

# **CURRICULUM DEVELOPMENT ADVISORY**

## **Safety Case Practitioners' Course**

**Version 2.2  
11 Oct 2016**

**Major Hazards Department (MHD), Singapore  
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### **Version History**

<b>Version</b>	<b>Effective Date</b>	<b>Author</b>
1.0	6 May 2016	MHD
2.0	1 Sep 2016	MHD
2.1	27 Sep 2016	MHD
2.2	11 Oct 2016	MHD

## **1. BACKGROUND**

Major Hazard Installations (MHIs) are required under the Workplace Safety and Health (MHI) Regulations to develop and implement Safety Cases. A Safety Case is a written presentation of the hazards and risks that may lead to a major accident at an MHI and the technical, management and operational measures in place to control risks arising from major accident hazards.

MHIs shall demonstrate through their Safety Cases that a systematic process is in place to identify and implement safety measures on-site, so that risks arising from major accident hazards are effectively reduced to levels that are as low as reasonably practicable (ALARP).

Led by the Ministry of Manpower (MOM), the Major Hazards Department (MHD) comprises MOM, National Environment Agency (NEA) and Singapore Civil Defence Force (SCDF) officers. MHD is the single regulatory front for all Safety Case matters in MHIs.

## **2. AIM OF THE ADVISORY**

MHD recognises that competency of Safety Case practitioners is crucial to the continued safety and sustainability of operations in MHIs.

This Curriculum Development Advisory (CDA) is intended to assist Safety Case training providers with the recommended instructional design and development of any competency-based Safety Case practitioners' course. The CDA contains key information, including learning objectives, target audiences, recommended course duration and training deliveries.

This CDA will be reviewed on a regular basis or whenever there are changes to related legislation, training or advancement in industry practices.

## **3. OBJECTIVES AND DELIVERABLES OF A SAFETY CASE PRACTITIONERS' COURSE**

- 3.1 The aim of any Safety Case practitioners' course is to equip participants with relevant knowledge and skills to develop and implement the Safety Case for their MHI.
- 3.2 Safety Case practitioners' course shall be designed based on the objectives of the various aspects in a Safety Case as detailed in the Safety Case Technical Guide and Assessment Guide.
- 3.3 To provide an in-depth learning and better understanding of a Safety Case, it is recommended that Safety Case training providers use sample Safety Cases for case studies and relevant examples when conducting the course.

3.4 To enhance learning outcomes, it is recommended that Safety Case training providers obtain consent to use their clients' MHI information, as far as reasonably practicable, to facilitate the course. If such information is not available, arbitrary but realistic MHI data could be used instead.

#### 4. SPECIFICATIONS FOR SAFETY CASE PRACTITIONERS' COURSE

4.1 The scope of any Safety Case practitioners' course conducted by Safety Case training providers has to be based on the requirements under the WSH (MHI) Regulations, the Safety Case Technical Guide and Safety Case Assessment Guide. The scope includes:

<b>Key Aspects of the Safety Case</b>	
WSH Act and WSH (Major Hazard Installations) Regulations	<p>Key legal requirements for MHIs, among others, include:</p> <ul style="list-style-type: none"> <li>• Definition of MHI</li> <li>• Registration of MHI with MHD</li> <li>• Safety Case</li> <li>• Provision of information about pertinent off-site risks</li> <li>• Reporting of process-related incidents</li> </ul>
Safety Case Overview	<ul style="list-style-type: none"> <li>• Benefits of the Safety Case regime</li> <li>• Demonstration is the key feature of the Safety Case regime</li> <li>• Planning for Safety Case – resources, key personnel etc.</li> </ul>
Key components of Safety Case, as detailed in the Safety Case Technical-Guide	<ul style="list-style-type: none"> <li>• Descriptive information of MHI, including how to gather and analyse information for presentation in Safety Cases</li> <li>• Major Accident Prevention Policy (MAPP) and Safety &amp; Health Management System (SHMS)</li> <li>• Predictive aspects <ul style="list-style-type: none"> <li>- Identification of major accident hazards and Major Accident Scenarios (MASs)</li> <li>- Risk assessment</li> <li>- Selection of Safety Critical Events (SCEs)</li> </ul> </li> <li>• Technical aspects, including <ul style="list-style-type: none"> <li>- Process safety</li> <li>- Mechanical</li> <li>- Electrical, controls and instrumentation (EC&amp;I)</li> <li>- Human factors</li> </ul> </li> <li>• Emergency response <ul style="list-style-type: none"> <li>- Evident link between preventive measures and mitigative measures in emergency response plan</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• ALARP demonstration <ul style="list-style-type: none"> <li>- Key concepts and fundamental approaches</li> </ul> </li> <li>• Evident links through the Safety Case, from predictive to technical aspects, emergency response, as well as ALARP demonstration.</li> </ul>
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4.2 Safety Case practitioners' course is intended for Safety Case practitioners, including but not limited to:

- Safety Case Leads coordinating the preparation of Safety Cases
- MHI personnel involved in preparing Safety Cases
- MHI personnel involved in implementing Safety Cases

4.3 The recommended trainer to trainee ratio is capped a maximum of 1:20, while the duration for a Safety Case practitioners' course is at least 32 hours, including discussions and assessments.

