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Measure to harmonize and improve port state control procedures worldwide

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MEASURES TO HARMONIZE AND IMPROVE PORT STATE CONTROL PROCEDURES WORLDWIDE

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views and are not necessarily endorsed by the University.

Signature: ……..…….

Date: ……..…….

Supervised by: ……..…….

Supervisor's affiliation: ……..……

NB The supervisor's signature is not required.

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Abstract

Title of Dissertation: **Measures to Harmonise and Improve Port State Control Procedures Worldwide**

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PSC is a vital mechanism employed to counter substandard shipping by verifying if foreign-flagged ships and equipment comply with relevant conventions and regulations. While the IMO provides a common and consistent approach for conducting PSC inspections worldwide, each MOU/Agreement formulates its own differentiated implementation requirements according to local practices. However, there are discrepancies in procedures and actual implementation. Some sub-standard ships take advantage of these discrepancies by calling selectively at ports with relatively low inspection coverage and relatively lax deficiency treatment policies, resulting in the inconsistent and ineffective implementation of the PSC worldwide. This study presents a comparative analysis method and an online questionnaire on the PSC procedures established by the IMO, Paris MOU, Tokyo MOU, and USCG, aiming to summarise their unique characteristics, similarities, differences, and distinctive procedural requirements. Theoretical formulation issues and practical implementation issues of the procedures are identified, highlighting the potential consequences and implications for consistency and effectiveness to propose theoretical and practical recommendations for harmonising and improving PSC procedures worldwide.

The research mainly focuses on four PSC processes, the initial inspections, more detailed inspections, deficiency treatment, and RO responsibilities. It highlights the challenges and implications of different procedural requirements and the implementation process, which may affect the consistency and effectiveness of PSC. To address these issues, the study offers recommendations drawn from good practices across different MOUs/Agreements. These recommendations are intended to serve as a practical reference for the organisations involved and as a starting point for further discussions and refinements to improve the consistency and effectiveness of PSC procedures worldwide.

KEYWORDS: Port State Control, Procedures, Comparative Analysis, Harmonisation, Improvement.

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List of Abbreviations

ANOVA	Analysis of Variance
BN	Bayesian Network
CG-CVC-2	USCG Office of Commercial Vessel Compliance, Port State Control Division
COTP	Captain of the Port
ECDIS	Electronic Chart Display and Information Systems
EQUASIS	Electronic Quality shipping information System
GISIS	Global Integrated Shipping Information System
HRS	High Risk Ship
IACS	International Association of Classification Societies
III	Implementation of IMO Instruments
LL	The International Convention on Load Lines
ILO	The International Labor Organization
IMO	The International Maritime Organization
ISPS	International Ship and Port Security
LRS	Low Risk Ship
ITCP	Integrated Technical Cooperation Programme

MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee
MISLE	Marine Information for Safety and Law Enforcement
MLC	Maritime Labour Convention, 2006
MOU	The Memorandum of Understanding
MSC	Maritime Safety Committee
MTSA	Maritime Transportation Security Act Security Compliance Examination
NIR	New Inspection Regime
NPV	Non-Priority Vessel
OCMI	Officer in Charge Marine Inspection
PSC	Port State Control
PSCO	Port State Control Officer
RO	Recognized Organization
RSO	Recognised Security Organization
SMS	Safety Management System
SOLAS	International Convention for Safety of Life at Sea
SRS	Standard Risk Ship
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development

USCG	United States Coast Guard

1 INTRODUCTION

1.1 Background and Context

Maritime transportation is the backbone of global trade, facilitating the movement of approximately 80% of the world's goods by volume (UNCTAD, 2020). As an effective complement to Flag State implementation, the establishment of the PSC was a significant mechanism to defend against substandard ships, and it has become a critical aspect of ensuring maritime safety, security, and environmental protection (IMO, 2019).

PSC inspects foreign ships in national ports to verify that the ship's condition and crew's operations comply with international regulations (IMO, 2019). IMO, as the specialised agency of the United Nations responsible for the regulation of international shipping, has played a key role in formulating and harmonising PSC procedures. The numerous conventions and related resolutions provide a comprehensive foundation for PSC, with the procedures ensuring a common and consistent approach to conducting inspections worldwide (IMO, 2021).

Apart from the IMO's global approach, regional agreements, such as Paris MOU and Tokyo MOU, have been established to ensure the effective regional implementation of PSC in their respective areas. These MOUs supplement the IMO's framework by providing a mechanism for cooperation among Port States to eliminate sub-standard ships (Paris MOU, n.d.; Tokyo MOU, 2020). In the meantime, USCG has also developed and implemented its own PSC procedures at the national level.

Within the framework of IMO, various MOUs/Agreements are also facilitating regional-inter communication and cooperation through PSC data sharing, ITCP, etc. (IMO, 2019). Despite these collective efforts towards harmonisation, the implementations and procedures of PSC still exhibit considerable variation across different jurisdictions (Knapp & Velden, 2009). Whether in the process of ship selection mechanisms, the development of procedures such as initial and more detailed inspections, or deficiency treatment, each MOU/agreement has implemented its own PSC procedures specific to the region.

1.2 Problem Statement

The IMO's PSC procedure is intended to provide a consistent and common practice worldwide. In contrast, each MOU/Agreement has built on this to create its own PSC inspection mechanisms based on regional practices. This has led to regional differences at the PSC formulation and implementation level. Due to these differences, there are also different challenges and implications in procedures and the implementation process.

Procedurally, there has been a lack of comprehensive, comparative analysis of the PSC procedures across different organisations. While individual studies have examined specific aspects of PSC, focusing on the five areas of ship selection mechanisms, factors affecting inspection, the impact of PSC, improving the efficiency of PSC inspection and the analysis of PSC activities. There is a need for a more holistic analysis that compares and contrasts the different procedures at the theoretical level and analyses their unique and good practices in terms of specific PSC processes.

Theoretically, while IMO and MOUs/Agreements have made great strides towards harmonising and refining PSC procedures, inconsistencies and discrepancies remain (Zhang, 2016). There are thus different inspection scopes for these equally high-priority ships and different policies for rectifying and verifying deficiencies, etc. These variations in procedures may lead to different treatment of ships/deficiencies depending on the port of call, potentially undermining the overall consistency and effectiveness of the PSC system and leading to claims of 'forum shopping' where ships may choose to visit port with perceived lax PSC enforcement (Knapp & Franses, 2007), and situations where ships could sail with unclosed deficiencies for years.

Practically, even when the same rules are in place, the interpretation and implementation of PSC procedures can differ across jurisdictions. This can lead to a lack of effectiveness and consistency in PSC practices and frustrating efforts to ensure global maritime safety, security, and environmental protection (Knapp & Velden, 2009).

1.3 Research Questions

Considering the issues mentioned above, this dissertation aims to make a comparative analysis of the PSC procedures of IMO, Paris MOU, Tokyo MOU and USCG, and provide theoretical and practical recommendations for decision-making, contributing to the harmonisation and improvement of PSC procedures worldwide. Specifically, this dissertation seeks to answer the following research questions:

a. What are the key similarities, differences, unique characteristics, and distinctive procedural requirements of the PSC procedures across these organisations, particularly regarding initial inspections, more detailed inspections, deficiency treatment, and RO responsibilities?

b. What are the discrepant theoretical formulation issues and practical implementation issues of PSC procedures? How do these impact the consistency and effectiveness of PSC procedures worldwide?

c. What specific recommendations can be proposed to harmonise and improve PSC procedures worldwide based on a comparative analysis and an online questionnaire of the procedures implemented by these organisations?

1.4 Significance of this Study

Moving forward to the significance of this study. This research is multifaceted and may contribute to the field of PSC in the following aspects:

a. Comprehensive Comparative Analysis: Providing an in-depth analysis of PSC procedures across different MOUs/Agreements and IMO. The unique characteristics, similarities, and differences in these procedures are explored, and identifying their unique and good practices in specific PSC processes adds depth to understanding PSC procedures.

b. Theoretical and Practical Implications: Identifying the PSC procedures' theoretical formulation issues and practical implementation issues highlights the potential consequences and implications for consistency and effectiveness.

c. Policy Recommendations: Based on the analysis, the study offers theoretical and practical recommendations to address identified issues in PSC procedures. These recommendations can inform policy decisions and contribute to worldwide harmonising and improving PSC procedures.

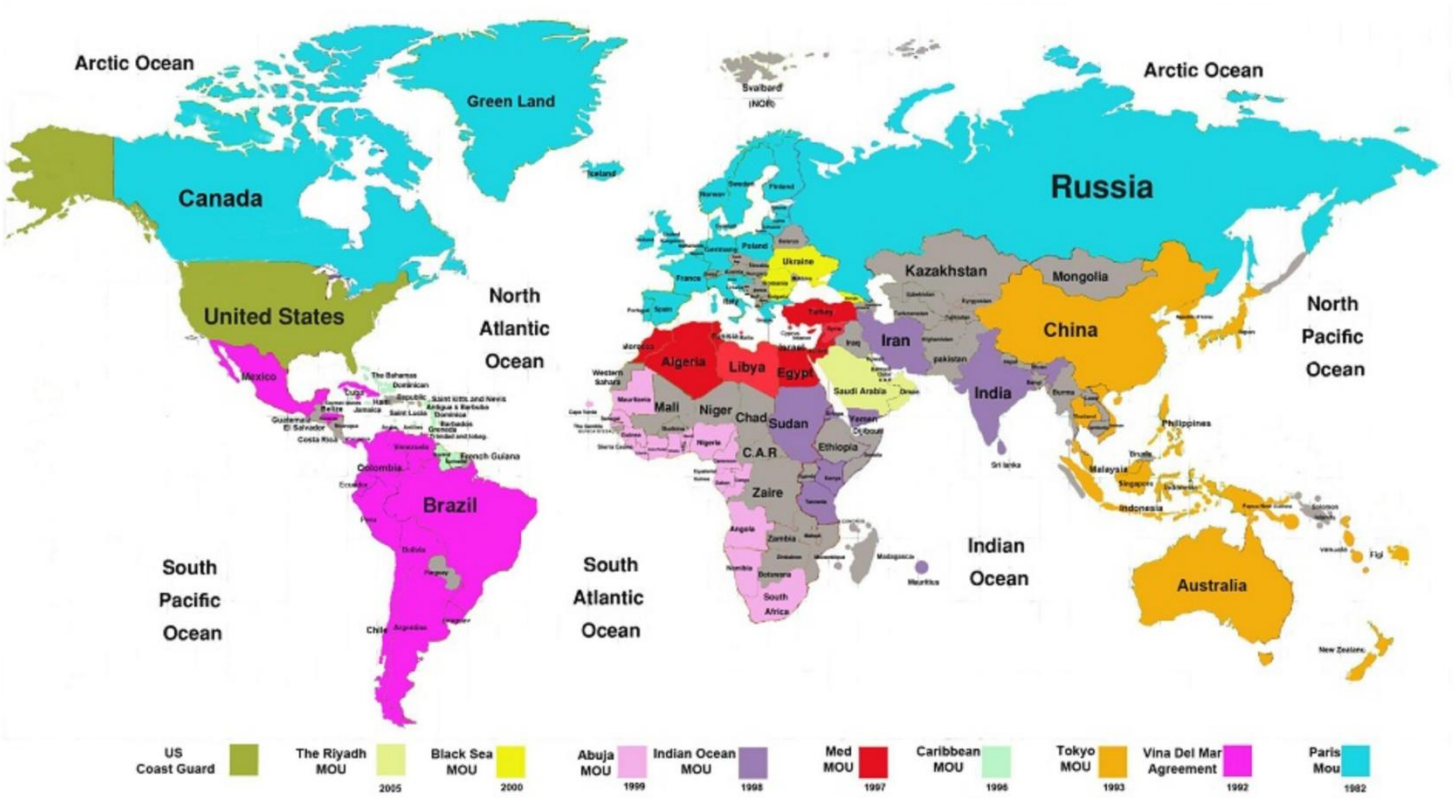
2 LITERATURE REVIEW

2.1 Overview of Existing PSC Procedures

2.1.1 History of PSC Development

PSC emerged in response to the complementary national measures implemented by Flag States domestically and abroad, primarily intended to support Flag States in achieving compliance with international regulations and safeguarding the safety of crew, passengers, and ships (IMO, 1975). The concept of PSC can be traced back to the adoption of SOLAS in 1916, which granted Port States the authority to check certificates of ships flying other States' flags and notify the Flag State of any deficiencies (Özçayir, 2004). However, the PSC mechanism began to take shape in the late 1970s and early 1980s, driven by a series of high-profile maritime accidents and increasing awareness of the risks posed by substandard ships, such as the grounding of Amoco Cadiz in 1978 (Paris MOU, n.d.).

Figure 1



The world map of PSC regimes

Note. Adapted from "World Wide PSC," by Mediterranean MOU, 2023 (http://www.medmou.org/World.aspx).

Recognising the necessity of ensuring ongoing compliance with safety standards prescribed by Conventions in force and acknowledging the procedures for Contracting Governments to follow when controlling ships visiting their ports as outlined in the relevant conventions (SOLAS, 1960 & LL, 1966), IMO considered and adopted the Procedures for the Control of Ships in 1975 (Resolution A.321(9)). This marked the first procedures adopted by IMO for the control of ships flying the

flag of other States by the Port States. UNCLOS further reinforced the role of Port States in enforcing international regulations (Articles 218 & 219). After considering the recommendations of the MSC (65th session) and the MEPC (37th session) to amalgamate the provisions of the relevant resolutions, IMO adopted the first resolution under the name "Procedures for PSC" (A.787(19)) at its 19th Assembly to provide essential guidance on the implementation of PSC. The first regional PSC agreement, Paris MoU, was signed in 1982 (Paris MOU, n.d.). Currently, there are ten PSC regimes, comprising nine regional MoUs, and one Agreement on PSC covering specific regions, as shown in Figure 1.

2.1.2 Key Elements of PSC Procedures

The Resolution A.1155(32) on Procedures for PSC, 2021 is the seventh version, as amended by IMO, superseding previous resolutions A.1138(31), A.1052(27), A.882(21), A.787(19), A.742(18), A.597(15), and A.466(XII). “This resolution offers fundamental guidance for conducting PSC inspections in compliance with the control provisions found in applicable conventions and the IMO Instruments Implementation Code (III Code) (Resolution A.1070(28)). The PSC procedures ensure uniformity in performing these inspections, identifying deficiencies in a ship, equipment, or crew, and executing PSC procedures.

PSC procedures involve the inspection of foreign ships in a Port State's jurisdiction to verify compliance with international maritime Conventions and Regulations” (IMO, 2021). Critical elements of PSC procedures (IMO, 2021) include:

a. Selection of ships for inspection: Port States based on its initiative, at the request of another Party or information regarding a ship provided by another Party, a member of the crew, a professional body, an association, a trade union or any other individual, to select the relevant ship to PSC inspection.

b. Initial inspection: The inspection is defined as an onboard inspection of the validity of the relevant certificates and documents of the ship, the overall condition of the ship, its equipment, and its seafarers.

c. More detailed inspection: an in-depth inspection based on clear grounds that have been found to assess the ship's compliance with relevant Conventions and Regulations.

d. Deficiencies rectification: depending on the severity of the conditions found to be non-compliant with the requirements of the relevant Convention, the actions such as detained, as in the agreed Flag State condition etc., taken by PSCOs to endeavor to secure the rectification of all deficiencies identified.

e. Reporting and feedback: corresponding reporting and feedback actions based on inspection results, such as denial of entry, detention, allowing the ship to sail to the next port with deficiencies, alleged violations of MARPOL, etc.

2.1.3 Main Functions and Responsibilities of MOUs, and Their Differences in Procedures and Implementation

PSC regimes, established under MOUs/Agreements, have various functions and responsibilities to ensure the effective implementation of PSC. These mainly include:

a. Establishing a framework for cooperation and information exchange among Member States (Cariou & Wolff, 2011).

b. Developing and maintaining inspection systems and databases containing information on ships' inspection history, deficiencies, detentions etc. (Knapp & Franses, 2007).

c. Setting inspection regimes and priorities based on risk evaluation and ensuring the uniform application of PSC procedures (Cariou & Wolff, 2011).

d. Providing training and support to PSCOs to enhance their knowledge and abilities for conducting PSC inspections (Knapp & Franses, 2007).

e. Monitoring and evaluating the performance of the PSC system within the region, identifying areas for improvement, and necessary implementation measures (Knapp, 2006).

While IMO sets the framework for PSC through International Conventions and guidelines, regional PSC regimes (such as Paris MoU and Tokyo MoU) establish their procedures and priorities based on their regional practices and specific challenges (Kara, 2022; Cariou et al., 2009; Knapp et al., 2007). Regional PSC regimes typically develop their own MoU/Agreement outlining their procedures/guidelines, inspection regimes, implementation actions, and information-sharing mechanisms (Bang, 2012), coordinating inspections that target substandard ships and minimise redundant inspections can offer enhanced efficiency and effectiveness for the Member States while ensuring a fair, competitive environment for the region.

