome
- That the IGC divides ships into four types, IG, 2G, 2PG and 3G.
- In simple terms:
  - integral tank
  - membrane tank
  - semi-membrane tank
  - independent tank
  - internally insulated tank
- In simple terms, the division of independent tanks into:
  - Type A, generally a self-supporting prismatic tank
  - Type B, generally a self-supporting spherical tank
  - Type C, generally a self-supporting cylindrical pressure tank
- The uses of cargo heaters and vaporizers.
- The effect of transfer of heat to the cargo on cargo temperature and tank pressure.
- The single-stage direct liquefaction cycle.
- How cargo leakage through the primary barrier can be detected.
- The arrangements for fire fighting on deck in the cargo area describes the water-spray system for ships carrying flammable or toxic products.

Familiarity with;

- That the transport by sea of liquid gases in bulk is internationally regulated with regard to safety, through standards laid down by IMO.
- That Chapter VII of the IMO International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, makes the provisions of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) mandatory.
- That a liquefied gas is the liquid form of a substance that at normal atmospheric temperatures and pressures would be a gas.
- That liquefied gas products transported by gas tankers are listed in Chapter 19 of the IGC Code.
- That some of those substances are also covered by the IBC Code.
- Division of gas cargoes into four groups as:
  - liquefied natural gas (LNG)
  - liquefied petroleum gas (LPG)
  - liquefied ethylene gas (LEG)
  - chemical gases
- That LNG is natural gas from which impurities have been removed, and consists mainly of methane.
- That LPG is the common name for petroleum gases consisting mainly of butane and propane.
- Lists chlorine, ammonia and vinyl chloride monomer as examples of chemical gases.
- That, in addition .to the surveys required for all ships, gas tankers must undergo surveys of the cargo-containment equipment and cargo-handling arrangements for the issue of an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk.
- That the Certificate of Fitness lists the cargoes which may be carried by the ship and may also stipulate conditions for carriage.
- That a Type 1 G ship is intended for the transportation of products considered to present the greatest overall hazard and Types 2G/2PG and 3G for products of progressively lesser hazards.
- That the division into ship types is based on the ship's capability to survive specified damage caused by collision or stranding and the location of the cargo tanks in relation to such damage.
- That a cargo tank has shut off valves located as close to the tank as possible for all liquid and vapour connections except for safety relief valves.
- That regulations require remotely operated emergency shutdown (ESD) valves in the cargo piping system.

- That the operation of the ESD system also stops pumps and compressors.
- That all cargo tanks must be provided with a pressure-relief system.
- That all equipment and piping which can be isolated when full of liquid must be provided with a pressure-relief system.
- That cargo pumps are usually centrifugal, either deepwell pumps or submerged electric pumps, in the tanks with deck-mounted booster pumps, if required.
- That, except for fully pressurized vessels, means for controlling the pressure must be provided.
- That pressure in cargo tanks may be controlled by:
  - insulation of tanks, to reduce heat transfer
  - leading cargo boil-off to the ship's boilers or main engine as fuel (ONLY with LNG)
  - leading cargo boil-off to the ship's reliquefaction plant, where vapour is liquefied and returned to the tank
  - cooling the liquid in a heat exchanger (indirect system)
- That the indirect system is only used for those products which cannot be compressed for safety reasons.
- That inert gas is used to inert hold spaces and inter barrier spaces and to purge tanks.
- That most gas tankers are fined with an inert-gas generator.
- That the liquid level in cargo tanks is commonly measured by means of float gauges.
- That each cargo tank is fitted with a high-level alarm and automatic shutoff valves to prevent overflow.
- That each cargo tank is fitted with means for indicating the temperature and pressure.
- That gas tankers have a fixed gas-detection system that gives audible and visual alarms of the accumulation of gas in enclosed spaces such as cargo pump-rooms, compressor rooms, hold spaces and interbarrier spaces.

.7 Cargo Operations in Gas Tankers **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The following cargo operations:
  - drying
  - inerting
  - purging
  - cooling down
  - loading
  - cargo conditioning on passage
  - discharging
  - changing cargoes
  - gas-freeing
  - preparing for tank inspection

Understanding of;

- The mass of vapour present in the ullage space is included in the calculation of liquefied gasses.

Familiarity with;

- That information for each product may be found on cargo data sheets contained in safety guides or obtained from the shipper.
  That information needed before loading includes:

- a full description of the physical and chemical properties that are necessary for the safe containment of the cargo
- action to be taken in the event of spills or leaks
- counter-measures against accidental personal contact
- fire-fighting procedures and fire-fighting media
- procedures for cargo transfer, gas-freeing, ballasting, tank cleaning and changing cargoes
- special equipment for particular cargoes
- minimum temperatures of the inner hull steel
- emergency procedures

- That products that react when mixed should only be loaded if the complete cargo systems are separated.
- That personnel should be made aware of the hazards and be required to use the appropriate protective equipment provided.
- That the master should ensure proper liaison between the ship and the terminal before and throughout cargo-transfer operations.
- That all operations involving cargo, ballast and bunkers should be carried out in accordance with the applicable international and local pollution regulations.
- That some gas cargoes are subject to the regulations of Annex II of MARPOL 73/78.
- That a gas tanker requires an International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (NLS Certificate) to carry such products.
- That such cargo must be handled in accordance with the Procedures and Arrangements Manual.

Ability to;

- Calculate the vapour mass.

2.1.7 Knowledge of the operational and design limitations of bulk carriers

.1 Operational and design limitations of Bulk carriers 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the problems that are generally considered to be associated with bulk carriers includes, but is not limited to;
  - high density cargoes, leading to loss of buoyancy or structural failure, if holds are flooded in the loaded condition
  - high loading rate, leading to possible loss of control of load condition; with consequent high stresses
  - vulnerability to internal damage during cargo loading and discharging operations, leading to protective coating damage, accelerated corrosion, and local structural failure.
  - low freeboard, leading to high green sea loads on deck structures
  - vulnerability to flooding of forward holds
  - rapid corrosion caused by corrosive cargo
  - minor damage to single sided ship structures or hatch covers can lead to hold flooding
- Why the nature of bulk cargoes can give rise to a number of problems.
- That cargoes such as coal produces gas and acidic conditions, high density cargoes produce large void spaces, and other cargoes can produce stability problems due to shifting or liquefaction.
- That loaded bulk carriers tend to have a low freeboard making forward hatches vulnerable to heavy seas.
- That a single hold flooding on a bulk carrier, particularly when loaded with high density cargoes, can have a severe adverse affect on stability and hull stresses.
- That the corrosive effects of some cargoes accelerate the rate of deterioration of internal structures.

- That ships can be more heavily stressed during ballast passage compared to loaded passage because the use of one or two ballast tanks leads to uneven weight distribution along the hull.
- That hold cleaning, ballasting at sea and ballast exchange carried out at sea are vulnerable aspects of a ballast voyage for a bulk carrier.
- That improper cleaning during hold cleaning leads to accelerated corrosion and structural faults going unnoticed.
- That additional hull stresses due to redistribution of ballast are imposed on the ship carrying out ballasting at sea and ballast water exchange which is required for operational and environmental reasons.
- That there is also a possibility of hull damage from 'sloshing' when ballasting at sea.
- That this is also one of the reasons why some ships have been fitted with hull stress monitoring systems.
- Why at shallow drafts ships in ballast are vulnerable to slamming with the consequent risk of bottom damage.
- Why loading operation of a bulk carrier has been identified as an area of operations that can have immediate and long term affects on the structural integrity of the ship.
- That loading of bulk carriers requires the careful consideration of the loads imparted to the ship structure.
- That high density cargoes bring high local stresses, particularly in shear, if the vessel is block loaded and can also cause local damage and fatigue when being loaded.
- That loading at excessive speeds can cause high local stresses.
- That high loading rates make it difficult to monitor the amount of cargo being loaded.
- That continued over stressing has a cumulative effect with respect to fatigue.
- That discharging the cargoes causes similar problems to that of loading.
- That in addition to the problems associated with discharging, mechanical grabs, bulldozers, hydraulic hammers, and other machinery produce local damage and loading that can weaken the ship's structure.
- That ballasting operations during discharge can also add to the stresses on the ship if not planned and executed properly.
- As with loading, the need of good coordination at the time of discharge and ballasting of the ship.
- The reason why maintenance and inspection play an important part in the safety of bulk carriers.
- That all ships are designed with limits deliberately imposed on their operations to ensure that structural integrity is maintained.
- That exceeding these limits may over-stress the structure and lead to catastrophic failure.
- That the ship's hull structure is designed to withstand the static loads of the ship's weight and sea water pressure on the hull and the dynamic loads on the hull due to waves and ship's motion.
- That overloading in any one cargo hold space will increase static stress in the hull structure and reduce the capability of the hull structure to withstand dynamic loads when the ship is at sea.
- That many bulk carriers are fitted with very large hatch openings to facilitate cargo loading and unloading and these openings may represent points of weakness in the hull since they reduce the torsional resistance of the hull.
- That when bulk carriers are loaded with dense and heavy cargoes such as iron, dense ores or steel products they rely on large empty spaces in holds, ballast tanks, voids and forward tanks as reserve buoyancy to stay afloat and if seawater enters any of these spaces due to damaged hull, hatches, accesses, ventilators or air pipes, the vessel can lose buoyancy and sink very quickly.
- The need for all crew on the ship to be aware that any loss of buoyancy in forward spaces due to flooding will reduce the freeboard forward and dramatically increase the forces of extreme weather on hull structures and hatches.
- Why there is an urgent need for action if a ship takes on an unusual trim or heel, or if her motions become changed.

- The vulnerability of the bulkhead in bulk carriers between number 1 and 2 holds identified by IACS and IMO and the potential consequences of this failing.

.2 SOLAS Chapter XII Additional Safety Measures for Bulk Carriers 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The regulations provided as Additional Safety Measures for Bulk Carriers in Chapter XII of the SOLAS convention which apply to bulk carriers of 150m in length and upwards, carrying high density dry bulk cargoes, including:
  - damage stability and flotation,
  - structure of bulkheads and double bottoms,
  - overall longitudinal strength in the flooded state,
  - strength and flooding requirements for carrying cargoes with densities of 1,000 kg/m3 or greater
  - the bulkhead strength requirements for carrying cargoes of 1,780 kg/m3 or greater
  - hold loading,
  - cargo density declarations,
  - provision of a loading instrument
  - hold, ballast and dry space water ingress alarms
  - availability of pumping systems
  - restrictions from sailing with any hold empty
  - the imposition of restrictions on loading higher density cargoes and homogenous loading in adjacent holds, including the endorsement of loading information and marking of the ship
- That no bulk carrier over ten years old can carry a high density bulk cargo unless she has undergone either a periodical survey or a survey of her cargo holds to an equivalent extent, as required by regulation XII/7.

.3 CSR Bulk 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the IACS Common structural rules (CSR) are classification society rules covering structural requirement for Bulk Carriers and Tankers.
- That IACS Common Structural Rules (CSR) Bulk which contains structural requirements are applicable for Bulk Carriers with L > 90 m signed for construction after 1 April 2006.
- That vessels built to CSR shall have overall safety of the hull structure equivalent to or better than that currently achieved by present rules.
- That the reasons for implementing of these rule are:
  - to eliminate competition between class societies with respect to structural requirements and standards
  - to employ the combined experience and recourses of all IACS societies to develop a single standard, or set of rules
  - to fully embrace the intentions of the anticipated IMO requirements for goal based new construction standards
  - to ensure that a vessel meeting this new standard will be recognised by the industry as being at least as safe and robust as would have been required by any of the existing rules
- The general benefit of these rules.
- The critical areas of weakness identified in bulk carrier and tanker structure and the requirements for enhanced inspection identified in these rules.

2.1.8 Loading, care and unloading of bulk cargoes

.1 Application of all available shipboard data related to loading, care and unloading of bulk cargoes 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The procedure for loading a bulk cargo in detail.
- That prior to loading bulk cargo, the shipper should declare characteristics & density, stowage factor, angle of repose, amounts and special properties of the cargo.
- That in preparing the vessel for a safe planning and cargo stowage, the loading and unloading sequences and other operational matters should be informed well in advance by the charterers / terminal.
- The content of the loading manual.
- That the consumption of ship's bunkers, consumption/generation of fresh water, during the voyage should be taken into account when carrying out the stress and displacement calculations.
- That loading and unloading sequences must consider the loading rate, the de-ballasting capacity and the applicable strength and draught limitations.
- The action that should be taken if the Master does not believe they have been provided with the required or correct information relating to the cargo to be loaded.
- The requirements for the carriage of loading instruments.
- The typical information that can be obtained from a loading instrument.
- The certification, testing and use of a loading instrument.

Understanding of;

- All relevant information to be appraised prior planning of loading a bulk cargo.
- All relevant publications, IMO codes and recommendations to be referred prior loading a bulk cargo:
  - SOLAS regulation VI/7 and the related code of practice for the safe loading and unloading of bulk carriers (BLU Code)
  - International Maritime Solid Bulk Cargoes (IMSBC)
  - International Code for the Safe Carriage of Grain in Bulk
  - Code of Safe Practice for Cargo Stowage and Securing

Ability to;

- Prepare cargo stowage plan after carefully considering and assessing information such as seasonal load line zones, port restrictions, shipboard limits, e.g. draft, cargo capacity, stability, stresses and loading rates.
- Plan the loading, care and unloading of bulk cargoes using the ship's approved loading manual and the typical information provided.
- Utilize a typical loading instrument to plan and monitor bulk carrier loading, ballast exchange and discharge operations.

.2 Code of practice for the safe loading and unloading of bulk carriers (BLU code) 2hrs (T) + 0hrs (P) + 0hrs (E).

Understanding of;

- The contents of the Code of Practice for the Safe Loading and Unloading of Bulk Barriers (BLU code) in relation to:
  - planning the sequence of operations
  - communications and coordination between ship and terminal
  - allocation of ships to appropriate terminals
  - condition of ships and terminal equipment

- training of ship and terminal personnel
- requirement to be familiar with and comply with local regulations
- use of safety checklists
- responsibility of the Master
- additional considerations in relation to dangerous cargoes
- the use of the BLU Manual by terminal staff
- the impact of arrival and departure condition on manoeuvrability
- actions to minimise hull and local stress
- actions to take where acceptable hull and local stress levels may be exceeded

2.1.9 Safe cargo handling in accordance with the provisions of the relevant instruments

.1 Establish Procedures for safe cargo handling in accordance with the provisions of the relevant instruments such as; IMDG Code, IMSBC Code, MARPOL 73/78, Annexes III and V 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The procedures that should be followed for accepting solid bulk cargoes, packaged dangerous goods and marine pollutants for shipment in terms of:
  - the required documentation
  - ensuring that the condition and labelling of the goods are fit for carriage
  - ensuring that the vessel is able to safely stow the cargo in terms of vessel certification, the ability to achieve separation and segregation requirements and the availability of any particular safety equipment that might be required
- The preparations and precautions that should be taken prior to the handling of bulk cargoes, packaged dangerous goods and marine pollutants in terms of:
  - preparation of spaces
  - mooring of the ship
  - information exchange and communication with port and regulatory authorities
  - flag and light signals
  - provision of emergency, fire and protective equipment
- The appropriate action to take in case of general and medical emergencies involving packaged dangerous goods using the EMS and MFAG guidance of the IMDG Code.
- The risks that might be created by undeclared dangerous goods or goods that are not packaged or separated/segregated in accordance with the IMDG Code.
- That the loading and discharge of dangerous goods, bulk cargoes and marine pollutants may be subject to port and national regulations in loading and discharge ports in addition to the requirements of the IMO codes.
- That there are procedures also given in the shipboard SMS for the reporting of incidents involving the loss, or likely loss of harmful substances.
- That cargo residues are created through inefficiencies in loading, unloading and on-board handling.

Familiarity with;

- That the ship carrying MP should have a special list or manifest or detailed plan showing the location of these goods as per MARPOL Annex III/4(3).
- That the master and chief mate should ensure MP are stowed in the location specified in the special list or manifest or detailed plan.
- That the information provided on the special list or manifest should be compliant with section 5.4.3 of the IMDG code as per MARPOL Annex III/4(3).

- That the master and chief mate should ensure that when MP or any other dangerous goods are loaded on their ship, they must be stowed as required by Chapter 7.1, Section 7.1.4 of the IMDG Code in order to comply with MARPOL Annex III/5.
- That to avoid accident which may lead to marine pollution, the master and chief mate should take note that MP goods should not be placed on the outer row or out board stow at the side of the ship. In addition, if they are stowed on deck, they should be located in such a way that any leakage will not escape into the sea and containers are not in exposed location where they may be damaged by the action of the sea or weather.
- That as given in MARPOL Annex III/5, the master and chief officer should ensure that when MP or any other dangerous goods is carried on their ship, the stowage and securing must be in accordance with the requirements of the Document of Compliance (DOC) and approved Cargo Securing Manual (CSM).
- That that the disposal of dry bulk cargo residues is regulated by the requirements of MARPOL Annex V which governs garbage disposal at sea.
- That as per the guidelines given in MARPOL Annex V, cargo-associated waste means all materials which have become wastes as a result of use on board a ship for cargo stowage and handling and this includes but is not limited to dunnage, shoring, pallets, lining and packing materials, plywood, paper, cardboard, wire, and steel strapping.
- That as per the guidelines given in MARPOL Annex V, operational wastes means all cargo-associated waste and maintenance waste, and cargo residues.
- That as per the guidelines given in MARPOL Annex V, cargo residues, expected to be in small quantities, are defined as the remnants of any cargo material on board that cannot be placed in proper cargo holds (loading excess and spillage) or which remain in cargo holds and elsewhere after unloading procedures are completed (unloading residual and spillage).
- That this means that under the terms of MARPOL 73/78, discharge of cargo residues, except in limited safety circumstances, is prohibited until the ship is more than twelve nautical miles from the nearest land.
- That minimisation of cargo residue wash down and discharge should form part of the ship's Garbage Management Plan and all residue discharges should be recorded as garbage category 4.
- That discharges of cargo residues also require start and stop positions to be recorded in the Garbage record book.
- That cargo materials contained in the cargo hold bilge water is not treated as cargo residues provided that the cargo material is not classified as a marine pollutant in the IMDG Code and the bilge water is discharged from a loaded hold through the vessel's fixed piping bilge drainage system.
- That as cargo residues fall under the scope of these guidelines provided by MARPOL annex V, it may, in certain cases, be difficult for port reception facilities to handle such residues and is therefore recommended that cargo be unloaded as efficiently as possible in order to avoid or minimize cargo residues.
- That spillage of the cargo during transfer operations should be carefully controlled, both on board and from dockside and since this spillage typically occurs in port, it should be completely cleaned up prior to sailing and either delivered into the intended cargo space or into the port reception facility.
- That areas on the ship where spillage is most common should be protected such that the residues are easily recovered.

Ability to;

- Develop stowage plans for cargoes that contain multiple packaged dangerous goods and ensure that separation and segregation requirements of IMDG, IMSBC and MARPOL are achieved
- Prepare dangerous goods manifests and stowage plans in accordance with IMDG requirements

2.1.10 Effective communications and improving working relationship

.1 Basic principles for establishing effective communications and improving working relationship between ship and terminal personnel 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The necessity for effective communication and working relationships between ship and terminal
- The information that should be exchanged between the ship and terminal:
  - prior to ship's arrival
  - when arriving in a part loaded condition or with residues
  - for combination carriers (OBO or O/O)
  - in relation to the readiness of holds to load cargo
  - in ensuring that the plan and understanding of the operation is up to date and shared by both the ship and terminal
  - ensuring that the cargo declaration as required by chapter VI of SOLAS 1974 is completed
  - provisions for changing loading or unloading plans

COMPETENCES 2.2 Assess reported defects and damage to cargo spaces, hatch covers and ballast tanks and take appropriate action

2.2.1. Limitations on strength of the vital constructional parts of a standard bulk carrier and interpret given figures for bending moments and shear forces

.1 Limitations on strength of the vital constructional parts of a standard bulk carrier and interpret given figures for bending moments and shear forces 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the longitudinal bending causes an axial force on the upper deck that may cause cracking of the deck plate at the locations where the stress is concentrate.
- That these hatchways reduce the ship's torsional strength and invite concentrated stress at the hatchway corners which may be evident by cracking of the deck plates in these areas.
- That cross-deck strips come under stress by transverse bending.
- That the transverse bulkheads provide transverse strength to a bulk carrier and the cross-deck strips provide the strength to withstand the resultant axial forces in a transverse direction.
- That there are various types of cracking in the upper deck states that those propagating from the cargo hatchways are generally considered serious to the ship's safety
- That various metal fittings are welded to the upper deck plating and these installations may cause stress concentrations at the welded joints or have defects in the welds.
- That although they are not critical longitudinal strength members, they should be watched carefully to ensure that these cracks do not spread.
- That the area around the corners of a main cargo hatch can be subjected to high cyclical stress due to the combined effect of hull girder bending moments, transverse and torsional loading.
- That discontinuous cargo hatch side coamings can be subjected to significant longitudinal bending stress.
- That this introduces additional stresses at the mid-length of hatches and stress concentrations at the termination of the side coaming extensions.
- That hatch cover operations, in combination with poor maintenance, can result in damage to cleats and gasket, leading to the loss of weathertight integrity of the hold spaces.
- That the transverse bulkheads may also be susceptible to accelerated corrosion, particularly at the midheight and at the bottom.

- That deformation/twisting of exposed structure above deck, such as side-coaming brackets and bulwarks, may result from impact due to improper handling of cargo and cargo handling machinery.
- That such damages may also be caused by shipping of green sea water on deck in heavy weather.
- Other fractures that may occur in the deck plating at hatches and in connected coamings.
- That this kind of damage is considered to be caused by insufficient continuity between forepeak construction and cargo hold structure.
- That on large bulk carriers such as capesize and panamax bulkers, bilge hopper plating around the knuckle line may be cracked along the bilge hopper transverse webs.
- That on some bulk carriers, bilge hopper tanks and topside tanks form one integral tank connected with trunk spaces.

Familiarity with;

- That the longitudinally continuous upper deck of a bulk carrier suffers hull girder stress.
- That bulk carriers have cargo hatchways for the convenience of cargo-handling facilities.
- That in this regard upper deck plating at hatchway corners is one of the focal points for cracking.
- That deck plating in the vicinity of manholes, hatch side coaming end brackets, bulwark stays, crane post foundations and deck houses, etc. are to be carefully watched for cracking.
- That hatch coamings are subjected to hull girder stress.
- That damage to hatch covers can also be sustained by mishandling and overloading of deck cargoes.
- That the marine environment, the humid atmosphere due to the water vapour from the cargo in cargo holds, and the high temperature on deck and hatch cover plating due to heating from the sun may result in accelerated corrosion of plating and stiffeners making the structure more vulnerable to the exposures described above.
- That when carrying out visual inspection, special attention should be paid to areas where pipes, e.g. fire main pipes, hydraulic pipes and pipes for compressed air, are fitted close to the plating, making proper maintenance of the protective coating difficult to carry out.
- That cracking may be initiated at defects in welded joints and metal fittings to the coamings that will invite stress concentration.
- That such cracking is considered serious to the ship's safety because it may be the initiation of a fracture on a large scale.
- That on typical bulk carriers, the topside and bilge hopper tanks compose a double hull surrounding the cargo space, which together with the double bottom provides hull strength and rigidity.
- That if corrosion and waste become excessive, failure of hold frames invites additional loads to the adjacent ones, which may lead to failure throughout the side shell structure.
- That particular care should be exercised when inspecting hold frames.
- That the transverse bulkheads, in that these members may appear in deceptively good condition.
- That the tank top and side shell plating generally corrodes from the steel surface facing the cargo hold and corrosion from inside the double bottom is usually less than that from the cargo hold side.
- That cargo hold frames should also be carefully inspected for mechanical damage, corrosion and waste, because many cargoes will damage hold frames through direct contact.
- That this damage will invite corrosion from seawater brought on board in loading operations.
- That the most important aspects of cargo hold inspections are the condition of side shell structures and their reinforcements.
- That special attention should be paid to the condition of hold frames and their connection to the shell plating.
- the common damage/defects that may occur on watertight transverse bulkheads situated at the ends of dry cargo holds of a bulk carrier
- That cracks may often be found at or near the connection of the stool of the transverse bulkhead and the tanktop in bulk carriers having combination cargo/ballast holds.

