

IChemE

# IChemE Safety Centre Guidance

Process Safety Experiences  
During Industrial Placements  
for Undergraduate Engineering  
Students

The diary scheme



released August 2021



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# Preface

The IChemE Safety Centre (ISC) is a not-for-profit industry consortium focused on improving process safety [www.icheme.org/isc](http://www.icheme.org/isc)

Most chemical engineering courses require students to spend some time experiencing relevant work in industry. This Guide has been produced by the ISC to provide advice on how that time can be used to improve the students' education and understanding of process safety management.

This document defines a framework for the interactions between students, employers and universities that occur during work placements that should significantly increase the students' understanding of process safety in practice. Similar to other documents developed by ISC on this project, it does not seek to mandate how process safety should be taught, and its contents are not accreditation guidelines. Rather, it is offered as guidance which can be applied or adapted as suited to particular academic institutions and the different forms of work in industry that students may take. For information on IChemE's *Accreditation of Chemical Engineering Programmes* refer to [www.icheme.org/education/universities-accredit-your-degree/guidance/](http://www.icheme.org/education/universities-accredit-your-degree/guidance/) The accreditation document is based on learning outcomes, which apply to an educational setting. This ISC guidance document refers to competencies, which is more aligned with development activities undertaken in the workplace.

This document uses the generic term 'work placement' to describe student's time working in industry, which could range from lengthy, formal internship programmes to brief, temporary or casual employment during university vacations. It should be recognised that the level of application may vary depending on the duration of the interaction, meaning, not all elements may always be addressed, especially for shorter placements. Note that a glossary of other generic terms used throughout the Guide is provided at the end, if any of the terms used are unfamiliar to some readers.

## Acknowledgements

The ISC would like to acknowledge the efforts of the following organisations and people, who formed the ISC Undergraduate Working Group:

- Adelaide University – Professor David Lewis
- ConocoPhillips – Jeffrey Mayne
- Mary Kay O'Connor Process Safety Center – Dr Syeda Zohra Halim
- Monash University - John Westover
- R4Risk – Astrid Ichsan
- Sherpa Consulting – Stuart Chia, Simone Ligori, Angelyn Wu
- Unilever – Liz Hallifax
- University of Melbourne – Professor Sandra Kentish
- University of New South Wales – Associate Professor Pierre Le Clech

The ISC would also like to thank Mike Connell for facilitating this workgroup.

## Contact the ISC

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## Disclaimer

The information provided in this document is provided in good faith but without liability on the part of IChemE or the IChemE Safety Centre.

# How to use this guide

This document consists of several parts, an overview, and then multiple appendices. These are hyperlinked throughout the document for ease of navigation. The material in this guide is just that, a guide, you are free to modify and adapt the content to your specific situation. The forms referenced in this document can be downloaded from the ISC website [www.icheme.org/isc](http://www.icheme.org/isc)

## Work placement framework – the diary scheme

The framework for work placements is shown in figure 1. To emphasise the educational aspect of seeing how process safety works in practice during work placement, the term 'Industrial Training' (IT) is used in the diagram and throughout this guide. The name 'diary' is used for form which documents completion of the IT, and specifies process safety elements which the student experiences during their placement. It functions as a way to record the student's Continuing Professional Development (CPD).

Under the framework, the student and the workplace supervisor agree on aspects of process safety which could be seen in action during a student's time at the workplace and take steps to see that this happens. Before describing these steps, it is worth discussing the benefits to the industry and universities of the diary approach.

# Why adopt this diary scheme?

## Employer benefits

Sound knowledge of process safety and an understanding of how the associated risks can be managed are highly desirable skills for practising chemical engineers. The main benefit to employers of adopting this scheme is the long-term advantage of the pool of motivated, process safety aware graduates it should provide. This is good for the chemical engineering profession, the industry in which they work and the broader society.

A more immediate benefit for employers is that it could help identify good candidates for future recruitment. Employers who successfully participate in this scheme could also find that their reputation amongst student groups as a good employer is enhanced as a result of the effort and interest shown during the work placement.

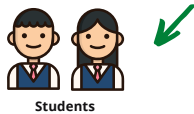
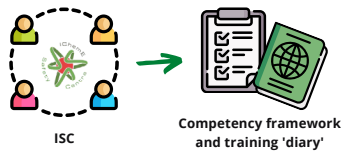
## Student benefits

The diary form, once completed, is tangible evidence of the improved knowledge and understanding of process safety they will have gained. This should be a clear benefit to them when seeking future employment opportunities.

## University benefits

Universities should find this scheme a worthwhile means of reinforcing or complementing the education in process safety they already deliver to their students. It may also result in students bringing more experiences back into their final years of study. The benefits it delivers to their students should also be an attraction to them.

# DIARY SCHEME FRAMEWORK OVERVIEW



## CONCEPT DEVELOPMENT

Development of approach and key concepts by the ISC working group

Key concepts include:

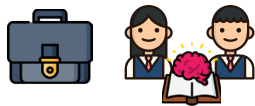
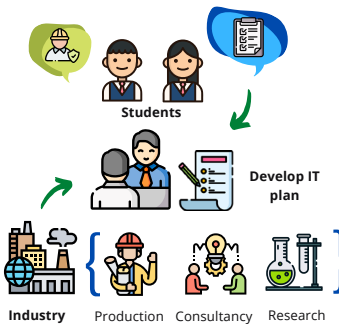
- 1 **Competency framework** – provides a list of process safety elements which students could experience.
- 2 **The diary** – a form that records what the student achieved during industrial training.