2.2 IMO's Actions and Involvement in PSC Harmonization

IMO plays an indispensable role in harmonising PSC procedures and activities worldwide. This section discusses IMO's main actions to harmonise and improve PSC practices across different MOUs/Agreements in conjunction with all reports of IMO's Sub-Committee III meetings under the session of measures to harmonise PSC activities and procedures worldwide.

a. Revision and Amendment of PSC procedures

IMO takes a proactive approach in its ongoing updation and amendment of PSC procedures to ensure that the procedure remains relevant, effective, and responsive to the ever-evolving maritime landscape. IMO constantly monitors PSC performance, gathers feedback from member states and various MOUs/Agreements, and identifies areas that require improvement or revision. The main amendments mainly include the updation and modification of applicable conventions and resolutions (Resolution A.1119(30)), the integration of amendments including SOLAS, MARPOL, and STCW (Resolution A.1052(27)), and the revision of relevant guidelines for PSCOs (Resolution A.1152(32)).

b. Development and Amendment of Guidelines for PSCOs

Developing relevant inspection guidelines for PSCOs (as shown in Table 1) is one of the critical measures to ensure uniformity and consistency in applying PSC inspections worldwide. These guidelines provide a clear framework and standardised

procedures for PSCOs to conduct ship inspections, assess compliance with international conventions and identify appropriate corrective measures. In addition, IMO continually reviews and updates these guidelines to address evolving maritime challenges and to improve the effectiveness and coordination of inspections. Differences between regional inspection regimes are minimised by providing common procedures and standards.

Table 1

Guidelines developed and under development during the Sub-Committee III meetings

Num	Name of gudelines	Status
1	Guidelines for port State control officers on the ISM Code	Developed and amended
2	Guidelines for port State control officers on certification of seafarers, manning and hours of rest	Developed and amended
3	Guidelines for port State control under MARPOL Annex VI	Developed and amended
4	Guidelines for control of operational requirements	Developed and amended
5	Guidance PSCOs on suspension of inspection in PSC procedures	Under development
6	Guidelines for port State control under the BWM Convention	Under development
7	2022 Guidelines for inspection of anti-fouling systems on ships	Under development

Note. Adapted from "Report to the MSC And the MPEC of Sub-Committee of III from 1st section to 8th section," by IMO, 2014-2022 (https://docs.imo.org/Search.aspx).

c. PSCO Training, Capacity Building and Technical Cooperation

IMO is producing a new entrant training manual for PSCOs, regularly updated for voluntary use and considering updating and revising the IMO Model Course 3.09 on PSC (III-7, 2021 & III-8, 2022). Moreover, The IMO's ITCP convened workshops for PSC MOU/Agreement Secretaries and Database Managers in the form of open meetings for cooperation and sharing experience, offers capacity-building initiatives, technical assistance programs, and training to help Member States improve their relevant capabilities and implement IMO conventions effectively (IMO, 2019).

d. Analysis of PSC Activities, Practices and Statistics, Transparency and Harmonization of PSC Information, as well as Performance of Flag Administrations and RO

The four topics are permanent features of Sub-Committee III under its session (From III-1 to III-8). IMO requests annual reports, Concentrated Inspection Campaign results, and the performance of ROs submitted from regional PSC regimes and USCG to provide progress reports to assist flag Administrations in authorising ROs, and establishes the GISIS to facilitate data collection and information sharing related to PSC activities. In addition, IMO promotes the receipt of data from MOUs/Agreements and organisations through EQUASIS, thus improving the targeting of high-priority ships and promoting transparency in PSC activities.

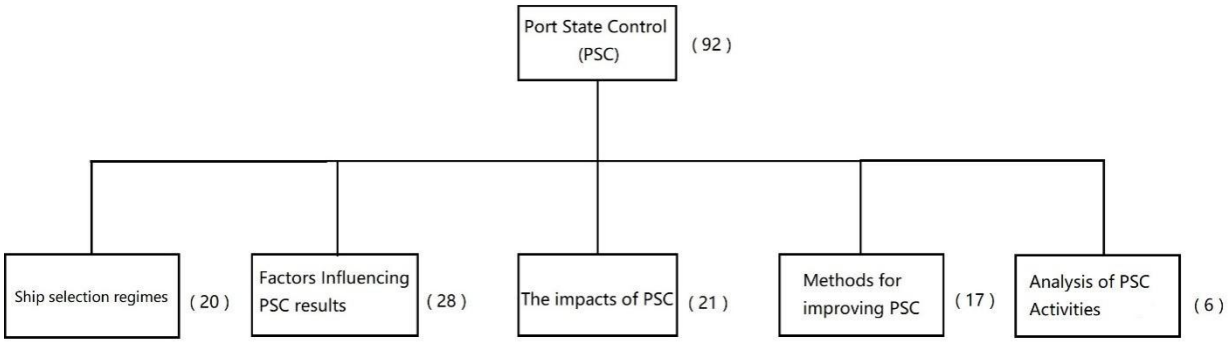
2.3 Review of Current Research

Since the conduction of the first PSC in 1982, PSC has garnered significant interest from policymakers and researchers. To identify relevant papers, the author searched

the Engineering Village, Web of Science, and IEEE databases using the keywords "Port State Control" and found 92 papers primarily focusing on PSC. And the literature is divided into five categories based on their research: ship selection regimes, factors influencing PSC results, the impacts of PSC, methods for improving PSC, and analysis of PSC activities. Figure 2 illustrates an overview of the literature classification.

Figure 2

The overview of the literature classification



2.3.1 Ship Selection Regimes

The literature on ship selection regimes can be categorised into risk assessment, targeting ship selection, and the impact of NIR. Regarding risk assessment, several studies employed risk assessment systems/models to improve the accuracy and

effectiveness of risk assessment (Xu et al., 2007; Dinis et al., 2021; Liu et al., 2022; Shen et al., 2021; Wang et al., 2019; Gao et al., 2008; Degre, 2008; Hou et al., 2022). These studies used various approaches to assess high-risk ships, such as web mining, multi-criteria decision analysis, BN, support vector machines, and unsupervised machine learning. When it comes to targeting ship selection, several studies focus on improving ship selection processes for PSC (Cariou & Wolff, 2015; Chi & Sun, 2010; Degré, 2007; Heji et al., 2011; Itoh et al., 2006; Yan et al., 2021, 2022; Yang et al., 2018). These studies propose different methods/models, such as quantile regressions, discriminant analysis, and game theory, to improve ship targeting and make the system more efficient and accurate. And the studies regarding the impact of NIR investigated the efficiency and impact of NIR on PSC (Xiao et al., 2021; Yang et al., 2020; Tian et al., 2023), which compare the NIR with other inspection regimes, evaluate its efficiency and stability, and provide suggestions for improving the ship selection scheme.

2.3.2 Factors Influencing PSC Results

In recent years, a number of studies have analysed the factors that influence PSC results, focusing on three main areas: the effect of ship elements on deficiencies/detentions, the impact of objective conditions (such as policies or pandemics) for PSC, and the potential correlation between deficiency types and detention. Firstly, regarding ship elements, Various studies focus on the relationship between deficiencies/detentions and ships' types, age, etc.(Chen et al.,2013; Fu et al., 2020; Cariou et al., 2009., Chen et al., 2019; Yang et al., 2018; Chuah et al., 2022). The approaches/models ranged from the Apriori model, grey rational analysis, BN-based, etc. Secondly, other studies have analysed the impact of objective

conditions on PSC, such as Yan and Wang (2019) examining the impact of stricter sulphur limits on inspections, Fotteler et al. (2020) evaluating the impact of MLC on working and living conditions for seafarers, and Akyurek and Bolat (2020) revealing changes in inspection trends post-pandemic. Lastly, researchers have explored the correlation between deficiency types and detention. Yan and Wang (2022) predicted ship detention based on deficiency codes using isolation forest models, and Wang et al. (2021) developed a BN-based model to analyse dependencies among risk factors. Other studies, such as Xiao et al. (2020), employed binary logistic regression and decision trees to analyse detention decisions, while Zhu et al. (2022) utilised a comprehensive analysis framework combining the cloud model, CRITIC method, and prospect theory to identify specific deficiencies impacting ship detention (Akyurek & Bolat, 2020; Cariou et al., 2009; etc.).

2.3.3 The Impacts of PSC

PSC is crucial for ensuring maritime safety and reducing the possibility of ship accidents. In analysing the impact of PSC activities, several studies employed models to analyse the relationship between ship deficiencies and accidents (Hänninen & Kujala, 2014; Fan et al., 2019; Fan et al., 2022). These studies highlighted the importance of structural deficiencies, safety and labour conditions, and the need for specific and diversified PSC policies to improve ship safety (Fan et al., 2022). Flag state performance has also been examined, with studies focusing on the Black Sea MOU and the Turkish Straits (Kara, 2016; Kara, 2018; Ekici et al., 2022). And Ekici et al. (2022) emphasise the significance of PSC regime implementation in discriminating ship risk profiles and enhancing maritime safety. While the impact of PSC inspections on ship accidents has been further studied by

Knapp and Franses (2007) and Fan et al. (2020), who provide insights into the targeting of substandard ships and the relationship between inspection time intervals and safety levels. Moreover, the concept of "ship risk age" has been introduced by Sun and Zhang (2014) to provide a basis for managing older ships. Studies focusing on tankers (Wang & Zhang, 2010) and ships for liquefiable solid bulk cargo (Wu et al., 2021) have identified specific risk factors and proposed suggestions for improving safety. In addition, the relationship between flag choice, PSC inspection, and shipping policy has been explored by Fan et al. (2014) and Cariou and Wolff (2011), who found that flag-out and class-out are more common among ships in poor condition or with a history of changing flag and class. The studies conclude that PSC inspections can influence flag-out decisions and inspection priority. Finally, studies by Larrucea & Mihailovici (2010), Popescu et al. (2011), and Bai & Wang (2019) address the historical context and importance of PSC in maritime safety, the role of PSC in polar navigation, and the development of international rules for fishing vessels in polar waters. While Xiao et al. (2021) examine the strategies of port states, flag states, and shipowners in a game model, emphasising the need for differentiating flag state performance and reputation rewards.

2.3.4 Methods for Improving PSC

For improving PSC, several studies have explored data-driven methods to improve the efficiency of PSC inspection. Yang et al. (2022) developed a BN model to reduce ship detention duration and improve inspection efficiency. Akyurek & Bolat (2021) used the Analytical Hierarchy Process Approach to guide the maritime industry on PSC detainable elements and risk profiles. Hou et al. (2022) employed unsupervised machine learning to analyse the relationship between ship deficiencies and detention,

while Qiao et al. (2021) proposed an adaptive Apriori algorithm-based method for ship deficiency diagnosis. Yan et al. (2021a) suggested two high-efficient PSC inspection schemes help authorities decide on inspection items and their sequence. Yan et al. (2021b) developed an XGBoost model for predicting a ship's deficiencies and a PSCO scheduling model for optimal resource allocation. Meanwhile, efforts have also been made to restructure port authorities and develop innovative strategies for PSC inspection. Liou et al. (2011) aimed to improve the dedication and objectivity of Taiwan's PSC system by restructuring port authorities, while Yan et al. (2021c) proposed two coordinated inspection strategies for liner and tramp ships to improve efficiency. Furthermore, Yuan et al. (2020a) explored the application of statistical process control in PSC inspections, while Yuan et al. (2020b) used the analytical hierarchy process to assess the priority of major factors affecting PSC operations. Finally, some studies have investigated the effectiveness of PSC inspections and provided suggestions for improvement. Fan et al. (2022) and Yang et al. (2021) used a BN model to examine the impact of PSC inspections on ship safety levels and accidents, considering factors such as ship attributes and inspection time intervals. Bang & Jang (2012) examined the nine MOUs' operational strengths and weaknesses.

2.3.5 Analysis of PSC Activities

Regarding examining different PSC activities, the studies use different approaches to represent differences in PSC activities within MOU, regionally and globally. Within MOU, Graziano et al. (2018) focused on implementing Directive 2009/16/EC among EU Member States, identifying areas requiring further harmonisation. Graziano et al. (2017) investigated the EU PSC regime, revealing discrepancies in inspection

processes and outcomes due to differences between PSCO and Member State levels. Regionally, Zhang (2016) highlighted the challenges faced by countries along the 21st Century Maritime Silk Road, stemming from the lack of unified PSC standards and requirements. Recommendations included learning from successful PSC organisations, establishing uniform PSC standards, and enhancing stakeholder cooperation. Globally, Knapp and Velden (2009) analysed differences in ship treatment across PSC regimes, recommending standardisation of inspection procedures, joint training of PSCOs, and the use of combined datasets across regimes for harmonisation. Kara et al. (2020) assessed similarities between PSC regimes using hierarchical clustering, emphasising the need for uniform inspections and detentions. Similarly, Kara (2022) suggested the Technique for Order Preference by Similarity to an Ideal Solution as a standard measure for Flag State performance, aiming to harmonise PSC regimes.

2.4 Research Gaps

Despite the extensive research and IMO's efforts to harmonise and improve PSC worldwide, several gaps persist, particularly regarding the PSC procedures across IMO and MOUs/Agreements. The identified research gaps include the following:

a. Analysis of the PSC procedures, particularly a comparative analysis of the PSC procedures of the IMO and the various MOUs/Agreements.

b. Analysis of the distinctive characteristics and differences in procedures between the IMO and the different MOUs/Agreements, summarising their unique and good practices regarding specific PSC processes.

c. Identification of the theoretical and practical issues due to the differences between these PSC procedures, their potential impact, and the implications for implementation.

Overall, this study seeks to fill the identified research gaps and provide theoretical and practical suggestions for decision-making.

3 RESEARCH METHODOLOGY

Based on the comprehensive review of the actions taken by IMO and the literature, this study employs a comparative analysis method and an online questionnaire to examine the PSC procedures of four well-represented organisations. The comparative analysis focuses on the theoretical requirements of key PSC processes. Meanwhile, the online questionnaire gathers feedback on the formulation and implementation of PSC procedures from the perspective of the PSCO at a practical level. Combining these two approaches identifies the urgent issues that need to be

addressed at the theoretical and practical level of PSC procedures so that recommendations can be made accordingly.

3.1 Comparative Analysis

The comparative analysis will base on documentary analysis to systematically examine PSC procedures established by IMO, Paris MOU, Tokyo MOU, and USCG. This study focuses on the initial inspection, more detailed inspection, deficiency treatment, and the assessment of RO responsibilities, identifying and analysing characteristics, similarities, and differences in these procedures, developing a comparative table, and summarising theoretical issues that may affect the consistency and effectiveness of PSC procedures.

3.2 Online Questionnaire for PSCOs

Online questionnaires for PSCOs of the Paris MOU, Tokyo MOU, and USCG focus on gathering practical perspective feedback on formulating and implementing the PSC procedures. Quantitative and empirical measures are used to (1) analyse discrepancies in the formulation and implementation of the PSC process in the three MOUs/Agreements and the real existence of the theoretical issues identified by the comparative analysis using the one-way ANOVA and (2) investigate practical issues with implementing PSC procedures using a multi-responsive analysis.

3.3 Questionnaire Design and Distribution

The questionnaire's design aims to ensure a user-friendly interface that encourages participation. The quantitative and empirical questions seek detailed responses on PSC procedures, theoretical challenges, potential areas for improvement, and perceptions of implementation. The questionnaire will be distributed via a web link to a representative sample of PSCOs across the Paris MOU, Tokyo MOU, and USCG. To encourage a high response rate, the survey will be concise, respectful of respondents' time, and adhere to ethical considerations such as informed consent.

3.4 Data Grouping and Analysis

Responses to the questionnaire will be grouped according to the MOU/Agreement to which the respondent belongs. The one-way ANOVA will focus on the quantitative questions, examining the variances between MOU/Agreement for each question to show their theoretical and practical discrepancies. Concurrently, the multiple-response analysis will be used to investigate practical issues regarding empirical questions, involving analysis of each option's response rate and penetration rate to identify specific practical challenges.

3.5 Trustworthiness and Ethical Considerations

To ensure trustworthiness and ethical integrity, a pilot test of the online questionnaire was conducted from 20th April 2023 to 23rd April 2023. The web link was distributed with the assistance of the China PSC Database. Respondents were informed that the survey was completely voluntary and were encouraged to provide feedback on the structure and content of the questionnaire. Based on the feedback

from the twenty-three respondents who participated in the online questionnaire, the validation questionnaire's question setting was acceptable and understandable. Ethical concerns were addressed by obtaining informed consent from PSCOs, participation was voluntary, and participant confidentiality was maintained. A total of 217 responses were received, of which two chose not to agree to use their personal data, and seventeen were from other MOUs. So, the nineteen responses were not included in the follow-up statistics. The remaining 198 were fully completed and valid for use.

4 COMPARATIVE ANALYSIS OF PSC PROCEDURES

PSC is a critical mechanism for ensuring ships' safety, security, and environmental compliance and operations. Paris MOU, Tokyo MOU, and USCG have developed their respective PSC procedures, which serve as regional frameworks for implementing and enforcing maritime regulations. This chapter presents a

comparative analysis of PSC procedures among the four organisations regarding initial inspection, more detailed inspection, deficiency treatment, and assessment of RO responsibility. The aim is to highlight each PSC process's characteristics, similarities, and differences.

The primary official documents and guidelines involved include, among others:

a. IMO. (2021). Procedures for Port State Control, 2021 (Resolution A.1155(32)).

b. EU. (2019). Directive 2009/16/EC of the European Parliament and of the Council of 23 April 2009 on port State control (recast)

c. Paris MOU. (2022). Paris Memorandum of Understanding on Port State Control.

d. Paris MOU. (2022). Guidance on detention and action taken. PSCC55-2022-10.

e. Paris MOU. (2015). Criteria for RO responsibility assessment.

f. Tokyo MOU. (2022). Asia-Pacific Port State Control Manual.

g. Tokyo MOU. (2021). Memorandum of Understanding on Port State Control in the Asia-Pacific Region.

h. USCG. (2021). Marine Safety: Port State Control. COMDTINST 16000.73.

i. USCG. (2020). Targeting of Foreign Vessels for Port State Control (PSC) Examination. CVC-WI-021(1).

4.1 The Initial Inspection

The initial inspection is a crucial aspect of the PSC process, as it offers a preliminary

evaluation of a ship's compliance with international regulations and standards. In this section, the procedures, characteristics, similarities, and differences among the IMO, Paris MOU, Tokyo MOU, and USCG requirements are analysed.