4.4 Safety Case training providers are encouraged to work with MHD, which includes, from time to time, permitting MHD officers to sit in and observe Safety Case practitioners' course as part of the process for continual improvements to the CDA.

4.5 Annex A provides details of the recommended approach to conduct a Safety Case practitioners' course. Safety Case training providers are encouraged to explore various teaching methodologies to enhance the delivery of the training. Some of the suggested methodologies include:

- Individual or group assessment to ensure proficiency
- Creating a personalised Safety Case individually by using outcomes of discussions to encourage participation and ownership
- Individual or group projects, brainstorming, presentations and assignments

4.6 Additional specialised workshop options, which delve into more depth of a particular Safety Case aspect, are also recommended to cater to the needs of the industry. Specialised workshops may include but not limited to the following topics:

- Major Accident Prevention Policy & Safety Management System
- Process Safety
- Mechanical Integrity
- Electrical, Controls and Instrumentation (EC&I);
- Human Factors
- Emergency Response Plan
- ALARP Demonstration
- Or any suitable combination of key Safety Case components

## **5. GENERAL REQUIREMENTS**

5.1 Safety Case training providers shall ensure that their trainers do not give any false, inaccurate or misleading information to participants of Safety Case practitioners' course.

5.2 Safety Case training providers shall put in place a proper and effective system of ensuring that Safety Case trainers employed conduct Safety Case practitioners' course in accordance to this CDA.

## **6. TRAINER REQUIREMENTS**

6.1 Any trainer of a Safety Case practitioners' course should possess the following:

- Relevant Safety Case experience or technical personnel with sufficient expertise in the scope defined under paragraph 4.1 <sup>1</sup>
- Relevant qualifications in Workplace Safety and Health

6.2 Safety Case trainers shall conduct Safety Case practitioners' course in accordance to this CDA.

## **7. RELATED WSH LEGISLATION, INDUSTRY CODES & STANDARDS AND OTHER REFERENCES**

7.1 Safety Case training providers are recommended to use the following reference as guidance for Safety Case practitioners' course:

- WSH Act
- WSH (MHI) Regulations 2016
- Guide to WSH (MHI) Regulations
- Safety Case Technical Guide
- Safety Case Assessment Guide
- Revised QRA Guidelines

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<sup>1</sup> Demonstration of expertise will be required through course materials, supporting information, and interviews to showcase understanding of the safety case requirements.

## Recommended Approach to Conduct a Safety Case Practitioners' Course

To provide an in-depth learning and better understanding of a Safety Case, it is recommended that training providers use sample Safety Cases for case studies and relevant examples when conducting the course.

To enhance learning outcomes, it is recommended that training providers use the client's MHI information (with client's consent), as far as reasonably practicable, to facilitate course. If such information is not available, arbitrary but realistic MHI data could be used for the delivery.

The recommended topics, objectives, content and delivery approaches of Safety Case practitioners' course are:

#	Topics	Objectives	Content	Preferred Delivery Approaches
1	<b>WSH Act and WSH (Major Hazard Installations) Regulations</b>	<ul style="list-style-type: none"> <li>Understanding legal provisions, obligations for the occupier under WSH Act Section 11 and under WSH (MHI) Regulations</li> <li>Understanding how Safety Case can assist MHIs in enhancing safety and providing accountability to various stakeholders</li> </ul>	<ol style="list-style-type: none"> <li>Identify, explain the relevant WSH legislation, applicable to MHIs</li> <li>Identify and explain the various roles of each stakeholder and their responsibilities required under the WSH (MHI) Regulations</li> <li>Explain the purpose and contents of Safety Case under the WSH (MHI) Regulations</li> </ol>	-