## BEFORE THE WORK PLACEMENT

### Preparation of the Industrial Training Plan (IT plan) with industry

The workplace supervisor and the student will have a meeting and prepare an IT plan to be followed during the placement.

The IT plan will list specific process safety competencies to be achieved, and the activities by which this will be done.



## DURING WORK PLACEMENT

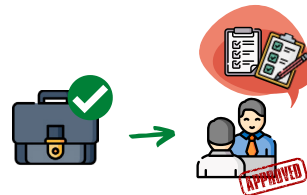
### Complete work placement activities

Student conducts placement and completes the activities planned on the IT plan.

## THE DIARY

### Review and sign off of the diary

At completion of the placement, the student and industry supervisor will review the completed work on the **diary**. The supervisor will then record the process safety elements covered and at what competency level it was achieved.



## IT REPORT AND SUBMISSION

### Student writes up IT report as per university requirements

As per university requirements, the student will then prepare an IT report discussing and reflecting on what they have learned about process safety during the work placement. The IT report and attached the diary is then submitted to the university.



## USING THE DIARY

### Completion of the diary scheme and application in future

After placement the student receives a diary certifying the relevant process safety competencies. This will support applications for future employment and demonstrate student competencies to prospective employers.

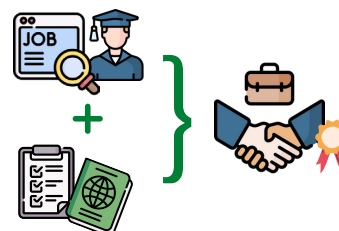


Figure 1. Overview of the process.

# How the diary scheme works

The overall approach to the process is as shown in figure 1.

## Phase 1 – concept development

The approach and concepts were developed by a working group with representatives from industry and universities. The approach follows the Plan, Do and Review process familiar to industry. The key concept that was developed for the scheme is a **diary form** that provides a list of process safety elements which students could experience and a diary that records what the student achieved during the work placement (see [Appendix 3](#)).

## Phase 2 – industrial training plan (at the start of the work placement)

At the start of the work placement, the person assigned by the employer as work placement supervisor/guide and the student prepare an **Industrial Training Plan** (IT plan) to be followed during the placement. The IT plan will list specific process safety elements that will be covered, and the activities by which this will be done.

## Phase 3 – the work placement/industrial training

In this phase the student conducts the work as agreed on the IT plan. At completion of the work, the student and industry supervisor review the work on a **diary form**. The supervisor will then record the process safety elements that were covered at the appropriate competency level on a summary sheet which becomes the student's diary form.

The student is then expected to prepare an IT report for their university discussing and reflecting on what they had learned about process safety during the work placement. The IT report and the **diary form** are submitted to the university.

## Phase 4 – using the diary form (after the work placement/IT)

After the placement, the student will be able to show the diary form as evidence of relevant process safety competencies to support applications for future employment. This can be used to demonstrate to prospective employers that they have learned about process safety in practice, as well as in the classroom. The completion of the diary form also encouraged the practice of recording CPD.



# Key components of the diary scheme

This section discusses the key components of the steps that are followed in the diary scheme. Templates for the forms that are used, and other documents are shown in the appendices and are downloadable from the ISC website. Detailed advice on how to use these components is provided in Guides for Supervisors/Mentors (see [Appendix 6](#)) and Students (see [Appendix 5](#)).

## Competency framework

The Competency framework for students in work placements is a matrix similar in structure and format to the one developed by ISC for professional chemical engineers (see [Appendix 1](#)) but adapted to allow for the different knowledge and experience base of most students.

Each row of the matrix for students is a process safety element similar to those in the framework for professional engineers. The competency levels heading the columns of the matrix are considerably simpler for students. The matrix can be found in [Appendix 1](#).

The cells of the matrix for students are filled with examples of the types of activities which a student could do during work placement and thereby achieve the appropriate competency level for that process safety element. The full matrix is a multipage document (see [Appendix 1](#)). To illustrate its use, some of the following example activities or tasks could be undertaken for the common process safety management system **Hazard Identification and Risk Assessment** (particularly as applied to hazards at the employer's workplace) is shown in figure 2:

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
1	Process safety knowledge			
1.1	Hazard identification and risk assessment.	Learned about the different hazard identification (HAZID) and risk assessment (RA) methods used at the workplace.	Review a sample of completed HAZID/RA records (eg job safety analysis (JSA) forms, HAZOP study records).	Actively participate in HAZID/RA review for work assigned during the work placement (eg prepare JSA for a sampling programme or construction stage of a small change project or HAZOP study for a project involving process changes).

Figure 2. Competency matrix excerpt.

## Industrial training plan

The IT plan is a formal plan of activities which the student will undertake in the course of the work placement similar to the one shown in figure 3 listing the process safety elements to be covered and the specific activities to be undertaken relevant to those process safety elements. The equivalent competency level of each activity is also added. To illustrate the concept, activities that could be done in order to see a work permit system in action are shown in figure 3.