4.1.1 Documentary Analysis

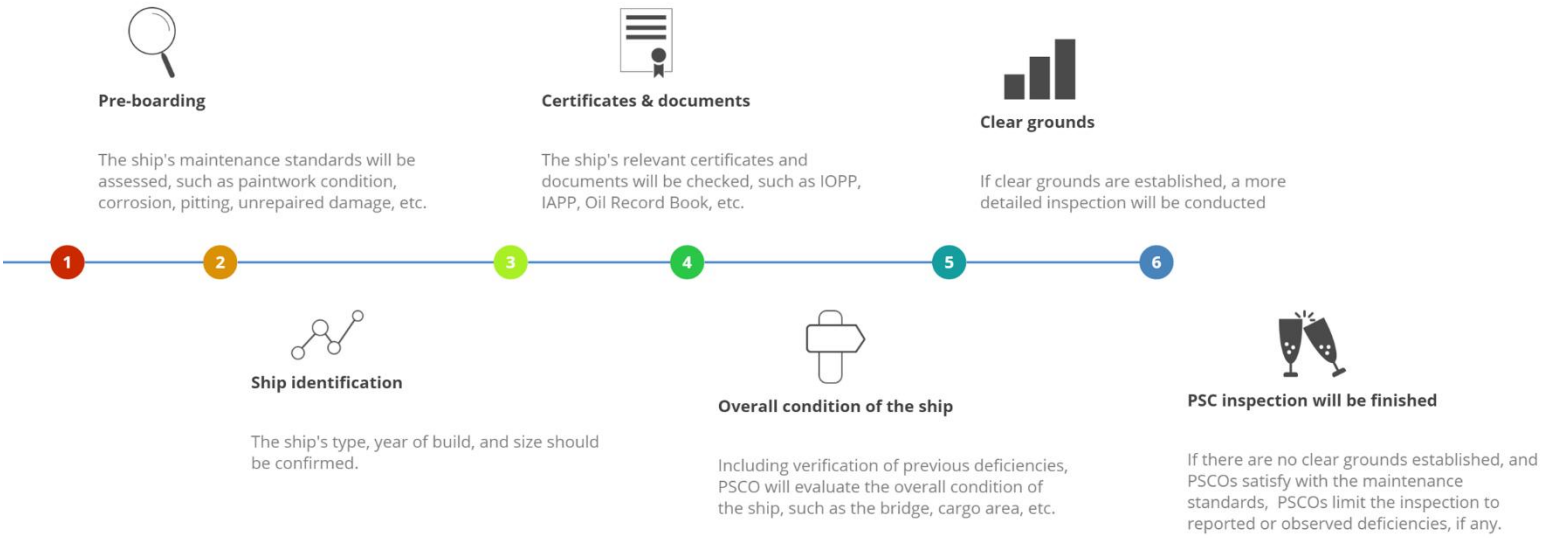
This part examines the procedural requirements for initial inspections in the IMO, Paris MOU, Tokyo MOU, and USCG. Each organisation’s key steps in the inspection process will be analyzed, highlighting the characteristics and specific areas where they diverge from the IMO's general framework and guidelines.

4.1.1.1 Requirements for IMO Initial Inspection

4.1.1.1.1 IMO first specified the initial inspection as a separate section in Resolution A.1052(27), and it was first defined in Resolution A.1119(30). IMO provides a general framework and guidelines for conducting initial inspections (see Fig 3) to obtain a comprehensive impression and visual observations of the ship's maintenance standards. This process involves inspecting the ship's certificates and relevant documents and assessing the ship's overall condition. The inspection process broadly follows these steps:

Figure 3

Flow chart of the initial inspection of the PSC



Note. Made by the author following the requirements of "IMO's PSC procedure for the initial inspection," 2023 (https://www.imo.org/en/OurWork/IIIS/Pages/Port%20State%20Control.aspx).

a. Pre-boarding observations: PSCOs assess the ship's maintenance standards based on its appearance in the water, considering factors such as paintwork condition, corrosion, pitting, and unrepaired damage.

b. Ship identification: PSCOs ascertain the ship's type, year of build, and size to determine the applicability of convention provisions.

c. Certificate and document check: PSCOs examine the ship's relevant certificates and documents after boarding and introducing themselves to the master or responsible ship's officer.

d. Ship condition assessment: PSCOs evaluate the overall condition of the ship,

including equipment, navigational bridge, forecastle, cargo holds/areas, engine room, and pilot transfer arrangements, while verifying if unclosed deficiencies from previous inspections have been rectified.

e. Inspection scope determination: If relevant certificates are valid and the ship's general maintenance standards appear satisfactory, PSCOs limit the inspection to reported or observed deficiencies, if any.

f. Detailed inspection: PSCOs conduct a more detailed inspection if there are clear grounds for believing that the ship, equipment, or crew do not substantially meet the requirements.

4.1.1.1.2 On the other hand, IMO pay particular attention to providing guidelines for PSCOs during relevant inspection actions, including examining the ship's certificates and documents (such as electronic certificates, International Tonnage Certificates, and seafarer certificates or documentary evidence), conducting ISM inspections, forming a general impression on board, and carrying out detailed inspections.

4.1.1.2 Requirements for Paris MOU Initial Inspection

Table 2

Paris MOU's PSC Inspection Data from 1st January 2020 to 31st December 2022

Inspection Type	Ships	Inspecions	Detentions	ISM Deficiencies	Non ISM Deficiencies	Bans
Initial Inspection	11763	17426	0	157	10666	0
Expanded Inspection	5869	10289	413	1507	30429	11
More detailed inspection	11634	18160	1243	3689	64882	18

Note. Adapted from "Inspection Data," by Paris MOU, 2023

(https://www.parismou.org/inspection-search/inspection-search).

4.1.1.2.1 Paris MOU categorises inspections into three types: initial, more detailed, and expanded (Reference Data see Table 2). Expanded inspections assess the overall condition of a ship, are more comprehensive than initial inspections and closely resemble more detailed inspections, but expanded inspections cover all risk areas. Paris MOU classifies ships into risk classes (HRS, SRS, and LRS) based on their Risk Profile, determining inspection priority. The inspection category is determined by Table 3 below:

Table 3

Categories of inspections to be conducted depending on the Risk Profile of the ship

<table>
<tr><th rowspan="2">Category of Inspection</th><th rowspan="2">Ship Risk Profile</th><th colspan="3">Inspection Type</th></tr>
<tr><th>Initial</th><th>More detailed</th><th>Expanded</th></tr>
<tr><td rowspan="3">Periodic</td><td>HRS</td><td>NO</td><td>NO</td><td>YES</td></tr>
<tr><td>SRS</td><td rowspan="2">YES</td><td rowspan="2">If clear grounds are found</td><td rowspan="2">If the ship is of a risk ship type and more than 12 years old</td></tr>
<tr><td>LRS</td></tr>
<tr><td>Additional due to overriding or unexpected factor</td><td>All</td><td>NO</td><td>YES</td><td>According to the professional judgement of the PSCO if HRS or SRS/LRS of a risk ship type[1] and more than 12 years old</td></tr>
</table>

Note. Adapted from "Annex 9 - Inspection Type and Clear Grounds of the Paris MOU on PSC (For types of ships that are at risk, additional due to overriding or unexpected factors, see Appendix 3)" (https://www.parismou.org/inspections-risk/library-faq/memorandum).

4.1.1.2.2 Initial inspections apply to ships in the SRS and LRS risk classes. The initial inspection procedures closely resemble those of the IMO, and key differences include the emphasis on the hygiene situation and the inspection areas specified for the overall condition assessment (bridge, accommodation and galley, decks, cargo holds/area, and engine room).

4.1.1.2.3 Expanded inspections target ships in Table 3 and those subject to a re-inspection following a refusal of access order, covering all the 14 risk areas (e.g., structural conditions, emergency systems), and verify the comprehensive at least items in those risk areas listed in the PSCC Instruction for each ship type based on their practical feasibility or any constraints relating to the safety of persons, the ship or the port. PSCOs must exercise professional judgement to determine the suitable extent of inspection or testing of each specific item. And as needed, operational controls are incorporated and address the human aspect covered by ILO, ISM, and STCW.

4.1.1.2.4 Both initial and expanded inspections will include a more detailed inspection whenever clear grounds are established.

4.1.1.3 Requirements for Tokyo MOU Initial Inspection

4.1.1.3.1 Tokyo MOU mainly adheres to the IMO's PSC procedural standards and integrates relevant ILO requirements. It adapts and improves implementation

requirements based on regional practice. For instance, it adopts and continually amendments guidelines in addition to PSC procedures. Tokyo MOU also classifies ships based on their risk profile and overriding priority (see Appendix 4), and the ships that have overriding priority can be inspected between periodic inspections.

4.1.1.3.2 Tokyo MOU’s initial inspection procedures are generally similar to the IMO's. In section 3.1-1 of its manual, the PSC Inspection Checklist, Tokyo MOU provides a general flow of notes for the initial inspection. Used in conjunction with the checklist, these notes are intended to aid memory, indicate the items to be inspected, and help PSCOs achieve sufficient breadth and depth of inspection. The main differences highlight inspecting items' conditions en route to the master's room (e.g., firefighting and life-saving appliances, appliances on deck) and accommodation areas during the overall condition assessment.

4.1.1.4 Requirements for USCG Initial Inspection

4.1.1.4.1 USCG emphasises relevant security compliance examinations (Reference Data see Table 4), which used to be completed as a separate examination category (ISPS/MTSA or Non-Convention Security Compliance Examination) alongside PSC Safety and Environmental Protection Compliance Examinations. Since 2020, USCG combined safety and security compliance examinations into PSC examinations. During PSC examinations, USCG also monitors bunkering or lightering operations and supervises cargo.

Table 4

Comparison of the number of ISPS-related deficiencies as a percentage of the number of deficiencies for the year in the three MOUs/Agreements

Number of ISPS-relate deficiencies as a percentage of the number of deficiencies for the year			
MOU/Agreement	2020	2021	2022
Paris MOU	1.06%	1.24%	N.A
Tokyo MOU	1.75%	1.56%	1.68%
USCG	2.15%	1.70%	1.72%

Note. Adapted from "Annual Report of PSC," by Paris MOU, Tokyo MOU, and USCG. Due to USCG combining the security compliance exam with PSC in 2020, comparisons of percentage data were only available from 2020 onwards (https://www.parismou.org/publications-category/annual-reports, https://www.tokyo-mou.org/publications/annual_report.php, https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Commercial-Vessel-Compliance/Foreign-Offshore-Compliance-Division/Port-State-Control/Annual-Reports/).

4.1.1.4.2 The updated PSC targeting program includes three exam types (PSC A, PSC B, and PSC C) that dictate the exam scope:

a. PSC A: a “more detailed” examination for high-risk vessels with an increased scope beyond a standard examination, including equipment operational tests and emergency drills.

b. PSC B: the standard exam, including certificates/documents checks, deck and

engine room walks, and limited operational tests may be tested.

c. PSC C: for vessels not targeted for a standard exam but eligible for a random exam (PSC A/B) or an exam based on potential non-compliance information/reports.

Additionally, post-casualty exams and damage surveys may be conducted with marine investigations for reportable marine casualties. These exams determine the cause, extent of damage, and risk mitigation. PSCOs may expand post-casualty exams when aware of non-compliance with applicable conventions or regulations.

4.1.1.4.3 The USCG provides detailed PSC Job Aids to assist PSCOs in containing the detailed items that should be examined for corresponding PSC exams of specific vessel types (e.g., Tankers, Passenger vessels).

4.1.2 Comparative Analysis

The initial inspection processes of the IMO, Paris MOU, Tokyo MOU, and USCG share similarities in their overall structure and objectives. However, each MOU/Agreement has adapted its procedures based on local practices, leading to distinct differences in inspection priorities, classification systems, and specific implementation guidelines. The following is a comparative analysis of the initial inspection requirements of the IMO, Paris MOU, Tokyo MOU, and USCG:

4.1.2.1 Similarities

All three MOUs/Agreements follow similar procedures to that of IMO, including pre-boarding observations, ship identification, certificate and document checks, ship condition assessment, inspection scope determination, and the possibility of conducting more detailed inspections if there are clear grounds. They all provide guidelines for PSCOs during relevant inspection items and emphasise the need to comprehensively evaluate a ship's overall condition.

4.1.2.2 Differences

4.1.2.2.1 Paris MOU classifies inspection types into three categories (initial, more detailed, and expanded), with expanded inspections being more comprehensive than initial inspections, like extending the initial inspection to all risk areas and specifying items (including operational ones) that should be checked for each ship type. The key differences in the Paris MOU's initial inspection procedures include emphasising hygiene and specified inspection areas during the overall condition assessment.

4.1.2.2.2 Tokyo MOU primarily follows the IMO's PSC procedural standards and incorporates relevant ILO requirements. It adapts and improves implementation requirements based on regional practices. The main differences in the Tokyo MOU's initial inspection procedures specify inspecting items en route to the master's room and accommodation areas during the overall condition assessment.

4.1.2.2.3 USCG focuses on enhanced relevant security compliance examinations, which used to be separated from the PSC process. The updated PSC targeting program includes three exam types (PSC A, PSC B, and PSC C) that dictate the exam scope. The PSC A examination has a broader and deeper scope than PSC B. PSC A will witness the crew's performance on the drills, but PSC B will not unless PSCO expands the examination. USCG also provides detailed PSC Job Aids to assist PSCOs in listing the items that should be checked for relevant PSC exams for specific vessel types.

4.1.2.2.4 Both Paris MOU and USCG can conduct PSC inspections of ships involved in marine casualties/accidents.

4.1.3 Conclusion

In summary, the initial inspection processes of the IMO, Paris MOU, Tokyo MOU, and USCG share similarities in their overall structure and objectives. However, each organisation has adapted its procedures based on local practices, leading to distinct differences in inspection priorities, classification systems, and specific implementation guidelines, particularly in the case of the Paris MOU and the USCG, which can conduct PSC inspections of ships involved in marine casualties/accidents, and depending on the risk attributes of the ship, will accordingly conduct a more comprehensive inspection type compared to the initial inspection.

4.2 The More Detailed Inspections

The more detailed inspection is an inspection action based on the finding of clear grounds to check further that the ship's condition complies with the requirements of the Convention concerned. The MOUs/Agreements build on this and provide their detailed inspection guidance accordingly. Each organisation's PSC procedures are analysed, highlighting the characteristics, similarities and differences in this section.

4.2.1 Documentary Analysis

The procedures analysis examines the more detailed inspection requirements of the IMO, Paris MOU, Tokyo MOU, and USCG. The following discussion highlights each organisation's distinct requirements.

4.2.1.1 Requirements for IMO More Detailed Inspection

4.2.1.1.1 IMO introduced the concept of "clear grounds" for conducting more detailed inspections through Resolution A.321(9). The more detailed inspections were first introduced in 1993 with Resolution A.742(18). After amalgamating relevant resolutions and documents, more detailed inspections were set out in a separate Chapter of Resolution A.787(19). At the theoretical level, the provisions for more detailed inspections are relatively fewer in comparison to the initial inspection and mainly regulate the conditions and processes for conducting more detailed inspections:

a. Conditions for a more detailed inspection: A more detailed inspection should be

conducted if the ship does not have valid certificates, or if the PSCO has clear grounds to believe that the ship's condition or equipment does not comply with relevant regulations, or that the master or crew are unfamiliar with essential shipboard procedures.

b. Reference documents for more detailed inspections: PSCOs can find support in the documents mentioned in Appendix 12, Part B, where applicable.

c. General scope of more detailed inspections: More detailed inspections are not intended to cover all equipment and procedures outlined during a single inspection unless the ship's condition or the master or crew's familiarity with essential shipboard procedures necessitates it. These procedures should not impose the seafarer certification program of the Port State on a ship entitled to fly the flag of another Party to STCW, nor should they impose control procedures on foreign ships over those imposed on ships of the Port State.

4.2.1.1.2 At the practical level, IMO continuously introduces and amends specific guidelines, including more detailed inspection instructions in several appendices to its PSC procedures. These appendices containing guidelines for relevant more detailed inspections include those related to MARPOL Annex II, ship structural and equipment requirements, operational requirements, the ISM Code, LRIT, seafarer certification, manning and hours of rest, and MARPOL Annex VI, etc.

4.2.1.2 Requirements for Paris MOU More Detailed Inspection

4.2.1.2.1 Paris MOU requiring a more detailed inspection will be conducted when,

during an initial inspection, there are clear grounds to believe that the ship's condition, equipment, crew, or seafarers' working and living conditions do not substantially comply with the relevant provisions of applicable instruments. Furthermore, more detailed inspections are warranted if the ship is subject to overriding or unexpected factors.

4.2.1.2.2 More detailed inspections concentrate on the areas where clear grounds are established, areas related to any overriding or unexpected factors, and other randomly selected risk areas. Paris MOU identifies 14 risk areas, including documentation, structural condition, water/weathertight condition, emergency systems, radio communication, cargo operations, fire safety, alarms, seafarers' living and working conditions, navigation equipment, life-saving appliances, dangerous goods, propulsion and auxiliary machinery, and pollution prevention.

4.2.1.2.3 Furthermore, Paris MOU continuously provides inspection guidelines to PSCOs for conducting more detailed inspections on specific subjects. The main guidelines introduced include Guidelines on MARPOL ANNEX IV, ISM Code, MARPOL Annex VI, IGF Code, and Procedures for Operational Controls.

4.2.1.3 Requirements for Tokyo MOU More Detailed Inspection

4.2.1.3.1 The procedures for implementing more detailed inspections in Tokyo MOU are generally similar to those of the IMO and are based primarily on valid certificates that are not available or if there are clear grounds to believe that the

ship's condition, crew, or equipment does not significantly comply with the applicable regulations, or if the master or crew lack familiarity with critical shipboard procedures concerning ship safety or pollution prevention.