#	Topics	Objectives	Content	Preferred Delivery Approaches
2	<b>Chapter 1: Safety Case Overview</b>	<ul style="list-style-type: none"> <li>Understanding of the demonstration feature in the Safety Case regime and the key personnel required for the development of Safety Case</li> </ul>	<p>d) Explain how to demonstrate when presenting the Safety Case. Show poor examples of demonstration (e.g. poor linkages to major accident scenarios, MASs) and good examples of adequate demonstration</p> <p>e) Explain the steps in writing of Safety Case from gathering of information, analysing the information to make the demonstration, acting on the information if additional safety measures are needed, and presenting the information in a structured way</p>	<p><u>Group exercise and presentation:</u></p> <ul style="list-style-type: none"> <li>Provide examples of major accident scenarios (MASs) and various control measures, allowing participants to brainstorm how to present a “Demonstration”.</li> <li>Brainstorm on the possible resources required in their MHI: <ul style="list-style-type: none"> <li>- Functional Roles</li> <li>- Discipline</li> <li>- Diversity</li> </ul> </li> </ul>
3	<b>Chapter 2: Descriptive information of MHI</b>	<ul style="list-style-type: none"> <li>Understanding the requirements under the descriptive chapter.</li> </ul>	<p>f) Explain the requirements required under descriptive information of an MHI</p>	-
4	<b>Chapter 3: Major Accident Prevention Policy (MAPP), Safety &amp; Health Management System (SHMS)</b>	<ul style="list-style-type: none"> <li>Understanding the improvements/enhancement required for SHMS</li> </ul>	<p>g) Explain the requirements of MAPP</p> <p>h) Explain the requirements under the SHMS</p>	<p><u>Group exercise and presentation:</u></p> <ul style="list-style-type: none"> <li>Enhancing SHMS to increase emphasis on prevention of major accidents and limitation of consequences</li> </ul>

#	Topics	Objectives	Content	Preferred Delivery Approaches
5	<b>Chapter 4: Predictive Aspects of Safety Case Risk Assessment</b>	<ul style="list-style-type: none"> <li>Understanding how to use existing hazards identification studies such as Quantitative Risk Assessment (QRA) and Process Hazard Analysis (PHA) to identify Major Accident Hazard (MAH), Major Accident Scenarios (MASs) and select Safety Critical Events (SCEs)</li> <li>Understanding of proportionality principles for risk assessment</li> </ul>	<ul style="list-style-type: none"> <li>i) Explain major accidents</li> <li>j) Describe examples on how various sections of the installation could give rise to major accidents</li> <li>k) Describe the types of analyses (QRA, PHA, etc.) that could be used to identify MASs</li> <li>l) Explain how a systematic process of identifying all potential MASs looks like</li> <li>m) Explain how to produce adequate and detailed assessment of the extent, severity and likelihood for a representative set of MASs</li> <li>n) Explain and apply how to identify SCEs from representative set of MASs</li> <li>o) Explain the proportionality principle for risk assessment</li> </ul>	<p><u>Group exercise and discussion:</u></p> <ul style="list-style-type: none"> <li>Select a section of installation that could give rise to major accidents <ul style="list-style-type: none"> <li>Identify and describe in a systematic manner common MAHs and their associated scenarios in MHIs</li> </ul> </li> </ul> <p><u>Group exercise and presentation:</u></p> <ul style="list-style-type: none"> <li>Selecting SCEs from MASs</li> </ul>
6	<b>Chapter 5: Technical Aspects of Safety Case Report</b>	<ul style="list-style-type: none"> <li>Understanding of barriers and their effectiveness in all phases of the MHI life cycle</li> </ul>	<ul style="list-style-type: none"> <li>p) Explain tools (e.g bowtie) available to assist MHIs in demonstrating the clear link between identification and analysis of MASs and the selection of control measures</li> <li>q) Describe types of analyses/ reviews/ standards (SIL, human factors evaluation etc.) available to demonstrate effectiveness of barriers</li> </ul>	<p><u>Group exercise and discussion:</u></p> <ul style="list-style-type: none"> <li>Select a section of installation/plant that could give rise to major accidents: <ul style="list-style-type: none"> <li>Draw clear links between MAS, SCE and measures taken.</li> <li>Describe how measures taken will prevent or limit the consequences</li> </ul> </li> </ul>



#	Topics	Objectives	Content	Preferred Delivery Approaches
			<p>r) Explain systematic approaches to show how control measures contribute to reducing the risks of MASs</p> <p>s) Describe the types of demonstration required in the different stages of an MHI's lifecycle (i.e. design, construction, operation, maintenance, modification and decommissioning) so as to ensure there is adequate safety during each life cycle stage of the MHI and the demonstrations are relevant to major accidents</p> <p>t) Provide examples on the key technical issues of measures pertaining to:</p> <ul style="list-style-type: none"> <li>• Process safety</li> <li>• Mechanical Integrity</li> <li>• Electrical, control &amp; instrumentation (EC&amp;I)</li> <li>• Human factors</li> </ul> <p>u) Explain how to set performance standard for measures taken</p>	<p>of a major accident in an MHI, linking it to relevant standards or analyses</p>