- That wastage/corrosion may affect the integrity of steel hatch covers and the associated moving parts, e.g. cleats, pot-lifts, roller wheels, etc.
- The damages caused by cargoes in cargo holds, especially to tanktop plating and side
  - at loading and unloading ports for coal or iron ore, large grab buckets, high-capacity cargo
  - loaders, bulldozers and pneumatic hammers may be employed for cargo-handling operations
  - large grab buckets may cause considerable damage to tank top plating when being dropped to grab cargo
  - use of bulldozers and pneumatic hammers may also be harmful to cargo hold structures and may result in damage to tank tops, bilge hoppers, hold frames and end brackets
  - lumber cargoes may also cause damage to the cargo hold structures of smaller bulkers that are employed in the carriage of light bulk cargoes and lumbers
- That side stringers and/or side shells in way of No. 1 cargo hold along the collision bulkhead are often found cracked.
- That this is considered to be caused by insufficient local reinforcement.
- That though the water ballast tanks of newer bulk carriers are well protected against corrosion, the upper portion is susceptible to corrosion because the protective coating will easily deteriorate due to heat from the upper deck and the cyclic wet/dry effect of seawater.
- That cracks may be found at the intersections of longitudinals and transverse members.
- That cracks may be found in the side, bottom and/or tanktop longitudinals at intersections with solid floors or bilge hopper transverses.
- That cracks also may be found in the floors or transverses occurring at the corners of the slots cut for longitudinal.
- That longitudinals may be cracked at the ends of additional (partial) side girders provided in the double bottom below cargo hold bulk heads or at the side walls of bilge wells for cargo holds, due to additional stress concentration caused by the structural discontinuity at those connections.
- That cracks may be observed in transverse webs in bilge hoppers initiating from the slot openings for longitudinals and at the knuckled corners of the lower ends of the hoppers.
- That corrosion accelerated by heat have been observed in double-bottom water ballast tanks adjacent to fuel oil tanks.
- That in recent years, the grade of bunker oil being used requires the temperature in the tank to be 80°C or more and such a temperature can accelerate corrosion of the steel in the tanks, particularly in the vicinity of the boundaries of the fuel oil tanks.
- That bottom plates are often eroded under the suction bellmouths in tank.
- That a sounding pipe has a pad plate at its bottom end for protection of the tank bottom against the strike of the sounding scale's lead and extent of diminution of the protection plate should be examined during inspections.
- That connection trunks provided between topside and bilge hopper spaces are to be carefully watched for signs of corrosion and waste of the steelworks inside.
- That the inside surface of a connection trunk is liable to corrosion and should be examined carefully.

.2 interpret given figures for bending moments and shear forces 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That in harbour, where the ship is in sheltered water and is subjected to reduced dynamic loads, the hull girder is permitted to carry a higher level of stress imposed by the static loads.
- That when a ship is floating in still water, the ship's lightweight (the weight of the ship's structure and its machinery) and deadweight (all other weights, such as the weight of the bunkers, ballast, provisions and cargo) are supported by the global buoyancy up thrust acting on the exterior of the hull.

- That along the ship's length there will be local differences in the vertical forces of buoyancy and the ship's weight and these unbalanced net vertical forces acting along the length of the ship causes the hull girder to shear and to bend, inducing a vertical still water shear force (SWSF) and still water bending moment (SWBM) at each section of the hull.
- That at sea, the ship is subjected to cyclical shearing and bending actions induced by continuously changing wave pressures acting on the hull.
- That these cyclical shearing and bending actions give rise to an additional component of dynamic, wave induced, shear force and bending moment in the hull girder.
- That at any one time, the hull girder is subjected to a combination of still water and wave induced shear forces and bending moments.
- That the stresses in the hull section caused by these shearing forces and bending moments are carried by continuous longitudinal structural members.
- That these structural members are the strength deck, side shell and bottom shell plating and longitudinals, inner bottom plating and longitudinals, double bottom girders and topside and hopper tank sloping plating and longitudinals, which are generally defined as the hull girder.
- That all officers should be aware over-stressing of local structural members can occur even when the hull girder still water shear forces (SWSF)and bending moments (SWBM) are within their permissible limits.
- The causes and effects of shearing forces and bending moments on ship's structures.

Familiarity with;

- That the bulk carriers are assigned 2 sets of permissible still water shear forces (SWSF) and still water bending moment (SWBM) limit to each ships, namely;
  - seagoing (at sea) SWSF and SWBM limits
  - harbour (in port) SWSF and SWBM limits
- That the seagoing SWSF and SWBM limits should not be exceeded when the ship is put to sea or during any part of a seagoing voyage.
- That the harbour SWSF and SWBM limits should not be exceeded during any stage of harbour cargo operations.
- That over-loading will induce greater stresses in the double bottom, transverse bulkheads, hatch coamings, hatch corners, main frames and associated brackets of individual cargo holds, and it can be observed as;
  - increased stress at hatch corners and coamings
  - increased stress in main frames and brackets
  - increased stress in double bottom structure
  - increased stress in transverse bulkhead
  - increased stress in cross deck strip
  - greater distortion of topside tank
- That exceeding the permissible limits specified in the ship's approved loading manual will lead to overstressing of the ship's structure and may result in catastrophic failure of the hull structure.
- That when deviating from the cargo load conditions contained in the ship's approved loading manual, it is necessary to ensure that both the global and local structural limits are not exceeded.

Demonstrate

- The knowledge gained on the fore mentioned topics by interpreting given figures for bending moments and shear forces.

2.2.2 Methods to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling

.1 Methods to avoid the detrimental effects on bulk carriers of corrosion, fatigue and inadequate cargo handling 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That corrosive effects of some cargoes like coal which produces acidic conditions, accelerates the rate of deterioration of internal structures in cargo holds, welds in particular.
- That since bulk carriers tend to have low freeboard the uppermost continuous deck and other fittings including hatch covers are prone to exposure to green seas, which may again cause accelerated corrosion, and in some cases even structural damages which may again lead to catastrophic result, if not detected early and appropriate action taken.

Familiarity with;

- That deterioration of structure through corrosion, fatigue and damage is identified as a principal factor in the loss of many bulk carriers.
- That failing to identify such deterioration may lead to sudden and unexpected failure.
- That it is critical to inspect the cargo holds, ballast tanks and vital constructional parts of the bulk carriers, after every operation to ensure, rapid action can be taken if the inspection reveals any cracks, fracture or other damages.
- That Internal degradation through corrosion may be accelerated through chemical action from certain cargoes.
- That certain cargoes, including coal, phosphates and sulphur, transported by bulk carriers can rapidly corrode the hold side frames and promote fractures.
- That the scouring effect of abrasive cargoes may cause hold coatings to deteriorate rapidly.
- That since improper cleaning during hold cleaning leads to accelerated corrosion all crew should be well trained for hold cleaning, and proper checks to be made after the holds have been cleaned, to ensure no remnants of previous cargo is left behind.
- That in ballast holds, sloshing forces due to partially filled spaces, during ballast exchange at sea may result in damage to the structure and this damage may go unnoticed if it is in inaccessible positions, this has to be prone in mind while carrying out inspections.
- That coatings are the first barriers to protect metal surfaces against corrosion.
- That ballast exchange, especially for cargo hold, can also cause accelerated corrosion, if the hold has any exposed, unprotected steel surface.
- That intact coatings prevent corrosion of the steel surface, however a local absence of coating (due to coating depletion, deterioration, damage, etc) can result in corrosion rates similar or greater than those of unprotected steel.
- That periodic inspections at appropriate intervals and repair of coating as required are effective in minimizing corrosion damage.
- That to ensure that such exposures are not neglected, all officers should be well trained in identifying and reporting to the chief officer or the Master.
- That care should be taken, to tend any unprotected surfaces in cargo holds caused due to any reasons, after carefully examining the structure for any signs of fatigue or fracture.
- That hold cleaning, ballasting at sea and ballast exchange carried out at sea are vulnerable aspects of a bulk carrier operation, and thus to avoid any kind of undue stress, proper, careful procedures, specified, in loading manual, ballast water management plan, among others should be followed.
- That in single side-skin bulk carriers, bulkheads, trunks and ballast tank boundaries, can present "hard spots" that concentrate forces where the change in construction occurs (e.g. longitudinal to transverse framing).

- That this may lead to undetected fractures, hence careful examination at periodic intervals is necessary.
- That damage to bow plating is possible through impacts associated with swinging or loosely stowed anchors may cause an initiating fracture or fatigue in bow shell plating that could lead to failure and subsequent flooding.
- That internal integrity of forward spaces (that are usually used for ballast and/or stores) is therefore of vital importance
- That to prevent this from happening, the anchor must be fully hauled-in, stowed and retained in position by the lashing arrangement provided, ensuring there is three-point contact of anchor with the ship side at all given times.
- That corrosion degradation will seriously reduce the ability of plating and stiffening to withstand the forces to which it will be subjected.
- That any external forces - horizontal and/or vertical - may cause hatch cover dislodgement.
- That the cargo hatchway, if it loses its protection in this way, is a major access for water ingress and a serious threat to the integrity of the hull.
- That to ensure such thing does not happen, the hatch covers must be stowed, secured, battened down at all given times.
- That metal fatigue is the progressive failure of metal under cyclic loading and as the name "fatigue" implies, it is a mode of degradation in which the steel is worked until it simply gets tired.
- That bulk carriers are susceptible to many modes of cyclic forces that combine with other forces acting upon the vessel's structure and over time these cyclic stresses, can seriously weaken the vessel's structural capacity.
- That fatigue failure may result due to loss of cross-sectional area in the plating joints.
- The areas that are prone to fatigue cracks in the cargo holds, which have to be carefully examined during routine, periodic, scheduled inspections, are;
    - corrugated bulkhead
    - shedder plate
    - inner bottom longitudinal (tank top)
    - side frames
    - side longitudinals
    - hopper tank
    - lower stool
    - toes of the hatch coaming termination brackets
- That carriage of high density cargoes can cause buckling, structural deformities over a period of years, which can result in acceleration of corrosion and fatigue.
- That many terminals have the practice of dislodging cargo from side shell, frames, hoppers using mechanical grabs, bulldozers, hydraulic hammers, and other machineries.
- That these machineries produce local damage and loading that can weaken the ship's structure.
- That precaution must be taken to ensure the terminals are instructed not to use any machinery which may cause damage, clearly, during the formal filling and agreeing as per the ship/shore checklist, contained in the BLU code, and duty officer's to be instructed to stop any such activities that may endanger the ship's structure, also bringing it to the notice of Master.
- That buckling of plating caused due to high density cargoes, found generally on cargo hold tanktops, can lead to fractures or accelerated corrosion, if not inspected thoroughly.
- That damage to side shell caused externally through contact with docksides or tugs and, internally from impact by cargo dislodging equipment during discharge, can result in initiating fractures and/or fatigue of the structure.
- That careful examination is of prime importance after any such incidents, to assess the extent of damage and action required.

COMPETENCE 2.3 Carriage of Dangerous Goods

2.3.1 International regulations, standards, codes including the international maritime dangerous goods (IMDG) code and the international maritime solid bulk cargoes (IMSBC) code and recommendations on carriage of dangerous cargoes

.1 International Regulations and Codes 4hrs (T) + 0hrs (P) + 0hrs (E).

Understanding of;

- The content and applies the of International Regulations Standards, Codes and Recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code and the International Maritime Solid Bulk Cargoes (IMSBC) Code, which aims primarily to facilitate the safe stowage and shipment of solid bulk cargoes by providing information on the dangers associated with the shipment of certain types of solid bulk cargoes and instructions on the procedures to be adopted when the shipment of solid bulk cargoes is contemplated plans loading, stowage and segregation in accordance with the IMDG Code.

Familiarity with;

- That the International Maritime Solid Bulk Cargoes Code (IMSBC Code) amplifies the mandatory provisions contained in the parts A and B of chapter VI and part A-1 of chapter VII, of the International Convention for the Safety of Life at Sea, 1974 (SOLAS Convention), as amended, governing the carriage of solid bulk cargoes and the carriage of dangerous goods in solid form in bulk, respectively.
- That the provisions contained in the IMSBC Code apply to all ships to which the SOLAS Convention, as amended, applies and that are carrying solid bulk cargoes as defined in regulation 2 of part A of chapter VI of the Convention.
- That the prime hazards associated with the shipment of solid bulk cargoes are those relating to structural damage due to improper cargo distribution, loss or reduction of stability during a voyage and chemical reactions of cargoes.
- That the primary aim of the IMSBC Code is to facilitate the safe stowage and shipment of solid bulk cargoes by providing information on the dangers associated with the shipment of certain types of solid bulk cargoes and instructions on the procedures to be adopted when the shipment of solid bulk cargoes is contemplated.
- That the observance of the Code harmonizes the practices and procedures to be followed and the appropriate precautions to be taken in the loading, trimming, carriage and discharge of solid bulk cargoes when transported by sea, ensuring compliance with the mandatory provisions of the SOLAS Convention.
- That typical cargoes currently shipped in bulk, together with advice on their properties and methods of handling, are given in the schedules for individual cargoes.
- That appendix 1 of the IMSBC Code contains individual schedules of solid bulk cargoes.
- That if a solid cargo which is not listed in appendix1 to this Code is proposed for carriage in bulk, the shipper shall, prior to loading, provide the competent authority of the port of loading with the characteristics and properties of the cargo in accordance with section 4 of this Code.
- That based on the information received, thecompetent authority will assess the acceptability of the cargo for safe shipment.
- That regulation 2 of the IMSBC Code states that, the shipper shall provide the master or his representative with appropriate information on the cargo sufficiently in advance of loading to enable the precautions which may be necessary for proper stowage and safe carriage of the cargo to be put into effect.
- That the fore mentioned information shall be confirmed in writing and by appropriate shipping documents prior to loading the cargo on the ship.

- That the cargo information shall include:
  - The Bulk Cargo Shipping Name (BCSN) when the cargo is listed in this Code. Secondary names may be used in addition to the BCSN;
  - the cargo group (A and B, A, B or C);
  - the IMO Class of the cargo, if applicable;
  - the UN number preceded by letters UN for the cargo, if applicable;
  - the total quantity of the cargo offered;
  - the stowage factor;
  - the need for trimming and the trimming procedures, as necessary;
  - the likelihood of shifting, including angle of repose, if applicable;
  - additional information in the form of a certificate on the moisture content of the cargo and its transportable moisture limit in the case of a concentrate or other cargo which may liquefy;
  - likelihood of formation of a wet base (see subsection 7.2.3 of this Code);
  - toxic or flammable gases which may be generated by cargo, if applicable;
  - flammability, toxicity, corrosiveness and propensity to oxygen depletion of the cargo, if applicable;
  - self-heating properties of the cargo, and the need for trimming, if applicable;
  - properties on emission of flammable gases in contact with water, if applicable;
  - radioactive properties, if applicable; and
  - any other information required by national authorities
- That as per definitions listed in the IMSBC Code, Bulk Cargo Shipping Name (BCSN) identifies a bulk cargo during transport by sea.
- That when a cargo is listed in this Code, the Bulk Cargo Shipping Name of the cargo is identified by capital letters in the individual schedules or in the index.
- That as per definitions listed in the IMSBC Code, Group A consists of cargoes which may liquefy if shipped at moisture content in excess of their transportable moisture limit.
- That as per definitions listed in the IMSBC Code, Group B consists of cargoes which possess a chemical hazard which could give rise to a dangerous situation on a ship.
- That as per definitions listed in the IMSBC Code, Group C consists of cargoes which are neither liable to liquefy (Group A) nor to possess chemical hazards (Group B).
- The content of section 2, General loading, carriage and unloading precautions, of the IMSBC Code.
- The content of section 3, Safety of personnel and ship, of the IMSBC Code.
- The information provided in appendix 1 of the IMSBC Code, which contains individual schedules of solid bulk cargoes.

Ability to;

- Plan loading and stowage in accordance with the IMSBC Code.

2.3.2 Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage of dangerous, hazardous and harmful cargoes

.1 Dangerous Goods in Packages 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The contents of the shipper's declaration of dangerous goods.
- The actions to take when documentation, packaging, labelling or the condition of packages does not meet the requirements of the IMDG Code.
- That a port authority may be empowered to refuse dangerous substances if it is considered that their presence would endanger life or property because of:

  - their condition
  - the condition of their containment
  - the condition of their mode of conveyance
  - conditions in the port area
- The inspections which may be made by a port authority.
- The signals as:
  - by day, flag 'B' of the International Code of Signals
  - by night, an all-round fixed red light
- How effective communications with the port authority can be maintained.
- The requirements regarding mooring a ship carrying dangerous substances.
- That the port authority should be informed of the intention to carry out repair work when dangerous substances are on board.
- The handling precautions which should be observed regarding:
  - avoidance of damage to packages
  - access to handling areas
  - lifting goods over dangerous goods stowed on deck
  - escape of a dangerous substance from a package entry into enclosed spaces
- The special precautions for loading or unloading explosives.

Understanding of;

- The marking and labelling required on packages or cargo units.
- That the documentation provided to the ship and the packaging and labelling of packaged dangerous cargo complies with the requirements of the IMDG Code.
- The appropriate action to take in emergency and medical first aid situations involving dangerous goods.
- 'dangerous substances', 'port authority', 'regulatory authority', 'designated port office' and 'responsible person' as used in the Recommendations on the Safe Transport, Handling and Storage of Dangerous Substances in Port Areas.

Familiarity with;

- That the IMDG Code is an evolving document and is updated every two years to take account of:
  - new dangerous goods which have to be included
  - new technology and methods of working with or handling dangerous goods
  - safety concerns which arise as a result of experience
- The explosives which may be carried on a passenger ship.
- Why additional labelling may be necessary to meet the requirements for through transport.
- That, if any dangerous substance constitutes an unacceptable hazard, the port authority should be able to order the removal of such substance or any ship, package, container, portable tank or vehicle containing it.
- That a port authority will normally require notification at least 24 hours in advance of the transport or handling of dangerous substances, including those which are not for discharge at that port.
- That the designated port officer should be empowered to:
  - direct when and where a ship having any dangerous substances on board may anchor, moor or berth
  - direct a ship to be moved within or to leave the port area
  - attach conditions appropriate to local circumstances and the quantity and nature of the dangerous substances
- That the regulatory authority may require signals to be shown while transporting or handling dangerous substance.

- That at all times there should be sufficient crew on board to maintain a proper watch and operate appliances in the case of an emergency, taking into account the nature and quantity of dangerous substances on board.
- That a responsible person should be designated to supervise the handling of dangerous goods.
- The measures which should be taken by the responsible person in connection with:
  - the weather
  - lighting
  - protective clothing and equipment
  - intoxicated persons
  - fire and other emergency procedures
  - reporting of incidents and safety precautions

Ability to;

- Plan the stowage and segregation of a cargo containing dangerous goods when provided with the loading list, the copies of the shipper's declarations and the IMDG code to plan a stow and segregation and prepares the dangerous goods manifest and stowage plan for a cargo containing multiple dangerous good.
- Extract the relevant references to EmS and MFAG.

.2 Solid Bulk Cargoes 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The contents of the International Maritime Solid Bulk Cargoes (IMSBC Code).
- That certificates stating transportable moisture limits should be accompanied by a statement that the moisture content is the average moisture content at the time of presenting the certificate.
- How to distribute a high-density cargo between holds when detailed information is not available.
- How to prevent shifting of bulk cargo by reducing an excessively high GM.
- Precautions to take before, during and after loading of bulk cargo.
- The precautions to take to minimise the effect of dust on deck machinery, navigational aids and living quarters.
- The health hazards which may be associated with bulk materials.
- How to trim cargoes having an angle of repose:
  - less than or equal to 35 degrees
  - greater than 35 degrees
- How to stow material which flows freely like grain.
- The IMSBC code method for determining the approximate angle of repose on board ship.
- The types of cargo which may liquefy during carriage.
- That such cargoes may look relatively dry when loaded but liquefy as a result of compaction and vibration during the passage.
- The precautions to be taken to keep liquids out of holds where such cargoes are carried and the danger of using water to cool a shipment of these materials.
- The test for approximately determining the possibility of flow which may be carried out on board ship.
- That some materials are classified as dangerous goods in the IMDG code while others are Materials Hazardous only in Bulk' (MHB).
- The content the content and use of the following;
  - The BLU code
  - The BLU manual
  - MSC/Circ. 908 - Uniform Method of Measurement of the Density of Bulk Cargoes

- MSC/Circ. 1146 - Lists of Solid Bulk Cargoes for which a Fixed Gas Fire-extinguishing System may be Exempted or for which a Fixed Gas Fire-extinguishing System is Ineffective
- Res. A. 864(20) - Recommendations for Entering Enclosed Spaces Aboard Ships
- MSC.1/Circ.1264 - Recommendations on the Safe Use of Pesticides in Ships Applicable to the Fumigation of Cargo Holds
- BC.1/Circ.66 - Contact Names and Addresses of the Offices of Designated National Competent Authorities Responsible for the Safe Carriage of Grain and Solid Bulk Cargoes

- The list of materials possessing chemical hazards is not exhaustive, that the properties listed are for guidance only and that it is essential to obtain currently valid information about bulk materials before loading.
- The use of the tables for segregation between incompatible bulk materials and between bulk materials and dangerous goods in packaged form.

Familiarity with;

- That the main hazards associated with the shipment of bulk solids are:
  - structural damage due to improper distribution of the cargo
  - loss or reduction of stability during a voyage
  - chemical reactions
- The information which should be supplied by the shipper to the master before loading.
- That a certificate stating the relevant characteristics of the material should be provided to the master at the loading point.
- That the loading instrument, loading information and the ship's stability information book should be used to check the suitability of a proposed stow for stresses and stability.
- That safety precautions and any appropriate national regulations should be complied with during the handling and carriage of bulk materials.
- That a copy of the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods should be on board.
- That cargoes which may liquefy should not be carried with a moisture content above that of the transportable moisture limit.
- That such cargoes should be trimmed reasonably level, regardless of the angle of repose stated.
- That specially fined or constructed cargo ships may carry materials with a moisture content above the transportable moisture limit if approved by their Administrations.
- That some materials transported in bulk present hazards because of their chemical properties.
- That the IMSBC Code categorises cargoes into three groups - A, B and C.
- That the IMDG code should also be consulted for additional requirements regarding the stowage and segregation of packaged dangerous goods.
- That particular care should be taken with the segregation of toxic substances and foodstuffs.
- use the IMSBC code to extract all necessary information for the safe carriage in bulk of a stated cargo, describes how it should be loaded and lists any special precautions or requirements to be observed during loading, carriage and discharge.

.3 International Code for the Safe Carriage of Grain in Bulk (International Grain Code)
4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the International Code for the Safe Carriage of Grain in Bulk (International Grain Code) are based on the recognition that grain like cargoes have a propensity to shift and that even fully loaded cargo spaces may contain voids that allow dangerous cargo shifts.
- That the Code requires demonstration, by calculation, which at all times during a voyage the ship will have sufficient intact stability to provide adequate dynamic stability after taking into account an assumed shift of cargo.
- That vessels with appropriate design features may be able to meet the required minimum stability criteria after the assumed movement of cargo without taking further physical precautions to reduce the shift of cargo.
- The stability and grain loading information that is required to be provided for such vessels if they are to receive a Document of Authorisation.
- The method of verifying that the loading of a vessel supplied with a Document of Authorisation meets stability requirements using volumetric heeling moments, cargo details and maximum deadweight heeling moments.
- That the grain loading stability booklet and associated plans contain all of the information necessary to check that a proposed loading plan complies with the stability requirements of the Regulations at all stages of the voyage.
- The importance of trimming to fill all of the spaces under decks and hatch covers to the maximum extent possible.
- The use of physical precautions to reduce cargo movement.
- The use and fitting of longitudinal divisions in both filled and partly filled compartments.
- The construction of a saucer as an alternative to a longitudinal division in a hatchway.
- The use of bagged grain or other suitable cargo stowed in the wings and ends of a compartment to reduce the heeling effects of a grain shift.
- Methods of securing the free grain surface in partly filled compartments.
- The conditions which must be met before a ship without a document of authorization may load grain.

Understanding of;

- The following terms as used in chapter VI of SOLAS:
  - grain
  - filled compartment
  - partly filled compartment
  - angle of flooding

Familiarity with;

- That the international Grain code applies to all ships to which the SOLAS regulations apply and to cargo ships of less than 500 gross tons.
- The Code requirements for minimum stability in terms of initial metacentric height, angle of heel due to assumed grain shift and residual dynamic stability.
- That in some countries a certificate of loading, certifying that the cargo has been loaded in compliance with the Regulations, is required before sailing.
- That the ability to comply with the stability criteria should be demonstrated before loading.
- That the master should ensure that the ship is upright before proceeding to sea.
- That the hatch covers of filled compartments which have no cargo stowed over them should be secured as laid down in the document of authorization.

Demonstrate

- the use of Part C of the Code to determine the scantlings for uprights and shifting boards.

Ability to;

- given a ship's data and details of consumption of fuel and of fresh water for an intended voyage, prepares a stowage plan for a cargo of bulk grain and performs the calculations to check that the proposed stowage complies, at all stages of the voyage, with the stability criteria set out in chapter VI of SOLAS 1974.

Function: 3 controlling the operation of the ship and care for persons on board at the management level

Competence: 3.1 Control Trim, Stability and Stress

3.1.1 Fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability

.1 Shipbuilding Materials 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That mild steel, graded A to E, is used for most parts of the ship.
- That the use of higher tensile steel in place of mild steel results in a saving of weight for the same strength.
- What is meant by:
  - tensile strength
  - ductility
  - hardness
  - toughness
- Followings:
  - yield point
  - ultimate tensile stress
  - modulus of elasticity
- That toughness is related to the tendency to brittle fracture.
- That stress fracture may be initiated by a small crack or notch in a plate.
- The advantages of the use of aluminium alloys in the construction of superstructures.
- How strength is preserved in aluminium superstructures in the event of fire.
- The special precautions against corrosion that are needed where aluminium alloy is connected to steelwork.