4.2.1.3.2 After clear grounds are established, PSCO should conduct a more detailed inspection in the area(s) where clear grounds were identified and other randomly selected areas, including further checking compliance with onboard operational requirements.

4.2.1.3.3 In addition, during follow-up inspections, PSCO should consider a more detailed inspection of the unclosed deficiencies and the ISM procedure for managing PSC deficiencies / non-conformities when the deficiencies are not rectified in a timely manner or to the appropriate standard.

4.2.1.3.4 Tokyo MOU also provides guidelines for conducting specific more detailed inspections in its adopted inspection guidelines, such as guidelines for PSC inspections of certification of seafarers and manning requirements, ECDIS, MLC & SOLAS, Polar Code, MARPOL Annex IV, and MARPOL Annex V.

4.2.1.4 Requirements for USCG Expanded Examination (More Detailed Inspection)

4.2.1.4.1 USCG has specific requirements for conducting expanded examinations. During any examination, expanded inspections are warranted when clear grounds exist, indicating that the vessel, equipment, or crew do not substantially correspond

to the requirements of relevant conventions, or the master or crew members lack familiarity with essential shipboard procedures.

4.2.1.4.2 Expanded examinations should focus on areas where clear grounds have been established and not include other areas or systems unless PSCOs' general impressions or observations support such an examination. In the event of clear grounds regarding a vessel's security arrangements, the PSCO should take control action, potentially including a Comprehensive Security Inspection into the area of non-compliance.

4.2.1.4.3 If detainable deficiencies are discovered during the examination, PSCOs should also assess whether the substandard condition results from a poorly implemented SMS. If clear grounds lead the PSCO to believe that the ship has not effectively implemented its SMS, an expanded examination of the SMS should be conducted.

4.2.2 Comparative Analysis

Based on the analysis of the procedures, this section compares the more detailed inspection requirements of the IMO, Paris MOU, Tokyo MOU, and USCG to identify similarities and differences in their implementation approaches.

4.2.2.1 Similarities:

4.2.2.1.1 All three MOUs/Agreements, in line with IMO, have adopted the concept of "clear grounds" as the condition for the more detailed inspection at the theoretical level. Clear grounds generally arise when invalid certificates are found, or the ship, its equipment, or its crew do not substantially meet the requirements of relevant conventions, or when the master or crew members lack familiarity with essential shipboard procedures.

4.2.2.1.2 At the practice level, all four organisations have provided guidelines to assist PSCOs in conducting corresponding more detailed inspections in response to the clear grounds identified. These guidelines cover various aspects such as certification, operational requirements, specific equipment, and other relevant conventions.

4.2.2.2 Differences:

4.2.2.2.1 IMO does not offer as comprehensive theoretical guidance for more detailed inspections as it does for initial inspections. Its focus is primarily on regulating the conditions and general scopes for conducting more detailed inspections, as well as providing relevant guidelines in practical terms.

4.2.2.2.2 Paris MOU has a more extensive focus on areas related to any overriding or unexpected factors and other randomly selected risk areas, identifying 14 risk areas that include documentation, structural conditions, emergency systems, navigation equipment, dangerous goods, and pollution prevention. And the human elements

related to ILO, ISM, and STCW, alongside operational control are involved.

4.2.2.2.3 Tokyo MOU's more detailed inspection area includes other randomly selected areas and the in-depth operational inspection. The procedures also emphasise the importance of follow-up inspections, considering more detailed inspections of unclosed deficiencies and ISM procedures for managing PSC deficiencies or non-conformities.

4.2.2.2.4 USCG does not expand the detailed inspection area as in the Paris MOU and Tokyo MOU when the clear grounds are established but only conducts it for the area of the clear grounds unless PSCOs' general impressions or observations support such an examination. While comprehensive security inspection is a control option when clear grounds for security deficiencies are established.

4.2.3 Conclusion

In summary, the IMO, Paris MOU, Tokyo MOU, and USCG share similar core principles and approaches to more detailed inspections; however, they differ in their specific focus areas, guidelines, and inspection procedures.

4.3 The Deficiency Treatment

Deficiency is a condition identified as non-compliant with the applicable requirements of relevant conventions. The action taken in response to the

corresponding deficiency, the rectification of the deficiency and release is one of the key processes of the PSC to confirm that the deficiency has been rectified and meets the requirements of the Convention. This section will discuss and analyse the implementation requirements for the deficiency treatment in the procedures of the IMO, Paris MOU, Tokyo MOU and USCG, except the requirements of the suspension of inspections and the assessment of RO responsibilities.

4.3.1 Documentary Analysis

This section will explore the key requirements for deficiency treatment across four organisations: the IMO, Paris MOU, Tokyo MOU, and USCG, highlighting their unique features and specific aspects of procedural implementation.

4.3.1.1 Requirements for IMO Deficiency Treatment

IMO's requirements for the deficiency treatment aspect are rather general in that they do not define follow-up actions (follow-up inspection) or a detailed guideline of relevant control actions. The general requirements for deficiency treatment are as follows:

a. PSCO should endeavour to secure the rectification of all deficiencies identified.

b. For clearly hazardous deficiencies, PSCO should ensure the hazard is removed before the ship proceeds to sea, which may involve detention or formal prohibition of continued operation. If such deficiencies cannot be rectified at the port of

inspection, the Port State authority may allow the ship to proceed to the nearest appropriate repair yard, providing that certain conditions are met. These conditions ensure that the ship does not sail until it can proceed without risk and include confirmation from the flag State that remedial action has been taken.

c. For all other deficiencies, on the condition that all possible efforts have been made to rectify these deficiencies, the ship might be allowed to proceed to a port where any such deficiencies can be rectified.

4.3.1.2 Requirements for Paris MOU Deficiency Treatment

4.3.1.2.1 The Paris MOU's overall deficiency treatment requirements align with those of the IMO, and the main features are that:

a. For the deficiencies found, PSCO should take appropriate control actions to satisfy that the deficiencies be rectified.

b. In general, all deficiencies should be rectified before the ship's departure. However, this does not imply that each deficiency must be verified as closed by PSCO. Instead, unclosed deficiencies can be verified when the PSCO performs the initial inspection.

c. The main control actions involve requesting further information, consulting with Flag and/or RO, immediate or future rectification, detention, allowing a ship to proceed to a repair port, and flexible non-standard action, such as instructing the master to take specific actions.

d. Deficiencies, individually or together, may lead to actions such as detention or prohibition of operations.

4.3.1.2.2 On deciding on the appropriate control action, PSCOs will be guided by the PSCC Instruction (Guidance on detention and action taken), which provides detailed guidance to PSCOs on using associated Action Codes of deficiency, inspection, and reporting.

4.3.1.3 Requirements for Tokyo MOU Deficiency Treatment

The general requirements for deficiency treatment in Tokyo MOU are generally consistent with IMO as well, with the main feature being the adoption of the Action Codes User Guide and the establishment of procedures for follow-up inspection:

a. Tokyo MOU define the follow-up inspection, which verifies the rectification of deficiencies found during previous initial inspections and requires deficiencies can only be closed by PSCOs.

b. When a ship has unclosed deficiencies and is selected for an initial inspection, the follow-up inspection should be conducted first. A separate initial inspection should be initiated if new deficiencies are found during the follow-up inspection. The new initial inspection report should not repeat deficiencies from previous reports. PSCO should check the rectification of all unclosed deficiencies during follow-up inspections.

c. If deficiencies haven't been rectified to the satisfaction of PSCO during a follow-up inspection. PSCO may conduct a new initial inspection, considering a more detailed inspection and evaluating ISM procedures. If a deficiency hasn't been rectified, but the crew demonstrates all reasonable steps have been taken, PSCO should update the information in APCIS accordingly.

d. If the follow-up inspection is necessary but impractical, a remote follow-up inspection may be conducted according to the Guidelines for PSCOs on Remote Follow-up Inspections.

4.3.1.4 Requirements for USCG Deficiency Treatment

4.3.1.4.1 USCG developed detailed instructions for documenting deficiencies and relevant control actions to address hazard risk. And comprehensive guidance on rectifying these deficiencies before departure, such as the deficiencies follow-up during the initial examination.

4.3.1.4.2 For deficiencies requiring rectification before departure, COTP/OCMI may choose one of the rectification methods (to the satisfaction of RO/RSO, Administration, or USCG) to verify correction before departure, depending on the severity of the deficiencies. PSCO should revisit the vessel to verify the rectification for serious deficiencies that contributed to detention. If PSCO is unavailable, COTP/OCMI may accept certification from the Administration or, depending on the circumstances, the RO. Take the less serious deficiencies as an example, COTP/OCMI may accept certifications from the vessel's master, Classification

Society (except non-approved, non-IACS Classification Societies), or Administration that the vessel has corrected the deficiencies.

4.3.1.4.3 If a vessel has multiple deficiencies that collectively make it substandard concerning international conventions but individually do not merit detention or major control action, the COTP/OCMI may include a statement on Form B to indicate that the vessel is unsafe to proceed to sea, which means a combination of less serious deficiencies may also warrant detention (Code 30) of the ship. The PSCO should add a note to the bottom of Form B explaining this action.

4.3.1.4.4 The USCG's requirements for vessel control procedures for security and safety involve multiple options. The COTP/OCMI initiates appropriate control actions based on the severity of the deficiencies, the risk posed to the crew, vessel, port, or environment, and the efforts made by the vessel to rectify such deficiencies. The control options range from denial of entry or expulsion to IMO reportable detentions, COTP orders, Customs Holds, restrictions on operations or vessel movement, delays, comprehensive security inspections, and letters of deviation. Lesser administrative or corrective measures may be applied for non-detainable security deficiencies. Administrative enforcement measures, such as civil penalties and letters of warning, may be applied for violations of U.S. laws or regulations.

4.3.2 Comparative Analysis

This section will analyse the similarities and differences in the procedures for deficiency treatment and the control actions in the IMO, Paris MOU, Tokyo MOU,

and USCG.

4.3.2.1 The Comparative Analysis of the Procedures for Deficiency Treatment

4.3.2.1.1 Similarities:

4.3.2.1.1.1 The requirements for deficiency treatment in the three MOUs/agreements are generally consistent with the IMO's, i.e., the secure rectification of all identified deficiencies. They also refine and enrich the requirements for verifying deficiencies and control actions, such as follow-up deficiencies and allowing ships to sail under certain conditions when deficiencies cannot be rectified at the inspection port.

4.3.2.1.1.2 Each MOU/Agreement employs specific codes of action and guidelines to assist PSCOs in deficiency treatment accordingly.

4.3.2.1.1.3 Paris MOU and USCG could detain a ship with a combination of less serious deficiencies.

4.3.2.1.2 Differences:

4.3.2.1.2.1 Paris MOU provides guidance on detention and action taken through a PSCC Instruction, which offers detailed guidance to PSCOs on deficiency treatment

and does not require that deficiencies only be verified for closing only by the PSCO.

4.3.2.1.2.2 Tokyo MOU defines follow-up inspection and establishes relevant procedures, which verify the rectification of deficiencies identified during previous inspections, which can only be closed by PSCOs. If deficiencies haven't been rectified, PSCO may conduct a new initial inspection, considering a more detailed inspection and evaluating ISM procedures. In the meantime, the Action Codes User Guide and Guidelines for PSCOs on Remote Follow-up Inspections are provided to assist PSCOs with deficiency treatment.

4.3.2.1.2.3 USCG has detailed instructions codes on rectifying deficiencies and control actions for addressing hazard risk actions. The deficiency is indicated by a clear code and can be closed by the PSCO or other parties, depending on the severity of the deficiency. USCG also takes a multi-option approach to vessels of control, which depends on the severity of the deficiencies, the risk posed, and the efforts made to rectify them.

4.3.2.2 The Comparative Control Actions/Codes of the Three MOUs/Agreements

The control actions of the Paris MOU, Tokyo MOU, and USCG is shown in Table 5 below. The comparative results show that the control actions/codes of the three MOUs/Agreements are generally uniform, while there are some differences in the setting of individual control actions/codes according to regional practice. Paris MOU has more diverse reporting actions (such as Coastal State Informed, Other Authority

informed, etc.), Tokyo MOU has specific actions to investigate discharge violations (Investigation or contravention of discharge provisions), and USCG has more control actions (such as Prior to carriage of passengers/cargo, embarking on international voyage, bunkering operations, etc.). Although there are some differences, each MOU is also taking steps to harmonize the control actions/codes. For example, Paris MOU and Tokyo MOU adopted a process to harmonize the PSC action codes and open them to all other PSC regimes and IMO secretariats (IMO,2016). USCG uses a similar action code to indicate relevant deficiency treatment.

Table 5

Comparative Control Action Codes of Paris MOU, Tokyo MOU and USCG

Numb.	Items	Paris MOU	Tokyo MOU	USCG
1	Deficiency rectified	10	10	10
2	To be rectified at next port	15	15	15
3	To be rectified within 14 days	16	16	16
4	To be rectified before departure	17	17	17
5	To be rectified deficiency within 3 months (ISM-	N.A	18	N.A
6	Safety management audit by the Administration is required before departure of the ship (ISM-related)	19	N.A	N.A
7	Ship expelled	N.A	Provided	20
8	Correctiveaction taken on the ISM system by the Company isrequired within 3 months (ISM-related)	21	N.A	N.A
9	Ship denied entry	Provided	Provided	25
10	Competent Security Authority informed	26	26	N.A
11	Ship expelled on security grounds	N.A	27	N.A
12	Detainable deficiency	Grounds for detention (tick box only)	30	30
13	Rectify deficiencies prior to next US port after sailling foreign	N.A	N.A	40

14	Rectify detainable deficiency at agreed repair port	46	46	N.A
15	As in the agreed class condition	47	N.A	N.A
16	As in the agreed flag State condition	48	48	N.A
17	As in the agreed rectification action plan	49	49	N.A
18	To be rectified within 30 days	N.A	N.A	50
19	Rectify deficiencies prior to movement	N.A	N.A	60
20	To the satisfaction of RO/RSO	N.A	N.A	a
21	To the satisfaction of the Administration	N.A	N.A	b
22	To the satisfaction of Coast Guard	N.A	N.A	c
23	Next port informed	Provided	40	Provided
24	Flag state/consul informed	N.A	50	Provided
25	Flag state consulted	55	55	N.A
26	Operation stopped	65	Provided	Provided
27	Recognized organization informed	Provided	70	Provided
28	Temporary substitution	80	N.A	N.A
29	Temporary repair carried out	81	N.A	N.A
30	Investigation or contravention of discharge provisions (MARPOL)	N.A	85	N.A
31	Letter of warning issued	95	N.A	Provided
32	Letter of warning withdrawn	96	N.A	N.A
33	Master instructed to …/Others	99	99	705
34	ILO informed	Provided	151	N.A
35	Seafarers' organization informed	Provided	152	N.A
36	Ship owner representative informed	Provided	155	N.A
37	Coastal State informed	Provided	N.A	N.A
38	Other authority informed	Provided	N.A	Provided
39	Prior to carriage of passengers/cargo	N.A	N.A	701
40	Prior to embarking on international voyage	N.A	N.A	702
41	Prior to bunkering operations	N.A	N.A	703
42	RO responsibility	Tick box only	Write"YES" on the corresponding cross	N.A

Note. Adapted from "Guidance on Detention and Action Taken," by Paris MOU, 2022; "PSC Manual," by Tokyo MOU, 2022; and "Marine Safety Manual, Vol. II: Materiel Inspection," by USCG, 2021 (https://www.parismou.org/guidance-detention-and-action-taken, https://tokyomou-private.org/mou/members/, https://www.uscg.mil/Resources/Library/).

4.3.3 Conclusion

In conclusion, while there are similarities in the general principles of deficiency

treatment among the IMO, Paris MOU, Tokyo MOU, and USCG, the differences lie in the control level of detail and the actions they use, especially the follow-up inspection of the Tokyo MOU and the verification indication measures of USCG.

4.4 The Assessment of RO Responsibilities

RO is defined as an organization that is assessed and authorized by the Flag State Administration. These organizations follow the provisions of the RO Code, enabling them to deliver the required statutory services and certification for ships eligible to fly that State's flag. All three MOU establish and implement requirements for assessing RO responsibility (reference data see Table 6). This section will focus on the procedures and implementation of the IMO, Paris MOU, Tokyo MOU, and UCSG concerning the assessment of RO responsibility.

Table 6

Detentions of Ships with RO-Related Detainable Deficiencies in Paris MOU, Tokyo MOU, and USCG

Detentions of Ships with RO-Related Detainable Deficiencies in Each Organization					
MOU/Agreements	2018	2019	2020	2021	2022
Paris MOU	97	80	36	64	N A
Tokyo MOU	59	72	150	35	84
USCG	12	12	4	11	9

Note. Adapted from "Annual Report of PSC," by Paris MOU, Tokyo MOU, and USCG, 2018-2022 (https://www.parismou.org/publications-category/annual-reports, https://www.tokyo-mou.org/publications/annual_report.php,

https://www.dco.uscg.mil/Our-Organization/Assistant-Commandant-for-Prevention-Policy-CG-5P/Inspections-Compliance-CG-5PC-/Commercial-Vessel-Compliance/Foreign-Offshore-Compliance-Division/Port-State-Control/Annual-Reports/).

4.4.1 Documents Analysis

The detailed requirements of RO in the procedures of the IMO, Paris MOU, Tokyo MOU, and USCG are discussed in this part, especially the assessment of RO responsibility, emphasizing the key characteristic of each organization.