## Industrial training plan for process safety

For: Student name \_\_\_\_\_ Work placement at: Insert employer name  
Identify employer facility/office \_\_\_\_\_

During: Insert period of work placement \_\_\_\_\_

No.	Process safety management element	Specific activities and projects to be undertaken	Competency level (see definitions below)
Competency number from matrix	In this column, enter process safety elements that will be covered by the student's worklist. (Refer to the list of possible process safety elements in the first column of the competency matrix – <b>Process Safety Competency Matrix for students in work placement – for consultation 29-3-21</b> ).	In this column, enter specific activities that will be carried out and are relevant to the process safety elements. (Refer to the competency matrix – <b>Process Safety Competency Matrix for students in work placement – for consultation 29-3-21</b> – for examples of possible relevant activities).	In this column, enter the competency level that applies to each planned activity. (See below for definitions of competency levels).
3.2.1	<b>As an example to illustrate:</b> Safe systems of work (eg permit to work).	<b>As an example to illustrate:</b> <ul style="list-style-type: none"> <li>■ complete company work permit system training;</li> <li>■ prepare and submit permit application for removal and overhaul of pump xxx.</li> </ul> Observe operation of permit through all stages of job.	<b>For this example:</b> Level 1  Level 2  Level 3

Figure 3. Industrial training plan excerpt.

Development of the IT plan is meant to be a joint effort between the student and the person assigned by the employer to supervise or mentor the student, known as the supervisor. The employer should have given some thought before the work placement to what work can usefully be assigned to an undergraduate in the relatively short time that is available. This would usually be the starting point for the IT plan.

A template to help prepare the IT plan is available (see [Appendix 2](#)). It is hoped that use of the plan will encourage the supervisor to think of a few more aspects of process safety they could demonstrate in the time allowed. Hopefully, it will also encourage the student to ask about some more process safety elements as well. The IT plan should arrive at a limited but manageable number of activities for the time available.

Note that the IT plan is not intended to be fixed and inflexible. The IT plan should be amended if circumstances change, such as if (a) other opportunities arise for the student to see more process safety elements in practice, or (b) if the employer wants the student to work on other more urgently required activities.

## The diary form

The diary form consists of part A and part B. At the end of the work placement the student and supervisor complete the diary form. A template, with advice on how it is to be completed, is found in [Appendix 3](#). Part B is used to detail the activities that were undertaken and the student's competency development. The layout of part B can be seen in figure 4.

Student to complete			Supervisor to check		Supervisor to verify
PSE no.	Competency level achieved	Activities completed to achieve competency	Description of activities		Supervisor verification and comments
Process safety element no.	Levels achieved according to Passport PSE guidelines	Activity completed Project name	<ul style="list-style-type: none"> <li>Level 1: Description of how Level 1 was achieved, completed on (date)</li> <li>Level 2: Description of how Level 2 was achieved, completed on (date)</li> <li>Level 3: Description of how Level 3 was achieved, completed on (date)</li> </ul>		<ul style="list-style-type: none"> <li>Evidence of completion (optional)</li> </ul> Supervisor additional comments
3.2.1	1, 2, 3	Work permit application project XXX	<ul style="list-style-type: none"> <li>Level 1: Work permit training completed on XX/XX/XX</li> <li>Level 2: observed work conducted under permit on XX/XX/XX. Permit was extended to allow job carry over to XY/XX/XX.</li> <li>Level 3: Application for WPXXXX prepared and submitted XX/XX/XX. Permit was granted and job proceeded XX-XY/XX/XX</li> </ul>		See attached documents (optional) <ul style="list-style-type: none"> <li>Training records</li> <li>Application for WPXXXX</li> </ul> Student made genuine contribution to the design work; more time required to complete this project. Agree that this was consistent with Level 3


Figure 4. Layout of diary form part B (excerpt).

The student fills out the first four columns based on the agreed IT plan and activities undertaken.

The second column is arguably the most important in the table. In this column, the student enters the competency level which they believe they achieved (with reference to the competency framework described earlier). The third column lists the activities which they undertook to obtain this level, with the fourth column providing a description of the activities and their competency level. The student can also add any relevant comments justifying this outcome level such as the complexity of the task, hazards and risks which were eliminated or mitigated by the student's activities etc.

The fifth column provides space for the supervisor to confirm that the activities listed were done. The supervisor could also add comments supporting or qualifying the students' opinions on competency level achievement.

Part A of the diary form is an overall summary of the level of competency achieved in each element. There is also space on the part A to identify the student, company, and site at which the work placement occurred, and the university at which the student is enrolled, as shown in figure 5.




## The diary Part A

**Student Information**

Name:	University:
Placement name:	Placement date:
Supervisor name:	Supervisor role:

**Summary of achieved process safety competencies**

No.	Process safety element	Level 1	Level 2	Level 3
<b>1</b>	<b>Process safety knowledge</b>			
1.1	Hazard identification and risk assessment	✓		
1.2	Specific hazards at employer's workplace	✓	✓	✓
1.3	Hazardous materials	✓	✓	
1.4	Hazardous procedures	✓	✓	

Figure 5. Layout of diary form part A (excerpt).

There are two authorisation signatures on part A. The supervisor fills in the process safety elements and competency levels achieved based on the details in part B, signs it and gives it to the student. The student will then submit it with a report on the work placement (the IT report – discussed below) to their university, for review and sign-off. These are shown in figure 6.