Understanding of;

- Strain as extension divided by original length.

Familiarity with;

- That steels are alloys of iron, with properties dependent upon the type and amounts of alloying materials used.
- That the specifications of shipbuilding steels are laid down by classification societies.
- That shipbuilding steel is tested and graded by classification society surveyors, who stamp it with approval marks.

- Why higher tensile steel may be used in areas of high stress, such as the sheer strake.
- Stress-strain curve for mild steel sketches.
- That cold conditions increase the chances of brittle fracture.
- Why mild steel is unsuitable for the very low temperatures involved in the containment of liquefied gases.
- Examples where castings or forgings are used in ship construction.
- That aluminium alloys are tested and graded by classification society surveyors.

.2 Welding 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The process of manual electric arc welding.
- The purpose of flux during welding.
- The automatic welding processes, electro-slag, TIG and MIG.
- Butt, lap and fillet welds.
- The various preparations of a plate edge for welding.
- What is meant by a full-penetration fillet weld.
- What is meant by 'single pass', 'multipass' and 'back' run.
- How welding can give rise to distortion and describes measures which are taken to minimize it.
- The use of tack welding.
- Weld faults:
  - lack of fusion
  - no inter-run penetration
  - lack of reinforcement
  - lack of root penetration
  - slag inclusion
  - porosity
  - overlap
  - undercut

Familiarity with;

- That classification societies require tests on weld materials and electrodes before approving them.
- The electrode type and process of welding high tensile steels.
- Gas cutting of metals.
- The testing of welds:
  - visual
  - radiographic
  - ultrasonic
  - magnetic particle
  - dye penetrant

.3 Bulkheads 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That cargo ships require additional bulkheads, as laid down by classification society rules, according to their length.
- The construction of a watertight bulkhead and its attachments to sides, deck and tank top.
- How watertightness is maintained where bulkheads are pierced by longitudinal, beams or pipes.

- That oil tight bulkheads and bulkheads forming boundaries of tanks are built with heavier scantlings than watertight bulkheads.
- How bulkheads are tested for tightness.
- Examples of non-watertight bulkheads.
- The purpose of washing bulkheads in cargo tanks or deep tanks.
- The use of cross ties in tanker construction.

Familiarity with;

- That transverse bulkheads serve to subdivide a ship against flooding and spread of tire, to support decks and superstructures and to resist racking stresses.
- Watertight, non-watertight and oil-tight or tank bulkheads.
- Followings:
  - margin line
  - bulkhead deck
  - weather tight
- That cargo ships must have:
  - a collision bulkhead, watertight up to the freeboard deck, positioned not less than 5% of the length of the ship (or 10 meters, whichever is the less) and not more than 8% of the length of the ship from the forward perpendicular
  - an afterpeak bulkhead enclosing the stem tube and rudder trunk in a watertight compartment
  - a bulkhead at each end of the machinery space
- The rule regarding penetrations of the collision bulkhead.
- That watertight floors are fitted directly below main watertight bulkheads.
- Longitudinal bulkheads serve to subdivide liquid cargoes, provide additional longitudinal support and reduce free surface effect.
- Cofferdam, Flat plate and Corrugated bulkhead construction.

.4 Watertight and Weather tight doors **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The general design and construction features of SOLAS compliant vessels in terms of watertight integrity.
- The arrangement of a power-operated sliding watertight door with sketches.
- A hinged watertight door, showing the means of securing it with sketches.

Familiarity with;

- That openings in watertight bulkheads must be fitted with watertight doors.
- That the number of openings in watertight R2 bulkheads of passenger ships should be reduced to the minimum compatible with the design and working of the ship.
- Categorizes watertight doors as:
  - class 1 — hinged doors
  - class 2—hand-opened sliding doors
  - class 3 — sliding doors which are power-operated as well as hand-operated
- That all types of watertight doors should be capable of being closed with the ship listed to 15° either way.
- That hinged watertight doors are only permitted above a deck at least 2.0 metres above the deepest subdivision load line.

i. **Cargo Vessels**

Knowledge of;

- Ships of Type 'A' and Type 'B' for the purposes of computation of freeboard.
- The extent of damage which a Type 'A' ship of over 150 metres length should withstand.
- That a Type 'A' ship of over 150 metres length is described as a 'one- compartment ship.
- The requirements for survivability of Type 'B' ships with reduced freeboard assigned.
- The equilibrium conditions regarded as satisfactory after flooding.

ii. **All Ships**

Knowledge of;

- That weather tight doors in superstructure openings are similar to hinged watertight doors.

Familiarity with;

- That openings in watertight bulkheads must be fitted with watertight doors.
- That drills for the operating of watertight doors, side scuttles, valves and other closing mechanisms must be held weekly.
- The requirements for watertight openings to be closed at sea.
- The procedures for ensuring that all watertight openings are closed.
- That all watertight doors in main transverse bulkheads, in use at sea, must be operated daily.
- That watertight doors and their mechanisms and indicators, all valves the closing of which is necessary to make a compartment watertight and all valves for damage-control cross-connections must be inspected at sea at least once per week.
- That records of drills and inspections are to be entered in the log, with a record of any defects found.

.5 Corrosion and its Prevention **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- What is meant by corrosion.
- What is meant by erosion of metals and gives examples of where this is likely to occur.
- The formation of corrosion cell and defines anode, cathode and electrolyte.
- The galvanic series of metals in seawater.
- The galvanic series, which of two metals will form the anode in a corrosion cell.
- The differences in surface condition or in stress concentration can give rise to corrosion cells between two areas of the same metal.
- That cathodic protection can only be used to protect the underwater hull or ballasted tanks.
- What mill scale is and states that it is cathodic to mild steel.
- The treatment of steel in a shipyard and the use of holding primers (shop primers).
- That the required preparation of steelwork depends upon the type of paint to be applied.
- The suitability of the following paint types for various applications as:
  - drying oils
  - oleo-resins
  - alkyd resins
  - polymerizing chemicals
  - bitumen

The action of anti-fouling paint.
The use of self-polishing anti-fouling paint.

- The ban on harmful types of antifouling paint.
- Typical paint schemes for;
  - underwater areas
  - boot topping
  - topsides
  - weather decks
  - superstructures
  - tank interiors
- The system of cathodic protection using sacrificial anodes.
- The metals and alloys which may be used as anodes.
- Why anodes of magnesium and of magnesium alloy are not permitted in cargo/ballast tanks and in adjacent tanks in tankers.
- Why the anodes are insulated from the hull.
- The impressed-current system of hull protection.
- That the system is adjusted for optimum protection, often automatically, by use of a reference cell.
- That, as the underwater paintwork deteriorates, higher currents are required for protection.

Familiarity with;

- That corrosion takes place at the anode while the cathode remains unaffected.
- That corrosion can be controlled by:
  - applying a protective coating to isolate the steel from the air or from seawater electrolyte
  - using cathodic protection to prevent steel from forming the anode of a corrosion cell
- That both of the methods mentioned above are normally used together.
- That many modem paints, such as epoxy and polyurethane, need to be applied to a very clean shot-blasted surface.
- That paints consist mainly of a vehicle, a pigment and a solvent, and explains the purpose of each
- The safety precautions to take when using paints.
- That good electrical contact between the anode and the hull or tank is essential.
- That electrical connection with the hull via slip rings and brushes on the rudder stock and propeller shaft ensures protection of the rudder and propeller.
- That too high a current can result in damage to paintwork and a chalky deposit on areas of bare metal, which has to be removed before repainting can be carried out.
- That a protective shield of epoxy resin is applied for about 1 metre around the anodes to withstand the alkaline conditions there.

.6 Surveys and Dry-docking **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- All types of survey a ship is subjected to, including but limiting to : Initial Survey, Renewal Survey, Periodical Survey, Intermediate Survey, Annual Survey, Inspection of the outside of the ships bottom, Additional Survey.
- Harmonized system of ship survey and certification.
- Condition Assessment Scheme (CAS) for oil tankers and Condition Assessment Programme (CAP).

Familiarity with;

- The frequency of classification society surveys.
- That intervals between dry-dockings may be extended up to 2.5 years where a ship has high-resistance paint and an approved automatic impressed- current cathodic protection system.
- That continuous hull survey, in which all compartments are examined over a 5-year period, may replace the special surveys.
- The items inspected at annual survey as:
  - protection of openings: hatches, ventilators, cargo doors, side scuttles, overside discharges and any other openings through which water might enter
  - guardrails
  - water-clearing arrangements, freeing ports, scuppers
  - means of access to crews quarters and working areas
- That the inspections listed above are also required for the annual inspection under the International Convention on Load Lines, 1966.
- The items to examine in dry-dock as:
  - shell plating
  - cathodic protection fittings
  - rudder
  - stem frame
  - propeller
  - anchors and chain cable
- The examinations to be made of the items listed above.
- The cleaning, preparation and painting of the hull in dry-dock.

Ability to;

- calculates paint quantities, given the formula for wetted surface area as:
  - $S = 2.58 \sqrt{\Delta} L$
  - Where S=surface area in m2 , Δ = displacement in tonnes , L = length of ship in metres

.7 Stability **40hrs (T) + 0hrs (P) + 40hrs (E).**

i. Approximate Calculation of Areas and Volumes

Knowledge of;

- That the volume of a body may be calculated by using Simpson's rules with cross-sectional areas as ordinates.

Familiarity with;

- The trapezoidal rule for the area under a curve in terms of the number of ordinates, the interval and the ordinate values.
- Simpson's first rule as;
  - $A = h (y1 + 4y2 + y3) / 3$
  - where: A = area under curve , h = interval length , y1, y2, y3 are ordinates
- That the area is exact for a linear, quadratic or cubic curve but an approximation otherwise.
- Simpson's second rule as;
  - $A = 3h (y1 + 3y2 + 3y3 + y4) / 8$
  - where: A = area , h = interval length , y1, y2, y3, y4 are ordinates
- That the area is exact for linear, quadratic or cubic curves .

- That the first rule has smaller errors that the second and should be used in preference where possible.
- That errors can be reduced by using a smaller interval.
- The 5, 8, -1 rule as;
  - A = h(5y1 + 8y2 - y3) / 12
  - where: A = area between first and second ordinates, h = interval length,y1, y2, y3, are ordinates

Ability to;

- use the trapezoidal rule to find the area under a curve defined by given ordinates.
- write down the repeated first rule for any odd number of ordinates.
- use Simpson's first rule to find the area under a curve defined by an odd number of ordinates.
- write down the repeated second rule for 7, 10, 13, etc, ordinates.
- use Simpson's second rule to find the area under a curve defined by a suitable number of given ordinates.
- use Simpson's rules to find the area under a curve defined by any number of ordinates.
- calculate the volume of a ship to a stated draught by applying Simpson's rules to given cross-sectional areas or waterplane areas.
- Use Simpson's first, second and 5/8-1 Rules to approximate areas and volumes of ship structure and GZ curves with any number of ordinates and intermediate ordinates.

ii. Effects of Density

Knowledge of;

- explains why the density of the water in the dock should be taken at the same time as the draughts are read
- describes the statical and dynamic effects on stability of the movement of liquids with a free surface

Familiarity with;

- The use of the Fresh Water Allowance and how to determine this for a ship.
- That FWA only applies when the ship is floating at or near its summer load line.
- That the quantity 'inertia x density of liquid' is called the 'free surface moment' of the tank, in tonne-metres.
- That information for calculating free surface effect is included in tank capacity tables.
- That the information may be given in one of the following ways:
  - inertia in metre4
  - free surface moments for a stated density of liquid in the tank
  - as a loss of GM, in tabulated form for a range of draughts (displacements) for a stated density of liquid in the tank

Ability to;

- Given the density of the water in the dock, calculates the displacement for a particular draught from the seawater displacement for that draught extracted from hydrostatic data.
- Calculate the TPC for given mean draught and density of the dock water.
- Calculate the virtual reduction in GM for liquids with a free surface in spaces with rectangular and triangular waterplanes.
- Deduce from the above objective that halving the breadth of a tank reduces the free surface effect to one eight of its original value.

- Deduce that subdividing a tank at the centre reduces its free surface effect to one quarter of that of the undivided tank.
- Correct free surface moments when a tank contains a liquid of different density from that slated in the capacity table.
- Given a ship's displacement and the contents of its tanks, uses the information from a to calculate the loss of GM due to slack tanks.
- Given a ship's departure conditions and the daily consumption of fuel, water and stores, calculates the GM on arrival at destination.

iii. Stability at Moderate and Large Angles of Heel

Knowledge of;

- How to use the initial metacentric height as an aid to drawing the curve.
- The effect of increased freeboard on the curve of statical stability for a ship with the same initial GM.
- The effect when heeled to the listed side on:
  - the maximum righting moment
  - the angle of vanishing stability
  - the range of stability

Familiarity with;

- That the formula $GZ = GM \sin \theta$ does not hold for angles in excess of about 10º
- That the initial KM is calculated from KM = KB + BM uses a metacentric diagram to obtain values of KM, KB and BM for given draughts
- That the transverse $BM = I / V$
  - Where: I = second moment of area of the waterplane about the centre line; V = underwater volume of the ship
- That for a rectangular waterplane $I = LB^3/ 12$
  - where: L is the length of the waterplane; B is the breadth of the waterplane
- That, for a box-shaped vessel, $KM = (B^2 /12d) + (d / 2)$ where: d = draught
- That, for moderate and large angles of heel, values of GZ found by calculating the position of the centre of buoyancy are provided by the shipbuilder for a range of displacements and angles of heel for an assumed position of the centre of gravity.
- That the righting lever, GZ, may be found from the wall-sided formula up to the angle at which the deck edge is immersed.
- That cross-curves and KN curves are drawn for the ship with its centre of gravity on the centre line.
- That cross-curves and KN curves are drawn for the ship at the designed trim when upright.
- That righting levers may differ from those shown if the ship has a large trim when upright.
- Simplified Stability Data;
  - states that stability information may be supplied in a simplified form, consisting of:
  - a diagram or table of maximum deadweight moment
  - a diagram or table of minimum permissible GM
  - a diagram or table of maximum permissible KG all related to the displacement or draught in salt water
- That a deadweight moment is mass in tonnes X vertical height of the mass above the keel.
- That free surface moments are to be added to the deadweight moments when using the diagram of maximum deadweight moment.
- That if, for a stated displacement or draught, the total deadweight moment or KG is less than the maximum permissible value; the ship will have adequate stability.
- That curves of maximum KG or minimum GM to ensure adequate stability in the event of partial loss of intact buoyancy are provided in passenger ships.

Ability to;

- Use cross-curves of stability and KN curves to construct a curve of statical stability for a given displacement and value of KG, making correction for any free surface moments.
- Identify from the curve the approximate angle at which the deck edge immerses.
- Given the wall-sided formula GZ = (GM + BM / 2 $\tan^2 \theta$) $\sin \theta$ and other relevant data, calculates the value of GZ for a stated angle of heel.
- Show that, for small angles of heel, the term BM / 2 $\tan^2 \theta$ is negligible, leading to the usual expression for GZ at small angles of heel.
- Use the wall-sided formula for calculating the angle of loll of an initially unstable ship.
- Compare the result in the above objective with that obtained by connecting a curve of statical stability.
- Read the maximum permissible deadweight moment from a curve of deadweight moment for a given displacement.
- Given the masses loaded, their heights above the keel and the free surface moments of slack tanks, calculates the deadweight moment and uses the result with the diagram of deadweight moment to determine if the stability is adequate.
- Use the diagram of deadweight moment to calculate the maximum mass that can be loaded in a given position to ensure adequate stability during a voyage, making allowance for the fuel, water and stores consumed and for any resulting free surface.

Demonstrates

- How to adjust the curve of statical stability for a ship with a list.

iv. Trim and List

Knowledge of;

- That the LCG must be at the same distance from amidships as LCB when the ship floats on an even keel.

Understanding of;

- Longitudinal centre of gravity (LCG) and R1 longitudinal centre of buoyancy (LCB).

Familiarity with;

- That a ship trims about the centre of flotation until LCG and LCB are in the same vertical line.
- That a ship trims about the centre of flotation until LCG and LCB are in the same vertical line.
- That the distance of the LOB from amidships or from the after perpendicular is given in a ship's hydrostatic data for the ship on an even keel.
- That the trimming moment = displacement x the horizontal distance between LCB (tabulated) and LCG (actual) = Δ x GG1 where GG1 is the horizontal distance between the position of LCG for the even- keel condition and the actual LCG.
- That trim = (Δ x GG1) / MCT 1cm.
- That if the actual LCG is abaft the tabulated position of LCB, then the trim will be by the stern, and vice versa.

Ability to;

- Show on a diagram of a ship constrained to an even keel the couple that is formed by the weight and buoyancy forces when LCG is not the same distance from amidships as LCB.
- Given the initial displacement, initial position of LCG, masses loaded or discharged and their LCGs, calculate the final position of LCG.
- Using a ship's hydrostatic data and a given disposition of cargo, fuel, water and stores, determine the trim, the mean draught and the draughts at each end.
- Calculate the mass to move between given positions to produce a required trim or draught at one end.
- Calculate where to load a given mass to produce a required trim or draught at one end.
- Calculate how to divide a loaded or discharged mass between two positions to produce a required trim or draught at one end.
- Calculate where to load a mass so as to keep the after draught constant.
- Show that calculated draughts refer to draughts at the perpendiculars.
- Given the distance of draught marks from the perpendiculars and the length between perpendiculars, correct the draughts indicated by the marks .
- Given draughts forward, aft and amidships, state whether or not the ship is hogged or sagged and the amount.
- Correct the draught amidships for hog or sag.
- Given the forward and after draughts, the length between perpendiculars and hydrostatic data, calculate the correction for trim to apply to the displacement corresponding to the draught amidships.
- Show that a second correction for trim, using Nemoto's formula, may be applied to the displacement.
- Given Nemoto's formula, calculate the second correction to displacement.
- Calculate the maximum list during loading or discharging a heavy lift, using a ship's derrick, given the relevant stability information and the dimensions of the derrick.
- Calculate the minimum GM required to restrict the list to a stated maximum when loading or discharging a heavy lift.
- Calculate the quantities of fuel oil or ballast to move between given locations to simultaneously correct a list and achieve a desired trim.
- Show how to distinguish between list and loll and describes how to return the ship to the upright in each case.
- By making use of curves of statical stability, including those for ships with zero or negative initial GM, determine the equilibrium angle of heel resulting from a transverse moment of mass.

v. Dynamical Stability

Knowledge of;

- That the dynamical stability at a given angle of heel represents the potential energy of the ship.
- That a heeling moment is formed, equal to the force of the wind multiplied by the vertical separation between the centres of the lateral areas of the portions of the ship above and below the waterline.

Understanding of;

- Dynamical stability at any angle of heel as the work done in inclining the ship to that angle.

Familiarity with;

- That the dynamical stability at any angle is given by the product of displacement and the area under the curve of statical stability up to that angle.
- That dynamical stability is usually expressed in tonne-metres.
- That the potential energy is used partly in overcoming resistance to rolling and partly in producing rotational energy as the ship returns to the upright.
- That the rotational energy when the ship is upright causes it to continue rolling.
- That, in the absence of other disturbing forces, the ship will roll to an angle where the sum of the energy used in overcoming resistance to rolling and the dynamical stability are equal to the rotational energy when upright.
- That a beam wind exerts a force equal to the wind pressure multiplied by the projected lateral area of the portion of the ship and deck cargo above the waterline.
- That the heeling lever equals the heeling moment divided by the ship's displacement.
- That a steady wind will cause a ship to heel to an angle at which the righting lever is equal to the heeling over.
- That a ship under the action of a steady wind would roll about the resulting angle of heel.

Ability to;

- Given a curve of statical stability, use Simpson's rules to find the area in metre-radians up to a stated angle.
- On a curve of righting levers, indicates the angle of equilibrium under the action of a steady wind and the areas which represent the dynamical stability at angles of roll to each side of the equilibrium position.
- By reference to dynamical stability, describes the effect of an increase in wind pressure when a vessel is at its maximum angle of roll to windward.
- Summarizes the recommendation on severe wind and rolling criterion for the intact stability of passenger and cargo ships.
- By reference to a curve of righting levers and dynamical stability, describes the effect of a listing moment on the rolling of the ship about the equilibrium position.

vi. Approximate GM by Means of Rolling Period Tests

Knowledge of;

- How an inclining test is carded out.

Understanding of;

- The rolling period as the time taken for one complete oscillation from the extreme end of a roll to one side, right across to the extreme on the other side and back to the original position.
-

Familiarity with;

- That, for ships up to 70m in length, the GM can be verified in still water by causing the ship to roll and noting the rolling period.
- That for small angles of roll in still water, the initial metacentric height, GMo is given by:
  - $GMo = [fB / Tr]^2$
  - where: f=rolling factor , B=breadth of the ship , Tr=rolling period in seconds
- That the formula may be given as:

- GMo= F / Tr^2
- where the F- value is provided by the Administration

- The limitations of the method.
- The limitations of the method states that when construction is completed, a ship undergoes an inclining test to determine the displacement and position of the centre of gravity, KG and LCG, in the light ship condition.
- That the displacement and KM are calculated from the observed draughts and the ship's lines plans, making allowance for density of water and trim.
- That the position of the centre of buoyancy is calculated to enable the LCG for the light ship to be determined.
- That the values obtained in a test are corrected for masses to be removed and added to obtain the KG and LCG for the light ship.
- That, at periodical intervals not exceeding five years, a light ship survey must be carried out on all passenger ships to verify any changes in light ship displacement and longitudinal centre of gravity.
- That the ship must be re-inclined whenever, in R2 comparison with the approved stability information, a deviation from the light ship displacement exceeding 2% or a deviation of the longitudinal centre of gravity exceeding 1% of L is found or anticipated.

Ability to;

- Summarize the procedures for determining a ship's stability by means of the rolling period test.
- Given values of F and T and the equation GMo = F / T^2, calculate GMo.
- Given the mass and the distance through which it was moved, the displacement, length of the plumb line and the deflection, calculate the KG.

vii. The Intact Stability code

Knowledge of;

- The general precautions to be taken against capsizing.

Familiarity with;

- The recommended criteria for passenger and cargo ships of all types.
- That stability information should comprise:
  - stability characteristics of typical loading conditions
  - information to enable the master to assess the stability of the ship in all loading conditions differing from the standard ones
  - information on the proper use of anti-rolling devices, if fitted
  - information enabling the master to determine GMo by means of a rolling test corrections to be made to GMo for free surface liquids
  - for ships carrying timber deck cargoes information setting out changes in deck cargo from that shown in the loading conditions, when the permeability of the deck cargo is significantly different from 25%
  - for ships carrying timber deck cargoes, indications of the maximum permissible amount of deck cargo
- That criteria are laid down for ships carrying timber deck cargoes.
- The use of the weather criterion and how to assess whether a vessel complies with this.
- The additional criteria recommended for passenger ships.
- That the information includes a curve or table giving, as a function of the draught, the required initial GM which ensures compliance with the recommendations on intact stability.

Ability to;

- Given the initial metacentric height and the GZ curve, determine whether the ship meets the recommended criteria.

viii. Intact Stability Requirements for the Carriage of Grain

Knowledge of;

- What is volumetric heeling moments.

Familiarity with;

- The intact stability requirements for the carriage of grain.
- That before loading bulk grain the master may be required to demonstrate that the ship will comply with the stability criteria at all stages of the voyage.
- That the ship must be upright before proceeding to sea.
- That grain loading information includes:
  - curves or tables of grain heeling moments for every compartment, whether filled or partly filled
  - tables of maximum permissible heeling moments or other information sufficient to allow the master to demonstrate compliance with the requirements
  - details of the requirements for temporary fittings and the provisions for the bundling of bulk grain
  - typical loaded service departure and arrival conditions and, where necessary, intermediate worst service conditions
  - a worked example for the guidance of the master
  - loading instructions in the form of notes summarizing the requirements of SOLAS, chapter VI
- That heeling moment = volumetric heeling moment / stowage factor.
- How the vertical shift of grain surfaces is taken into account in filled compartments and in partly filled compartments.

Ability to;

- calculate the heeling arm, λO, from:
  - λO = Volumetric heeling moment / (Stowage factor x displacement)
- draw the heeling-arm curve on the righting-arm curve for a given ship and KG, corrected for free surface liquid, and:
  - determines the angle of heel
  - using Simpson's rules, calculates the residual dynamical stability to the angle laid down by Regulation 4 of SOLAS chapter VI
- compare the results of the calculations in the above objective with the criteria set out in Regulation 4 and states whether the ship complies with the requirements or does not comply.

ix. Rolling of Ships

Knowledge of;

- The effect on GM of rolling.
- How increase of draught and of displacement influence rolling.
- How the distribution of mass within the ship affects the rolling period.
- What synchronization is and the circumstances in which it is most likely to occur.
- The actions to take if synchronization is experienced.
- How bilge keels, anti-rolling tanks and stabilizer fins reduce the amplitude of rolling.