4.4.1.1 The IMO Requirements of RO in PSC Procedures

The responsibilities of RO are not defined in the IMO's relevant PSC procedures. The main requirements for PSC implementation concerning RO are related to information feedback, cooperating with the PSCO in conducting inspections, etc. The following is a summary of the items requiring RO involvement in PSC activities and the actions required of ROs:

a. During PSC inspections, the RO may be invited on board for more detailed inspections by the ship master to cooperate with PSCOs, especially about the detention of ships and confirm the completion of required surveys.

b. Port States notify the RO of relevant information, such as potential ship detentions, ships sailing with outstanding deficiencies, and relevant deficiency reports.

c. Upon receiving notifications, the RO, in collaboration with the Flag State, informs the IMO of remedial actions taken for detentions, reports immediate actions for alleged deficiencies, and conducts safety management audits when required before releasing a ship from ISM-related detention.

4.4.1.2 The Requirements for Paris MOU Assessment of RO Responsibilities

Paris MOU updated its Criteria for RO responsibility assessment in July 2015. According to these criteria, a class-related deficiency implies that the ship's RO, which conducted the relevant survey or issued certification, is responsible for the deficiencies that led to the detention, either alone or in combination. The notification procedure in section 3.7 of the Paris MOU requires that responsible RO(s) be notified in writing as soon as reasonably practicable. Notifications should clarify whether or not the RO is deemed responsible, and more than one RO can be deemed responsible in certain cases.

4.4.1.3 The Requirements for Tokyo MOU Assessment of RO Responsibilities

Tokyo MOU updated its Criteria for attribution of RO responsibility in October 2015. Tokyo MOU summarizes the relevant MLC provisions related to the RO responsibility in the guideline and emphasises the requirement for ROs to cooperate with Port States in detention cases and for reported deficiencies. The notification procedures should be followed in all cases of detention. If an RO or RO(s) are deemed responsible, they should be notified in writing as soon as reasonably

practicable.

4.4.1.4 The Requirements for USCG Assessment of RO Responsibilities

The local office of the classification societies, RO, or RSO must be notified upon identifying RO-related detention. The involvement of the local surveyor or class representative can facilitate the deficiency correction process. The completed report should be delivered as soon as possible, but no later than 1630 local time on the next business day following the detention. It is important to note that the USCG does not decide to grant a determination of RO responsibility at the time of issuing the PSC report. The OCMI/COTP should advise the Commandant (CG-CVC-2) of these organizations' unsatisfactory performance rather than correspond directly, who will review detention cases to determine if actions taken by the RO contributed to the detention and/or major control action.

4.4.2 Comparative Analysis

A comparative analysis of the requirements of the IMO, Paris MOU, Tokyo MOU and USCG concerning the requirements of RO and their assessment criteria of RO responsibility will be presented in this section showing the similarities and differences.

4.4.2.1 Comparative Analysis of the Requirements for Assessment of RO Responsibilities

4.4.2.1.1 Similarities

4.4.2.1.1.1 All three MOUs/Agreements are consistent with IMO's requirement for requiring Port States to notify the RO about relevant information, such as ship detentions, outstanding deficiencies, and deficiency reports, and emphasize the need for ROs to be involved in PSC activities and cooperate with the respective authorities during inspections and detentions.

4.4.2.1.1.2 Paris MOU, Tokyo MOU, and USCG deem that more than one RO may be responsible for a ship's deficiencies leading to detention and have corresponding criteria for the assessment of RO responsibility.

4.4.2.1.2 Differences

4.4.2.1.2.1 IMO does not define the responsibilities of ROs in its PSC procedures, whereas the Paris MOU, Tokyo MOU, and USCG outline more explicit requirements.

4.4.2.1.2.2 In the USCG requirements, the OCMI/COTP informs the Commandant (CG-CVC-2) of the unsatisfactory performance of organizations, who then reviews detention cases to determine if actions taken by the RO contributed to the detention and/or major control action. Rather not a direct decision by the PSCO of the field

unit or OCMI/COTP.

4.4.2.2 Comparative Analysis of the Assessment Criteria of RO Responsibility

The criteria for assessing the RO responsibility of the Paris MOU, Tokyo MOU and USCG are shown in Table 7. And each has criteria for assessing RO responsibility in cases of detainable deficiencies, with some similarities and differences:

Table 7

The criteria for assessing the RO responsibility of the Paris MOU, Tokyo MOU and USCG

Assessment Items	Paris MOU Requirements	Tokyo MOU Requirements	USCG Requirements
Type of deficiency applied	detainable deficiency	detainable deficiency including a major nonconformity	detainable deficiency
Detainable deficiencies associated with the RO	a. Serious structural deficiencies, unless clearly occurred since the last RO survey. b. Serious non-structural equipment or fitting deficiencies, if less than 90 days since the last RO survey. c. Serious non-structural deficiencies that clearly existed at the time of the last survey. d. Serious out-of-date equipment deficiencies that existed at the time of the last survey. e. Missing approval or endorsement of Plans and Manuals required for statutory certificates, existing at the time of the last survey. f. Detainable ISM-deficiency with evidence of lack of effective implementation of the ISM Code, if clear evidence existed during the last RO audit within 90 days. g. Detainable MLC-deficiency with evidence of lack of implementation of the MLC Code, existing at the last RO inspection.	a. Serious structural deficiencies, unless they occurred since the last RO survey. b. Serious non-structural equipment or fitting deficiencies, if less than 90 days since the last RO survey and not occurred since the last survey. c. Serious non-structural deficiencies that clearly existed at the time of the last survey. d. Serious out-of-date equipment deficiencies that existed at the time of the last survey. e. Missing approval or endorsement of Plans and Manuals required for statutory certificates, existing at the time of the last survey. f. Major nonconformity with evidence of lack of effective implementation of the ISM Code, if clear evidence existed during the last RO audit within 90 days, including operational drills and operational control. g. Detainable MLC-deficiency with evidence of lack of implementation of the MLC Code regarding accommodation and recreation facilities and existing at the last RO inspection.	a. Only equipment covered by a survey conducted by the RO, or in which the RO has issued the certificate on behalf of the flag state should be considered to determine RO association. b. When multiple deficiencies are noted, only those deficiencies serious enough to justify detention should be evaluated to determine RO association. c. Outdated equipment, when the cause of a detention, will not be associated with the RO unless the equipment was outdated at the time of the last survey conducted by the RO on behalf of the flag state. d. Detentions based on crewing issues, whether conducted in accordance with SOLAS or STCW, will not be associated with an RO. e. A time limit of 90 days will generally be placed on detentions resulting from equipment failures (i.e., non-operational fire pumps, emergency generators, etc.) unless it is apparent that the deficiency was long-standing. f. Serious wastage or other structural deficiencies not caused by voyage damage will be listed as RO nonconformities.
Detainable deficiencies are not associated with the RO	a. Resulting from accidental damage. b. Missing equipment likely stolen, with evidence of follow-up action by the ship's master. c. Expired certificates, unless improperly issued by the RO following a flag State survey.	a. Resulting from accidental or voyage damage. b. Missing equipment likely stolen, with evidence of follow-up action by the ship's master. c. Expired certificates, unless improperly issued by the RO following a flag State survey.	a. Voyage damage unless other organization-related deficiencies are noted during the damage survey. b. The absence of easily stolen equipment unless a large amount is missing and it is within 90 days of the last survey by the RO on behalf of the flag State. c. Expired certificates unless the certificates were not endorsed or were improperly issued by the RO when they conducted the last survey on behalf of the flag State.

Note. Adapted from "Criteria for RO Responsibility Assessment," by Paris MOU, 2015; "Memorandum of Understanding on PSC in the Asia-Pacific Region," by Tokyo MOU, 2022; and "USCG Marine Safety Manual, Vol. II: Materiel Inspection," by USCG, 2021 (https://www.parismou.org/criteria-ro-responsibility-assessment, https://www.tokyo-mou.org/inspections_detentions/criteria_for_attribution_of_ro_responsibility.php, https://www.uscg.mil/Resources/Library/).

4.4.2.2.1 Similarities:

All three MOUs/Agreements apply criteria to deficiencies covered by an RO-issued

or endorsed statutory certificate, considering serious structural and non-structural deficiencies within 90 days of the last survey, and out-of-date equipment at the time of RO's last survey. They exclude deficiencies from accidental or voyage damage and expired certificates unless improperly issued by the RO after a Flag State survey.

4.4.2.2.2 Differences:

Paris MOU and Tokyo MOU associate detainable deficiencies with the RO if the ISM and MLC Codes lack implementation, while USCG does not mention these conventions in its criteria. USCG excludes outdated equipment, stolen equipment, and crewing issue detentions under specific circumstances, imposing a 90-day limit on detentions due to equipment failures and classifies serious wastage or structural deficiencies as RO nonconformities, while Paris MOU and Tokyo MOU do not mention these time limit and this classification.

4.4.2.2.3 Noteworthy Highlights

It is worth noting that Paris MOU and Tokyo MOU are very similar in the criteria for assessing RO responsibility. The main difference is the timeframes for equipment or non-structural deficiencies (The Paris MOU specifies that a serious deficiency in equipment or non-structural fittings is associated with the RO if it is less than 90 days since the last survey conducted by the RO. The Tokyo MOU has a similar criterion but adds the condition that the deficiency should not have occurred since the last survey conducted by the RO.)

4.4.3 Conclusion

In summary, while IMO does not define RO responsibility in PSC procedures, Paris MOU, Tokyo MOU, and USCG establish and implement requirements for assessing RO responsibility, having similarities in their approaches to RO responsibility assessment. However, there are differences in the specific procedures and criteria each organization outlines.

4.5 Summary of Distinctive Findings

This chapter identifies distinctive characteristics, similarities and differences through a comparative analysis of the IMO, Paris MOU, Tokyo MOU and USCG procedural requirements for each PSC process, providing a comprehensive evaluation of the comparative analysis by a comparative table using the outstanding characteristics and differences in the four processes of the initial inspection, more detailed inspection, deficiency treatment and assessment of RO responsibility as benchmarks, identifying the theoretical discrepancies in Table 8, consolidating the distinctive procedural requirements in Table 9.

Table 8

The comparative evaluation of the PSC procedures of the IMO, Paris MOU, Tokyo MOU and USCG

	Initial Inspection		More Detailed insptcion		Deficiency Rectification		Assessment of RO Responsibility	
Items	Clear Inspection Scope	Inspection of ships involved in marine casualties/accidents	Clear Inspection timing	Clear Inspection Scope	Follow-up Inspection Procedure	Rectification Indication Code	Requirements for Assessment of RO Responsibility	Follow-up Actions
IMO	N	N	N	N	N	N	N	N
Paris MOU	Y	Y	Y	Y	N	N	Y	N
Tokyo MOU	N	N	N	Y	Y	N	Y	N
USCG	Y	Y	Y	Y	N	Y	Y	N

Note: A "Y" indicates the presence of a corresponding requirement, while a "N" indicates the absence of a corresponding requirement.

Table 9

Distinctive procedural requirements for each PSC process

PSC Process	MOU/Agreement	Distinctive Procedural Requirements
Initial Inspection	Paris MOU	Paris MOU classifies inspection types into three categories (initial, more detailed, and expanded), with expanded inspections being more comprehensive than initial inspections, like extending the initial inspection to all risk areas and specifying items (including operational ones) that should be checked for each ship type.
	USCG	USCG includes three exam types (PSC A, PSC B, and PSC C) that dictate the exam scope. The PSC A examination has a broader and deeper scope than PSC B. PSC A will witness the crew's performance on the drills, but PSC B will not unless PSCO expands the examination. USCG also provides detailed PSC Job Aids to assist PSCOs in listing the items that should be checked for relevant PSC exams for specific vessel types.

More detailed inspection	Paris MOU	Paris MOU has a more extensive focus on areas related to any overriding or unexpected factors and other randomly selected risk areas. And the human elements related to ILO, ISM, and STCW, alongside operational control are involved.
	Tokyo MOU	Tokyo MOU's more detailed inspection area includes other randomly selected areas and the in-depth operational inspection.
	USCG	USCG does not expand the detailed inspection area as in the Paris MOU and Tokyo MOU when the clear grounds are established but only conducts it for the area of the clear grounds unless PSCOs' general impressions or observations support such an examination.
Deficiency Rectification	Tokyo MOU	Tokyo MOU defines follow-up inspection and establishes relevant procedures, which verify the rectification of deficiencies identified during previous inspections, which can only be closed by PSCOs. If deficiencies haven't been rectified, PSCO may conduct a new initial inspection, considering a more detailed inspection and evaluating ISM procedures.
	USCG	USCG has detailed instructions codes on rectifying deficiencies and control actions for addressing hazard risk actions. The deficiency is indicated by a clear code and can be closed by the PSCO or other parties, depending on the severity of the deficiency.
Assessment of RO Responsibility	USCG	In the USCG requirements, the OCMI/COTP informs the Commandant (CG-CVC-2) of the unsatisfactory performance of organizations, who then reviews detention cases to determine if actions taken by the RO contributed to the detention and/or major control action. Rather not a direct decision by the PSCO of the field unit or OCMI/COTP.

5 EVALUATION OF THEORETICAL AND PRACTICAL ISSUES AND RECOMMENDATIONS

The formulation and implementation of PSC procedures are often inseparable. Therefore, this chapter combines the results of the comparative analysis with the results of the online questionnaire, which allows for the analysis of theoretical and practical issues. These issues pertain to the initial inspection, more detailed inspection, deficiency treatment, and assessment of RO responsibility within PSC processes, aiming to provide relevant recommendations for harmonization and effectiveness.

5.1 The Initial Inspection

For the initial inspection, the questionnaire presents four quantitative questions. These pertain to the scope of the inspection guidance, adherence to procedures during inspections, potential accountability for procedure violations, and the need for inspection of ships involved in marine casualties/accidents. It also includes a multiple-choice question on the conditions necessary to complete the inspection of the ship's overall condition.

Table 10

The one-way ANOVA results of the initial inspection

ANOVA

	Q2 (Mean±Std. Deviation)			*F*	*p*
	Paris MOU(*n*=50)	Tokyo MOU(*n*=117)	USCG (*n*=31)		
scope of the inspection guidance (Q4)	4.28±0.95	3.02±1.36	3.90±1.11	20.713	0.000**
adherence to procedures during inspections (Q5)	4.38±0.85	3.63±1.24	4.03±1.05	8.081	0.000**
potential accountability for procedures violation (Q6)	3.16±1.20	3.51±1.21	3.61±0.88	2.024	0.135
the need for inspection of ships involved in marine casualties/accidents (Q7)	4.34±1.12	4.13±1.26	4.26±1.09	0.583	0.559

* $p<0.05$ ** $p<0.01$

Note. The scale of options is from 1 (strongly disagree/ never) to 5 (strongly agree/ always), which shows higher scores generally indicate stronger agreement or frequency.

Table 10 shows the ANOVA results for the four quantitative questions across the three MOU/Agreement groupings. Differences in the scope of the inspection guidance and adherence to procedures during inspections are both statistically significantly less than 0.05 level (a p-value less than 0.05 suggests that the differences in means are likely due to a real difference in perceptions between the MOUs/Agreements, rather than chance). When comparing the two questions, the mean group scores differ more significantly in the following order: "Paris MOU > Tokyo; USCG > Tokyo MOU" for the scope of the inspection guidance, and "Paris

MOU > Tokyo MOU" for adherence to procedures during inspections. Regarding the need to inspect ships involved in marine casualties/accidents, all three MOUs/Agreements have high mean scores, indicating that PSCOs generally agree on this. Therefore, when combined with the results of the comparative analysis, two issues at the theoretical level of PSC procedure formulation arise in the context of the initial inspection.

5.1.1 The Inconsistencies of the Initial Inspection Scope, particularly for High-priority Ships

The initial inspection scope, particularly for high-risk ships, varies across MOUs/Agreements. This discrepancy is evident because Paris MOU and USCG have detailed inspection scopes and inspection items for high-priority ships, covering the ship's risk areas. In contrast, some MOUs, such as the Tokyo MOU, lack specific requirements for the initial inspection scope of high-priority ships. In Annex 2 of the Memorandum, Tokyo MOU states, "Based on Ship Risk Profile, the selection scheme determines the scope, frequency, and priority of inspections" (Paragraph 2.1) but failed to provide relevant guidance on the corresponding inspection scope. This inconsistency may lead to varying practices in implementing initial inspections, affecting consistency. Additionally, it may result in selective port calls by sub-standard ships, as a lack of clarity on the scope of inspections for high-priority ships might reduce the possibility of these ships being found on clear grounds or even detained. Consequently, sub-standard ships might choose ports where the scope of inspections is unclear rather than improve the overall safety standard of the ships, thereby affecting the effectiveness of PSC.

Recommendation A.1 for the Harmonization and Improvement of Initial Inspection Scopes: To address the inconsistencies in initial inspection scopes across MOUs/Agreements, particularly for high-priority ships, recommend a common framework be developed. This framework should, at a minimum, provide clear guidance on the basic inspection scopes and inspection items for high-priority ships. The framework could draw on the good practices of Paris MOU, USCG, and other MOUs/Agreements. Adopting such a framework could ensure a more consistent and coordinated approach to the initial inspection of high-priority ships, which could effectively avoid selective port calls by sub-standard ships.

5.1.2 The Inconsistencies of Overriding Factors/Priorities, particularly for Ships Involved in Maritime Casualties/Accidents

Table 11

Statistics of ship accidents in the Yangtze Estuary from 2006 to 2020

Time	Number of accidents	Collision number	Shipwreck number	Number of People dead/missing	Direct economic loss (million yuan)
2006	8	7	2	2	9.7
2007	1	1	0	0	0.15
2008	6	4	2	17	46
2009	4	4	0	1	9.1
2010	5	4	1	10	10.3
2011	3	3	0	0	14.1
2012	3	2	1	1	3.545
2013	6	5	3	2	123.8
2014	4	3	0	0	4.7
2015	1	1	0	0	0.3
2016	4	3	0	0	2.03
2017	9	7	0	0	19.1
2018	6	6	0	0	5.14
2019	3	3	0	0	1.93
2020	7	7	1	0	35

Note. Adapted from Wusong Maritime Safety Administration of China, 2021.