3.5.2	Safety integrity level (SIL) assurance			
3.5.3	Safety system auditing			

<p><b>Employer certification</b> I certify that, to the best of my knowledge, achieved the process safety competencies shown above during work placement at</p> <p><b>Supervisor signature</b></p>	<p><b>University representative certification</b> I certify that has enrolled in at and met work placement reporting requirements.</p> <p><b>University representative signature</b></p>
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Figure 6. Sign off section of part A (excerpt).

The signature on the bottom left of part A certifies that the student completed work with the employer during work placement consistent with the competency levels shown above. The signature on the bottom right certifies that the student was enrolled at the university shown, and that the student complied with any additional requirements of the university, such as submitting a report on completion of the work placement that discussed what they had learned about process safety.

## Industrial training report

Reflecting on what they had learned during the work placement, and reporting on it, completes this phase of student education in process safety. However different universities may have their own reporting requirements. The student will need to comply with whatever format or content requirements apply in their case, eg the report could be stand-alone or part of another report on the work placement.

The focus of the report is what the student learned about process safety, and the means of managing the associated risks. To avoid issues with disclosing confidential company or personal information, the report should avoid discussing specific details of the activities undertaken during the work placement, and instead focus on the process safety implications of the activities and observed safety management systems and controls.

If a particular university has chosen not to receive and review a formal report, or not to countersign the diary, the template provided on the website (see [Appendix 3](#)) can be adapted by removing the appropriate references from the template.

# Appendix 1 – Process safety competency matrix

Table 1

Competency level	Description
1. Concept awareness	Student has been informed why a system is needed to manage this aspect of process safety.
2. Observed in action	Student has received training in the host employee's system for managing that element of process safety, and has seen examples of that system being used in practice.
3. Applied successfully	Student successfully put the employer's system into practice during the work placement.

The competency levels in table 1 apply to all of the process safety elements in table 2 below. Table 2 lists typical activities by which students could demonstrate that they achieved that competency level during their work placement.

Please note that the activities listed in the various columns of table 2 are simply examples of tasks which could be undertaken during student work placements and would probably meet the criteria of table 1 for the corresponding process safety element. The table does not specify that, in order to achieve a particular competency level, the student must successfully complete all of example tasks shown.

The tasks that a student will carry out during their work placement are listed on the IT plan. The supervisor should determine which competency level corresponds with each task in the IT plan by comparison with the examples in table 2.

Table 2

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
1	<b>Process safety knowledge</b>			
1.1	Hazard identification and risk assessment.	Learned about the different hazard identification (HAZID) and risk assessment (RA) methods used at the workplace.	Review a sample of completed HAZID/RA records (eg job safety analysis (JSA) forms, HAZOP study records).	Actively participate in HAZID/RA review for work assigned during the work placement (eg prepare JSA for a sampling programme or construction stage of a small change project or HAZOP study).

Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
1.2	Specific hazards at employer's workplace.	Be informed during Induction that specific hazards (eg certain hazardous materials or dangerous equipment) exist at this workplace.	Find and read training material on these specific hazards.	Prepare training material on any new hazard which could be introduced by a project which the undergraduate works on during the work placement.
1.3	Hazardous materials.		Receive the employer's formal training in any specific hazards which apply to the work assigned during the work placement.	
1.4	Hazardous procedures.			
<b>2</b>	<b>Engineering and design</b>			
2.1	Design conditions/safe operating window.	Be informed if limits exist for the operating conditions of the employer's plant and equipment, where to find them and why they are there.	<p>If available, review documentation explaining the design bases for plant and equipment, and discuss with supervisor.</p> <p>Observe how these limits were given consideration in the design work for recent modifications.</p> <p>Observe how these limits are highlighted in Operating Procedures and training information.</p>	Take the necessary steps to ensure that safe operating limits are not exceeded in any relevant project activity during the work placement.
2.2	Inherently safer design principles including risk reduction techniques.	Find out how the employer applies inherently safer design principles in the engineering and design activities.	If available, review documentation explaining the design bases for plant and equipment, and discuss with supervisor how this relates to inherently safer design principles.	If possible, in the course of any specific project work undertaken during the work placement, select or implement a control or barrier that is based on inherently safer design principles.
2.3	Regulatory requirements.	Learn the name and scope of the main safety regulations that apply to the employer's operations.	<p>Read at least one set (or sub-section) of relevant regulations and discuss its implications with employer contact.</p> <p>Observe steps the employer has taken to comply with a sample of specific regulations.</p>	In the course of any specific project work undertaken during the work placement, carry out the procedure which the employer has for checking regulatory compliance.

Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
2.4	Codes and standards.	Find out about standards (eg maintenance, engineering or HSE) that apply to the design, installation and operation of the employer's plant and equipment (eg national, corporate or industry).	Access and read some of these standards and check compliance of a sample of existing equipment.  Review some recent project specifications and see how standards have influenced design decisions.	Incorporate compliance with relevant standards in the design work for a small change project.
2.5	Safety critical equipment (SCE) and assumptions.	Find out what safety critical and SCE means. If the employer uses these terms, learn how the employer has identified specific equipment items as safety critical and why.	Read any procedures the employer has for identifying and managing SCE.  If available, review the design basis documents or later risk assessment records to understand why some equipment has been labelled safety critical, and any important assumptions underpinning that designation.  Confirm that a sample of SCE is being managed as specified.	If a project the student is working on involves an item of SCE (eg introduces a new Pressure Safety Valve (PSV) or modifies an existing PSV) commence the work needed to ensure that the necessary steps for future management are taken.
2.6	Management of Change (MoC).	If available, read any information on incidents that have occurred in the employer's industry due to poorly managed change and discuss with supervisor.  Learn about the issues that need to be considered and, if necessary, addressed before a change is made at the workplace.	Find and read the employer's MoC procedure, and discuss with supervisor.  Take part in the employer's formal training programme for MoC.  Review the files and documents prepared for a sample of number of previously completed change projects at the workplace.	Take part in a small change project, including necessary steps such as preparing forms, consulting people who may be affected by the change, highlighting changes to drawings, related procedures etc and taking part in safety reviews.  Discuss any issues or objections raised to the proposal with the person who raised them and consider how to address them.

Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
3	<b>Systems and procedures</b>			
3.1	<b>Systems, manuals and drawings</b>			
3.1.1	Piping and instrumentation drawings (P&IDs), cause & effect (C&E) charts, process flow diagrams (PFDs).	Note the differences between a simple PFD, detailed P&ID, and isomeric drawings if they are available for an area the student will be working on.	<p>Review the symbols table at the front of the P&amp;IDs.</p> <p>Find the P&amp;ID for an area the student will be working on.</p> <p>Trace the pipelines in the workplace and confirm that equipment location matches the drawing.</p> <p>Discuss with supervisor how any trip system shown on that P&amp;ID is presented in the C&amp;E chart and what this means.</p>	Mark up any modifications to the P&ID which would be needed as a result of a project done by the student during the work placement.
3.1.2	Process manuals (ie process description etc), equipment specification catalogues.	Find these manuals at the employer's workplace and note their structure and type and contents.	<p>Observe if/how the process description information is carried into training manuals.</p> <p>Confirm in the field that equipment specification details match equipment nameplate details.</p>	Prepare new equipment specification sheets or additional process information if needed as a result of a project done by the student during the work placement.
3.1.4	Operating procedures, maintenance procedures.	Learn that these manuals exist and find them in the employer's document system/library.	Review a sample of these procedures, and observe some being followed as documented (could be a discreet operation such as unloading a tanker, or following the plant line-up for a continuous operation, maintenance operation such as filter change-out or instrument testing).	Develop additions or modifications to operating or maintenance procedures which are needed as a result of a project done by the student during the work placement.



Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
<b>3.2</b>	<b>Safe work management</b>			
3.2.1	Work permit system.	Find and read the employer's procedure(s) for these systems.	Take part in the employer's formal training programme for these systems.  Review a number of previously completed permit forms.  Observe the permit systems in operation (eg see equipment isolated, with tags in place etc if required, and confined space entry requirements being complied with).	Prepare and submit an application for a permit under these systems.  Take part in the preparatory work for this job (eg assisting with development of an isolation list, temporary modifications to operating procedures etc).  Follow progress of the job and permit forms from preparation through to hand back after completion.
3.2.2	Safe isolation and preparation for maintenance.			
3.2.3	Confined space entry.			
<b>3.3</b>	<b>Training system</b>			
3.3.1	Position descriptions, skills matrix.	Receive the employer's basic induction training.  Discuss the purpose Induction with supervisor and who the employer requires to receive it.	Observe the skills matrix for a range of positions at the workplace.  Complete the additional training needed for aspects of work during the work placement (eg if special training is need before entering particular parts of the workplace).  Learn how the system assesses and records completion of required training, including the need for refresher training.	Prepare new or modified training material if it is needed as a result of a project the student is working on.  Deliver the new or modified training to the target audience.
3.3.2	Training manuals and aids.			

Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
3.4	Emergency management			
3.4.1	Emergency procedures.	<p>Learn the essential emergency procedures such as response to alarms, reporting incidents and site evacuation as part of the employer's basic induction training.</p> <p>Discuss with supervisor how the procedures which the student would need to follow fit in with the employer's full emergency procedures.</p>	<p>Find and review the employer's Emergency Procedures manual.</p> <p>Note the way the manual is structured with descriptions of the roles to be assumed in emergencies, lines of command and communication, and specific procedures to be followed handling various emergency scenarios. Review how emergency planning had fed into the manual.</p>	<p><i>It is unlikely that a student would take an active role dealing with an emergency during a work placement.</i></p>
3.4.2	Emergency detection and prevention equipment.	<p>Learn during induction that there is equipment at the workplace to detect and deal with emergencies.</p>	<p>Read the description of emergency equipment in the emergency manual, and their location in the workplace.</p>	<p>Design changes to emergency facilities as a result of work done during the work placement. <i>It is unlikely that an undergraduate would have a large role in critical work such as this.</i></p>
3.4.3	Emergency exercises.	<p>As above, learn the procedure to be followed in an emergency during Induction.</p>	<p>Find and read the reports from previous emergency exercises.</p> <p>Learn how recommendations in these reports were addressed.</p>	<p>Participate in an emergency exercise if one is programmed during the work placement.</p> <p><i>Undergraduate could play a role as an independent observer and record taker.</i></p>

Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
3.4.4	Incident reporting and investigation.	Learn from supervisor how addressing lessons from previous incidents, big and small, has led to many improvements in process safety.	<p>Find and review the employer's procedures for incident reporting and investigation.</p> <p>Read the reports of a sample of investigations the employer has conducted in recent years, and recommendations made in them.</p> <p>Observe how recommendations have since been implemented or otherwise addressed.</p>	If an incident happens to occur relevant to some work the student is doing, participate as required by the incident reporting and investigation system.
3.5	<b>Process safety assurance</b>			
3.5.1	Inspection, testing and maintenance.	If the employer has a programme for regular or routine planned inspection, testing and maintenance of specified equipment, discuss with supervisor why this is done. Does the employer see this programme as a means of preventing process safety incidents?	<p>Observe the range of equipment types that are subject to routine inspection etc. (eg pressure vessels, process instruments, fire protection equipment etc).</p> <p>Access and read the procedures for some of this work, including inspection method, frequency, pass/fail criteria etc.</p> <p>Observe some of this inspection or testing being done or review a sample of previous inspection or testing records.</p>	After receiving suitable training, participate in some stages of the inspection and testing of equipment that is relevant to assigned work during the work placement.

Table 2 (continued)

No.	Process safety element	Competency level 1 Concept awareness	Competency level 2 Observed in action	Competency level 3 Applied successfully
3.5.2	Safety Integrity Level (SIL) assurance.	Learn about the concept of SIL classification and rating for safety instrumented control systems if applicable for the employer's operations.	<p>Read SIL analysis reports for some of the employer's instrument systems.</p> <p>Read SIL rating reports for those systems and note compliance with requirements.</p> <p>Compare the testing and inspection frequency in maintenance records for those instruments with the frequency required by SIL analysis.</p>	<p>If project work includes a new safety instrumented system, prepare the data needed for independent SIL analysis and rating.</p> <p>Consider any issues raised by SIL analysis etc.</p>
3.5.3	Safety system auditing.	Understand the difference between performance monitoring and auditing.	<p>Find the current or planned schedule of audits of the employer's safety systems.</p> <p>If available, review the report from the audit of at least one safety system, noting the objectives, method, and criteria followed.</p> <p>Observe how recommendations arising from audits have led to safety improvements.</p>	Participate, as circumstances allow, if an audit relevant to some activity the student is doing is conducted during the work placement.

# Appendix 2 – Industrial training plan for process safety

For:

Work placement at:

During:

No.	Process safety management element	Specific activities and projects to be undertaken	Competency level see definitions below
Competency number from matrix	In this column, enter process safety elements that will be covered by the student’s worklist. Refer to the list of possible process safety elements in the first column of the Competency Matrix – <b>Appendix 1</b> .	In this column, enter specific activities that will be carried out and are relevant to the process safety elements.(Refer to the Competency Matrix – <b>Appendix 1</b> – for examples of possible relevant activities.	In this column, enter the competency level that applies to each planned activity. See below for definitions of competency levels.
3.2.1	<b>As an example to illustrate:</b> Safe systems of work (eg permit to work).	<b>As an example to illustrate:</b> <ul style="list-style-type: none"> <li>■ complete company work permit system training;</li> <li>■ prepare and submit permit application for removal and overhaul of pump xxx.</li> </ul> Observe operation of permit through all stages of job.	<b>For this example:</b> Level 1  Level 2  Level 3
2.1	<b>As another example to illustrate:</b> Engineering and design (eg design conditions/safe operating window).	Prepare process design for replacement of dosing pump for cooling water treatment chemical xx.	Level 3
	<b>Insert other process safety elements as agreed</b>	<b>Insert specific tasks as agreed</b>	

Plan agreed by:

Employer representative:

Student:

The table lists particular process safety elements that will be examined during the student's work placement and the depth at which they were looked at, listed under three basic competency levels, defined as follows:

Competency level	Description
1. Concept awareness	Student has been informed why a system is needed to manage this aspect of process safety
2. Observed in action	Student has received training in the host employee's system for managing that element of process safety, and has seen examples of that system being used in practice
3. Applied successfully	Student successfully put the employer's system into practice during the work placement.

Further advice for the Employer supervisor on preparing the IT plan is provided in the guide for supervisors/mentors is available in [Appendix 6](#). Advice for students is provided in [Appendix 5](#).

# Appendix 3 – The diary

## The diary

### Part A

No.	Process safety element	Level 1	Level 2	Level 3
<b>1</b>	<b>Process safety knowledge</b>			
1.1	Hazard identification and risk assessment	✓		
1.2	Specific hazards at employer's workplace	✓	✓	✓
1.3	Hazardous materials	✓	✓	
1.4	Hazardous procedures	✓	✓	
<b>2</b>	<b>Engineering and design</b>			
2.1	Design considerations/safe operating window			
2.2	Inherently safer design principles including risk reduction approaches			
2.3	Regulatory requirements			
2.4	Codes and standards			
2.5	Safety critical equipment and assumptions			
2.6	Management of change (MoC)			
<b>3</b>	<b>Systems and procedures</b>			
<b>3.1</b>	<b>Systems, manuals and drawings</b>			
3.1.1	P&IDs, cause and effect charts, PFDs			
3.1.2	Process manuals, equipment specification catalogues			
3.1.3	Document management system			
3.1.4	Operating procedures, maintenance procedures			
<b>3.2</b>	<b>Safe work management</b>			
3.2.1	Work permit system			
3.2.2	Safe isolation and preparation for maintenance			
3.2.3	Confined space entry			
<b>3.3</b>	<b>Training system</b>			
3.3.1	Position descriptions, skills matrix			
3.3.2	Training manuals and aids			
<b>3.4</b>	<b>Emergency management</b>			
3.4.1	Emergency procedures			
3.4.2	Emergency detection and prevention equipment			
3.4.3	Emergency exercises			
3.4.4	Incident reporting and investigation			
<b>3.5</b>	<b>Process safety assurance</b>			
3.5.1	Inspection, testing and maintenance			
3.5.2	Safety integrity level (SIL) assurance			
3.5.3	Safety system auditing			

Once *Diary Part B* (page 25) is completed:  
The student is to tick off the competencies they have achieved and supervisors to check and verify it is correct.  
If correct, supervisors are to sign below (left hand side).  
The student is then to ask a university representative to sign off below (right hand side).