Familiarity with;

- That a ship generally heels when turning.
- That, while turning, the ship is subject to an acceleration towards the centre of the turn.
- That the force producing the acceleration acts at the underwater centre of lateral resistance, which is situated at about half-draught above the keel.
- That the force in the above objective is called the centripetal force, given by $F = Mv^2 / r$
  - where: M = mass of the ship in tonnes , v = speed in metres per second , r= radius of turn in metres , F = centripetal force in kilo newtons
- How the force acting at the centre of lateral resistance can be replaced by an equal force acting through the centre of gravity and a heeling couple equal to the force x vertical separation between the centre of lateral resistance and the centre of gravity,

$$Mv^2/r \times (KG - d/2) \times \cos\theta$$

- That the ship will heel until the resulting righting moment equals the heeling couple, i.e

$$M \times g \times GM \sin\theta = Mv^2 /r \times (KG - d/2) \times \cos\theta$$

  - where: g = acceleration due to gravity , θ = angle of heel

Ability to;

- Given the relevant data, calculate the angle of heel from;

$$\tan\theta = v^2 \times (KG - d/2) / (g \times GM \times r)$$

x. Dry-docking and Grounding

Knowledge of;

- Why the GM must remain positive until the critical instant at which the ship takes the blocks overall.
- That a ship with a large trim will develop a large up thrust, which may damage the stern frame, trip the blocks or lead to an unstable condition before taking the blocks overall.
- That the stability of a ship aground at one point on the centre line is reduced in the same way as in dry-docking.
- That the increase in up thrust as the tide falls increases the heeling moment and reduces the stability.

Familiarity with;

- That for dry-docking a ship should:
  - have adequate initial metacentric height
  - be upright
  - have a small or moderate trim, normally by the stern
- That part of the weight is taken by the blocks as soon as the ship touches, reducing the buoyancy force by the same amount.

- That the up thrust at the stern causes a virtual loss of metacentric height.
- That when grounding occurs at an off-centre point, the up thrust causes heel as well as trim and reduction of GM.

Ability to;

- Derive the formula for the up thrust at the stern P = (MCT x t)/L
  - where: P = up thrust at the stern in tonnes , t = change of trim in cm , L = distance of the centre of flotation from aft
- By taking moments about the centre of buoyancy, shows that, for a small angle of heel, θ, righting moment= Δ x GM sin θ – P x KM sin θ
  - where GM is the initial metacentric height when afloat
- Show that the righting lever is that for the ship with its metacentric height reduced by (P x KM) /Δ .
- By using the equation in the above objective and KM + KG + GM, shows that righting moment = (Δ – P) x GM sin θ – P x KG sin θ.
- Show that the righting lever is that for a ship of displacement (Δ – P) and with metacentric height reduced by (P x KG) /Δ – P.
- Show that the righting moment remains positive providing Δ x GM is greater than P x KM or equivalently, (Δ – P) x GM is greater than P x KG.
- Calculate the minimum GM to ensure that the ship remains stable at the point of taking the blocks overall.
- Calculate the maximum trim to ensure that the ship remains stable on taking the blocks overall for a given GM.
- Calculate the virtual loss of GM and the draughts of the ship after the after level has fallen by a stated amount.
- Calculate the draughts on taking the blocks overall.

xi. Shear Force, Bending Moments and Torsional Stress

Knowledge of;

- What is meant by shearing stress.
- That, for a beam in equilibrium, the sum of forces to one side of a point is equal to the sum of the forces on the other side with the sign reversed.
- What is meant by a bending moment.
- That shear forces and bending moments arise from differences between weight and buoyancy per unit length of the ship.
- How wave profile affects the shear-force curve and bending-moment curve.
- What is meant by a torsional stress.
- How torsional stresses in the hull are set up.
- The likelihood of overstressing the hull structure when loading certain bulk cargoes.

Familiarity with;

- That the shear force at a given point of a simply supported beam is equal to the algebraic sum of the forces to one side of that point.
- That the bending moment at a given point of a beam is the algebraic sum of the moment of force acting to one side of that point.
- That the bending moment measured to opposite sides of a point are numerically equal but opposite in sense.
- That the bending moment at any given point is equal to the area under the shear-force curve to that point.
- That the differences between buoyancy and weight is called the load.
- That the shear force at any given point is equal to the area under the load curve between the origin and that point.
- That each ship above a specified length is required to carry a loading manual, in which are set out acceptable loading patterns to keep shear forces and bending moments within acceptable limits.
- That the classification society may also require a ship to carry an approved means of calculating shear forces and bending moment at stipulated stations.
- That the loading manual and instrument, where provided, should be used to ensure that shear forces and bending moments do not exceed the permissible limits in still water during cargo and ballast handling.
- That wave-induced torsional stresses are allowed for in the design of the ship.
- That cargo-induced torsional stresses are a problem mainly in container ships.
- That classification societies specify maximum.

Ability to;

- Draw a diagram of shear force and bending moment for simply supported beams
- Use the above objective to show that the bending-moment curve has a turning point where the shear force has zero value
- Draw a load curve from a given buoyancy curve and weight curve
- Draw a diagram of shear force and bending moment for a given distribution of weight for a box-shaped vessel
- permissible torsional moments at a number of specified cargo bays
- Given details of loading, calculates cumulative torsional moments for stated positions

Demonstrates

- the use of a loading instrument

3.1.2 EFFECT ON TRIM AND STABILITY IN THE EVENT OF DAMAGE AND FLOODING

.1 Effect of flooding on Transverse Stability and Trim 6hrs (T) + 0hrs (P) + 6hrs (E).

i. Passenger Vessels

Knowledge of;

- What is meant by 'floodable length'.
- What is meant by 'permissible length of compartments' in passenger ships.
- The significance of the Criterion of Service Numeral.
- The significance of the factor of subdivision.
- The provisions for dealing with asymmetrical flooding.

- The minimum residual stability requirements in the damaged.

Understanding of;

- followings:
  - margin line
  - bulkhead deck
  - permeability of a space

Familiarity with;

- The assumed extent of damage used in assessing the stability of passenger ships in damaged condition.
- With reference to the factor of subdivision, the extent of damage which a passenger ship should withstand.
- The requirements for the final condition of the ship after assumed damage and, where applicable, equalization of flooding.
- That the master is supplied with data necessary to maintain sufficient intact stability to withstand the critical damage.
- The use of the damaged stability information required to be provided to the Master of a passenger vessel.

ii. Cargo Ships

Knowledge of;

- Ships of Type A and Type B for the purpose of computation of freeboard.
- The extent of damage that a Type A ship of over 150 m in length should be able to withstand.
- That a Type A ship of over 150m in length is described as a one compartment ship.
- The requirements for the survivability of Type B ships with reduced assigned freeboard condition with the required number of compartments flooded.
- The equilibrium conditions regarded as satisfactory after flooding.

Familiarity with;

- That damage to compartments may cause a ship to sink as a result of :
  - insufficient reserve buoyancy leading to progressive flooding
  - progressive flooding due to excessive list or trim
  - capsizing due to a loss of stability
  - structural failure

iii. Calculation of vessel condition after flooding

Knowledge of;

- That the loss of buoyancy of a holed compartment is equal to the mass of water which enters the compartment up to the original waterline.
- That a heeling arm is produced, equal to the transverse separation of G and the new position of B for the upright ship.

Why the GM usually decreases where:

- there is a large loss of intact waterplane
- there is intact buoyancy below the flooded space

- the flooded surface has a high permeability

- Why the bilging of empty double-bottom tanks or of deep tanks that are wholly below the waterline leads to an increase in GM.
- How lost area of waterplane affects the position of the centre of flotation.

Familiarity with;

- That, in the absence of hull damage, the stability is calculated in the usual way using the added mass and making allowance for free surface liquid.
- That free surface moments for any rectangular compartment that is flooded by salt water can be approximated by moment = length x (breadth) 3 x 1. 025 / 12.
- That virtual loss of GM = moment / flooded displacement.
- That when a compartment is holed the ship will sink deeper in the water until the intact volume displaces water equivalent to the mass of the ship and its contents.
- That the volume of lost buoyancy for a loaded compartment is equal to the volume of the compartment x the permeability of the compartment.
- That if the lost buoyancy is greater than the reserve buoyancy the ship will sink.
- That the centre of buoyancy moves to the centre of immersed volume of the intact portion of the ship.
- That when a compartment is hold the ship's displacement and its centre of gravity are unchanged.
- That the area of intact waterplane is reduced by the area of the flooded spaces at the level of the flooded waterline multiplied by the permeability of the space.
- That if the flooded space is entirely below the waterline there is no reduction in intact waterplane.
- That the height of the centre of buoyancy above the keel increases by about half the increase in draught due to flooding.
- That a reduction in waterplane area leads to a reduction in the second moment of area (I).
- That change in GM is the net result of changes in KB and BM.
- That, for small angles of heel, θ, tan θ = heeling arm / GM.

Ability to;

- Calculate the permeability of cargo, given its density and its stowage factor.
- Calculate the increase in mean draught of a ship, given the TPC and the dimensions of the flooded space, using increase in draught = volume of lost buoyancy / area of intact waterplane.
- Use the formula BM = I / V to explain why the BM of a ship is generally less when bilged that when intact.
- Calculate the reduction in BM resulting from lost area of the waterplane, given the following corrections:
- Second moment of lost area about its centroid /displaced volume;
  - this is Lb^3 / 12 V for a rectangular surface , where: L is length of the lost area , b is breadth of the lost area , V is displaced volume = displacement / density of water
  - original waterplane area / intact waterplane area x lost area x (distance from centerline) ^{2} / displaced volume
  - this is original waterplance area / intact waterplane area x 1bd ^{2} / V for a rectangular surface, where d is the distance of the centre of the area from the centreline
- Deduce that the second correction applies only in the case of asymmetrical flooding.
- Calculates the shift (F) of the centre of flotation (CE) from the centreline, using;
  - F = a x d / A - a where: a is the lost area of waterplane , A is the original waterplane area , d is the distance of the centre of lost area of waterplane from the centerline

Show that the heeling arm is given by;

- heeling arm = lost buoyancy (tonnes) / displacement x transverse distance from new CF

- Construct a GZ curve for the estimated GM and superimposes the heeling- arm curve to determine the approximate angle of heel.
- Use wall sided formula to determine GZ values.
- Use wall sided formula to calculate angle of heel.

iv. Effect of Flooding on Trim

Knowledge of;

- How the reduction in intact waterplane reduces the MCT 1cm.
- Measures which may be taken to improve the stability or trim of a damaged ship.

Familiarity with;

- That the trimming moment is calculated from:
  - Trimming moment = lost buoyancy x distance from new CF where the lost buoyancy is measured in tonnes.

Ability to;

- Calculate the movement of the centre of flotation (CF),given:
  - Movement of CF = moment of lost area about original CF / intact waterplane area
- Calculate the reduction of BML, given the following corrections:
  - second moment of lost area about its centroids/ displaced volume;
  - this is $bL^3/12V$ for a rectangular surface , where: L is length of lost area
  - B is breadth of lost area , V is displaced volume = displacement / density of water
  - Original waterplane area / intact waterplane area x lost area x (distance from CF)^2 / displace volume
  - This is original waterplane area / intact waterplane area x bld^2 / v
  - for a rectangular surface, where d is the distance of the centre of area from the original centre of flotation
- Calculate the reduction of MCT 1cm, given, reduction of MCT 1 cm = (displacement x reduction of GM) / 100 x ship's length.
- Given the dimensions of a bilged space and the ship's hydrostatic data, calculates the draughts in the damaged condition.

.2 Theories Affecting Trim and Stability **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The static and dynamic effects on stability of liquids with a free surface.
- Free surface moments and its application to dead-weight moment curves.
- Changes in stability which take place during a voyage.
- Effect on stability of ice formation on superstructure.
- The effect of water absorption by deck cargo and retention of water on deck.
- Stability requirements for dry docking.
- The dangers to a vessel at an angle of loll.
- Effects of wind and waves on ships stability.
- The main factors which affect the rolling period of a vessel.
- The term synchronous rolling and describes the dangers associated with it.
- The actions that can be taken to stop synchronous rolling.

Familiarity with;

- Precautions to be observed in correction of angle of loll.

Demonstrates

- Understanding of angle of loll.

3.1.3 IMO recommendations concerning ship stability

.1 Responsibilities under the International Conventions and Codes 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The use of the weather criterion
- How grain heeling moment information is used.
- The requirements for passenger ship stability after damage.

Familiarity with;

- Minimum stability requirements required by Load R1 Line Rules 1966.
- The minimum stability requirements and recommendations of the Intact Stability Code.

Demonstrates

- Correct use of IMO Grain Regulations.

Competence: 3.2 Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and the protection of the marine environment

3.2.1 International maritime law embodied in various conventions

.1 Certificates and Other Documents required to be carried on Board Ships by International Conventions
1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How each of the certificates and documents required to be carried on board ships are obtained.
- The proof of validity that may be required by authorities for the certificates and documents above.

Familiarity with;

- That IMO publishes a list of certificates and documents required to be carried on board ship.
- How a current version of the IMO list of certificates and documents required to be carried on board ship may be obtained.
- The certificates and documents that are required to be carried on board a ship of any type using the IMO information.
- The period of validity for each of the above certificates and explains the requirements for renewing or maintaining the validity of each.

.2 Responsibilities under the Relevant Requirements of the International Convention on Load Lines
1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The general requirements of the Conditions of Assignment to be met before any vessel can be assigned a loadline.
- The factors that determine the freeboards assigned to a vessel.
- The requirements and coverage of initial, renewal and annual surveys.
- The contents of the record of particulars which should be supplied to the ship.
- The documentation and records that must be maintained on the ship in terms of
  - certificates
  - record of particulars
  - record of freeboards
  - information relating to the stability and loading of the ship
- The preparation required for renewal and annual loadline surveys.
- The treatment of a port lying on the boundary between two zones or areas.
- The circumstances in which an International Load Line Certificate (1966) would be cancelled by the Administration.

Familiarity with;

- That a ship to which the Convention applies must comply with the requirements for that ship.
- That after any survey has been completed no change should be made in the structure, equipment or other matters covered by the survey without the sanction of the Administration.
- That, after repairs or alterations, a ship should comply with at least the requirements previously applicable and that, after major repairs or alterations, ships should comply with the requirements for a new ship in so far as the Administration deems reasonable and practicable.
- That the appropriate load lines on the sides of the ship corresponding to the season and to the zone or area in which the ship may be must not be submerged at any time when the ship puts to sea, during the voyage or on arrival.
- That when a ship is in fresh water of unit density the appropriate load line may be submerged by the amount of the fresh water allowance shown on the International Load Line Certificate (1966).
- That when a ship departs from port situated on a river or inland waters, deeper loading is permitted corresponding to the weight of fuel and all other materials required for consumption between the point of departure and the sea.

.3 Responsibilities under the Relevant Requirements of the International Convention for the Safety of Life at Sea 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The rights of the master of a ship in distress to requisition one or more ships which have answered his call for assistance.
- When the master of a ship is released from the obligation to render assistance.
- The requirements for the carriage of navigational equipment.
- The procedure for the testing of the ship's steering gear before departure.
- The requirements for the display of operating instructions and change-over procedures for remote steering gear control and steering gear power units.
- The requirements for emergency steering drills.

Familiarity with;

- The obligations of the master concerning the sending of danger messages relating to dangerous ice, a dangerous derelict, other dangers to navigation, tropical storms, sub-freezing air temperature with gale force winds causing severe ice accretion or winds of force 10 or above for which no storm warning has been received.
- The information required in danger messages.
- That when ice is reported near his course, the master of every ship at night is bound to proceed at a moderate speed or to alter his course so as to go well clear of the danger zone.
- That the use of an international distress signal, except for the purpose of indicating that a ship or aircraft is in distress, and the use of any signal which may be confused with an international distress signal are prohibited.
- The obligations of the master of a ship at sea on receiving a signal from any source that a ship or aircraft or a survival craft thereof is in distress.
- That all equipment fitted in compliance with Reg V/12 must be of a type approved by the Administration.
- That all ships should be sufficiently and efficiently manned.
- That manning is subject to Port State Control inspection.
- The contents of the minimum safe manning document referred to in Assembly resolution A481 (XII), Principles of Safe Manning.
- That in areas where navigation demands special caution, ships should have more than one steering gear power unit in operation when such units are capable of simultaneous operation
- The entries which should be made in the log-book regarding the checks and tests of the steering gear and the holding of emergency drills .
- That all ships should carry adequate and up-to date charts, sailing directions, lists of lights, notices to mariners, tide tables and other nautical publications necessary for the voyage.
- Which ships should carry the International Code of Signals.

.4 Responsibilities under the international convention for the prevention of pollution from ships, 1973, and the protocol of 1978 relating thereto (MARPOL 73/78) 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Who may cause proceedings to be taken when a violation occurs within the jurisdiction of a Party to the Convention.
- The Parties to the Convention must apply therequirements of the Convention to ships of non-Partiesto ensure that no more favourable treatment is given to such ships.

i. Annex I — Oil

Familiarity with;

- That, after survey has been completed, no change should be made in the structure, equipment,fittings, arrangements or materials without the sanction of the Administration, except the direct replacement of equipment and fittings.
- The masters duty to report when an accident occurs or a defect is discovered which substantially affects the integrity of the ship or the efficiency or completeness of its equipment covered by this Annex.
- That the dates of intermediate and annual surveys are endorsed on the IOPP Certificate.
- That a record of construction and equipment is attached as a supplement to the IOPP Certificate.

- The duration of validity of the IOPP Certificate and the circumstances in which the IOPP Certificate will cease to be valid.
- That all new crude oil tankers of 20,000 tonnes deadweight and above must be fitted with a crude oil washing system.
- That the competent authority of the Government of a Party to the Convention may inspect the Oil Record Book while the ship is in its port or offshore terminals and may make a copy of any entry and may require the master to certify that the copy is a true copy of such entry.
- That a copy certified by the master is admissible in any judicial proceedings as evidence of the facts stated in the entry.
- That the master should be provided with information relative to loading and distribution of cargo necessary to ensure compliance with the regulation on subdivision and stability and the ability of the ship to comply with the damage stability criteria.
- That all ships of 400gt or more must carry an approved shipboard oil pollution emergency plan (SOPEP).

ii. Annex II — Noxious Liquid Substances in Bulk

Familiarity with;

- The duration of validity of the certificate.
- That ships which have been surveyed and certified in accordance with the International Bulk Chemical Code (IBC Code) or the Bulk Chemical Code (BCH Code), as applicable, are deemed to have complied with the regulations regarding survey and certification and do not require to have an International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk.

iii. Annex III — Harmful Substances Carried by Sea in Packaged Forms, or in Freight Containers, Portable Tanks or Tank Wagons

Familiarity with;

- That the master of the ship, or his representative, should notify the appropriate port authority of the intention to load or unload certain harmful substances at least 24 hours in advance.

iv. Annex IV — Sewage

Familiarity with;

- For the purposes of Annex IV:
  - holding tank, sewage and nearest land
- The ships to which the provisions apply.
- That ships to which the regulations apply are subject to surveys for the issue of an International Sewage Pollution Prevention Certificate (1973).
- The duration of validity of the certificate.

v. Annex V — Garbage

Familiarity with;

- That when garbage is mixed with other discharges having different disposal requirements, the more stringent requirements apply.

- The provisions for disposal of garbage from off-shore platforms and from ships alongside or within 500 metres from them.
- The special areas for the purposes of this annex.
- The requirements for disposal of garbage within special areas.
- The exceptions to regulations 3, 4 and 5.
- The form of record keeping required.
- Records are subject to scrutiny by port state control officers.

vi. Annex VI — (Regulations for the Prevention of Air Pollution from Ships) of the MARPOL Convention.

Familiarity with;

- That MARPOL 73/78 Annex VI Regulations for the prevention of Air Pollution from ships entered into force on 19 May 2005
- That MARPOL Annex VI sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances
- That Annex VI emission control requirements are in accordance with the 1987 Montreal Protocol (a UN international environmental treaty), as amended in London in 1990
- That MARPOL ANNEX VI applies to all ships, fixed and floating drilling rigs and other platforms, but the certification requirements are depending on size of the vessel and when it is constructed
- That Regulation 16 sets out requirements for shipboard incineration and as per 16(4) bans the incineration of:
  - MARPOL Annex I, II and III cargo residues and related contaminated packing materials;
  - polychlorinated biphenyls (PCBs);
  - garbage, as defined in MARPOL Annex V, containing more than traces of heavy metals; and
  - refined petroleum products containing halogen compounds
- That under regulation 16(5) incineration of sewage sludge and sludge oil generated during the normal operation of a ship may take place in the main or auxiliary power plant or boilers (as well as in an incinerator), but in those cases, must not take place inside ports, harbours and estuaries
- That Regulation 16(6) prohibits the shipboard incineration of polyvinyl chlorides (PVCs), except in incinerators for which IMO Type Approval Certificates have been issued
- That under regulation 16(7) all ships with incinerators subject to regulation 16 must possess a manufacturer's operating manual which must specify how to operate the incinerator within the limits described in paragraph 2 of appendix IV to Annex VI
- That under regulation 16(8) personnel responsible for operation of any incinerator must be trained and capable of implementing the guidance in the manufacturer's operating manual
- That Regulation 3 provides that the regulations of Annex VI will not apply to any emission necessary for the purpose of securing the safety of a ship or saving life at sea, or any emission resulting from damage to a ship or its equipment, subject to certain conditions
- That Regulation 15 provides that in ports or terminals in Party States any regulation of emissions of Volatile Organic Compounds (VOCs) from tankers must be in accordance with Annex VI
- That as per Regulation 15 a tanker carrying crude oil is required to have a "VOC Management Plan" approved by the Administration onboard
- That ships of 400 gross tons and above engaged in international voyages involving countries that have ratified the conventions, or ships flying the flag of those countries, are required to have an International Air Pollution Prevention Certificate (IAPP Certificate)
- That the IAPP certificate will be issued following an initial survey carried out by the Flag Administration or by a recognised organization on behalf of the Flag Administration, confirming compliance with MARPOL Annex VI. For ships with the flag of an Administration that have not yet ratified Annex VI, a Certificate of Compliance with Annex VI may be issued

- That Annex VI also requires diesel engines with a power output of more than 130 kW which is installed on a ship constructed on or after 1 January 2000 or with a power output of more than 130 kW which undergoes a major conversion on or after 1 January 2000 or with a power output of more than 5000 kW and a per cylinder displacement at or above 90 litres which is installed on a ship constructed on or after 1 January 1990 but prior to1 January 2000, to carry individual certificates with regard to NOx emissions, named Engine International Air Pollution Prevention (EIAPP) Certificates
- That Annex VI requires that every ship of 400 gross tonnage or above and every fixed and floating drilling rig and other platforms shall be subject to a schedule of surveys that occur throughout the life of a vessel

vii. The schedule of surveys:

Familiarity with;

- Initial survey: This survey occurs before the ship is put into service or before a vessel certificate is issued for the first time. This survey ensures that the equipment, systems, fitting, arrangements and material used onboard fully comply with the requirements of Annex VI. The vessel's International Air Pollution Prevention certificate (IAPP) will be issued to the vessel by an organization authorized to act on behalf of the state, after this survey.
- Periodic surveys: These surveys occur at least every five years after the initial survey. These surveys confirm that nothing has been done to the ship's equipment that would take it out of compliance. The vessel's IAPP certificate will be re-issued by an organization authorized to act on behalf of the state, after this survey.
- Intermediate surveys: These surveys occur at least once during the period between issuance of an IAPP and the periodic surveys. They also confirm that all of the ship's equipment remains in compliance.
- That Chapter III of Annex VI (regulations 12 to 19) contains requirements for control of emissions from ships, but the following regulations directly impact Vessel operation:
  - Regulation 12 – Ozone Depleting Substances
  - Regulation 13 – NOx emissions
  - Regulation 14 – Sulphur Oxide emissions
  - Regulation 15 – VOC emissions
  - Regulation 16 – Shipboard Incinerators
  - Regulation 18 – Fuel Oil Quality control
- That Regulation 12(1) prohibits deliberate emissions of ozone-depleting substances, except where necessary for the purpose of securing the safety of a ship or saving life, as provided in regulation 3.
- That Regulation 12(2) prohibits, on all ships, new installations containing ozone-depleting substances, except that new installations containing hydrochlorofluorocarbons (HCFCs) are permitted until 1 January 2020.
- That all the ships subject to the requirements of Annex VI, are required to maintain a list of equipment containing ozone depleting substances and in case a ship which has rechargeable systems containing ozone depleting substances, an Ozone depleting Substances Record Book is to be maintained on board.
- That Regulation 13 sets NOx emission limits for diesel engines with a power output of more than 130kW installed on ships built on or after 1 January 2000, and diesel engines of similar power undergoing a major conversion on or after 1 January 2000.
- That Regulation 13 does not apply to emergency diesel engines, engines installed in lifeboats and any device or equipment intended to be used solely in case of emergency, or engines installed on ships solely engaged in voyages within waters subject to the sovereignty or jurisdiction of the flag State, provided that such engines are subject to an alternative NOx control measure established by the Administration.