The overriding factors/priorities, particularly for ships involved in maritime casualties/accidents, vary across MOUs/Agreements, and these discrepancies are reflected in the effective control of such priority ships. Table 11 shows data on ship accidents in the Yangtze estuary from 2006 to 2020. There were many accidents due to human factors and relevant equipment ineffective maintenance, which reflected problems in the crew's operation and the running of SMS on these ships. Paris MOU, USCG, Black Sea MOU, and Abuja MOU all add such ships to a similar priority category (Paris MOU, 2023; USCG, 2020; Black Sea MOU, 2023; Abuja MOU, 2019), allowing to conduct PSC for the such ship so that the PSC can help Port State dig out the root cause of the casualties/accidents, the damage, and significantly reduce the risk to the ship, the port and the waters. In other MOUs like Tokyo MOU,

the concept of overriding priority is in place to ensure that certain ships may receive inspection between periodic inspections. However, the ships involved in maritime casualties or accidents are not explicitly considered as having overriding priority in the current selection scheme (see Appendix 4). Although the competent authorities conduct the corresponding accident investigations under the relevant conventions, subsequent administrative measures, such as recommendations on the operation of SMS, are not as effective as PSC. Moreover, the PSC makes it possible to check whether there are deep-seated problems in the area of the accident, as well as management or personnel factors. Therefore, such inspections are very necessary and effective. This aspect of the PSC procedures needs to be harmonized and improved.

Recommendation A.2 for the Harmonization and Improvement of Overriding Factors/Priorities: To address inconsistencies in the overriding factors/priorities across MOUs/agreements, particularly for ships involved in maritime casualties/accidents, suggesting a common framework might be developed. This framework should, at a minimum, include the inclusion of ships that need to be highlighted as overriding factors/priorities and those areas/items that primarily involve the inspection. This framework could draw on good practices from Paris MOU and other MOUs/Agreements. By adopting such a framework, MOUs/Agreements could take a more consistent, effective and coordinated approach to conduct PSC inspections on overriding factors/priorities ships, which could be effective in avoiding the risks that could be posed by such risky ships.

5.2 The More Detailed Inspections

For the more detailed inspection, the questionnaire includes four quantitative questions on the scope of the inspection guidance, the timing of the inspection guidance, adherence to procedures during inspections, and the need to clarify the scope and timing of procedures. Additionally, it includes a multiple-choice question on the areas for conducting the more detailed inspection.

Table 12

The one-way ANOVA results of the more detailed inspection

ANOVA

	Q2 (Mean±Std. Deviation)			*F*	*p*
	Paris MOU (*n*=50)	Tokyo MOU (*n*=117)	USCG (*n*=31)		
the scope of the inspection guidance (Q9)	4.02±1.00	3.91±1.19	4.06±1.21	0.286	0.752
the timing of the inspection guidance (Q10)	4.28±0.97	3.80±1.06	4.32±0.79	5.821	0.004**
adherence to procedures during inspections (Q11)	3.94±0.96	3.91±0.92	3.87±0.92	0.054	0.947
the need to clarify the scope and timing of procedures (Q12)	4.24±1.19	4.22±0.88	4.03±1.14	0.496	0.610

* $p<0.05$ ** $p<0.01$

Note. The scale of options is from 1 (strongly disagree/ never) to 5 (strongly agree/ always), which shows higher scores generally indicate stronger agreement or frequency.

Table 12 shows the ANOVA results for the four quantitative questions for the three MOU/Agreement groups. Among these, the timing of the inspection guidance shows significant differences ($p<0.05$). The more significantly different group mean scores are "Paris MOU>Tokyo; USCG>Tokyo MOU", which indicates that the Tokyo

MOU is lower than the other two regarding the timing of the inspection guidance. As for the scope of the inspection guidance, adherence to procedures during inspections, and the need to clarify the scope and timing of procedures, there are high mean scores across all three MOUs/Agreements, indicating that PSCOs generally agree on the need to clarify the scope and timing of procedures. Therefore, combined with the results of the comparative analysis, the more detailed inspection has the following two issues at the theoretical level of PSC procedures formulation.

5.2.1 The Inconsistencies of the Priority Areas Inspected During More Detailed Inspections

IMO set out the more detailed inspections in a separate Chapter (Chapter 3) in Resolution A. 787(19). Paragraph 3.1.2 mutually corresponds to the four guidelines included in this chapter, providing clear guidance on the areas where clear grounds identified should be conducted for more detailed inspection. However, the text related to more detailed inspections failed to be updated after four amendments to the Procedures. In Paragraph 2.5.3 of the Procedures for PSC, 2021, the phrase "equipment and procedures outlined in the chapter" lost its mutual correspondence due to the intent of separation of the "theory" and "practical" sections, and the relevant guidelines were removed from the resolution and placed in the Appendices to the Procedures. More detailed inspections are based on the clear grounds established and are conducted using the inspection guidelines corresponding to those clear grounds. However, section 2.5 does not reflect the priority area of the detailed inspection, i.e., the area where clear grounds have been established. The text does not explicitly link the detailed inspection and the relevant inspection guidelines through the term "clear grounds." This ambiguity could lead to situations where

PSCOs identify clear grounds but inspect other areas without giving more detailed attention to the areas of clear grounds. Therefore, ambiguities and inconsistencies exist in the PSC procedures at the theoretical level.

Recommendation B.1 for Harmonization and Improvement of the Priority Area of the More Detailed Inspection: Regarding the priority of detailed inspections, Paris MOU, Tokyo MOU and USCG's detailed inspection requirements clearly state that detailed inspections will be conducted in areas where clear grounds are established. By making the priority of detailed inspections visible and highlighted, the targeting of detailed inspections is enhanced. Thus, IMO could amend and update the text in Paragraph 2.5.3 of Resolution A.1155(32) to clarify the priority of more detailed inspections, requiring “PSCO should conduct more detailed inspections based on where the "clear grounds" have been established, utilizing the guidelines in relevant appendices”, and replace the phrase "this chapter" with "relevant guidelines" to provide common, consistent, and clear PSC procedures worldwide.

5.2.2 The Inconsistencies of the Timing for Conducting More Detailed Inspections

Table 13

The requirements of the IMO, Paris MOU, Tokyo MOU, and USCG are to conduct the more detailed inspection

Items	The time point for conducting more detailed inspection	Source
IMO	If the ship does not carry valid certificates, or if the PSCO, from general impressions or observations on board, has clear grounds for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of the certificates or that the master or crew is not familiar with essential shipboard procedures, a more detailed inspection, as described in this chapter, should be carried out, utilizing relevant appendices.	IMO, Procedures for PSC, 2021 (Res A.1155(32)), Paragraph 2.5.1
Paris MOU	A more detailed inspection will be carried out whenever there are clear grounds for believing, during an initial inspection, that the condition of the ship or of its equipment or crew or the working and living conditions of seafarers does not substantially meet the relevant requirements of a relevant instrument. Clear grounds exist when a Port State Control Officer finds evidence, which in his professional judgement warrants a more detailed inspection of the ship, its equipment or its crew. The absence of valid certificates or documents is considered a clear ground. Other examples of clear grounds are set out in paragraph 6.	Paris MOU, Annex 9 to Memorandum, Paragraph 3
Tokyo MOU	In the absence of valid certificates, or if there are clear grounds for believing that the crew or the condition of the ship or its equipment does not substantially meet the requirements of a relevant instrument, or the master or crew are not familiar with essential shipboard procedure relating to the safety of ships or the prevention of pollution, a more detailed inspection will be carried out. Inspections will be carried out in accordance with the Manual.	Tokyo MOU, Memorandum, Paragraph 3.1
USCG	During any examination, the PSCO should expand the exam of a vessel if there is "clear grounds" that the vessel, its equipment, or its crew, do not correspond substantially with the particulars of its certificates. Expanded exams should focus on those areas where "clear grounds" exist and should not include other areas or systems unless the general impressions or observations of the PSCO support such exam.	USCG Marine Safety Manual, Vol. II: Materiel Inspection, SECTION D, CHAPTER 1, Part G, 2. Expanding the Examination

Note. Adapted from "Procedures for PSC," by IMO, 2021; "Paris Memorandum of Understanding on PSC," by Paris MOU, 2023; "Memorandum of Understanding on PSC in the Asia-Pacific Region," by Tokyo MOU, 2022; and "USCG Marine Safety Manual, Vol. II: Materiel Inspection," by USCG, 2021 (https://www.imo.org/en/OurWork/IIIS/Pages/Port%20State%20Control.aspx, https://www.parismou.org/inspections-risk/library-faq/memorandum, https://www.tokyo-mou.org/organization/memorandum_of_understanding.php, https://www.uscg.mil/Resources/Library/).

Table 13 shows the requirements of the IMO, Paris MOU, Tokyo MOU, and USCG for conducting more detailed inspections. The comparative analysis identified another theoretical issue concerning the lack of clarity about the timing for conducting these inspections. IMO and Tokyo MOU's procedures do not mention the specific timing of the more detailed inspection. Consequently, there is ambiguity regarding whether the initial inspection should be continued or finished and when to transition to a more detailed inspection. This could result in inconsistencies between the theoretical PSC procedural requirements and the practical implementation of PSC inspections. Specifically, PSCOs might confuse when conducting a PSC inspection, especially if the initial inspection continues or finishes after a more detailed inspection of the corresponding area has been completed. And thus, there exists a potential issue with consistent implementation in the formulation of PSC procedures at the theoretical level.

Recommendation B.2 for Harmonization and Improvement of the Timing of More Detailed Inspection: Both Paris MOU and USCG explicitly state that more detailed inspections should be conducted "during the initial inspection," thereby clarifying the timing for conducting detailed inspections. This clarifies the time point for conducting detailed inspections, explaining quite well the ambiguity about whether the initial inspection should be continued or finished. It would be beneficial for IMO and Tokyo MOU to consider adding similar language to their requirements, specifying that more detailed inspections should be conducted "during the initial inspection." This would help to clarify and harmonize PSC activities at the theoretical level of procedure formulation.

5.3 The Deficiency Treatment

The questionnaire for deficiency treatment included four quantitative questions on the guidance of the combination of action codes, adherence to procedures during inspections, potential accountability for procedural violations, the effectiveness of requirements of deficiency treatment, and a multiple-choice question on potential practical issues that might arise during deficiency treatment.

Table 14

The one-way ANOVA results of the deficiency treatment

ANOVA					
	Q2 (Mean±Std. Deviation)			*F*	*p*
	Paris MOU (*n*=50)	Tokyo MOU (*n*=117)	USCG (*n*=31)		
guidance of the combination of action codes (Q14)	4.24±0.89	4.32±0.85	4.48±1.03	0.729	0.484
adherence to procedures during inspections (Q15)	3.82±1.32	3.38±1.29	4.10±1.14	4.753	0.010**
potential accountability for procedural violations (Q16)	4.12±0.94	3.74±1.23	4.23±0.88	3.555	0.030*
effectiveness of requirements of deficiency treatment (Q17)	3.12±0.98	3.15±1.03	3.61±0.67	3.073	0.049*

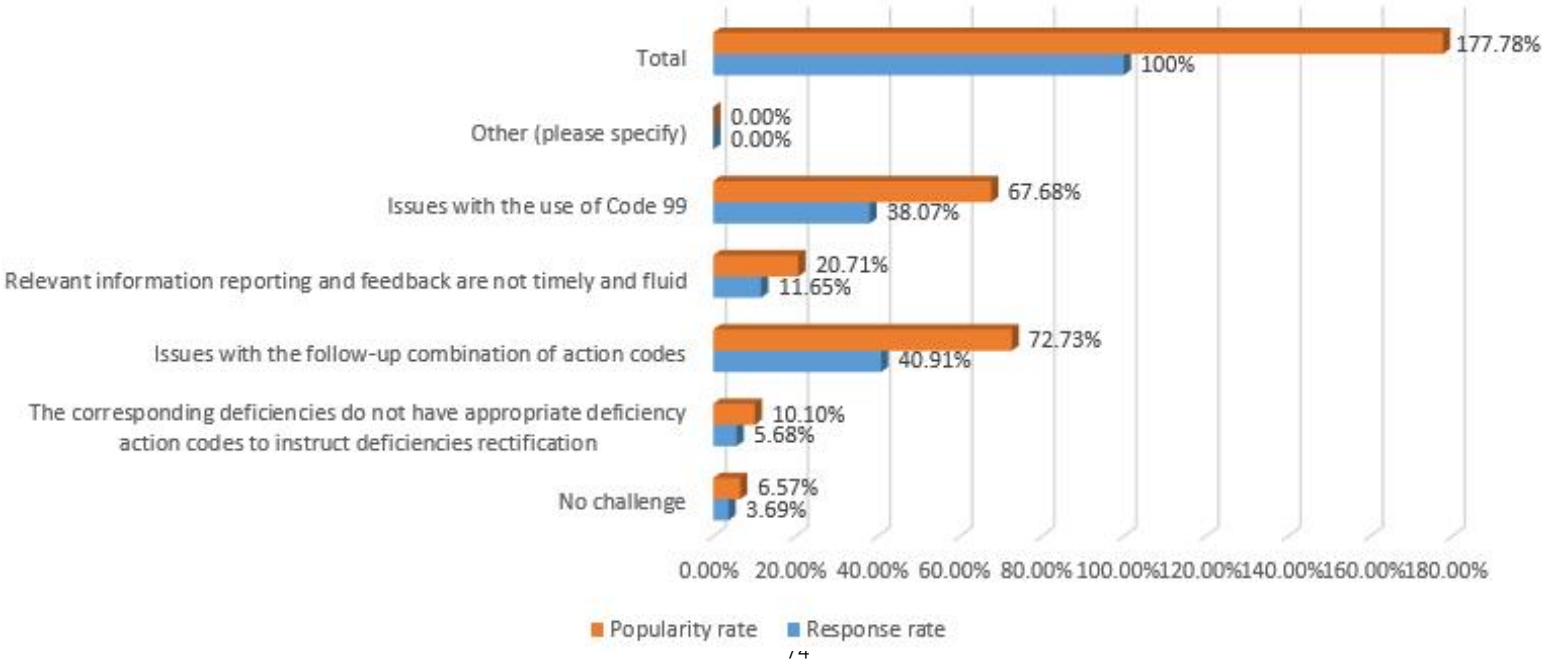
* $p<0.05$ ** $p<0.01$

Note. The scale of options for Q15, Q16, and Q17 is from 1 (strongly disagree/ never) to 5 (strongly agree/ always), and for Q18, it's from 1 (not effective) to 4 (very effective), which shows higher scores generally indicate stronger agreement or frequency.

Table 14 shows the ANOVA results for the four quantitative questions across the three MOUs/Agreements groupings. Significant differences ($p<0.05$) were observed in adherence to procedures during inspections, potential accountability for procedural violations, and the effectiveness of deficiency treatment requirements. The mean group scores differed significantly with "Paris MOU > Tokyo MOU; USCG > Tokyo MOU" for adherence to procedures during inspections and potential accountability for procedural violations. The result was "USCG > Paris MOU; USCG > Tokyo MOU" for adherence to procedures during inspections. While regarding the effectiveness of requirements of deficiency treatment, there might be a real difference in perception of effectiveness between the PSCOs of three MOUs/Agreements, but they generally agree with its effectiveness. And on the guidance of the combination of action codes, there were high mean scores for all three MOUs/Agreements.

Figure 4

The multiple-response results of the deficiency treatment (Q18)



The multiple-choice questions included potential challenges that might be encountered during the implementation of deficiency treatment. Figure 4 shows the response and prevalence rates for each option as a result of the multiple-response analysis. The options related to the combination of action codes and issues with the "other" use code had relatively high response and prevalence rates. Therefore, combined with the results of the comparative analysis, the deficiency treatment presents two main issues at the practical level of PSC procedures implementation.

5.3.1 The Inconsistencies and Irregularities of Using Code of Other

Table 15

The use of instruction of code of "other" in the Paris MOU, Tokyo MOU, and USCG

Organizations	The Code	The requirements of using Code of "Other"
Paris MOU	Master instructed to ... (code 99)	Use only when an instruction to the master is considered appropriate and it is not covered by the standard actions taken. Further it is necessary to indicate in clear text as to what the master is instructed to do and the time allowable for completing the action requested. Code 99 is available for all deficiencies of all main groups of codes except: 15150 ISM, 1610X Security (exception 16105 – Access control to ship, where code 99 is available)
Tokyo MOU	other (specify) (code 99)	Code 99 should only be used if it is not possible to assign any other action code. Use action code 99 when rectification of defects is deferred beyond the next port of call or for any other actions that cannot be described appropriately by the available codes.
USCG	Other–as specified (code 705)	Action "705 –Other" should be used to annotate deficiencies only in cases where no other option is applicable. For example, "705 –Other: by next Drydock" may be appropriate for some deficiencies that can only be repaired during a shipyard period, but otherwise do not pose an immediate risk to the vessel, persons on board, or the marine environment.

Note. Adapted from "Guidance on Detention and Action Taken (PSCC55-2022-10)," by Paris MOU, 2022; "PSC Manual," by Tokyo MOU, 2022; and "USCG Marine

Safety Manual, Vol. II: Materiel Inspection," by USCG, 2021 (https://www.parismou.org/guidance-detention-and-action-taken, https://tokyomou-private.org/mou/members/, https://www.uscg.mil/Resources/Library/).