**Student Information**  
 Name: \_\_\_\_\_ University: \_\_\_\_\_  
 Placement name: \_\_\_\_\_ Placement date: \_\_\_\_\_  
 Supervisor name: \_\_\_\_\_ Supervisor role: \_\_\_\_\_

**Summary of achieved process safety competencies**

**Employer certification**  
 I certify that, to the best of my knowledge, (student name) achieved the process safety competencies shown above during work placement at (company/site name).  
**Supervisor signature** \_\_\_\_\_  
**Supervisor name:** \_\_\_\_\_

**University representative certification**  
 I certify that (student name) has enrolled in (course name) at (university name) and met work placement reporting requirements.  
**University representative signature** \_\_\_\_\_  
**University representative name:** \_\_\_\_\_

*See following page for an explanation of this certification.*

### Diary scheme details

This scheme was developed by the IChemE Safety Centre (ISC) of the Institution of Chemical Engineers (IChemE). It aims to improve student education in process safety by helping students and explore process safety in action during time spent in industry as part of their course. These process safety competencies have been developed based on the **ISC Process Safety Competency Guidance**. Part A of this form lists specific process safety elements that were examined during the student's work placement and the depth at which they were experienced, based on three basic competency levels, defined as follows:

Competency level	Description
1. Concept awareness	Student has been informed why a system is needed to manage this aspect of process safety.
2. Observed in action	Student has received training in the host employee's system for managing that element of process safety, and has seen examples of that system being used in practice.
3. Applied successfully	Student successfully put the employer's system into practice during the work placement.

### Authorisations

The signature on the bottom left part A testifies that the student undertook work with the employer during work placement consistent with the competency levels shown above.

The signature on the bottom right testifies that the student was enrolled at the academic institution shown, and that the student submitted a report on completion of the work placement that discussed what they had learned about process safety.



# The diary

## Part B

Student to complete			Supervisor to check	Supervisor to verify
PSE no.	Competency level achieved	Activities completed to achieve competency	Description of activities	Supervisor verification and comments
Process safety element no.	Levels achieved according to Passport PSE guidelines	Activity completed Project name	<ul style="list-style-type: none"> <li>Level 1: Description of how Level 1 was achieved, completed on (date)</li> <li>Level 2: Description of how Level 2 was achieved, completed on (date)</li> <li>Level 3: Description of how Level 3 was achieved, completed on (date)</li> </ul>	<ul style="list-style-type: none"> <li>Evidence of completion (optional)</li> <li>Supervisor additional comments</li> </ul>
3.2.1	1, 2, 3	Work permit application project XXX	<ul style="list-style-type: none"> <li>Level 1: Work permit training completed on XX/XX/XX</li> <li>Level 2: observed work conducted under permit on XX/XX/XX. Permit was extended to allow job carry over to XY/XX/XX</li> <li>Level 3: Application for WPXXXX prepared and submitted XX/XX/XX. Permit was granted and job proceeded XX-XY/XX/XX</li> </ul>	See attached documents (optional) <ul style="list-style-type: none"> <li>Training records</li> <li>Application for WPXXX</li> </ul> Student made genuine contribution to the design work; more time required to complete this project. Agree that this was consistent with level 3

Student to fill. This indicates what levels of competency the student has achieved (ie level 1 – awareness, level 2 – observing, level 3 – applied successfully).

The Student is to pre-fill this with important key information such as:  
 project name;  
 student activity/role in project;  
 project/activity system/document.  
 eg HAZOP scribe for company XYZ seeking to modify refinery using PHA Pro.

The Student is to pre-fill this column with exactly what they did to achieve the competency, indicating date of completion and document names.

Supervisor to check and verify that students have done all activities in this column. Cross check with IT plan to ensure all tasks have been covered.

Supervisor to provide evidence (document name/number – document is then to be attached to this document for submission) if available.  
 Supervisor can also write comments if necessary.

Student to fill. The number for the process safety element is taken from the table in *Diary Part A* (page 23).  
 It refers to the process safety element the student is trying to achieve competency for.

# Appendix 4 – Guide for universities

## Introduction

This guide is written specifically for the staff of universities considering participation in the diary scheme developed by ISC to help students gain a better understanding of process safety during industrial work placements.

The guide is intended to help universities determine if the scheme could provide a useful learning experience for their students, to complement the process safety education they provide in the coursework under their direct control. It also provides information to help staff members involved in administering the final steps of the scheme. The earlier steps are completed during the work placement and do not necessarily require direct input from the university.