- That Regulation 13 further contains a 3-Tier approach;
  - Tier I (current limits)
  - For diesel engines installed on ships constructed from 1 January 2000 to 1 January 2011
  - Tier II
  - For diesel engines installed on ships constructed on or after 1 January 2011
  - Tier III
  - Ships constructed on or after 1 January 2016
- That Engine surveys are described in Chapter 2 of the NOx Technical Code, a supporting document to Annex VI.

viii. Kinds of engine surveys:

Familiarity with;

- Pre-certification survey: This survey occurs before an engine is installed onboard a vessel, to ensure the engine meets the NOx limits. The Engine International Air Pollution Prevention certificate (EIAPP) is issued after this survey for each applicable engine, engine family, or engine group.
- Initial certification survey: This survey occurs after the engine is installed onboard the ship, but before the ship is placed into service. It ensures that the engine meets the NOx limits as installed. If an engine has an EIAPP, the initial certification survey will primarily ensure that any modifications to the engine's settings are within the allowable adjustment limits specified in the EIAPP.
- Periodic and intermediate surveys: These surveys occur as part of the ship's surveys described above. They ensure that the engine continues to comply fully with the NOx limits.
- Modification survey: This survey occurs when an engine overhaul meets the criteria for a major conversion. It ensures that the modified engine complies with the NOx limits.
- That there are three documents that are essential for completing the engine and vessel surveys. These are the EIAPP or Statement of Compliance, the Technical File, and the Record Book of Engine Parameters.
- That Regulation 14 provides for adoption of "SOx Emission Control Areas"- "SECA" where the adoption of special mandatory measures for SOx emissions from ships is required to prevent, reduce and control air pollution from SOx and its attendant adverse impacts on land and sea areas with more stringent control on sulphur emissions.

ix. Emission Control Areas (ECA):

Familiarity with;

- The Baltic Sea area as defined in regulation 1.11.2 of Annex I, the North Sea as defined in regulation 5(1)(f) of Annex V.
- That in these areas the sulphur content of fuel oil used on ships must not exceed 1.5% m/m. Alternatively, ships in these areas must fit an exhaust gas cleaning system or use any other technological method to limit SOx emissions.
- That Regulation 15 provides that in ports or terminals in Party States any regulation of emissions of Volatile Organic Compounds (VOCs) from tankers must be in accordance with Annex VI.
- That Regulation 16 sets out requirements for shipboard incineration and as per 16(4) bans the incineration of:
  - MARPOL Annex I, II and III cargo residues and related contaminated packing materials;
  - polychlorinated biphenyls (PCBs);
  - garbage, as defined in MARPOL Annex V, containing more than traces of heavy metals; and
  - refined petroleum products containing halogen compounds

- That under regulation 16(5) incineration of sewage sludge and sludge oil generated during the normal operation of a ship may take place in the main or auxiliary power plant or boilers (as well as in an incinerator), but in those cases, must not take place inside ports, harbours and estuaries.
- That Regulation 16(6) prohibits the shipboard incineration of polyvinyl chlorides (PVCs), except in incinerators for which IMO Type Approval Certificates have been issued.
- That under regulation 16(7) all ships with incinerators subject to regulation 16 must possess a manufacturer's operating manual which must specify how to operate the incinerator within the limits described in paragraph 2 of appendix IV to Annex VI
- That under regulation 16(8) personnel responsible for operation of any incinerator must be trained and capable of implementing the guidance in the manufacturer's operating manual.
- That as per Regulation 15 a tanker carrying crude oil is required to have a "VOC Management Plan" approved by the Administration onboard.
- That Regulation 3 provides that the regulations of Annex VI will not apply to any emission necessary for the purpose of securing the safety of a ship or saving life at sea, or any emission resulting from damage to a ship or its equipment, subject to certain conditions.

.5 Maritime Declarations of Health and the Requirements of the International Health Regulations, Arrival Documents and Procedures 2hrs (T) + 0hrs (P) + 0hrs (E).

i. International Health Regulations (1969) as amended

Familiarity with;

- For the purposes of these regulations:
  - arrival of a ship
  - baggage
  - container or freight container
  - crew
  - diseases subject to the Regulations
  - disinsecting
  - epidemic
  - free pratique
  - health administration
  - health authority
  - infected person
  - in quarantine
  - international voyage
  - isolation
  - medical examination
  - ship
  - suspect
  - valid certificate
- That a health authority should, if requested, issue, free of charge to the carrier, a certificate specifying the measures applied to a ship or container, the parts treated, methods used and the reasons why they have been applied.
- That, except in an emergency constituting a grave danger to public health, a ship which is not infected or suspected of being infected with a disease subject to the Regulations should not be refused free pratique on account of any other epidemic disease and should not be prevented from discharging or loading cargo or stores, or taking on fuel or water.

That a health authority may take all practicable measures to control the discharge from any ship of sewage and refuse which might contaminate the waters of a port, river or canal.

The measures which the health authority of a port may take with respect to departing travelers.

- That no health measures should be applied by a State to any ship which passes through waters within its jurisdiction without calling at a port or on the coast.
- The measures which may be applied to a ship which passes through a canal or waterway in a territory of a State on its way to a port in the territory of another State.
- That, whenever possible, States should authorize granting of free pratique by radio.
- That the master should make known to port authorities, as long as possible before arrival, any case of illness on board, in the interests of the patient and the health authorities and to facilitate clearance of the ship.
- That, on arrival of a ship, an infected person may be removed and isolated and that such removal should be compulsory if required by the master.
- That a ship should not be prevented for health reasons from calling at any port, but if the port is not equipped for applying the health measures which in the opinion of the health authority of the port are required, the ship may be ordered to proceed at its own risk to the nearest suitable port convenient to it.
- The actions open to a ship which is unwilling to submit to the measures required by the health authority of a port.
- The measures concerning cargo and goods.
- The measures concerning baggage.

ii. Plague

Familiarity with;

- That, for the purposes of the Regulations, the incubation period of plague is six days.
- That vaccination against plague should not be required as a condition of admission of any person to a territory.
- That during the stay of a ship in a port infected by plague, special care should be taken to prevent the introduction of rodents on board.
- That ships should be permanently kept free of rodents and the plague vector or be periodically derailed.
- The requirements for the issue of a Ship Sanitation Control Certificate or a Ship Sanitation Control Exemption Certificate and states their periods of validity.
- The conditions in which a ship on arrival is to be regarded as infected, suspected or healthy.
- The measures which may be applied by a health authority on the arrival of an infected or suspected ship.

iii. Cholera

Familiarity with;

- The measures which may be applied by a health authority on the arrival of a healthy ship from an infected area states that, for the purposes of the Regulations, the incubation period of cholera is five days.
- The measures to be taken by the health authority if a case of cholera is discovered upon arrival or a case has occurred on board.

iv. Yellow Fever

Familiarity with;

That, for the purposes of the Regulations, the incubation period of yellow fever is six days.

- That vaccination against yellow fever may be required of any person leaving an infected area on an international voyage.
- That every member of the crew of a ship using a port in an infected area must be in possession of a valid certificate of vaccination against yellow fever.
- The conditions in which a ship on arrival is to be regarded as infected, suspected or healthy.
- The measures which may be applied by a health authority on the arrival of an infected or suspected ship.

v. Documents

Familiarity with;

- That bills of health or any other certificates concerning health conditions of a port are not require from any ship.
- The master's obligations concerning a Maritime Declaration of Health.
- That the master and the ship's surgeon, if one is carried, must supply any information required by the health authority as to health conditions on board during the voyage.
- That no health document, other than those provided for in the Regulations, should be required in international traffic.

.6 Responsibilities under other international maritime law embodied in international agreements and conventions that impact on the role of management level deck officers

i. Convention on Facilitation of International Maritime Traffic, 1965, as amended (FAL 1965)
1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the Convention lays down 'standards' and 'recommended practices' regarding documentation and procedures for facilitating international maritime traffic
- That the provisions do not preclude the requirement for the presentation for inspection by the appropriate authorities of certificates and other papers concerned with registry, measurement, safety, manning and other related matters
- That the Convention lays down 'standards' and 'recommended practices' regarding documentation and procedures for facilitating international maritime traffic
- That the provisions do not preclude the requirement for the presentation for inspection by the appropriate authorities of certificates and other papers concerned with registry, measurement, safety, manning and other related matters
- That arrival procedures may be expedited by:
  - providing the public authorities concerned with an advance message giving the best ETA, followed by any information as to change of time, and stating the itinerary of the voyage
  - having ship's documents ready for prompt review
  - rigging a means of boarding while the ship is en route to the berth or anchorage
  - providing for prompt, orderly assembling and presentation of persons on board, with necessary documents for inspection, including arrangements for relieving crew members from essential duties

Familiarity with;

- That the purpose of the Convention is to facilitate maritime transport by simplifying and reducing to a minimum the formalities, documentary requirements and procedures on the arrival, stay and departure of ships engaged in international voyages.

- The documents which should be the only ones required by public authorities for their retention on arrival, or departure of ships to which the Convention applies.
- The documents which should be the only ones required by public authorities for their retention on arrival, or departure of ships to which the Convention applies.
- That IMO has produced standard forms for:
  - general declaration
  - cargo declaration
  - ship's effects declaration
  - crew's effects declaration
  - crew list
  - passenger list
  - dangerous goods manifest

ii. United Nations Convention on the Law of the Sea (UNCLOS) 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the outcome of UNCLOS III conference convened at Geneva in 1974 was the United Nations Convention on the Law of the Sea commonly known as "UNCLOS".
- That UNCLOS attempts to codify the international law of the sea.
- That it defines the continental shelf and extends jurisdiction over the resources of the shelf beyond 200 miles where appropriate.
- That states in dispute about their interpretation of UNCLOS may submit their disagreements to competent courts such as the International Court of Justice (in The Hague), or the Law of the Sea Tribunal (in Hamburg).
- When a vessel is voluntarily within a port or at an offshore terminal, the port State may, where the evidence warrants, begin proceedings in respect of discharges in violation of international rules (i.e. regulations in MARPOL 73/78).
- That as per UNCLOS, States must agree international rules and standards to prevent pollution from vessels (Article 211). (This obligation is currentlymet by MARPOL 73/78).
- That Coastal States may also promulgate and enforce pollution regulations in their own EEZs which may, in some circumstances, include imposition of routeing restrictions.
- That Coastal States and ports may make entry to internal waters and harbours conditional on meeting additional pollution regulations.

Familiarity with;

- That UNCLOS defines the legal status of the high seas and establishes regulations for the control of marine pollution.
- That UNCLOS is a treaty document of 320 articles and 9 annexes, governing all aspects of ocean space, such as delimitation, environmental control, marine scientific research, economic and commercial activities, transfer of technology and the settlement of disputes relating to ocean matters.
- That UNCLOS came into force internationally on 16 November 1994.
- That UNCLOS sets the width of the territorial sea at 12 nautical miles, with a contiguous zone at 24 nautical miles from the baseline.
- That UNCLOS defines innocent passage through the territorial sea and defines transit passage through international straits.
- That UNCLOS defines archipelagic States and allows for passage through archipelagic waters
- That UNCLOS establishes exclusive economic zones (EEZs) extending to 200 nautical miles from baselines

- That the responsibility for enforcement of regulations rests mainly with flag States, but as vessels enter zones closer to the coast the influence of coastal State jurisdiction and, ultimately, port State jurisdiction, gradually increases.
- That Article 94 of the UNCLOS deals with duties of the flag State, while Article 217 deals with enforcement by flag States.
- That Article 218 of the UNCLOS deals with port State jurisdiction.
- That another State in which a discharge violation has occurred, or the flag State, may request the port State to investigate the violation.
- That Article 200 of the UNCLOS deals with coastal State jurisdiction as applied in relation to pollution provisions.
- That where there are clear grounds for believing that a vessel navigating in the territorial sea of a State has violated laws and regulations of the coastal State adopted in accordance with UNCLOS or applicable international pollution regulations, the coastal State may inspect the vessel and, where evidence warrants, institute proceedings including detention of the vessel.
- That vessels believed to have violated pollution laws in an EEZ may be required to give identification and voyage information to the coastal State.
- That in the territorial sea additional navigational restraints (e.g. traffic separation schemes and sealanes) may be imposed on vessels with dangerous and hazardous cargoes.

iii. Maritime Labour Convention (MLC 2006) 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That the Maritime Labour Convention, 2006 is an important new international labour Convention that was adopted by the International Labour Conference of the International Labour Organization (ILO), under article 19 of its Constitution at a maritime session in February 2006 in Geneva, Switzerland.
- That it sets out seafarers' rights to decent conditions of work and helps to create conditions of fair competition for shipowners.
- That it is intended to be globally applicable, easily understandable, readily updatable and uniformly enforced.
- That the MLC, 2006, complementing other major international conventions, reflects international agreement on the minimum requirements for working and living conditions for seafarers.
- That the Maritime Labour Convention, 2006 has two primary purposes:
  - to bring the system of protection contained in existing labour standards closer to the workers concerned, in a form consistent with the rapidly developing, globalized sector (ensuring "decent work");
  - to improve the applicability of the system so that shipowners and governments interested in providing decent conditions of work do not have to bear an unequal burden in ensuring protection ("level playing field" fair competition)
- That the Maritime Labour Convention, 2006 has been designed to become a global legal instrument that, once it enters into force, will be the "fourth pillar" of the international regulatory regime for quality shipping, complementing the key Conventions of the International Maritime Organization (IMO) such as the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS), the International Convention on Standards of Training, Certification and Watchkeeping, 1978, as amended (STCW) and the International Convention for the Prevention of Pollution from Ships, 73/78 (MARPOL).
- That the Convention "consolidates" the existing international law on all these matters.
- That the existing ILO maritime labour Conventions will be gradually phased out as ILO Member States that have ratified those Conventions ratify the new Convention, but there will be a transitional period when some parallel Conventions will be in force.

- That countries that ratify the Maritime Labour Convention, 2006 will no longer be bound by the existing Conventions when the new Convention comes into force for them.
- That countries that do not ratify the new Convention will remain bound by the existing Conventions they have ratified, but those Conventions will be closed to further ratification.
- That the Convention is organized into three main parts: the Articles coming first set out the broad principles and obligations which is followed by the more detailed Regulations and Code (with two parts: Parts A and B) provisions.
- That it occasionally contains new subjects in comparison to the existing ILO Maritime labour conventions, particularly in the area of occupational safety and health to meet current health concerns, such as the effects of noise and vibration on workers or other workplace risks.
- That the standards in the new Convention are not lower than existing maritime labour standards as the aim is to maintain the standards in the current maritime labour Conventions at their present level, while leaving each country greater discretion in the formulation of their national laws establishing that level of protection.
- That the advantages for ships of ratifying countries that provide decent conditions of work for their seafarers will have protection against unfair competition from substandard ships and will benefit from a system of certification, avoiding or reducing the likelihood of lengthy delays related to inspections in foreign ports.
- That the Maritime Labour Convention, 2006 aims to establish a continuous "compliance awareness" at every stage, from the national systems of protection up to the international system and it will improve compliance and enforcement;
    - Starting with the individual seafarers, who – under the Convention – have to be properly informed of their rights and of the remedies available in case of alleged non-compliance with the requirements of the Convention and whose right to make complaints, both on board ship and ashore, is recognized in the Convention.
    - It continues with the shipowners. Those that own or operate ships of 500 gross tonnage and above, engaged in international voyages or voyages between foreign ports, are required to develop and carry out plans for ensuring that the applicable national laws, regulations or other measures to implement the Convention are actually being complied with.
    - The masters of these ships are then responsible for carrying out the shipowners' stated plans, and for keeping proper records to evidence implementation of the requirements of the Convention.
    - As part of its updated responsibilities for the labour inspections for ships above 500 gross tonnage that are engaged in international voyages or voyages between foreign ports, the flag State (or recognized organization on its behalf) will review the shipowners' plans and verify and certify that they are actually in place and being implemented.
    - Ships will then be required to carry a maritime labour certificate and a declaration of maritime labour compliance on board.
    - Flag States will also be expected to ensure that national laws and regulations implementing the Convention's standards are respected on smaller ships that are not covered by the certification system.
    - Flag States will carry out periodic quality assessments of the effectiveness of their national systems of compliance, and their reports to the ILO under article 22 of the Constitution will need to provide information on their inspection and certification systems, including on their methods of quality assessment.
    - This general inspection system in the flag State (which is founded on ILO Convention No. 178) is complemented by procedures to be followed in countries that are also or even primarily the source of the world's supply of seafarers, which will similarly be reporting under article 22 of the ILO Constitution.
    - The system is further reinforced by voluntary measures for inspections in foreign ports (port State control)

- That the Maritime Labour Certificate would be issued by the flag State to a ship that flies its flag, once the State (or a recognized organization that has been authorized to carry out the inspections), has verified that the labour conditions on the ship comply with national laws and regulations implementing the Convention.
- That the declaration of maritime labour compliance is attached to the certificate and summarizes the national laws or regulations implementing an agreed-upon list of 14 areas of the maritime standards and setting out the shipowner's or operator's plan for ensuring that the national requirements implementing the Convention will be maintained on the ship between inspections.

Familiarity with;

- That it sometimes called the consolidated Maritime Labour Convention, 2006 as it contains a comprehensive set of global standards, based on those that are already found in 68 maritime labour instruments (Conventions and Recommendations), adopted by the ILO since 1920.
- That the new Convention brings almost all of the existing maritime labour instruments together in a single new Convention that uses a new format with some updating, where necessary, to reflect modern conditions and language.
- That the MLC, 2006 applies to all ships engaged in commercial activities (except fishing vessels, ships of traditional build and warships or naval auxiliaries).
- That ships of 500 GT or over are required to be certified: they must carry a Maritime Labour Certificate as well as a Declaration of Maritime Labour Compliance.
- That ships below 500 GT are subject to inspection at intervals not exceeding three years.
- That the Regulations and the Standards (Part A) and Guidelines (Part B) in the Code are integrated and organized into general areas of concern under five Titles:
  - Title 1: Minimum requirements for seafarers to work on a ship: minimum age, medical certificates, training and qualification, recruitment and placement.
  - Title 2: Conditions of employment: Seafarers Employment Agreements, Wages, Hours of Work and Hours of Rest, Entitlement to Leave, Repatriation, Seafarer compensation for the ship's Loss or Foundering, Manning Levels, Career and Skill Development and Opportunities for Seafarers' Employment
  - Title 3: Accommodation, recreational facilities, food and catering
  - Title 4: Health protection, medical care, welfare and social security protection: Medical Care on-board ship and Ashore, Ship-owners' Liability, Health & Safety Protection and Accident Prevention, Access to Shore-based Welfare Facilities, Social Security
  - Title 5: Compliance and enforcement: Flag State Responsibilities: General Principles, Authorization of Organizations, Maritime Labour Certificate and Declaration of Maritime Labour Compliance, Inspection and Enforcement, On-board Complaint Procedures, Marine Casualties
  - Port State Responsibilities: Inspections in Port, Detailed Inspection, Detentions, On-shore Seafarer Complaint Handling Procedures
  - Labour-supplying Responsibilities: Recruitment and Placement services, Social security provisions These five Titles essentially cover the same subject matter as the existing 68 maritime labour instruments, updating them where necessary
- That the appendices to the Convention contain key model documents: a maritime labour certificate and a declaration of maritime labour compliance.
- That the certificate would be valid for five years subject to periodic inspections by the flag State.
- That the lists of the 14 areas that must be certified by the flag State and that may be inspected, if an inspection occurs, in a foreign port are also set out in the Appendices to the Convention.

iv. Collision 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- International Convention for the Unification of Certain Rules of Law with Respect to Collision between Vessels (Collision, 1910).
- The apportionment of liability when two or more vessels are in fault.
- That liability attaches where the collision is caused by the fault of a pilot even when the pilot is carried by compulsion of law.
- The duties of the master after a collision.
- That the Convention extends to the making good of damages which a vessel has caused to another vessel or to goods or persons on board either vessel, either by the execution or non-execution of a manoeuvre or by the nonobservance of regulations ,even if no collision has actually taken place.

Familiarity with;

- That when collision is accidental, is caused by 'force majeure' or if the cause is left in doubt, the damages are borne by those who have suffered them.
- That if collision is caused by the fault of one of the vessels, liability to make good the damageattaches to the one which committed the fault.
- That in the event of a collision or any other incident of navigation concerning a sea-going ship and involving the penal or disciplinary responsibility of the master or any other person in the service of the ship,criminal or disciplinary proceedings may be instituted only before the judicial or administrative authorities of the State of which the ship was flying the flag at the time of the collision or other incident of navigation.
- That no arrest or detention of the vessel should be ordered, even as a measure of investigation, by any authorities other than those whose flag the ship is flying.
- That nothing in the present Convention is to prevent any State from permitting its own authorities ,in case of collision or other incidents of navigation, to take any action in respect of certificates of competence or licences issued by that State or to prosecute its own nationals for offences committed while on board a ship flying the flat of another State.
- That the Convention does not apply to collisions or other incidents of navigation occurring within the limits of a port or in inland waters and that the High Contracting Parties are at liberty to reserve to themselves the right to take proceedings in respect of offences committed within their own territorial waters.

v. Assistance and Salvage, International Convention on Salvage, 1989 (The London Salvage Convention)
1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The 'no cure — no pay' principle.
- The application of the Convention.
- The duties of the salvor, of the owner and of the master.
- The rights of salvors.
- That the apportionment of the remuneration amongst the owners, master and other persons in the service of each salving vessel is to be determined by the law of the vessel's flag.
- That every agreement as to assistance or salvage entered into at the moment and under the influence of danger may, at the request of either party, be annulled, or modified by the court, if it considersthat the conditions agreed upon are not equitable.

- The reasons for the court to set aside the agreed remuneration in whole or in part (salvor's fault, neglect, fraud or dishonesty) states that no remuneration is due from personswhose lives are saved except as provided in national law.
- The rights of salvors of human life who have taken part in the salvage operations.
- That the convention also applies to assistance or salvage services rendered by or to a ship of war or any other ship owned, operated or chartered by a State or Public Authority.
- The provision of security by the owner and the application of the salvor's maritime lien.

Understanding of;

- 'Salvage operation', 'vessel' and 'property'.

Familiarity with;

- The criteria for assessing a reward as:
  - salved value of property (ship, cargo and bunkers)
  - skill and efforts of salvor
  - Measure of success.
  - Nature and degree of danger.
  - Expenses of salvor.
  - Equipment used.
  - Vessel's equipment used.
  - Time taken to complete the salvage operation.
  - Preventing or minimising the damage to environment.
- The criteria for assessing Special Compensation.
- That every master is bound, so far as he can do so without serious danger to his vessel, her crew and her passengers, to render assistance to everybody, even though an enemy, found at sea in danger of being lost.

vi. Lloyd's Standard Form of Salvage Agreement (LOF, 2000) **1hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- The Contractor's agreed endeavours to salve the ship and/or cargo, bunkers and stores and while performing the salvage services to prevent or minimize damage to the environment.
- That the LOF 2000 form does not need to be on board; the masters of the vessels involved simply need to expressly agree to its terms before the salvage services commence.
- The exception to the 'no cure — no pay' principle.
- That LOF 2000 superseded LOF 95 and where a salvor offers services on LOF 95 or some other terms, the master of the vessel in difficulties should attempt to get agreement to LOF 2000 terms.
- That LOF 2000 is regarded by the International Salvage Union as a major advance, with clear, user-friendly language and many innovations.
- The obligation of the owners, their servants and agents to co-operate with the salvors.
- The Contractor's duty immediately after the termination of the services to notify the Council of Lloyd's and where practicable the owners of the amount for which he requires security.
- That the owners of the vessel, their servants and their agents should use their best endeavours to ensure that cargo owners provide their proportion of security before the cargo is released.
- That, pending the completion of the security, the Contractor has a maritime lien on the property salved for his remuneration.
- How claims for arbitration are decided.
- The provisions for special compensation set out in Convention Article.

- That Personnel effects of Master, crew and passengers including any car accompanying a passenger are excluded from reward for salvage as per the LOF 2000.
- That as compared to the old LOF 1995, the duty to co-operate as per the new LOF 2000 is extended to provide information about nature of cargo, plans, stability data etc.
- That LOF 2000 defines the conditions under which a casualty is in a safe condition for redelivery to the owner (which can be of crucial importance in the closing stages of a salvage operation.