The purpose of the use code of “other” in Paris MOU, Tokyo MOU and USCG is to provide flexibility in recording non-standard deficiency treatment. And the guidelines have clear instructions, as shown in Table 15. The use of the code requires stating that the action to be taken and/or the time to be completed/whether a follow-up inspection is required must be stated in clear terms. If these were omitted, it would be a meaningless code. However, practical issues often arise in practice with unclear descriptions and failure to indicate the deadline for rectification/follow-up inspections, etc. There are even a few instances of repeated use of 99 codes without closing deficiencies. Also, according to IMO's deficiency treatment requirements, certain conditions must be met to allow a ship to leave port when there are clearly hazardous deficiencies. Yet, there are also issues with the irregular use code of “other” to release such ships (Reference data see Tab 16). These inconsistencies can lead to ships being released without meeting procedural requirements or subsequent PSCOs encountering difficulties in verifying deficiencies due to unclear action descriptions, which can severely affect the effectiveness of the PSC.

Table 16

Number of deficiencies using Code 99 in Tokyo MOU from 2016 to 2018

Year	The number of deficiencies			
2016–2018	Used code 99 as the initial action code	Code 99 is the initial but still not close	Update code 99 with code 99	Update code 99 with code 99 but still not close
	22164	6094	4701	1255

Note. Adapted from “Study on the influence of '99' code on the Tokyo MOU PSC” by Li et al., 2023, China Maritime Safety, pp. 31-33+54. https://doi.org/10.16831/j.cnki.issn1673-2278.2023.01.008.

Recommendation C.1 for Harmonization and Improvement of the Use of the "Other" Code: To address the inconsistencies and irregularities in the use of the "other" code, firstly, MOUs/agreements should be clearer on the conditions for the use of this code and the requirements, in particular, the use of the code to release a ship after it has been detained. Enhancing guidance and training for PSCOs on appropriately using this code in deficiency treatment is also necessary. Secondly, when entering this code into the system (THETIS, APCIS, and MISLE), additional restrictions could be placed on what is need entered to ensure that the code use requirements are met. Thirdly, strengthen the assessment of the quality of PSC inspections and the review of PSC reports, thus standardizing the use of the relevant deficiency code. This will harmonize and enhance the use of the code and improve the consistency and effectiveness of deficiency treatment.

5.3.2 The Inconsistencies and Ineffectiveness of Deficiency Treatment Implementation

Another significant practical issue is the inconsistent and ineffective implementation

of deficiency treatment, primarily regarding the combination of follow-up action codes and the verification of previous deficiencies, leading to ineffective deficiency rectification. Action codes, such as codes 30 and 17, are mentioned in Table 5 and represent two of the most frequently utilized deficiency codes. Code 30, particularly, demonstrates high effectiveness as it mandates ship detention, compelling rectification efforts. Various codes (e.g., 99, 48, etc.) can be combined and updated with codes 30 and 17, allowing a ship to depart with the deficiency under specific conditions. However, irregularities, such as using Code 99 to update previous codes, do occur, as described in Table 16.

Figure 5

A ship's PSC inspection record has sailed with unclosed detainable deficiency for eight years

Authority	Port of inspection	Date of report	Detention	PSC Organisation	Type of inspection	Duration (days)	Number of deficiencies	Details
		14/11/2022	N					
		22/12/2021	N					
		01/03/2021	N					
		07/12/2020	N					
		05/09/2020	N					
		19/07/2020	N					
		20/04/2020	N					
		06/03/2020	N					
		18/11/2019	N				1	
		23/08/2019	N				1	
		25/05/2019	N				2	
		17/11/2018	N				4	
		15/06/2018	N					
							1	
		09/03/2018	N				8	
		27/12/2017	N				1	
		13/09/2017	N					
							1	
		07/07/2017	Y			N/A	14	
		07/02/2017	N				5	
		26/06/2016	N					
		10/03/2016	N				1	
		07/12/2015	N				2	

Note. Adapted from data retrieved from Equasis using the specific IMO number of the ship, 2023.

Data in Table 16 also indicate that rectification and verification of deficiencies are not effectively implemented. For instance, Figure 5 illustrates a ship that was detained in March 2015 due to only one escape trunk for the steering gear room and was released by updating the code 99, requiring the deficiency must be rectified by 4th June 2015, which did not meet the requirements of using code 99. But, since then, the ship has been inspected 22 times and even detained once until now, the deficiency was not closed.

There are several reasons for this: Firstly, there are difficulties in rectifying some of the deficiencies, especially structural deficiencies that were overlooked at the design stage, making it more difficult to rectify the deficiencies after the ship is in operation. Secondly, the deficiency treatment mechanism is not effectively implemented, and some PSCOs fail to use appropriate code to guide the deficiency rectification and to effectively carry out their duties to verify previous deficiencies during inspections. Lastly, there is a lack of effective supervision of inspections. All these mentioned factors permit ships to sail with unclosed deficiencies. This practical issue can lead to ineffective deficiency treatment and reflect the poor implementation of deficiency treatment, ultimately affecting the PSC system's overall effectiveness.

Recommendation C.1 for Harmonizing and Improving Deficiency Treatment: To address the difficulties associated with deficiency treatment, the following measures might be implemented:

a. Continually improve the mechanisms and requirements relating to deficiency treatment, ensure that they are effectively implemented by supervision, and strengthen the inspection of previous deficiencies. A good example to refer to is the follow-up inspection mechanism of Tokyo MOU, where PSCO shall verify previous deficiencies within 24 months of the ship. If the deficiency is not rectified, PSCO may conduct a new initial inspection, considering a more detailed inspection and evaluating ISM procedures.

b. Improve the corresponding rectification indication codes. A useful reference is the USCG action codes (to the satisfaction of RO/RSO, Administration, or USCG).

These action codes clearly indicate the conditions for meeting the rectification requirements and also make it easier for the ship to take rectification action accordingly.

c. Update the PSC system to show all deficiencies that remain unclosed of the ship after the PSCO has completed the ship selection to provide a detailed reference for the PSCO to conduct the relevant inspection. And set limits on subsequent system entries to ensure the effectiveness of inspection.

d. Provide comprehensive and ongoing training for PSCOs and implement measures to facilitate the rectification process for ships, such as providing clear guidelines on the rectification process and offering technical assistance when needed.

By addressing these issues, the implementation of deficiency treatment across the different PSC regimes could be harmonized and enhanced. Implementing these recommendations might help promote consistency and effectiveness in deficiency treatment.

5.4 The Assessment of RO Responsibilities

For the assessment of RO responsibility, the questionnaire sets out four quantitative questions concerning the guidance of assessment, adherence to procedures during inspections, the need for assessing the responsibility of RO directly, the need for follow-up actions after assessment, and a multiple-choice question on the theoretical and practical issues might counter during assessing RO responsibility.

Table 17

The one-way ANOVA results of the assessment of RO responsibility

ANOVA

	Q2 (Mean±Std. Deviation)			F	p
	Paris MOU (*n*=50)	Tokyo MOU (*n*=117)	USCG (*n*=31)		
guidance of assessment (Q19)	4.10±1.34	4.00±1.23	3.87±1.26	0.316	0.729
adherence to procedures during inspections (Q20)	3.82±1.06	3.62±1.29	3.94±1.24	1.071	0.345
need for assessing the responsibility of RO directly (Q21)	2.96±1.11	2.43±1.32	3.10±1.33	5.176	0.006**
the need for follow-up actions after assessment (Q23)	4.14±0.93	3.97±0.99	3.94±0.96	0.658	0.519

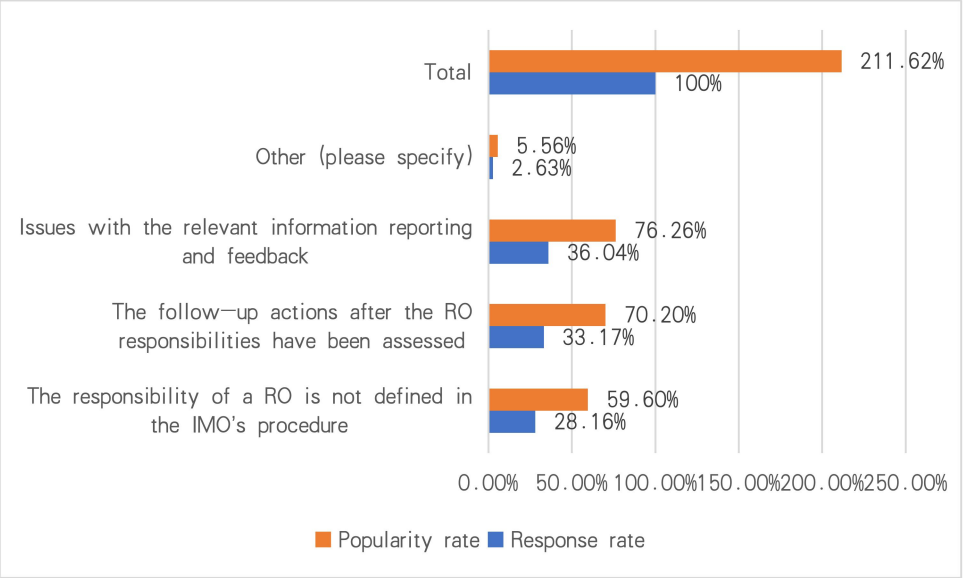
* $p<0.05$ ** $p<0.01$

Note. The scale of options is from 1 (strongly disagree/ never) to 5 (strongly agree/ always), which shows higher scores generally indicate stronger agreement or frequency.

Table 17 shows the ANOVA results for the four quantitative questions, categorized by the three MOUs/Agreements groups. The only question showing significant differences ($p<0.05$) is the necessity of directly assessing RO responsibility. However, the mean scores for this question were generally low across all groups (Paris MOU: 2.96, Tokyo MOU: 2.43, USCG: 3.10), showing a mix of views and uncertainty among PSCOs regarding this issue. For the questions on the guidance of assessment, adherence to procedures during inspections, and the necessity for follow-up actions after assessment, all three MOUs/Agreements groups showed high mean scores.

Figure 6

The multiple-response results of the assessment of RO responsibility (Q22)



The multiple-choice question included options for potential theoretical and practical issues that might arise during the assessment of RO responsibility. Figure 6 shows each option's response and prevalence rates based on a multiple-response analysis. The response rate and prevalence rate for the options relating to undefined RO responsibility in PSC procedures, follow-up actions, and the issues with the information reporting and feedback were all relatively high. Therefore, combined with the results of the comparative analysis, the deficiency treatment has the following two issues at the theoretical and practical level of PSC procedures implementation.

5.4.1 The Inconsistencies of the Assessment of RO Responsibilities

ROs are authorized by the Flag State to survey ships and issue certificates. Paris MOU, Tokyo MOU, and USCG list the relevant Conventions in their public criteria for assessing RO responsibility. However, these criteria do not directly indicate that the Port States have the right to assess responsibility. The lack of a clear definition of RO responsibility in the IMO's PSC procedures and the absence of provisions permitting Port States to bypass the Flag State for the assessment of RO responsibility during PSC inspections raise questions about the PSC body's appropriateness in assessing RO responsibility. The legal position of Port States about assessing the relevant RO responsible for detained deficiencies during a PSC inspection thus needs to be clarified and harmonized at the IMO level. If the legal status of assessing RO responsibility is not clarified and established, and there is no standardized framework or criteria for this assessment, this could lead to an unfounded and inconsistent approach to implementing relevant PSC control actions.

Recommendation D.1 for Harmonization and Improvement of the Assessment of RO Responsibility: Considering that ROs are authorized by the Flag State, it would be logical to assess RO responsibility through the Flag State. However, the Port State assessment may be more direct and effective in practice as it eliminates the intermediary link. To address this issue, IMO should work with member states and organisations such as IACS to establish a common framework for assessing responsibility. If the Port State conducts the direct responsibility assessment, its legal position should be confirmed and included in the IMO's PSC procedure. If a follow-up assessment is conducted through the Flag State, a clear communication and cooperation channel should be established between the Port States and Flag States. IMO might develop a clear channel for communication and cooperation between Port States and Flag States. IMO could work with Flag States, Port States,

and ROs to develop a clear framework regarding ROs' specific responsibilities in the context of PSC. This framework should establish standardized criteria for flag States to assess RO responsibility and a mechanism for Port States to send relevant deficiencies and materials to their Flag State counterparts, which will assess the RO's responsibility and coordinate the necessary actions.

5.4.2 The Inconsistencies of the Follow-up Actions after the Assessment of RO Responsibility

Another theoretical and practical issue is that while various MOUs/Agreements outline how to assess RO responsibilities, they do not guide follow-up actions. This omission may result in an unclear and potentially inconsistent approach to rectification of deficiency related to RO responsibilities. At the same time, the issue is further compounded by the fact that some ROs will react differently depending on the response of the Port State, and some ignore their responsibilities and take no action. There are no established requirements to ensure appropriate rectification measures are taken, and effective implementation is achieved to ensure accountability. This lack of clarity may lead to ineffective implementation and inefficient accountability.

Recommendation D.2 for Harmonization and Improvement of the Follow-up Actions after the Assessment of RO Responsibility: IMO should work with relevant PSC bodies and ROs to develop guidance on follow-up actions to be taken by Port States/Flag States when deficiencies related to RO responsibilities are found during PSC inspections. This guidance should include procedures for coordinating

deficiency rectification with relevant RO and timely feedback to the Port State/Flag States.

E. Conclusion

This chapter thoroughly examines the relevant processes of PSC procedures, including initial inspection, more detailed inspection, deficiency treatment and assessment of RO responsibility, both in the theoretical formulation and practical implementation. By identifying inconsistencies and inefficiencies in these areas, this study provides practical insights and recommendations to improve the harmonization and effectiveness of PSC procedures.

6 CONCLUSIONS

6.1 Summary of Findings and Contributions to Knowledge

This dissertation employs a comparative analysis method and an online questionnaire on the PSC procedures of the IMO, Paris MOU, Tokyo MOU, and USCG. The aim is to identify the characteristics, similarities, and differences in these PSC procedures, examining theoretical formulation issues as well as practical implementation issues regarding initial inspection, more detailed inspection, deficiency treatment, and assessment of RO responsibility. So as to propose recommendations for the harmonization and improvement of PSC procedures worldwide. The main findings and contributions of this dissertation are summarized below:

6.1.1 Comparative Characteristics, Similarities, and Differences in PSC Procedures:

The study makes a comprehensive comparative analysis of the PSC procedures, identifying key characteristics, similarities, and differences between the IMO, Paris MOU, Tokyo MOU, and USCG regarding initial inspection, more detailed inspection, deficiency treatment, and assessment of RO responsibility, providing an in-depth insight into the different PSC procedures and highlighting their theoretical procedural discrepancies and the distinctive procedural requirements.

6.1.2 Identification of theoretical formulation issues and practical implementation issues:

The study examined theoretical formulation issues and practical implementation issues of PSC procedures, analysing the potential consequences and implications for consistency and effectiveness. These issues include the scope for the initial inspection, overriding factors/priorities of ships, the scope and timing of more detailed inspections, difficulties and challenges in implementing deficiency treatment, and a lack of clarity regarding RO responsibilities and follow-up actions.

6.1.3 Recommendations to harmonize and improve PSC procedures worldwide:

The study makes specific theoretical and practical recommendations based on a consistency and effectiveness perspective to address the issues identified. These recommendations are intended to serve as a practical reference for relevant organizations and as a starting point for further discussions and refinements to improve the consistency and effectiveness of PSC procedures worldwide.

6.2 Research Limitations, Future Research Directions

Despite the comprehensive nature of this study, it is important to acknowledge its limitations and propose potential future research directions to harmonize and improve PSC procedures worldwide.

6.2.1 Research Limitations:

The primary constraint of this study focuses on four representative organizations - IMO, Paris MOU, Tokyo MOU, and USCG. This focus does not encompass all the PSC procedures in other MOUs. Additionally, the analysis relies primarily on publicly accessible documents, data, and PSCO questionnaires. Despite exhaustive efforts, access to some detailed comparative data was denied due to confidentiality issues. Consequently, this may affect the full comprehensiveness of the analysis. The data survey was only in the form of an online questionnaire. It did not cover other stakeholders, which may result in a lack of perceptions and suggestions from other perspectives, particularly from the seafarers. Lastly, the dissertation does not cover all aspects of the PSC process, such as the operational inspection, suspension of inspection, and, notably, the challenges related to building ships based on the GBS Conventions category.

6.2.2 Future Research Directions:

Given these limitations, the following recommendations are made for future research:

a. Broaden the scope of the study to include other processes of PSC procedures and a more extensive array of PSC MOUs/Agreements to gain a more comprehensive understanding of PSC procedures globally.

b. Seek permission to access more data that could provide a more robust analysis of PSC procedures and their comparative effectiveness.

c. Conduct qualitative research through interviews or focus groups with key stakeholders to enrich the data and provide a more comprehensive picture of the practical implications of these procedures.

d. Address the challenges posed by developments in Conventions and the industry, such as the issue of the basis for inspection concerning the construction of ships under the GBS category.

By acknowledging these limitations and exploring these proposed directions for future research, we can continue to develop a more comprehensive understanding of PSC procedures, challenges, potential areas of improvement, and the measures to harmonize and improve PSC procedures worldwide.