#	Topics	Objectives	Content	Preferred Delivery Approaches
7	<b>Chapter 6: Emergency Response</b>	<ul style="list-style-type: none"> <li>Understanding the process of incorporating Emergency Response Plan (ERP) into the Safety Case</li> </ul>	v) Describe the demonstration required for the measures used to draw up the ERP and explain its application to a selected type of MAS	<u>Group exercise and presentation:</u> <ul style="list-style-type: none"> <li>Summarise the protection and intervention measures used to draw up the ERP in relation to a specific type of MAS</li> </ul>
8	<b>Chapter 7: ALARP Demonstration</b>	<ul style="list-style-type: none"> <li>Understanding ALARP principles and its applications</li> </ul>	w) Explain key ALARP principles and the fundamental approaches to consider for ALARP. x) Explain the approaches for good practice, reasonable practicability and key success factors. y) Consideration of the factors in selecting or rejecting control measures	<u>Group exercise and presentation:</u> <ul style="list-style-type: none"> <li>Demonstrating ALARP using different decision-making criteria</li> </ul>
9	<b>Implementation</b>	<ul style="list-style-type: none"> <li>Understanding of resources and efforts required</li> </ul>	z) Describe the process and resources required when implementing Safety Case.	<u>Group exercise and presentation:</u> <ul style="list-style-type: none"> <li>Planning for resources to develop a Safety Case for an MHI: <ul style="list-style-type: none"> <li>-Manpower</li> <li>-Time</li> <li>-Technical documents and information</li> </ul> </li> </ul>

#	Topics	Objectives	Content	Preferred Delivery Approaches
10	<b>Provision of information to neighbours</b>	<ul style="list-style-type: none"> <li>• Understanding the benefits of provision of information to neighbours</li> <li>• Understand how to build positive relationships with neighbours and manage issues for domino impacts and toxic effects</li> </ul>	<p>aa) Explain the necessity to share information and the type of information to be shared.</p> <p>bb) Explain how such information could be incorporated in Safety Cases</p> <p>cc) Describe instances where working with neighbours for domino impacts achieved favourable outcomes for the companies</p>	<p><u>Group reflection</u></p> <ul style="list-style-type: none"> <li>• How to positively manage issues with neighbours on domino impacts or toxic effects.</li> </ul>
11	<b>Safety Case Assessment Guide</b>	<ul style="list-style-type: none"> <li>• Understanding the elements under the assessment criteria</li> </ul>	<p>dd) Allow participants to go through the assessment criteria and raise questions about the criteria</p>	<p><u>Group exercise and discussion:</u></p> <ul style="list-style-type: none"> <li>• Discussion on the questions raised and work on plausible solutions</li> </ul>

## APPLICATION TO BE RECOGNISED AS TRAINING PROVIDERS FOR SAFETY CASE PRACTITIONERS' COURSE

This form will take you approximately 15 minutes to complete.

Please read the Curriculum Development Advisory (CDA) before filling up the form and attach the following documents, together with the completed form:

- Curriculum Vitae of the Trainer(s)
- Course Objectives, Course Summary and Course Plan, including delivery approaches and assessment format(if applicable)
- Complete set of training materials, including sample Safety Cases for case studies
- Any other relevant documents to support your application

*Note:*

*All training providers recognised by the Major Hazards Department (MHD) are to adhere strictly to the CDA.*

<b>Section 1: Details of Training Provider</b>	
<b>Name of Organisation</b>	
<b>Year Established</b>	
<b>Address</b>	
<b>Website</b>	
<b>Company Registration Details</b>	ACRA / Ministry of Education / Registrar of Societies* Others: _____  <i>*Delete where necessary</i>
<b>Name of Contact Person</b>	
<b>Contact Number</b>	HP: _____  Office: _____
<b>Email Address</b>	

<b>Section 2: Particulars of Course</b>	
<b>Name of Course Conducted</b>	
<b>Language(s) of Course Conducted</b>	
<b>Target Audience</b>	
<b>Course Recommended Duration</b>	
<b>Trainer to Trainee Ratio</b>	
<b>Proposed Course Fee per participant</b>	

### Section 3: Particulars of Trainer

[Please complete and attach sections 3 and 4 for every additional trainer.]

<b>Name of Trainer</b>	
<b>Nationality</b>	
<b>Gender</b>	
<b>Job Designation</b>	
<b>Contact Number</b>	
<b>Email Address</b>	
<b>Years with the Organisation</b>	
<b>Employment Type</b>	Full time / Part Time / Others: _____ * <i>*Delete where necessary</i>

### Section 4: Trainer's Experience

<b>Year of Experience in the Subject</b> Please specify subject: _____	
<b>Years of Teaching the Subject</b> Please specify subject: _____	

**Section 5: Declaration**

I hereby declare, on behalf of the Safety Case training provider, that the information supplied in this application are true and correct to the best knowledge and belief, and all supporting evidence and documents submitted with this application are true and genuine copies of the original documents.

\_\_\_\_\_  
Name of Representative

\_\_\_\_\_  
Company Stamp

\_\_\_\_\_  
Signature of Representative

\_\_\_\_\_  
Date