Familiarity with;

- That LOF 2000 should be used where the ship or marine environment are at risk and the master has insufficient time to request the owner to arrange salvage services on a basis of a pre-agreed rate or sum.
- That LOF 2000 is a single sheet (2-page) document (whereas LOF 95 consists of 6 pages) in a simplified format.
- That the Contractor's remuneration is to be fixed by arbitration in London and any differences arising out of the Agreement are to be dealt with in the same way.
- That the provisions of the Agreement apply to salvage services, or any part of such services, referred to in the Agreement which have been already rendered by the Contractor at the date of the Agreement.
- That English Law is the governing law of the Agreement and of arbitration under it.
- That the master or other person signing LOF on behalf of the property to be salved enters into the agreement as agent for the vessel her cargo, freight, bunkers, stores and any other property thereon and the respective owners thereof and binds each to the due performance thereof.
- That when there is no longer any reasonable prospect of a useful result leading to a salvage reward in accordance with Convention Article 13 the owners of the vessel shall be entitled to terminate the services of the Contractor by giving notice to the Contractor in writing.
- That the currency of award as per the LOF 2000 is USA $.
- That as per LOF 2000, the salvors have right to terminate when "no longer any reasonable prospects of useful result".
- That in the LOF 2000, SCOPIC clause is introduced as an alternative to Art 14 set out in the convention.
- That that as per LOF 2000, the Master is authorized to sign on behalf of cargo.

vii. Special Compensation P and I Club (SCOPIC) Clause **1hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That SCOPIC clause is supplementary to any Lloyd's Form Salvage Agreement "No Cure - No Pay" ("Main Agreement") which incorporates the provisions of Article 14 of the International Convention on Salvage 1989 ("Article 14").
- That the Contractor have the option to invoke by written notice to the owners of the vessel the SCOPIC clause at any time of his choosing regardless of the circumstances and, in particular, regardless of whether or not there is a "threat of damage to the environment".
- That SCOPIC Clause determines the method of assessing special compensation where payable under Article 14(1) to 14(4) of the Convention.
- That special compensation assessed in accordance with the SCOPIC Clause is called "SCOPIC remuneration".
- That the SCOPIC remuneration is payable only by the owners of the vessel (and not by the cargo owners) and is only payable to the extent that it exceeds the total Article 13 award (the salvage award) or, if none, any potential Article 13 award.

- That where the owner of the vessel is a member of a P&I club the club is normally required to pay the special compensation hence interest and involvement of the P&I clubs in drafting the SCOPIC Clause.
- That the assessment of SCOPIC remuneration commences from the time the written notice is given to the owners of the vessel and services rendered before the said written notice will not be remunerated under this SCOPIC clause at all but in accordance with Convention Article 13 as incorporated into the Main Agreement ("Article 13").
- That the owners of the vessel have to provide the Contractor within 2 working days (excluding Saturdays and Sundays and holidays usually observed at Lloyd's) after receiving written notice from the contractor invoking the SCOPIC clause, a bank guarantee or P&I Club letter (called "the Initial Security") in a form reasonably satisfactory to the Contractor providing security for his claim for SCOPIC remuneration in the sum of US$3 million, inclusive of interest and costs.
- That the rates are based on time and materials plus an uplift of 25% in all cases.
- That in the absence of agreement, any dispute concerning the proposed Guarantor, the form of the security or the amount of any reduction or increase in the security in place shall be resolved by the Arbitrator.
- That if the owners of the vessel do not provide the Initial Security within the said 2 working days, the Contractor, at his option, and on giving notice to the owners of the vessel, shall be entitled to withdraw from all the provisions of the SCOPIC clause and revert to his rights under the Main Agreement including Article 14 which shall apply as if the SCOPIC clause had not existed.
- That the Owner and Contractor both have option to terminate SCOPIC under certain agreed circumstances.
- That even when the SCOPIC clause is invoked, the duties and liabilities of the Contractor remains the same as under the Main Agreement, namely to use his best endeavours to salve the vessel and property thereon and in so doing to prevent or minimise damage to the environment.
- That the assessment of SCOPIC remuneration includes the prevention of pollution as well as the removal of pollution in the immediate vicinity of the vessel insofar as this is necessary for the proper execution of the salvage.
- That the owner has the right to send on-board a casualty Representative (SCR).
- That Underwriters have the right to send one special hull representative and one special cargo representative collectively called the "Special Representatives").
- That the salvage masters are required to send daily reports to Lloyds and the owner until SCR arrives and thereafter to SCR.
- That the SCOPIC remuneration is not a General Average expense to the extent that it exceeds the Article 13 Award; any liability to pay such SCOPIC remuneration is that of the Shipowner alone and no claim whether direct, indirect, by way of indemnity or recourse or otherwise relating to SCOPIC remuneration in excess of the Article 13 Award is to be made in General Average or under the vessel's Hull and Machinery Policy by the owners of the vessel.
- That any dispute arising out of this SCOPIC clause or the operations is to be referred to Arbitration as provided for under the Main Agreement.
- That a non binding code of practice has been agreed between the International Salvage Union (ISU) and the International Group of Clubs.

viii. Convention on Limitation of Liability for Maritime Claims, 1976 (LLMC 1976) 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The circumstances in which limitation would be barred.
- That, except for claims in respect of death or injury of passengers, the calculation of limits of liability is based on the ship's gross tonnage.
- That the limit for claims in respect of death or injury of passengers is based on the number of passengers the ship is authorized to carry, subject to a maximum sum.
- The constitution of a limitation fund.

Familiarity with;

- The persons entitled to limit liability.
- The claims subject to limitation of liability.
- The claims exempted from limitation.
- The scope of application of the Convention.

ix. Classification Societies 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The reasons for having a ship classed with a classification society.
- That the classification society approves plans, examines the manufacture of parts and tests materials during the building of hull, machinery, equipment and, where appropriate, refrigerating machinery explains that equipment refers to anchors, chain cables, mooring ropes and wires, mooring arrangements, windlasses and mooring winches.
- The special survey requirements may be met by a system of continuous survey such that the interval between successive surveys on any given item does not exceed 5 years.
- That, when convenient, the loading port survey may be combined with a periodical survey for classification.

Familiarity with;

- That the majority of ships are built under survey.
- That, if requested, the classification societies will also survey and certificate cargo-handling equipment.
- That on satisfactory completion of surveys and sea trials the society issues certificates of class, which are kept aboard ship, and enters the particulars of the ship in its register.
- That a classification society will also survey an existing ship providing it meets the society's rules regarding scantlings, materials, workmanship and condition, assign a class to it.
- That to retain its class a ship must undergo periodical surveys as laid down in the society's rules .
- That periodical surveys are:
  - annual survey
  - docking survey at approximately 2-yearly intervals
  - intermediate survey
  - special survey every 4 years, which may be extended to five years
- That an occasional survey, additional to the regular surveys, must be conducted after any damage to the hull, machinery or equipment which may affect the ship's seaworthiness.
- That repairs or alterations must be carried out under survey and to the satisfaction of the society's surveyors.

- That classification societies carry out surveys for the issue of statutory certification on behalf of many governments.
- That a classification society may be asked to conduct the loading port survey on its classed refrigerating machinery.

x. Cargo 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- International Convention for the Unification of Certain Rules of Law Relating to Bills of Loading, as Amended by the Protocol of 1968 (Hague-Visby Rules).
- The carrier's duty to care for the cargo.
- The duty of the carder, master or agent of the carrier to issue a bill of lading.
- That a bill of lading is prima facie evidence of the receipt by the carrier of the goods as described in it and proof to the contrary is not admissible when the bill of lading has been transferred to a third party acting in good faith.
- That the shipper is deemed to have guaranteed the accuracy of marks, number, quantity and weight as furnished by him, and that the shipper is to indemnify the carrier against loss arising from inaccuracies in such particulars
- The duty of the carrier, master or agent to issue a 'shipped' bill of lading after the goods are loaded, provided the shipper surrenders any previously taken up document of title.
- The mandatory domain of the Hague-Visby rules.
- The carrier's liability for loss or damage arising or resulting from un-seaworthiness.
- The shippers responsibility for loss or damage sustained by the carrier or ship.
- The limitation of liability for loss or damage and the circumstances in which benefit of limitation is lost.
- The provisions regarding goods of an inflammable, explosive or dangerous nature.
- The liability of the carrier's servants (Himalaya clause) explains that this Convention does not apply to charter-parties, but, if bills of lading are issued under a charter party, they must comply with the terms of this Convention.
- That, in certain circumstances, goods may be carried under an agreement between the carrier and shipper in any contractual terms not contrary to public policy, provided that no bill or lading is issued and that the terms agreed are embodies in a non-negotiable receipt, marked as such.
- That the Rules do not prevent a carrier or shipper entering into any agreement regarding loss of damage to goods prior to the loading on, and subsequent to, the discharge from the ship on which the goods are carried by sea.
- The scope of application of the provisions of this Convention.
- Briefly the system of documentary credit in the sale of goods during shipment.

Understanding of;

- defines:
  - carrier
  - contract of carriage -goods
  - ship
  - carriage of goods

Familiarity with;

- Lists the duties of the carrier to make the ship seaworthy and fit for the carriage of cargo.
- Lists the information which should be shown in a bill of lading.
- That whenever loss of damage has resulted from unseaworthiness, the burden of proving due diligence is on the carrier.
- The exceptions to the carrier's responsibility for loss or damage.
- The right to deviate for the purpose of saving life or property.
- That any lawful provisions regarding general average may be inserted in a bill of lading.
- That the Convention does not affect the rights and obligations of the carrier under any statute relating to the limitation of the liability of owners of sea-going ships.

a. Charter Parties

Knowledge of;

- That a voyage charter-party is a contract to carry a specified, normally full, cargo between named ports at an agreed freight rate explains that the shipowner remains responsible for the operation of the ship and the costs involved, but the charterer sometimes pays the stevedoring charges
- The tendering of notice of readiness at the loading port.
- That if the ship is not ready to receive cargo, whether alongside or not, by the cancellation date the charterer may cancel the charter.
- What is meant by laytime and the terms 'running days/hours', 'Sundays and holidays excepted' and 'weather working days'.
- That if cargo work is not completed within the permitted laytime, the charterer is liable to pay demurrage at the agreed rate per day or hour until it is completed.
- That time lost due to defects of the ship or its equipment is not counted in the laytime.
- That in the event of cargo work being completed before the expiration of laytime, dispatch is usually payable by the shipowner to the charterer.
- That the bills of lading may incorporate the terms of the charter-party which, in any case, takes precedence over the bills of lading as between shipowner and charterer.
- That when bills of lading have been transferred to a third party they constitute the contract between the shipowner and that party.
- That the charterer may use the vessel for any voyage he wants within the trading area agreed in the charter-party.
- That the charterer pays for bunkers and for cargo loading and discharging, port dues, canal dues and pilotage.
- That inability to maintain the warranted speed or consumption as a result of heavy weather or other cause should be substantiated by entries in the logbook.
- That the off-hire clause states the circumstances in which payment of hire ceases during time lost to the charterer.
- That off - hire deductions may be made for time lost due to reduced- speed resulting from defects of ship or machinery, for the cost of additional fuel and for extra expenses.
- The master's actions regarding damage done by stevedores to the ship or cargo.
- That demise or bareboat charter-party is a leasing arrangement in which the charterer operates the ship as if it were his own.
- That a tonnage contract or contract of affreightrnent may be used where a shipper needs to transport large quantities over a long period.
- That the contract does not name particular ships and the shipowner is free to use any suitable ship, his own or chartered, for each shipment.

Familiarity with;

- That a charter-party is a contract between the ship-owner and the charterer for the use of a ship or her cargo space.
- That contracts are normally drawn up using standard charter-party forms amended as required by alterations and additional clauses.
- That the laytime for loading and discharging may be stated separately or as a total.
- That all times relevant to cargo working should be recorded in the logbook and time sheets for the calculations of laytime completed as a check on the charterer's laytime statement.
- That bills of lading are normally issued under a voyage charter-party and signed by the master or on his behalf.
- That a voyage charter may be arranged to cover a stated number of successive voyages or an unspecified number of voyages to be performed in a given time.
- That in a time charter-party the charterer agrees to hire the ship for a specified period of time.
- That owners pay crew costs and for provisions, necessary stores, insurance of the ship and the costs of maintaining the ship in class and keeping it in an efficient condition to carry out the charterer's wishes.
- That the charter-party contains a description of the ship, including its speed and fuel consumption.
- That crew overtime in connection with the cargo is usually for the account of the charterer, and separate time sheets should be kept.
- That the master is usually required to sign bills of lading as presented to him by the charterer or the charter-party may give the charterer the right to sign them on his behalf.
- That a time charter-party may be used for a single round voyage.
- That the master and crew are employed by the charterer, to whom they are responsible as if he were the owner.
- That the loading dates are specified and that punctual performance is essential.
- That each individual shipment is normally subject to the terms of a conventional voyage charter-party.

b. Hamburg Rules' Maritime Legislation

Knowledge of;

- The effect of charges where goods are carried under Hamburg Rules.
- Carrier's extended liability for loss or damage to the goods.
- Reductions to exception to liability, inward and outward bills of lading, live animals and deck cargo.
- The need to inform P & I Club where goods are carried under Hamburg Rules.

xi. General Average and Marine Insurance, The York-Antwerp Rules, 1974 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That only such losses, damages or expenses which are the direct consequence of the general average act are allowed as general average and that no indirect loss whatsoever will be admitted.
- That rights to contribution in general average when the event which gave rise to the sacrifice was due to the fault of one of the parties to the adventure.
- That general average is to be adjusted, as regards both loss and contribution, on the basis of values at the time and place when and where the adventure ends.
- The duty of the master to see to it that general average contributions (average bonds) are collected for the benefit of those entitled to them, whether they are cargo owners or shipowners, exercising the ship owner's lien on the cargo, where necessary, until they are paid.

Familiarity with;

- That where the York-Antwerp Rules apply, general average should be adjusted according to the Rules to the exclusion of any law or practice inconsistent with them.
- General average act.
- That general average sacrifices and expenses are to be borne by the different contributing interests on the basis of these Rules.
- That the onus of proof is upon the party claiming in general average to show that the loss or expense claimed is properly allowable as general average.
- That any extra expense incurred in place of another expense which would have been allowable as general average is deemed to be general average, but only up to the amount of the general average expense avoided.
- That the general principles contained in Rules A to G are amplified by numbered rules Ito XXII, dealing with specific points of practice.
- That the master should make a declaration of general average, as is required by the law and custom of the port, at a port of refuge and at a discharging port when general average damage to the cargo is suspected.

xii. Marine Insurance and liability **4hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- In general terms the purpose of marine insurance.
- What is meant by an insurable interest.
- briefly how insurance is arranged through brokers.
- The principle of 'utmost good faith'.
- The effect of misrepresentation or non- disclosure of material circumstances known to the assured.
- 'Warranty' and the effect on a marine insurance policy of breach of warranty.
- Briefly voyage policies, time policies and floating policies.
- What is meant by deviation and how the insurer is discharged from liability from the moment a ship deviates under a voyage policy.
- Permitted deviations.
- that a deviation clause will often permit the assured to extend his cover at a premium to be arranged, provided the insurer is given prompt notice of the deviation ('held covered' clause).
- The perils usually covered in a marine insurance policy.
- The use of 'Institute Clauses'.
- The 'duty of assured' clause ('Sue and Labour' clause).
- Partial loss, total loss and constructive total loss.
- What is meant by 'particular average'.
- The doctrine of subrogation.
- The function of Protection and Indemnity Associations (P and I clubs).
- Risks, liabilities and expenses covered by P and I clubs.

a. Noting and Extending Protests

Knowledge of;

- That a 'note of protest' is a declaration by the master of circumstances beyond his control which may give, or may have given, rise to loss or damage.
- That, although there is no requirement to use a special form, it is usual to do so.

- That statements under oath are taken from the master and other members of the crew and that such statements must be supported by appropriate entries in the log-book, which must be produced.
- Why protest should be noted at each discharging port and not just at the first port of call.

Familiarity with;

- That protests are made before a notary public, magistrate, consular officer or other authority.
- That protests should be noted as soon as possible, and in any case, within 24 hours of arrival in port.
- That, at the time of noting protest, the master should reserve the right to extend it.
- That protests concerning cargo damage should be made before starting to unload.
- That certified copes of the note of protest should be forwarded to the owners and one copy retained on board.
- That a note of protest is advisable when:
  - during the voyage the ship has experienced weather conditions which may result in damage to cargo the ship is in any way damaged, or there is reason to suspect that damage may have occurred
  - normal ventilation of perishable cargo has not been practicable on account of weather
  - cargo is shipped in such a condition that it is likely to deteriorate during the voyage (bills of lading must be appropriately endorsed)
  - the charterer or his agent commits any serious breach of the terms of the charter party
  - consignees fail to discharge cargo, take delivery or pay freight in accordance with the terms of a charter party or bill of lading any general average act has occurred
  - that, in cases where damage is found to have occurred, it is necessary to extend protest to support claims
  - that the master should consult his owner's agent about the local requirement and practice for extending a protest.
  - That the master must normally appear in person accompanied by a number, depending upon local custom, of crew members as witnesses.

b. Letter of Protest

Knowledge of;

- That a letter of protest, which may also be simply called a "protest", is a written communication intended to convey and record dissatisfaction on the part of the protester (the sender) concerning some matter over which the recipient has control, and holding the recipient responsible for any (legal or financial) consequences of the matter being complained of.
- That a letter of protest may help to substantiate a claim by the owner, or refute a claim by a charterer, harbour authority, etc., and may prove useful, if properly filed, in the resolution of a dispute long after the related event.
- That a letter of protest should not to be confused with a protest noted or lodged before a notary public or consul.
- That a letters of protest may be sent, in appropriate circumstances, by the master of any ship, large or small, in any trade, and can be expected to be received by the master of any ship. They are especially common (in both directions) in the tanker trades, where a variety of reasons give occasion for their sending.
- That letters of protest are in most cases in connection with cargo operations, although they may be written about almost any matter where there may be legal liability, whether there is a contractual arrangement between the employers of the sender and recipient (as in the case of cargo-related protests) or not (as in the case of a protest sent to the master of a closely berthed ship that is causing damage to the sender's ship).

- That some companies, especially those in the oil, gas or chemical trades, supply their masters with a stock of printed proforma protest forms phrased in the company's "house" style, while others expect their masters to compose suitable protest letters when required.

xiii. Stowaways **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That as per IMO Guidelines -a "stowaway" is defined as "a person who is secreted on a ship, or in a cargo which is subsequently loaded on the ship, without the consent of the shipowner or the master or any other responsible person, and who is detected on board after the ship has departed from a port and is reported as a stowaway by the master to the appropriate authorities".
- That an international convention relating to stowaways was adopted in Brussels in 1957, but it has not yet entered into force.
- That according to the P&I clubs (who deal with many stowaway incidents), certain parts of the world are high-risk areas for stowaways.
- That since the P&I clubs invariably have the latest intelligence on stowaway risks, masters should endeavour to obtain their latest club bulletins and information.
- That at any port in a high-risk area, great care should be taken to ensure that stowaways do not board, and the following safeguards should be observed:
  - A watch should be kept on the accommodation ladder or gangway.
  - Stevedores should only be allowed to work in restricted areas and a watch should be kept on them.
  - Open spaces should be closed as far as possible.
  - A search of the ship should be carried out before the ship sails.
  - All open-top containers on the quay should be checked. All containers on the quay should be stacked door-to-door, if possible.
- IMO has introduced various guidelines on stowaway matters, the latest being in Resolution A.871(20), adopted on 27 November 1997, and its Annex, "Guidelines on the Allocation of Responsibilities to seek the Successful Resolution of Stowaway Cases".
- That the guidelines in the resolution state that the resolution of stowaway cases is difficult because of different national legislation in the various countries involved, nevertheless, some basic principles can be applied generally.
- That as per the IMO guideline there are nine basic principles which can be applied generally with respect to stowaway cases, the second of these is that stowaway/asylum-seekers should be treated in compliance with international protection principles as set out in international instruments (including the UN Convention relating to the Status of Refugees of 28 July 1951 and the UN Protocol relating to the Status of Refugees of 31 January 1967) and relevant national legislation, the ninth is that stowaway incidents should be dealt with humanely by all parties involved. Due consideration should always be given to the operational safety of the ship and to the well-being of the stowaway.
- That Paragraph 5.1 of the IMO Guidelines lists responsibilities of the master in stowaway cases, which are as follows:
  - to make every effort to determine immediately the port of embarkation of the stowaway;
  - to make every effort to establish the identity, including the nationality/citizenship of the stowaway;
  - to prepare a statement containing all information relevant to the stowaway, in accordance with information specified in the standard document annexed to these Guidelines, for presentation to the appropriate authorities;
  - to notify the existence of a stowaway and any relevant details to his shipowner and appropriate authorities at the port of embarkation, the next port of call and the flag State;

- not to depart from his planned voyage to seek the disembarkation of a stowaway to any country unless repatriation has been arranged with sufficient documentation and permission for disembarkation, or unless there are extenuating security or compassionate reasons;
- to ensure that the stowaway is presented to appropriate authorities at the next port of call in accordance with their requirements;
- to take appropriate measures to ensure the security, general health, welfare and safety of the stowaway until disembarkation.

- The procedure to be adopted, in general, on the discovery at sea of stowaways, which is;
  - The owner or manager, as appropriate, should be contacted. The owner will normally contact the P&I club's managers to decide on a course of action. The P&I club's correspondent serving the next port of call will normally be contacted by the club managers. The correspondent should be able to advise what information will be required by port State and other officials.
  - An entry should be made in the Official Log Book recording the discovery of the stowaways.
  - The compartment or area in which the stowaways were found should be searched. Any documents or articles of clothing, etc. may give an indication of their place of origin. (Most countries only allow a stowaway to be landed if he has the necessary travel documents to return to his own country. Stowaways rarely have any documentation, however, and some will try to destroy all clues as to their identity.)
  - The clothing of the stowaways should be searched for indications as to their origin.
  - The agent at the next port of call should be contacted and instructed to advise the appropriate authorities of the port State of the presence of stowaways on board.
  - Each stowaway found should be individually interviewed in order to establish the following details:
    - name of stowaway;
    - stowaway's date and place of birth;
    - nationality of stowaway;
    - name, date and place of birth of either or both of the stowaway's parents;
    - postal and residential address of the stowaway and either parent;
    - stowaway's passport or seaman's book number, together with date and place of issue; and
    - stowaway's next of kin, if different from above.
  - The Stowaway Details Form contained in MGN 70 should be completed. The completed form should be copied by fax or e-mail to the agent and the P&I club correspondent at the next port of call.
  - Photographs of each stowaway should be taken and, where digital camera facilities are available, transmitted to the P&I club correspondent; these may enable travel documents to be obtained more quickly on the ship's arrival.
  - All stowaways should be housed in some part of the crew accommodation which can be locked when necessary.
  - The stowaways should not be locked in their accommodation when the vessel is at sea and well clear of land unless they are considered a threat to the safety of the ship or personnel on board. Consideration should be given, however, to the possibility of unguarded stowaways launching a liferaft or boat in an attempt to reach land.
  - The stowaways should be locked securely in their accommodation when the vessel approaches any port or nears any land. (Consideration should be given to the possibility of the stowaways' escape through open scuttles.)
  - The stowaways should be provided with adequate food, water, sanitary facilities, etc.
  - The stowaways should be treated in a humane manner.
  - The stowaways should not be made to work for their keep.

- The stowaways should not be signed on the Crew Agreement and should not be entered on any List of Crew. A "Stowaway List" should be made recording any known particulars, ready for production to port officials.
- Evidence of costs relating to the stowaway case, such as fuel, insurance, wages, stores, provisions and port charges, should be gathered to support the owner's claim on his P&I policy. (The owner's costs associated with the landing of stowaways are usually recoverable from his P&I club.)
- Full details of all events and particulars relating to the stowaway incident should be recorded in the Official Log Book, if necessary in an annexed document. (This may be used as part of any report required by owners, the club, etc.)

- That arriving with stowaways on board can have complications.
- That the IMO Guidelines on the Allocation of Responsibilities to seek the Successful Resolution of Stowaway Cases state (in paragraph 3) that the resolution of stowaway cases is difficult because of different national legislation in each of the potentially several countries involved: the country of embarkation, the country of disembarkation, the flag State of the vessel, the country of apparent, claimed or actual nationality/citizenship of the stowaway, and countries of transit during repatriation.
- That the IMO Guidelines on the Allocation of Responsibilities to seek the Successful Resolution of Stowaway Cases contain (in paragraph 4) certain basic principles which can be applied generally, the first of these is that there is recognition that stowaways arriving at or entering a country without the required documents are, in general, illegal entrants. Decisions on dealing with such situations are the prerogative of the countries where such arrival or entry occurs, the third is that the shipowner and his representatives on the spot, the master, as well as the port authorities and national Administrations, should co-operate as far as possible in dealing with stowaway cases.
- That in every case the agent should be notified of the presence of stowaways in advance of arrival .
- That under the U.S. Refugee Act 1980 a stowaway who arrives in the USA can request political asylum.
- That the Immigration and Naturalization Service (INS) has taken the position that shipowners are required to provide 24-hour armed guards during the entire asylum process which can take months.
- That there have been cases where the owner has incurred costs in excess of $1m for such detention.
- That many countries impose very heavy penalties (in some cases of over US$200,000) on masters who fail to ensure that stowaways are kept securely on board in port.

xiv. Ship's Agents and Agency **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That as per United Nations Conference on Trade and Development, UNCTAD MINIMUM STANDARDS FOR SHIPPING AGENTS, " Shipping agent" means any person (natural or legal) engaged on behalf of the owner, charterer or operator of a ship, or of the owner of cargo, in providing shipping services including;
  - Negotiating and accomplishing the sale or purchase of a ship;
  - Negotiating and supervising the charter of a ship;
  - Collection of freight and/or charter hire where appropriate and all related financial matters;
  - Arrangements for Customs and cargo documentation and forwarding of cargo;
  - Arrangements for procuring, processing the documentation and performing all activities required related to dispatch of cargo;
  - Organizing arrival or departure arrangements for the ship;
  - Arranging for the supply of services to a ship while in port
- The authority of the agency and where it may be actual authority or apparent authority (also called ostensible authority).
- That actual authority may be express or implied.