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APPENDICES

Appendix 1 The Online Questionnaire

Questionnaire for PSC Officers (PSCOs) on PSC Procedures Implementation

Section 1: Background Information

Q1. How many years of experience do you have as a PSCO?

a. Less than 2 years b. 2-4 years c. 4-6 years d. 6-8 years e. More than 8 years

Q2. Which MOU region do you primarily operate in?

a. Paris MOU b. Tokyo MOU c. USCG d. Other (please specify)

Q3. How long do you take in average for the whole process of one PSC inspection?

a. Less than 1 hour b. 1-2 hours c. 2-3 hours d. 3-4 hours e. 4-5 hours

f. More than 5 hours

Section 2: Initial Inspection:

Q4. On how to implement the initial inspection, take the inspection scope for example, whether the MOU/Agreement introduced very clear guidelines?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q5. When conducting the initial inspection, do you strictly follow the relevant requirements of the MOU/Agreement?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q6. When conducting the initial inspection, is there a risk of criticism or liability if you do not conduct the inspection as required by the MOU/Agreement?

a. Never b. Rarely c. Sometimes d. Often e. Always

Q7. Do you consider it necessary that ships involved in marine casualties/accidents can be inspected between periodic inspections?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q8. When do you complete conducting the overall condition check? (Select all that apply)

a. When all areas mentioned in the procedural requirements of the MOU/Agreement are checked

b. When a few randomly mentioned areas of the MOU/Agreement's procedural requirements are checked

c. When the targeted areas based on the risk profile and the type of the ship are

checked

d. When a general impression and visual observations on board are confirmed

e. When clear grounds are found

f. Other (please specify)

Section 3: More Detailed Inspection:

Q9. On how to implement the more detailed inspection, take the inspection scope for example, whether the MOU/Agreement introduced very clear guidelines?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q10. On how to implement the more detailed inspection, take the inspection timing for example, whether the MOU/Agreement introduced very clear guidelines?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q11. When conducting the more detailed inspection, do you strictly follow the relevant requirements of the MOU/Agreement?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q12. Do you consider it necessary to clarify in the procedures the scope and timing of the detailed inspections to be conducted?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q13. In which of the following areas do you carry out detailed inspections? (Select all that apply)

a. The area(s) where clear grounds were established

b. Other one area at random

c. Other several areas at random

d. Conducting operational inspections and considering the human factor

e. Other areas based on the requirements of the MOU/Agreement's procedure f. Other (please specify)

Section 4: Rectification of Deficiencies and Release:

Q14. On how to implement the deficiency treatment, take the follow-up combination of action codes for example, whether the MOU/Agreement introduced very clear guidelines?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q15. When conducting the deficiency treatment, do you strictly follow the relevant requirements of the MOU/Agreement?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q16. When conducting the deficiency treatment, is there a risk of criticism or liability if you do not conduct the inspection as required by the MOU/Agreement?

a. Never b. Rarely c. Sometimes d. Often e. Always

Q17. How effective do you think the requirements of deficiency treatment adopted in the MOU/Agreement procedures are?

a. Not effective b. Somewhat effective c. Effective d. Very effective

Q18. What challenges, if any, do you face when rectifying deficiencies and releasing ships? (Select all that apply)

a. No challenge

b. The corresponding deficiencies do not have appropriate deficiency action codes to instruct deficiencies rectification

c. Issues with the follow-up combination of action codes

d. Relevant information reporting and feedback are not timely and fluid

e. Issues with the use of Code 99

f. Other (please specify)

Section 5: RO Responsibilities:

Q19. On how to implement the assessment of RO responsibility, whether the MOU/Agreement introduced very clear guidelines?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q20. When conducting the assessment of RO responsibility, do you strictly follow the relevant requirements of the MOU/Agreement?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q21. Do you think it is necessary to assess RO responsibility directly through a PSC inspection, rather than indirectly through the flag state?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Q22. What challenges, if any, do you face when assessing RO responsibilities? (Select all that apply)

a. The responsibility of a RO is not defined in the IMO's procedure

b. The follow-up actions after the RO responsibilities have been assessed

c. Issues with the relevant information reporting and feedback

d. Other (please specify)

Q23. Do you consider it necessary to clarify in the procedure the follow-up actions after the assessment of RO responsibility?

a. Strongly disagree b. Disagree c. Uncertain d. Agree e. Strongly agree

Section 7: General:

Q24. How do you perceive the differences in requirements of PSC procedures between different MOUs/Agreement?

a. Differences are normal and acceptable and do not affect the harmonization of PSC procedures worldwide

b. Differences are normal and acceptable but do affect the harmonization of PSC procedures worldwide

c. Differences are significant but can be managed through increased collaboration and communication

d. Differences are significant and hinder the harmonization of PSC procedures worldwide

e. Differences should be minimized to promote better harmonization of PSC procedures worldwide

f. Not sure about the impact of differences on the harmonization of PSC procedures

Q25. What suggestions do you have for harmonizing and improving these procedures? (Select all that apply)

a. Harmonization of procedures across MOUs/Agreement

b. Improved training for PSCOs and other stakeholders

c. Enhanced communication and coordination among stakeholders

d. Increased transparency and sharing of information

e. Other (please specify)

Q26. What are your suggestions for harmonizing PSC procedures and activities worldwide?

Appendix 2 Additional Data and Charts from Questionnaire Results

Section 1: Background Information

Q1. How many years of experience do you have as a PSCO?

Option	Subtotal	Proportion

a. Less than 2 years	22	11.11%
b. 2-4 years	25	12.63%
c. 4-6 years	38	19.19%
d. 6-8 years	88	44.44%
e. More than 8 years	25	12.63%
Number of participants	198	

Q2. Which MOU region do you primarily operate in?

Option	Subtotal	Proportion
a. Paris MOU	50	25.25%
b. Tokyo MOU	117	59.09%
c. USCG	31	15.66%
d. Other (please specify)	0	0%
Number of participants	198	

Q3. How long do you take in average for the whole process of one PSC inspection?

Option	Subtotal	Proportion
a. Less than 1 hour	12	6.06%
b. 1-2 hours	22	11.11%
c. 2-3 hours	16	8.08%
d. 3-4 hours	71	35.86%
e. 4-5 hours	51	25.76%
f. More than 5 hours	26	13.13%
Number of participants	198	

Section 2: Initial Inspection:

Q4. On how to implement the initial inspection, take the inspection scope for example, whether the MOU/Agreement introduced very clear guidelines?

Option	Subtotal	Proportion
a. Strongly disagree	25	12.63%
b. Disagree	25	12.63%
c. Uncertain	33	16.67%
d. Agree	61	30.81%
e. Strongly agree	54	27.27%
Number of participants	198	

Q5. When conducting the initial inspection, do you strictly follow the relevant requirements of the MOU/Agreement?

Option	Subtotal	Proportion
a. Strongly disagree	12	6.06%
b. Disagree	11	5.56%
c. Uncertain	41	20.71%
d. Agree	58	29.29%
e. Strongly agree	76	38.38%
Number of participants	198	

Q6. When conducting the initial inspection, is there a risk of criticism or liability if you do not conduct the inspection as required by the MOU/Agreement?

Option	Subtotal	Proportion
a. Never	11	5.56%

b. Rarely	32	16.16%
c. Sometimes	59	29.80%
d. Often	51	25.76%
e. Always	45	22.73%
Number of participants	198	

Q7. Do you consider it necessary that ships involved in marine casualties/accidents can be inspected between periodic inspections?

Option	Subtotal	Proportion
a. Strongly disagree	9	4.55%
b. Disagree	18	9.09%
c. Uncertain	18	9.09%
d. Agree	32	16.16%
e. Strongly agree	121	61.11%
Number of participants	198	

Q8. When do you complete conducting the overall condition check? (Select all that apply)

Option	Subtotal	Proportion
a. When all areas mentioned in the procedural requirements of the MOU/Agreement are checked	84	42.42%
b. When a few randomly mentioned areas of the MOU/Agreement's procedural requirements are checked	119	60.1%
c. When the targeted areas based on the risk profile and the type of the ship are checked	126	63.64%
d. When a general impression and visual observations on board are confirmed	111	56.06%

e. When clear grounds are found	55	27.78%
f. Other (please specify)	12	6.06%
Number of participants	198	

Section 3: More Detailed Inspection:

Q9. On how to implement the more detailed inspection, take the inspection scope for example, whether the MOU/Agreement introduced very clear guidelines?

Option	Subtotal	Proportion
a. Strongly disagree	9	4.55%
b. Disagree	17	8.59%
c. Uncertain	28	14.14%
d. Agree	62	31.31%
e. Strongly agree	82	41.41%
Number of participants	198	

Q10. On how to implement the more detailed inspection, take the inspection timing for example, whether the MOU/Agreement introduced very clear guidelines?

Option	Subtotal	Proportion
a. Strongly disagree	6	3.03%
b. Disagree	7	3.54%
c. Uncertain	46	23.23%
d. Agree	60	30.30%
e. Strongly agree	79	39.90%
Number of participants	198	

Q11. When conducting the more detailed inspection, do you strictly follow the relevant requirements of the MOU/Agreement?

Option	Subtotal	Proportion
a. Strongly disagree	3	1.52%
b. Disagree	6	3.03%
c. Uncertain	58	29.29%
d. Agree	70	35.35%
e. Strongly agree	61	30.81%
Number of participants	198	

Q12. Do you consider it necessary to clarify in the procedures the scope and timing of the detailed inspections to be conducted?

Option	Subtotal	Proportion
a. Strongly disagree	4	2.02%
b. Disagree	13	6.57%
c. Uncertain	21	10.61%
d. Agree	62	31.31%
e. Strongly agree	98	49.49%
Number of participants	198	

Q13. In which of the following areas do you carry out detailed inspections? (Select all that apply)

Option	Subtotal	Proportion
a. The area(s) where clear grounds were established	86	4 3.43%
b. Other one area at random	106	5 3.54%

c. Other several areas at random	123	62.12%
d. Conducting operational inspections and considering the human factor	76	38.38%
e. Other areas based on the requirements of the MOU/Agreement's procedure f. Other (please specify)	10	5.05%
Number of participants	198	

Section 4: Rectification of Deficiencies and Release:

Q14. On how to implement the deficiency treatment, take the follow-up combination of action codes for example, whether the MOU/Agreement introduced very clear guidelines?

Option	Subtotal	Proportion
a. Strongly disagree	4	2.02%
b. Disagree	6	3.03%
c. Uncertain	14	7.07%
d. Agree	72	36.36%
e. Strongly agree	102	51.52%
Number of participants	198	

Q15. When conducting the deficiency treatment, do you strictly follow the relevant requirements of the MOU/Agreement?

Option	Subtotal	Proportion
a. Strongly disagree	23	11.62%
b. Disagree	12	6.06%
c. Uncertain	47	23.74%
d. Agree	54	27.27%

e. Strongly agree	62	31.31%
Number of participants	198	

Q16. When conducting the deficiency treatment, is there a risk of criticism or liability if you do not conduct the inspection as required by the MOU/Agreement?

Option	Subtotal	Proportion
a. Never	12	6.06%
b. Rarely	9	4.55%
c. Sometimes	37	18.69%
d. Often	67	33.84%
e. Always	73	36.87%
Number of participants	198	

Q17. How effective do you think the requirements of deficiency treatment adopted in the MOU/Agreement procedures are?

Option	Subtotal	Proportion
a. Not effective	19	9.6%
b. Somewhat effective	21	10.61%
c. Effective	56	28.28%
d. Very effective	102	51.52%
Number of participants	198	

Q18. What challenges, if any, do you face when rectifying deficiencies and releasing ships? (Select all that apply)

Option	Subtotal	Proportion
a. No challenge	13	6.57%

b. The corresponding deficiencies do not have appropriate deficiency action codes to instruct deficiencies rectification	20	10.1%
c. Issues with the follow-up combination of action codes	144	72.73%
d. Relevant information reporting and feedback are not timely and fluid	41	20.71%
e. Issues with the use of Code 99	134	67.68%
f. Other (please specify)	0	0%
Number of participants	198	

Section 5: RO Responsibilities:

Q19. On how to implement the assessment of RO responsibility, whether the MOU/Agreement introduced very clear guidelines?

Option	Subtotal	Proportion
a. Strongly disagree	15	7.58%
b. Disagree	16	8.08%
c. Uncertain	18	9.09%
d. Agree	53	26.77%
e. Strongly agree	96	48.48%
Number of participants	198	

Q20. When conducting the assessment of RO responsibility, do you strictly follow the relevant requirements of the MOU/Agreement?

Option	Subtotal	Proportion
a. Strongly disagree	14	7.07%
b. Disagree	22	11.11%

c. Uncertain	34	17.17%
d. Agree	64	32.32%
e. Strongly agree	64	32.32%
Number of participants	198	

Q21. Do you think it is necessary to assess RO responsibility directly through a PSC inspection, rather than indirectly through the flag state?

Option	Subtotal	Proportion
a. Strongly disagree	40	20.20%
b. Disagree	63	31.82%
c. Uncertain	45	22.73%
d. Agree	23	11.62%
e. Strongly agree	27	13.64%
Number of participants	198	

Q22. What challenges, if any, do you face when assessing RO responsibilities? (Select all that apply)

Option	Subtotal	Proportion
a. The responsibility of a RO is not defined in the IMO's procedure	118	59.60%
b. The follow-up actions after the RO responsibilities have been assessed	139	70.2%
c. Issues with the relevant information reporting and feedback	151	76.26%
d. Other (please specify)	11	5.56%
Number of participants	198	

Q23. Do you consider it necessary to clarify in the procedure the follow-up actions after the assessment of RO responsibility?

Option	Subtotal	Proportion
a. Strongly disagree	6	3.03%
b. Disagree	2	1.01%
c. Uncertain	50	25.25%
d. Agree	67	33.84%
e. Strongly agree	73	36.87%
Number of participants	198	

Section 7: General:

Q24. How do you perceive the differences in requirements of PSC procedures between different MOUs/Agreement?

Option	Subtotal	Proportion
a. Differences are normal and acceptable and do not affect the harmonization of PSC procedures worldwide	16	8.08%
b. Differences are normal and acceptable but do affect the harmonization of PSC procedures worldwide	80	40.40%
c. Differences are significant but can be managed through increased collaboration and communication	12	6.06%
d. Differences are significant and hinder the harmonization of PSC procedures worldwide	56	28.28%
e. Differences should be minimized to promote better harmonization of PSC procedures worldwide	12	6.06%
f. Not sure about the impact of differences on the harmonization of PSC procedures	22	11.11%
Number of participants	198	

Q25. What suggestions do you have for harmonizing and improving these procedures? (Select all that apply)

Option	Subtotal	Proportion
a. Harmonization of procedures across MOUs/Agreement	144	72.73%
b. Improved training for PSCOs and other stakeholders	46	23.23%
c. Enhanced communication and coordination among stakeholders	72	36.36%
d. Increased transparency and sharing of information	79	39.9%
e. Other (please specify)	9	4.55%
Number of participants	198	

Q26. What are your suggestions for harmonizing PSC procedures and activities worldwide?
N.A.

Appendix 3 The Risk Ship Types and Overriding Factors and Unexpected Factors of Paris MOU

1. The Risk Ship Types

The risk ship types are chemical tanker, gas carrier, oil tanker, bulk carrier and passenger ship

2. Overriding Factors

The overriding factors listed below are considered sufficiently serious to trigger an additional

inspection at Priority I:

- Ships reported by another Member State or the secretariat excluding unexpected factors,

- Ships involved in a collision, grounding or stranding on their way to port,

- Ships accused of an alleged violation of the provisions on discharge of harmful substances or effluents,

- Ships which have been manoeuvred in an erratic or unsafe manner whereby routing measures, adopted by the IMO, or safe navigational practices and procedures have not been followed,

- Ships which have been suspended or withdrawn from their Class for safety reasons after last PSC inspection,

- Ships which cannot be identified in the database.

3. Unexpected factors

Unexpected factors could indicate a serious threat to the safety of the ship and the crew or to the environment but the need to undertake an additional inspection is for the professional judgement of the Authority. These factors include:

- Ships reported by pilots or relevant authorities which may include information from Vessel Traffic Services about ships' navigation,

- Ships which did not comply with the reporting obligations,

- Ships reported with an outstanding ISM deficiency (3 months after issuing of the deficiency),

- Previously detained ships (3 months after the detention),

- Ships which have been the subject of a report or complaint by the master, a seafarer, or any person or organization with a legitimate interest in the safe operation of the ship, ship on-board living and working conditions or the prevention of pollution, unless the Member State concerned deems the report or complaint to be manifestly unfounded,

- Ships operated in a manner to pose a danger,

- Ships reported with problems concerning their cargo, in particular noxious or dangerous cargo,

- Ships where information from a reliable source became known, that their risk parameters differ from the recorded ones and the risk level is thereby increased,

- Ships carrying certificates issued by a formerly Paris MoU recognized organization whose recognition has been withdrawn since the last inspection in the Paris MoU

region.

Appendix 4 The Overriding Priority of Tokyo MOU

1. Ships which have been subject of report or notification by another Authority.

2. Ships which have been the subject of a report or complaint by the master, a crew member, or any other person or organization with a legitimate interest in the safe operation of the ship, shipboard living and working conditions or the prevention of the pollution, unless the Authority concerned deems the report or complaint to be manifestly unfounded.

3. Ships which have been permitted to leave the port of a State, the Authority of which is a signatory to the Memorandum, on the condition that the deficiencies noted must be rectified within a specified period, upon expiry of such period.

4. Ships which have been reported by pilots or port authorities as having deficiencies which may prejudice their safe navigation.

5. Ships carrying dangerous or polluting goods, which have failed to report all relevant information concerning the ships' particulars, the ships movements and concerning the dangerous or polluting goods being carried to the competent authority of the port and coastal State.

6. Ships proceeds to sea without compproceeds to sea without complying with the conditions agreed to by the Authority of the port of inspection.

7. Ships which are identified by port State intentionally choosing a particular port for inspection in order to obtain a favourable inspection result to reduce the ships' risk level and extend window of inspection.

8. Category of ships identified by the Committee from time to time as warranting priority inspections.