- That an exception to this would be where the principal has expressly placed a restriction on the implied authority of the agent, e.g. where the master is expressly prohibited from signing bills of lading.
- The different types of agent and agency.
- That agents are normally either general agents or special agents.
- That a general agent is an agent who has authority to act for his principal in all matters concerning a particular trade or business, or of a particular nature, many liner agents, for example, act as general agent in a particular city or country for one or more carriers.
- That a special agent is an agent appointed for the carrying out of particular duties which are not part of his normal business activities.
- That a special agent's authority is therefore limited by his actual instructions, most port agents are special agents since their authority does not extend beyond their actual instructions.
- That shipmasters are similarly special agents for purposes of engaging and discharging crew, purchasing ships' stores and bunkers, and making salvage agreements in certain cases.
- That under the terms of voyage charters port agents are normally appointed, and therefore paid for,by the shipowner. However, many voyage charterers insist on nominating port agents, and are entitled to do so if the charter party is suitably claused to that effect.
- Where a charter party provides that "the vessel shall be consigned to Charterers' agents....", it means that the charterer will nominate agents.
- That when on a time charter, most of the "voyage costs" associated with earning the freight or other revenue are normally for the time charterer's account, and it can be expected that port agents will be appointed by the charterer in order to look after his commercial interests.
- That the charterer's obligation to provide and pay for agents may be in a "Charterers to provide" clause, or a separate Agency Clause or Consignment Clause.
- That any "protecting" or "husbandry agent" used will be nominated and appointed by the shipowner.
- that the shipping agents have to adhere to a Code of professional conduct given in United Nations Conference on Trade and Development, UNCTAD Minimum Standards For Shipping Agents, which states that the shipping agent shall:
  - discharge his duties to his principal(s) with honesty, integrity and impartiality;
  - apply a standard of competence in order to perform in a conscientious, diligent and efficient manner all services undertaken as shipping agent;
  - observe all national laws and other regulations relevant to the duties he undertakes;
  - exercise due diligence to guard against fraudulent practices;
  - exercise due care when handling monies on behalf of his principal(s)

Familiarity with;

- that express authority is given by words (spoken or written) such as when an officer is appointed by letter to command of a ship and authority is implied when it is inferred by the conduct of the parties and the circumstances of the case, such as when a shipmaster is appointed to command by a shipowner, who thereby impliedly authorises him to carry out, on the owner's behalf, all the usual things that fall within the scope of a master's position, e.g. engagement and discharge of crew, signing of bills of lading, and purchasing of provisions.
- that an agent's duties to his principal are:
  - to perform his duties in person, using ordinary skill and diligence, and if he purports to have special skills, to use his special skills also;
  - to obey lawful instructions of his principal, and when he is not instructed on a particular matter, to act in his principal's best interests;
  - to disclose all information relevant to the agency to the principal, avoiding any conflict of interest;

- to maintain confidentiality about matters communicated to him as agent, and not to disclose them to prospective third parties;
- to keep proper accounts of all transactions and render them to his principal on request;
- not to make extra profits from the agency without disclosing them to his principal

xv. Port of refuge procedures 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That a "port of refuge" is a port or place that a vessel diverts to when her master considers it unsafe to continue the voyage due to a peril that threatens the "common safety", e.g. when there is a dangerous ingress of water into the vessel, a dangerous shift of cargo, the vessel adopts an angle of loll, there is a serious fire on board, etc.
- That where such a deviation is for the preservation from peril of property involved in a common maritime adventure, it will usually constitute a general average act and the costs of the deviation to and stay at the port of refuge will be allowed in general average.
- That where the shipowner or carrier is a party to a contract of carriage, discontinuation of the voyage is a deviation from the contract.
- That a deviation to a port of refuge will be regarded as a justifiable deviation if the reason can be shown to be a valid one within the terms of the contract. All contractual rights would, in that case, be unaffected.
- that if the reason for deviating could not be shown to be valid, the deviation would be considered unjustifiable and the consequences could be severe for the shipowner or carrier, in that it would probably constitute a repudiatory breach of the contract, making the owner/carrier liable for all costs of any accident to ship or cargo sustained during the deviation.
- that Valid reasons for deviating to a port of refuge usually include:
  - weather, collision or grounding damage affecting seaworthiness of the ship;
  - serious fire;
  - dangerous shift of cargo;
  - serious machinery breakdown;
  - any other accident causing some serious threat to the vessel and cargo;
  - shortage of bunkers (if it can be proved that the vessel left port with adequate bunkers for the foreseeable voyage, and ran short as a consequence of weathering exceptionally severe weather, contamination, etc.)
- That a "Port of refuge" is a term usually associated with a general average act since, under the York-Antwerp Rules, certain costs and expenses incurred in making for, entering, staying at and leaving a port or place of refuge, even where the ship returns to her port or place of loading, are admitted as general average.
- Describes the explanation given in Rule X for expenses at port of refuge provided in the York-Antwerp Rules.
- That a port or place where a vessel seeks temporary shelter from adverse weather is not a port of refuge, since running for shelter is "ordinary" practice and not "extraordinary" in the context of Rule A of the York-Antwerp Rules.
- That a "common maritime adventure" is said to be terminated on completion of discharge of cargo (or disembarkation of passengers) at the port of destination following a general average act. If the voyage is abandoned at an intermediate port (e.g. a port of refuge), then the adventure terminates at that port.
- That a declaration of general average should be formally made in compliance with local law and custom before delivery of cargo at the termination of the voyage, in order to initiate an adjustment.

- That the declaration is usually made by the shipowner or the master, but in some countries any one of the interested parties may make it. The owners or agent should be able to advise on local requirements.
- The procedure for any particular port or place of refuge in general, the following basic steps should be followed.
  - As soon as the decision is taken to discontinue the voyage and make for a port or place of refuge, (whether under tow or otherwise) inform the owner and charterer (if any), stating the reason for the deviation.
  - Record the ship's position. Sound tanks for quantity of bunkers on board. From this point until departure from the port or place of refuge, keep accurate records of events and expenditure, etc., for eventual delivery to the owner and average adjuster.
  - Request the owner to arrange the appointment of an agent at the port of refuge to handle the vessel's visit.
  - If the cause of the deviation is an "accident" inform MAIB.
  - Call the agent as soon as his identity is known. Pass ETA and information necessary for making preparations for the vessel's arrival, including tonnage, length, flag, P&I club, classification society, etc. Request the agent to notify:
    - port State Administration if vessel is damaged or seaworthiness is affected;
    - harbour master or port authority. Inform port authority of the full facts, as the authority may want to keep vessel outside port until cargo discharged, etc. Give details of the nature and severity of damage, mentioning any disabled navaids, steering gear, machinery, etc. State any pollution hazard.
    - Pilot station, linesmen, boatman, customs, port health, immigration, etc.
    - Local correspondent of the owner's P&I club. (See club handbook for name and address, or ask owners.) A representative from the correspondent firm, or a surveyor appointed by the correspondent, should attend on arrival.
  - On arrival at the port or place of refuge, the salvor (if any) will require salvage security, which should be arranged by the owner and cargo owners. Failing this, the salvor may have vessel arrested pending satisfaction of his claim.
  - Obtain health clearance in accordance with local regulations (as advised by the agent).
  - Enter vessel in with customs "under average".
  - Inform the owner (and charterer, if any) of vessel's safe arrival.
  - Owners will declare general average. (Any of the parties involved may declare general average, but the owners will normally do this since they are closest to "the action".)
  - Note protest as soon as possible but in any case within 24 hours, in compliance with local custom (ask the agent about this), reserving the right "to extend at a time and place convenient".
  - Where there is hull or machinery damage, the agent should be requested to notify local Lloyd's Agent (a requirement of the Notice of Claim and Tenders Clause in Institute Time Clauses - Hulls 1.10.83).
  - Hull and machinery underwriters normally instruct a surveyor, in major cases from the Salvage Association
  - Where there is hull or machinery damage, a class surveyor, if available at the port, will inspect and report on the damage, stipulating repairs necessary for the vessel to maintain class. Temporary repairs may be acceptable.
  - If no class surveyor is available, the class society should be contacted, and will advise the appropriate steps to take in order for class to be maintained until a port can be reached for survey, the old practice of requesting two independent masters or engineers to inspect temporary repairs and issue a Certificate of Seaworthiness should no longer be necessary. Even where a class surveyor cannot reach a damaged ship, the classification society can usually be notified of the damage and asked for instructions.

- If cargo damage is probable, or cargo discharge is necessary before repairs can be made, call a hatch survey before commencing discharge. Employ only registered and unbiased surveyors recommended by the P&I club correspondent. Cargo interests should be notified so that they can appoint their own surveyors. Remember that cargo surveyors are appointed by cargo interests and may criticise the master's actions or allege that the vessel was unseaworthy. Be guided by the P&I club correspondent as to who to allow on board and about making statements which may adversely affect the owner's legal position.
- If the voyage is being terminated and cargo owners are taking delivery of their consignments, General Average Bond and General Average Guarantee forms will first have to be signed. The owner's lien on cargo should be exercised if necessary; this should be discussed with the owner and agent.
- Arrange cargo discharge (under survey) and either trans-shipment or warehousing of cargo during the repairs, if necessary. (This will depend on the length of time in port, nature of cargo, etc.)
- On receipt of class surveyor's report re-hull/machinery damage, the owner will advertise for tenders.(Superintendents and the Salvage Association surveyor will jointly attend to this, bearing in mind the Notice of Claim and Tenders Clause and underwriters' power of veto. Tenders should only be accepted with guidance from Salvage Association surveyor and Lloyd's or IUA Agent.)
- Carry out repairs under class and Salvage Association surveyors' guidance.
- On completion of repairs, class surveyor will carry out another survey. If, in his opinion, the vessel is seaworthy he will issue an Interim Certificate of Class, and will send his report to the classification society. If acceptable to the society's committee, the vessel will retain class. If the class surveyor is employed by an authorised society, he may also issue provisional statutory certificates on behalf of MCA (or other flag State Administration) to enable the vessel to continue her voyage.
- Reload cargo (under survey) if voyage being continued.
- Extend Protest to include all details of the damage and repairs. Obtain copies for owners.
- Port agent will pay repairers. (If unpaid, repairers will have a maritime lien on the vessel.) Allow general average and Salvage Association surveyors (representing H&M insurers) to see the agent's account before paying.
- Send all relevant documents to the owner for onwards delivery to the average adjuster.
- Enter vessel outwards with Customs (in accordance with local regulations, as advised by the agent). Obtain outwards clearance.
- Continue the voyage.

- that in most general average cases the main evidence required for the adjustment comes from the various survey reports, supported by statements by witnesses and ship's records
- the evidence required at port of refuge as listed below:
  - full and accurate records should be kept of the general average incident and the call at the port of refuge, including details of all the various parties involved and their actions
  - photographs and video footage may be useful; the general average statement may take more than a year to produce
  - where salvage services are engaged, a full record should be kept of the salvor's actions and of the equipment used by both parties
  - in order to assess the various contributory values, the average adjuster will require the following documents:
    - all general average security documents including signed average bonds, average guarantees, counterfoils of average deposit receipts and cancelled deposit receipts;
    - casualty reports from the master;
    - certified extracts from deck and engine room logs;
    - copies of extended protests;

- survey reports on hull and machinery damage;
- survey reports on cargo lost or damaged by general average sacrifice;
- account sales of any cargo sold;
- copies of any shipping invoices;
- copies of telexes;
- accounts for disbursements incurred together with all supporting vouchers;
- cargo valuation forms;
- manifest of cargo onboard at time of the general average act;
- copies of bills of lading;
- portage account for the voyage, and an account of stores consumed;
- Any other evidence relating to the casualty.

xvi. The master / pilot relationship **2hrs (T) + 0hrs (P) + 0hrs (E).**

Knowledge of;

- That the law in most countries regards a ship's pilot as being merely an advisor to the master, without having command, navigational control or charge of the vessel.
- That in almost every country (with the notable exception of Panama, where Panama Canal pilots have extraordinary responsibility and powers, the master has full responsibility for the navigation and manoeuvring of his ship during all acts of pilotage.
- That the master should generally:
  - follow the pilot's advice unless he has good reason to believe that following it will endanger the ship;
  - see that the ship's navigation is monitored (including plotting fixes/positions on charts) as if there were no pilot on board;
  - insist that the pilot takes all reasonable precautions;
  - ensure that officers, helmsmen, etc. attend to the pilot's requests with efficiency and courtesy;
  - instruct the officer-of-the-watch that he has charge of the vessel whilst under pilotage, unless specifically informed otherwise by the master;
  - Always state his opinion to the pilot on important matters of navigation and manoeuvring.
  - warn the pilot if it appears that the pilot is taking or proposing to take any action of which the master disapproves

Familiarity with;

- That the pilot's duty is restricted to advising the master of local conditions affecting safe navigation.
- That Paragraph II.6 of Memorandum of Understanding Between the National Response Team and the Panama Canal Commission, dated December 12, 1997, the Pilotage in the Panama Canal provides: "Ships operating in the Panama Canal come under the direction of a Panama Canal Pilot who assumes operational control of the ship when it enters the Canal, unlike pilots in other locales who act as advisors to the Master of the ship. The Panama Canal Pilots are employees, or agents, of the PCC making the PCC effectively the ship operator for the time the ship is under the control of a Panama Canal Pilot".
- That examples of cases where the master should interfere are:
  - where the pilot is incapable through apparent illness, drink or drugs;
  - where the pilot gives orders to the helmsman which will, if carried out, result in a breach of the law

That the shipowner is generally liable for the consequences of negligent navigation whilst the ship is under pilotage.

.7 Responsibilities under International Instruments affecting the Safety of the Ship, Passengers, Crew and Cargo 4hrs (T) + 0hrs (P) + 0hrs (E).

i. Ballast Water Convention 2004

Knowledge of;

- The application of this convention.
- The conditions where the application of this convention may be exempted.
- The management and control requirement based on Section B Regulation B1 to B6.
- The Annex – Section A, B, C, D and E briefly.
- The standards that need to be observed in ballast water exchange.
- That in accordance with SOLAS Chapter V, Regulation 28 – Records of navigational activities and daily reporting, the commencement and termination of the operation should be recorded.
- That the navigational records generated during ballast water exchange may be reviewed during ISM Audits and port state control inspections.

Understanding of;

- The following:
  - ballast water
  - ballast water management
  - sediments

Familiarity with;

- Under Regulation B-4 Ballast Water Exchange, all ships using ballast water exchange should:
  - Whenever possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 metres in depth, taking into account Guidelines developed by IMO;
  - In cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 metres in depth
- As per Annex – Section B Management and Control Requirements for Ships:
  - Ships are required to have on board and implement a Ballast Water Management Plan approved by the Administration (Regulation B-1). The Ballast Water Management Plan is specific to each ship and includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices.
- That a new paragraph, 4, has been added with effect from July 1, 2010 to SOLAS Chapter V, Regulation 22 – Navigation bridge visibility. Some changes are operational and others introduce new requirements applicable to navigation records.
- That as a consequence of this amendment, any increase in blind sectors or reduction in horizontal fields of vision resulting from ballast water exchange operations is to be taken into account by the Master before determining that it is safe to proceed with the exchange.
- That as an additional measure, to compensate for possible increased blind sectors or reduced horizontal fields of vision, the Master must ensure that a proper lookout is maintained at all times during the exchange. Ballast water exchange must be conducted in accordance with the ship's ballast water management plan, taking into account the recommendations adopted by the IMO.

ii. Port State Control

Knowledge of;

- That "Port State control" is the inspection of foreign ships present in a nation's ports for the purpose of verifying that the condition of the ships and their equipment comply with the provisions of international conventions and codes, and that the ships are manned and operated in compliance with those provisions.
- That the primary responsibility for maintaining ships' standards rests with their flag States, as well as their owners and masters. However, many flag States do not, for various reasons, fulfill their obligations under international maritime conventions, and port State control provides a useful "safety net" to catch substandard ships.

Familiarity with;

- that a "Port State Control regime", where set up under a "memorandum of understanding" ("MOU") or similar accord between neighbouring port States, is a system of harmonised inspection procedures designed to target substandards ships with the main objective being their eventual elimination from the region covered by the MOU's participating States.
- That there are eight international PSC agreements currently in force world-wide.
- How to ascertain which port state agreement a particular port state might be party to and any areas of particular focus that may currently be in place.
- That the US Coast Guard operates a national Port State Control Initiative.
- That the list of certificates and documents which are checked during the inspection are:
  - International Tonnage Certificate (1969);
  - Passenger Ship Safety Certificate;
  - Cargo Ship Safety Construction Certificate;
  - Cargo Ship Safety Equipment Certificate;
  - Cargo Ship Safety Radio Certificate;
  - Exemption Certificate;
  - Cargo Ship Safety Certificate;
  - Document of Compliance (SOLAS 74, regulation II-2/54);
  - Dangerous Goods Special List or Manifest, or Detailed Stowage Plan;
  - International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk, or the Certificate of Fitness for the Carriage of Liquefied Gases in Bulk, whichever is appropriate;
  - International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, or the Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, whichever is appropriate;
  - International Oil Pollution Prevention Certificate;
  - International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk;
  - International Load Line Certificate (1966);
  - International Load Line Exemption Certificate;
  - Oil Record Book, parts I and II;
  - Shipboard Oil Pollution Emergency Plan;
  - Cargo Record Book;
  - Minimum Safe Manning Document;
  - Certificates of Competency;
  - Medical certificates (see ILO Convention No. 73);
  - Stability information;
  - Safety Management Certificate and copy of Document of Compliance (SOLAS chapter IX);

- Certificates as to the ship's hull strength and machinery installations issued by the classification society in question (only to be required if the ship maintains its class with a classification society);
- Survey Report Files (in case of bulk carriers or oil tankers in accordance with resolution A.744(18));
- For ro-ro passenger ships, information on the A/A max ratio;
- Document of authorization for the carriage of grain;
- Special Purpose Ship Safety Certificate;
- High-Speed Craft Safety Certificate and Permit to Operate High-Speed Craft;
- Mobile Offshore Drilling Unit Safety Certificate;
- For oil tankers, the record of oil discharge monitoring and control system for the last ballast voyage;
- The muster list, fire control plan and damage control plan;
- Ship's log-book with respect to the records of tests and drills and the log for records of inspection and maintenance of life-saving appliances and arrangements;
- Procedures and Arrangements Manual (chemical tankers);
- Cargo Securing Manual;
- Certificate of Registry or other document of nationality;
- Garbage Management Plan;
- Garbage Record Book;
- Bulk carrier booklet (SOLAS chapter VI regulation 7); and
- Reports of previous port State control inspections

- That in addition to the general control of above listed certificate and documents, examinations / inspections of the following are generally given priority by Port State Control Officer (PSCO):
  - Nautical publication (SOLAS 74 R V/20)
  - Navigational equipment (SOLAS 74 R V/12 and 19)
  - Emergency starting and running tests (SOLAS 74 R II-2 - 4.3)
  - Lifesaving equipment. Rafts FF (SOLAS 74 R III/20, 23, 26 and 29)
  - Emergency Generator (start/stop only) (SOLAS 74 R II-1/42&43)Hull corrosion and damages (Load Lines) (SOLAS 74 R I/11)
  - Main engine & aux. engines (SOLAS 74 R II/26, 27 &28)
  - Oily water separator 15 ppm alarm (MARPOL Annex I/16(1))
  - Oil discharge monitor (ODM) (MARPOL Annex I/16)
  - Charts corrected and proper scale (SOLAS 74 R V/20)
  - Fire safety Control plan (SOLAS 74 R II-2/20)
  - Ventilation inlets/outlets (SOLAS 74 R II-2/16.9 & 48)
  - Emergency training and drills (Log book rec. SOLAS 74 R III/18)
  - Emergency lighting/batteries (SOLAS 74 R II/42 &43)
  - Deck- and hatches corrosion and damages (LL 1966)
  - Steering gear – incl. auxiliary & emergency (Bridge inspection only – SOLAS 74 R V/19)
  - Cleanliness in engine room (SOLAS 74 R II-1/26 and ILO 134)
  - Cleanliness in accommodation (ILO 92 & 133)
- That the Port State Control Inspections may be conducted on the following basis:
  - initiative of the Port State Administration;
  - the request of, or on the basis of, information regarding a ship provided by another Administration
  - information regarding a ship provided by a member of the crew, a professional body, an association, a trade union or any other individual with an interest in the safety of the ship, its crew and passengers, or the protection of the marine environment.
- That the PSC inspections may be on random, targeted or periodical basis. The following types of PSC inspections are used in PSC:

- Initial Inspection (random)
- More detailed inspection (escalated)
- Expanded inspection (targeted/periodical)

- That the definition of Inspection is: "A visit on board a ship to check both the validity of the relevant certificates and other documents, and the overall condition of the ship, its equipment, and its crew".
- That the certificates and documents listed above should therefore be readily available and presented to the PSCO at his request during the PSC inspection.
- That the definition of more detailed inspection is: "An inspection conducted when there are clear grounds for believing that the condition of the ship, its equipment, or its crew does not correspond substantially with the particulars of the certificates".
- That the definition of Clear grounds is: "Evidence that the ship, its equipment, or its crew does not correspond substantially with the requirements of the relevant conventions or that the master or crew members are not familiar with essential shipboard procedures relating to the safety of ships or the prevention of pollution".
- That "Clear grounds" to conduct a more detailed inspection include:
  - the absence of principal equipment or arrangements required by the conventions;
  - evidence from a review of the ship's certificates that a certificate or certificates are clearly invalid;
  - evidence that documentation required by the conventions are not on board, incomplete, are not maintained or are falsely maintained;
  - evidence from the PSCO's general impressions and observations that serious hull or structural deterioration or deficiencies exist that may place at risk the structural, watertight or weathertight integrity of the ship;
  - evidence from the PSCO's general impressions or observations that serious deficiencies exist in the safety, pollution prevention or navigational equipment;
  - information or evidence that the master or crew is not familiar with essential shipboard operations relating to the safety of ships or the prevention of pollution, or that such operations have not been carried out;
  - indications that key crew members may not be able to communicate with each other or with other persons on board;
  - the emission of false distress alerts not followed by proper cancellation procedures;
  - receipt of a report or complaint containing
  - information that a ship appears to be substandard.
- That the PSCO during a more detailed inspection generally take the following into account:
  - structure;
  - machinery spaces;
  - conditions of assignment of load lines;
  - life-saving appliances;
  - fire safety;
  - regulations for preventing collisions at sea;
  - Cargo Ship Safety Construction Certificate;
  - Cargo Ship Safety Radio Certificates;
  - equipment in excess of convention or flag State requirements;
  - guidelines for discharge requirements under Annexes I and III of MARPOL 73/78 which includes:
    - inspection of crude oil washing (COW) operations;
    - inspection of unloading, stripping and prewash operations;
    - guidelines for control of operational requirements – which include:
    - muster list;
    - communication;
    - fire drills;

  - abandon ship drills;
  - damage control plan and Shipboard Oil Pollution Emergency Plan;
  - fire control plan;
  - bridge operation;
  - cargo operation;
  - operation of the machinery;
  - manuals, instructions etc.;
  - oil and oily mixtures from machinery spaces;
  - loading, unloading and cleaning procedures for cargo spaces of tankers;
  - dangerous goods and harmful substances in packaged form;
  - garbage;
- minimum manning standards and certification;
- STCW 78;
- ISM; and
- ISPS Code.

- That expanded inspection is an inspection conducted according to non-mandatory guidelines only once during 12 months period for certain types of ships and certain categories of age and size.
- That Oil tankers, bulk carriers, gas and chemical carriers and passenger ships are subject to expanded inspections once during a period of 12 months.
- The IMO RESOLUTIONS pertaining to Port State Controls are as follows:
  - A.9/Res.321 Procedures for the control of ships 12/11/1975
  - A.12/Res.466 Procedures of port state control 19/11/1981
  - A.15/Res.597 Amendments to the procedures for the control of ships 19/11/1987
  - A.19/Res.787 Procedures for port state control 23/11/1995
  - A 21/Res.882 Amendments to the procedures for port state control (Resolution A.787(19) 25/11/1999
- That the publication by IMO which gives the General Procedural Guidelines for Port State Control Officers are also of particular relevance to shipmaster.
- That a record of port State control inspections including safety-related details of many ships is available on the internet from the Equasis database and may be viewed by any member of the public.
- That Equasis forms part of the Quality Shipping campaign launched by the EU in 1997 which is formally supported by signatories from marine Administrations, classification societies, P&I clubs and the ITF.
- That more than 40 organisations provide information to Equasis and is used heavily by charterers and insurers as well as marine Administrations with port State control functions.

.8 Methods and Aids to Prevent Pollution of the Marine Environment by Ships 2hrs (T) + 0hrs (P) + 0hrs (E).

i. Convention of the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Dumping Convention) (LDC)

Knowledge of;

- The aims of the Convention.
- That the provisions of Article IV do not apply when d is necessary to secure the safety of human life or of vessels in cases of 'force majeure' caused by stress of weather, or in any case which constitutes a danger to human life or a real threat to vessels.
- That the appropriate authority of a Contracting Party should issue prior special or general permits in respect of matter intended for dumping:
  - loaded in its territory
  - loaded by a vessel flying its flag when the loading occurs in the territory of a State not party to the Convention

Understanding of;

- For the purpose of the Convention:
  - dumping
  - wastes or other matter
  - special permit
  - general permit

Familiarity with;

- That the dumping of wastes or other matter in whatever form or condition, as listed in annex I, is prohibited.
- That the dumping of wastes or other matter listed in annex II requires a prior special permit.
- That the dumping of all other wastes or mater requires a prior general permit.
- That such dumping should be done so as to minimize the likelihood of damage to human or marine life and must be reported immediately.
- That the Addendum to Annex I contains regulations on the incineration of wastes at sea.

ii. International Convention Relating to Intervention on the high Seas in Cases of Oil Pollution Casualties, 1969

Knowledge of;

- The rights of Parties to the Convention to intervene on the high seas following a maritime casualty.
- The provisions which a coastal State should apply when exercising the right to take measures in accordance with Article I.

Understanding of;

- For the purposes of the Convention:
  - maritime casualty
  - ship
  - oil
  - related interests

iii. Protocol relating to Intervention on the High Seas in Cases of Pollution by Substances other than Oil, 1973

Knowledge of;

- The rights of Parties to the Protocol to intervene on the high seas following a maritime casualty.
- That the Protocol extends the rights and obligations of coastal States to cases involving imminent threat of pollution by substances other than oil.

Understanding of;

- 'Substances other than oil'.

iv. International Convention on Civil Liability for Oil Pollution Damage, 1969 (CLC 1969)

Knowledge of;

- That, with certain exceptions, the owner may limit his liability by constituting a fund for the sum representing the limit of his liability with the Court of a Contracting States where the action is brought.
- That where a fund has been constituted and the owner is entitled to limit his liability, no person having a claim for pollution damage resulting from that incident is entitled to exercise any rights over other assets of the owner and that the ship or any other property belonging to the owner should be released.

Familiarity with;

- That no claim for compensation may be made against the servants or agents of the owner.
- That claims in respect of expenses reasonably incurred by the owner voluntarily to prevent or minimize pollution damage rank equally with other claims against the fund.
- That the owner of a ship registered in a Contracting State and carrying more than 2,000 tons of oil in bulk as cargo is required to maintain insurance in the sum of his limit of liability.
- That the appropriate authority of a Contracting State, after determining that the requirements have been, complied with, should issue a certificate attesting that insurance or other financial security is in force.
- That the certificate should be carried on board ship and a copy deposited with the relevant authorities.
- That a contracting state must not permit a ship under its flag to which this article applies to trade without a certificate.
- That contracting states must ensure under their national legislation, that insurance or other security is in force in respect of any ship, whenever registered, entering or leaving their ports of offshore terminals if the ship actually carries more than 2,000 tons of oil in bulk as cargo.

.9 National legislation for implementing international agreements and conventions 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The process by which international agreements and conventions are ratified and implemented into national legislation.

COMPETENCE 3.3 Maintain Safety and Security of Crew and Passengers and the Operational Condition of all Safety Equipment

3.3.1 Life-Saving Appliance Regulations (SOLAS)

.1 Life-Saving Appliance Regulations (SOLAS) 2hrs (T) + 0hrs (P) + 0hrs (E).

Demonstrate

- Thorough knowledge of the regulations concerning life-saving appliances and arrangements (SOLAS), including the LSA Code.

3.3.2 Organization of Fire and Abandon Ship Drills

.1 Organization of Fire and Abandon Ship Drills 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Ways in which crew can be motivated to participate fully in drills.
- The process for ensuring that required changes are made to the safety management system and on board procedures as a result of the lessons learnt from drills.

Ability to;

- Prepares schedules for the conduct of fire and abandon ship drills so that all required drills and equipment are covered within required timeframes.
- Prepares plans for effective drills.
- Organizes effective drills including the briefing, conduct and debriefing of the drill.

3.3.3 Maintenance of operational condition of Life-saving, Fire-fighting and Other Safety Systems

.1 Maintenance of operational condition of Life-saving, Fire-fighting and Other Safety Systems 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The use and upkeep of the SOLAS training manual in terms of the safety equipment provided and the required maintenance of this equipment.

Ability to;

- Prepares procedures and checklists for the inspection of lifesaving, fire fighting and other safety systems on board.
- Ensures that regular inspections of lifesaving, fire fighting and other safety systems on board are undertaken and that any deficiencies are identified and rectified.
- Prepare procedures and schedules for the maintenance of lifesaving, fire fighting and other safety systems on board.
- Prepares schedules for the required survey of lifesaving, fire fighting and other safety systems on board.
- Prepares for and supports the survey of lifesaving, fire fighting and other safety systems on board.
- Prepares procedures and checklists for the inspection of watertight doors, side scuttles, cross flooding arrangements valves and other closing mechanisms.

- Prepares maintenance plans and procedures for watertight doors, side scuttles, cross flooding arrangements, valves and other closing mechanisms.

3.3.4 Actions to be taken to Protect and Safeguard all Persons on Board in Emergencies

.1 Actions to be taken to Protect and Safeguard all Persons on Board in Emergencies 4hrs (T) + 0hrs (P) + 0hrs (E).

Familiarity with;

- That some crew members will be assigned specific duties for mustering and control of passengers
- Those duties as:
  - warning the passengers
  - ensuring that all passenger spaces are evacuated
  - guiding passengers to muster stations
  - maintaining discipline in passageways, stairs and doorways
  - checking that passengers are suitably clothed and that life jackets are correctly donned
  - taking a roll-call of passengers
  - instructing passengers on procedure for boarding survival craft or jumping into the sea
  - directing passengers to embarkation stations
  - instructing passengers during drills
  - ensuring that a supply of blankets is taken to the survival craft

i. Rescue of Persons from a Vessel in Distress or from a Wreck

Knowledge of;

- How both ships can spread oil in rough weather.
- The preparations for taking survivors on board from the boats.
- How to provide a lee and launch boats.
- How boats should approach the wreck and pick up survivors.
- The recovery of boats and survivors.
- The methods of rescue which may be used when sea conditions are too dangerous to use boats.

Familiarity with;

- Why it is preferable to wait for daylight when no immediate danger exists.
- That communications should be established between the ships and the method of rescue agreed upon when time permits.
- That rescue boats or motor-lifeboats would be used if conditions permitted.
- That unnecessary equipment should be removed from the boats and replaced by lifejackets, if buoys, blankets and a portable VHF radio.
- That the rescue vessel should reconnoitre the area to see if there is any wreckage which could be a danger to boats.

ii. Man-overboard Procedure

Knowledge of;

- Methods of recovering a person from the sea when heavy weather prevents the use of the normal manoeuvres and boats.
- The actions to take when a person is reported missing at sea.

3.3.5 Actions to Limit Damage and Salve the Ship following a Fire, Explosion, Collision or Grounding

.1 Means of limiting damage and salving the ship following a fire or explosion 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- The use and limitations of standard procedures and prepared contingency plans in emergency situations.
- Methods of fighting fires.
- The dangers of accumulated water from fire fighting and describes how to deal with it.
- The precautions to take before entry to a compartment where a fire has been extinguished.
- The inspection for damage.
- Measures which may be taken to plug holes, shore-up damaged or stressed structure, blank broken piping, make safe damaged electrical cables and limit ingress of water through a damaged deck or superstructure.

Familiarity with;

- That cooling of compartment boundaries where fire has occurred should be continued until ambient temperature is approached.
- That watch for re-ignition should be maintained until the area is cold.
- The measures to be taken when the inert-gas main and gas lines to a mast riser are fractured.
- That continuous watch should be kept on the damaged area and temporary repairs.
- That course and speed should be adjusted to minimise stresses and the shipping of water.

.2 Procedure for Abandoning Ship 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- That a ship should only be abandoned when imminent danger of sinking, breaking up,fire or explosion exists or other circumstances make remaining on board impossible.
- That a distress call should be transmitted by all available means until acknowledged.
- The information to include in the distress message.
- Other distress signals which may be used to attract attention.
- The launching of boats and liferafts when the ship is listing heavily.
- The launching of boats and liferafts in heavy weather conditions.
- The use of oil to calm the sea surface and explains why fuel oil is not suitable.

Competence: 3.4 Develop emergency and damage control plans and handle emergency situations

3.4.1 The preparation of contingency plans for response to emergencies

.1 Contingency plans for response to emergencies 6hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Options for the division of the crew, e.g., into a command team, an emergency team, a back-up emergency team and an engine-room emergency team.
- The composition of the emergency teams in the above objective.
- How drills and practices should be organized.
- The role of a shipboard safety committee in contingency planning.

Familiarity with;

- That crew members not assigned to emergency teams would prepare survival craft, render first aid, assemble passengers and generally assist the emergency parties as directed.
- That the engine-room emergency team would take control of engine-room emergencies and keep the command team informed.
- That good communications between the command team and the emergency teams are essential.

Ability to;

- Draws up a muster list and emergency instructions for a given crew and type of ship.
- assigns duties for the operation of remote controls such as:
  - main engine stop
  - ventilation stops
  - lubricating and fuel oil transfer pump stops
  - dump valves
  - CO2 discharge
  - watertight doors
  - and for the operation of essential services such as:
    - emergency generator and switchboard
    - emergency fire and bilge pumps
- Designates muster positions for the command team, both at sea and in port.
- Designates muster positions for the emergency teams.
- prepare contingency plans to deal with:
  - fire in specific areas, such as galley, accommodation, container stows on or under deck, engine-room or cargo space, including co-ordination with shore facilities in port, taking account of the ship's fire-control plan
  - rescue of victims of a gassing accident in an enclosed space
  - water ingress into the ship
  - serious shift of cargo
  - piracy attack
  - being towed by another ship or tug
  - heavy-weather damage, with particular reference to hatches, ventilators and the security of deck cargo
  - rescue of survivors from another ship or from the sea
  - leakages and spills of dangerous cargo stranding
  - abandoning ship

i. Actions to be taken when Emergencies Arise in Port

Knowledge of;

- Actions to take in the event of fire on own ship, with particular reference to co-operation and communication with shore facilities.
- Action which should be taken when fire occurs on a nearby ship or an adjacent port facility.
- The circumstances in which a ship should put to sea for reasons of safety.
- The actions to be taken when own ship is dragging anchor towards dangers in port.
- The actions which can be taken to avoid a ship dragging anchor towards own ship in an anchorage.
- The actions and precautions to take when a submarine cable is lifted by the anchor.
- How to buoy and slip an anchor.

- How an anchor may be recovered when no power is available at the windlass.

3.4.2 Ship construction including damage control

.1 Flooding of compartments 4hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- What is meant by 'floodable length'?
- What is meant by 'permissible length of compartments' in passenger ships?
- The significance of the factor of subdivision.
- The assumed extent of damage used in assessing the stability of passenger ships in damaged condition.
- With reference to the factor of subdivision, the extent of damage which a passenger ship should withstand.
- The provisions for dealing with asymmetrical flooding.
- The possible effects of sustaining damage when in a less favourable condition.
- Ships of Type 'A' and Type 'B' for the purposes of computation of freeboard.
- The extent of damage which a Type 'A' ship of over 150 metres length should withstand.
- That a Type 'A' ship of over 150 metres length is described as a 'one - compartment ship.
- The requirements for survivability of Type 'B'ships with reduced freeboard assigned.
- The equilibrium conditions regarded as satisfactory after flooding.

Understanding of;

- followings:
  - Margin line.
  - Permeability of a space.

Familiarity with;

- The final conditions of the ship after assumed damage and, where applicable, equalization of flooding.
- That the master is supplied with data necessary to maintain sufficient intact stability to withstand the critical damage.
- that damage to compartments may cause a ship to sink as a result of:
  - insufficient reserve buoyancy, leading to progressive flooding
  - progressive flooding due to excessive list or trim
  - capsizing due to loss of stability structural failure

3.4.3 Methods and aids for fire prevention, detection and extinction

.1 Methods and aids for fire prevention, detection and extinction 1hrs (T) + 0hrs (P) + 0hrs (E).

Review of;

- Different types of fire, international shore connection, emergency fire pump, different types and usage of fire extinguishers, breathing apparatus, smoke helmet or mask type, fixed fire extinguishing installations, fire detection system and fire preventive measures.

3.4.4 Functions and use of life-saving appliances

.1 Functions and use of life-saving appliances 1hrs (T) + 0hrs (P) + 0hrs (E).

Review of;

- Function and use of lifeboat, liferafts , line throwing apparatus and other L.S.A.

Competence: 3.5 Use of leadership and managerial skill

3.5.1 Shipboard Personnel Management and training

.1 Shipboard Personnel Management 6hrs (T) + 0hrs (P) + 0hrs (E).

i. Principles of Controlling Subordinates and Maintaining Good Relationships

Review of;

- Theories in cultural awareness and cross cultural communication.
- Theories in human error, situational awareness, automation awareness, complacency and boredom.
- Theories in leadership and teamwork.

Knowledge of;

- theories on how effective authority and power may be enhanced or diminished by management level officers on ships.
- Strategies that management level officers could adopt to enhance their effectiveness in managing crews of different cultures.
- strategies that management level officers can adopt to optimise situational awareness and to minimise human error and complacency of individuals and teams
- Strategies that management level officers can adopt to enhance leadership and teamwork.
- Theories of personnel motivation and relates these to shipboard situations encountered by management level officers.
- That an individual's motivation and well being may be effected by both real and perceived influences on board ship and at home.
- Strategies that management levels officers could adopt to optimise the motivation of individuals and teams.
- Theories on coaching individuals and teams to improve performance.
- Approaches to managing and improving the performance of oneself, individuals and teams.
- Strategies that can be adopted when a crew member is believed to be physically or mentally unwell or badly demotivated.
- Strategies that management level officers can take to ensure that crew remains physically well and are encouraged to remain physically active.

Ability to;

- Identify sources of authority and power.
- Prepare for and conducts a simulated formal performance review.
- Identify the impact of repeated harassment including bullying on individuals.
- Recognise indications that crew members may be physically or mentally unwell or badly demotivated.

ii. Crew Employment

Knowledge of;

- The need for management level officers to be fully familiar with the requirements of national law relating to crew employment and of all crew agreements in place on the ship.
- The process for signing on and discharging crew under national law.
- The need to ensure that new crew are appropriately certificated, competent and familiarised with the safety management system, working procedures and equipment of the ship.
- Those procedures for conducting investigations and applying consequences in disciplinary situations are governed by national law, codes of conduct, employment agreements and company procedures.
- The process for investigating and applying consequences in disciplinary situations under relevant national law and procedures.
- The formal process for addressing continuing levels of unacceptable performance by a crew member under national law.
- The process for investigating and responding to incidents of harassment or bullying of crew members under national law.
- Requirements for handling crew wages, advances and allotments when this is done by management level officers on board ship.

.2 Training **2hrs (T) + 0hrs (P) + 0hrs (E).**

i. Training Methods

Review

- Theories on training on board ship.

Knowledge of;

- The effectiveness of training methods that can be adopted for training.
  - in attitude
  - in skills
  - in knowledge
- The preparation needed before the start of a training session.
- Methods for ensuring that crew are motivated to participate fully in training.
- The resources that may be available on board ship that can be used for training.

Familiarity with;

- Lists the areas in which training is requiredby regulation including the requirements of SOLAS.
- Identifies other topics where training might be desirable.

Ability to;

- Delivers a training session to other members of the class.

Demonstrate

How to conduct a training session for a given topic.

3.5.2 Related international conventions and recommendations, and national legislation

.1 Related International Maritime Conventions and National Legislation 4hrs (T) + 0hrs (P) + 0hrs (E).

i. The ISM Code

Knowledge of;

- The principles underlying the ISM Code.
- The content and application of the ISM Code.

ii. STCW Convention

Knowledge of;

- The principles underlying the STCW Convention.
- The content and application of the STCW Convention.
- How to implement the regulations for controlling and monitoring to minimum hours of rest for watchkeepers.
- What shipboard familiarization may involve for watchkeeping officers.
- What tasks or duties elementary basic safety familiarization involves for a watchkeeping officer.
- How to organize shipboard training and how to maintain records.

Understanding of;

- That seafarers new to a particular type of vessel require ship specific shipboard familiarization.
- That penalties are prescribed for breaches of STCW 95 requirements and that these are determined by the flag state.
- That national legislation is required to implement the provisions of an international convention.
- That for STCW 1978, as amended, national legislation is subject to scrutiny and checking by IMO appointed persons.
- That National legislation may differ from one flag to another.

iii. Maritime Labour Convention (MLC)

Demonstrate

- a working knowledge of the Maritime Labour Convention provisions relating to the management of personnel on board ship, with particular reference to;
  - engagement of crew
  - employment conditions
  - crew entitlements and repatriation

3.5.3 Application of task and workload management

.1 task and workload management 4hrs (T) + 0hrs (P) + 0hrs (E).

Review

- Theories on applying task and workload management on Leadership and Teamwork.

Knowledge of;

- The scope of activity and conflict between activities managed by management level officers is broader than for operational level officers and requires greater task and workload management ability.
- The task and workload allocation for significant shipboard activities so that the following are considered:
  - human limitations
  - personal abilities
  - time and resource constraints
  - prioritisation
  - workload, rest and fatigue

Discuss

- Strategies to monitor the effectiveness of task and workload management during an activity and to adjust the plan as necessary.
- strategies to ensure that all personnel understand the activity to be undertaken and their tasks in this.
- Whether the encouragement of a challenge and response environment is appropriate to the task and workload management of particular shipboard tasks.
- The importance of debriefs and reflection after activities have been conducted to identify opportunities for improving task and workload management.

3.5.4 Effective Resource Management

.1 Application of effective resource management at a management level 4hrs (T) + 0hrs (P) + 0hrs (E).

Review

- Theories on effective communication.
- Theories on effective resource allocation, assignment and priortisation.
- Theories on decision making that considers team experience.
- Theories on assertiveness and leadership.
- Theories on obtaining and maintaining situational awareness.
- Theories on the use of short and long term strategies.

Discuss

- How management level officers can encourage other personnel to use effective communications.
- Appropriate leadership styles and levels of assertiveness for management level officers in a range of shipboard activities.

Demonstrate

- The effective communication in simulated or real situations involving communications on board ship and between ship and shore.
- The effective allocation, assignment and priortisation of resources when managing simulated or real shipboard activities.
- The ability to involve team member effectively in decision making when managing simulated or real shipboard activities.
- The ability to apply appropriate leadership styles and levels of assertiveness when managing simulated or real shipboard activities.

- The ability to obtain and maintain situational awareness when managing complex simulated or real shipboard activities.
- The ability to apply short and long term strategies when managing simulated or real shipboard activities.
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3.5.5 Decision Making Techniques

.1 Situation and risk assessment 1hrs (T) + 0hrs (P) + 0hrs (E).

Review

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- Theories of situation and risk assessment.

Familiarity with;

- Formal and informal approaches to risk assessment.
- Typical risks that management level officers may have to assess.

Demonstrate

- The ability to effectively assess risk in the planning and conduct of simulated or real shipboard activities.

.2 Identify and Generate Options 1hrs (T) + 0hrs (P) + 0hrs (E).

Review

- Theories on identifying and generating options.

Demonstrate

- The ability to identify and generate options when making decisions as a management level officer in simulated or real shipboard activity.

.3 Selecting Course of Action 1hrs (T) + 0hrs (P) + 0hrs (E).

Review

- Theories on selecting the course of action in making decisions.

Demonstrate

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- The ability to select appropriate courses of action when making decisions as a management level officer in simulated or real shipboard activity.

.4 Evaluation of outcome effectiveness 1hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- How to carry out the evaluation of outcome effectiveness and the importance of doing it.

3.5.6 Development, Implementation and Oversight of Standard Operating Procedures

.1 Development, implementation and oversight of standard operating procedures 2hrs (T) + 0hrs (P) + 0hrs (E).

Knowledge of;

- Approaches to developing standard operating procedures (SOP's).
- The methods to implement the SOP's.
- Why it may be desirable for there to be oversight and approval of many SOPs and explains the dangers associated with it.

Competence: 3.6 organize and manage the provision of medical care on board

3.6.1 International medical guide for ships medical section of international code of signals

.1 International Medical Guide for Ships 1hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- The content and application of the above publication.

Ability to;

- Extracts and applies information for given situations.

.2 International Code of Signals (Medical Section) 1hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- The content and application of the above publication constructs and interprets messages.

.3 Medical First Aid Guide for Use in Accidents Involving Dangerous Goods 1hrs (T) + 0hrs (P) + 0hrs (E).

Thorough Knowledge of;

- The content and application of the above publication.

Ability to;

- Extracts and applies information for given situations.

5-7 facilities and equipment required for conducting the course

Apart from those facilities, equipments and or requirements mentioned in Code of practice for approval and monitoring of maritime training courses followings have to be provided:

5-7-1 Classroom with air conditioning facilities, sufficient lighting and other facilities, suitable for delivering theoretical subjects(such as: chart table, white board, computer, multimedia projector and its curtain)

5-7-2 library with related technical books and references (such as suitable number of Almanac, Nories , Tide table and etc,)

5-7-3 Chart room with sufficient number of chart work facilities in relation to the number of trainees.

5-7-4 relevant educational and training films

5-7-5 Earth structure model, different buoys, ships model in day and night and relevant facilities for exercising rule of the road and ColReg in channels / rivers and lake or sea and berthing/unberthing exercises, ships model fitted with crane and other deck fittings. In addition followings to be provided:

- Cut-away three-dimensional models showing the structure of parts of the ship.
- Photographs, drawings and plans illustrating various types of ship and constructional details.
- A floating ship stability demonstration model and a flotation tank. The model should be capable of demonstrating the effects of adding or removing masses, shifting masses, suspending masses and free liquid surface.
- Copies of approved stability information books and computer loading programmes from ships.
- Schematic model of a product tanker, tanks and pump-room, showing piping and valves.
- Schematic model of a crude carrier, tanks and pump-room, showing piping and valves.
- Photographs, drawings and plans to illustrate different types of ship.
- Examples of cargo plans for various types of ship.

5-7-6 Instrument Room equipped with following items:

- Magnetic Compass, Binnacle with Magnetic Compass/ Accessories and Sighting Devices, Gyro Compass and Pelorus.

5-7-7 navigational aids such as : LRIT, AIS, BNWAS, VDR/S-VDR, GPS, NAVTEX, Weather facsimile receiver (replacing such equipments with approved simulation system or carry out ship visit to carry out relevant training may be accepted upon consultation and seeking approval of relevant monitoring office).

5-8 Lecturers and instructors minimum qualifications

5-8-1 Lecturers and instructors shall have completed a course in instructional techniques (TFT) in one of the training centers approved by the PMO, and:

5-8-1-1 for lecturing in theoretical subjects should;

5-8-1-1-1 Possess valid Master certificate of competency for ships of GT≥3000 engaged on unlimited voyages as well as having 12 months of seagoing service in that rank.

5-8-1-1-2 holder of valid Electro-Technical Officer (ETO) certificate of competency and having 12 months of seagoing service in that rank can be assigned in teaching Electronic Navigational Aids subjects.

5-8-1-1-3 holder of valid Chief Engineer certificate of competency for ships of KW≥3000 engaged on unlimited voyages and having 12 months of seagoing service in that rank can be assigned in teaching Marine Engineering & Control system subjects.

5-8-1-2 for delivering practical training should;

5-8-1-2-1 possess minimum nautical higher diploma as well as having 24 months of seagoing service.

5-9 Assessment and Certification

5-9-1 upon successful completion of the examination which is carried out during and at the end of the course, the trainee will be awarded relevant course completion certificate issued by the approved training center;

5-9-2 then after trainee applies for the PMO competency assessments specified in above paragraph 5-6-1; and

5-9-3 finally, Seafarers' Examination and Documents Directorate of the PMO will issue a CoC for those candidates who have passed above mentioned PMO competency assessments and fulfill other relevant certification requirements set out in the "Codes of practices for issuing, revalidation and renewing certificates for seafarers".

5-10 revalidation/renewal of certificates

5-10-1 CoPs and CoCs will be revalidated and renewed in accordance with provisions of the Codes of practices for issuing, revalidation and renewing certificates for seafarers.

5-11 course approval

5-11-1 it will be carried out as per code of practice for approval and monitoring of maritime training courses.

6-Records

6-1 All records which present the implementation of the content of this code of practice.

7- References

7-1 STCW Convention and STCW Code;

7-2 IMO Model course number7.01

7-3 Codes of practices for issuing, revalidation and renewing certificates for seafarers; and

7-4 Code of practice for approval and monitoring of maritime training courses.

8- Appendixes

Nil