## Can this diary scheme help your students?

The diary scheme offers students a chance to see how process safety is managed in practice in an industrial setting where a broad range of factors need to be considered. While universities can teach the principles involved in process safety management and can support this with case studies and class exercises, they have limited opportunities to show how the principles are applied when dealing with industrial-sized equipment, interacting systems and conditions, and people with variable levels of skills and knowledge. The diary scheme could fill this gap for your students without placing significant demands on university resources.

Process safety is taught in different ways and at different stages of many university courses. Similarly, industrial work placements can take different forms and occur at different stages of the courses at different universities. The question for universities to consider is, can the diary scheme be adapted and adopted to suit their courses and help their students.

The benefits of the scheme for the students are clear. Soundly based knowledge of process safety is a desirable skill for many potential employers. Completion of the scheme gives the student tangible evidence demonstrating that they have acquired that knowledge. This could be an important advantage when seeking future professional employment.

## What is the diary scheme?

The process to be followed in the diary scheme is described in this guide.

Briefly, at the start of the work placement the student and the employer's representative agree on a number of process safety elements that will be seen in action during the placement, and the specific activities that will demonstrate those elements in practice. The student can also add a limited number of elements of their own choosing to this list.

At the end of the work placement, the supervisor and student will then discuss the work that was done, and complete a form (see [Appendix 3](#)) which summarises the process safety elements that were actually covered, and the extent of direct involvement the student had in work associated with managing those process safety elements. Based on this, the supervisor will then verify and sign a diary form which lists the process safety elements which the student had examined during their industrial work and the competency level achieved.

A template for the diary, illustrating their format and contents, is available in [Appendix 3](#)). It consists of part A and part B. Part A is an overall summary noting the level achieved in each element. Part B describes the activities undertaken for each element.

Under the scheme, the student's education in process safety is strengthened. They can then prepare a report discussing what they learned about process safety during the work placement. The student would then submit this report together with the diary signed by the employer, and based on these two documents, the university would countersign the diary. The student could then use the diary in support of applications for future employment.

However, it is acknowledged that some universities may have different reporting requirements for students on work placement, and some universities may have reservations about reviewing reports, or signing documents referring to activities that are not within their direct control. These matters are discussed further in the next section of this advice.

## What is required of universities?

Most of the steps of the diary scheme are conducted away from the university, and do not require input from university staff. Depending on the extent to which the university chooses to be involved in this scheme, the role of the university is likely to be limited to the final two steps: receiving and reviewing the student's report, and countersigning the diary. To assist the staff member responsible for administering the issue of the diary, the following advice and guidance is provided.

## Competency level

The student's exposure to (and hence knowledge gained about) process safety elements is rated in the diary as level 1, 2 or 3 according to the following simple criteria.

At the most basic level (level 1), the student will have seen enough during the work placement to show that a particular aspect of process safety is important, and that systems and controls are available to manage the risks associated with it. At level 2, the student will have seen someone else applying those safety management systems in practice. At level 3, the student will have put those systems into practice themselves.

Examples of the sort of activities or tasks which students could do in order to achieve these outcomes in specific process safety areas are provided in [Appendix 1](#).

## Student's report (IT report)

The university will determine the format of the student's report, how it is to be handled by the university, and perhaps even if a report is required at all. The report can be in any format consistent with other university requirements, eg it could be stand-alone or part of another report on the work placement.

The focus of the report is what the student learned about process safety, and the means of managing the associated risks. To avoid issues with disclosing confidential company or personal information, the report should avoid discussing specific details of the activities undertaken during the work placement, and instead focus on the process safety implications of the activities and observed safety management systems and controls. It would be helpful to remind students of these issues before they commence the report.

It is taken for granted that, if the employer or university has procedures in place for these issues (eg signing confidentiality agreements before commencing the work) they will be complied with.

## Completion of the diary

When the report has been completed, the student submits it, along with the diary signed by the employer to the relevant university staff member. The employer's signature on the diary certifies that (a) the student did see various aspects of process safety in action, and (b) the extent of direct involvement the student had in those tasks. The report should demonstrate what the student learned about the listed process safety elements through their time in the work placement.

The university is then asked to countersign the diary if satisfied that (a) the student was enrolled in a relevant course at the university, and (b) the student has complied with requirements the university has for work placement, such as submitting a report on what they had learned.

If the student were to use the diary in support of future applications for employment, it is expected that interviewers would be quite interested in discussing some of the process safety elements with the student and forming their own opinions of the outcomes.

## If the university chooses not to require a report or countersign

It is hoped that the university will see the benefits for their students in fully participating in this scheme, and therefore support it. The comments and reflections on aspects of process safety ought to provide useful input to academic staff when considering future content for related coursework and class exercises.

However, if for some reason a particular university chooses not to require a report from their students on work placement, or not to countersign the form, the students should still be able to participate in the scheme. The diary (see [Appendix 3](#)) could be adapted by deleting the references to the university and countersigning. In effect the diary would be issued by the industry supervisor alone.

# Appendix 5 – Guide for students

## Introduction

Process safety is a critical aspect within industry for chemical engineers. The scheme has been developed by ISC to help students gain a better understanding of process safety during industrial training (IT). This guide has been prepared to explain how you, the student, can use the scheme to develop your process safety skills. Under the scheme, your IT supervisor will demonstrate how process safety is managed at the workplace and provide you with (a) opportunities to develop an awareness, (b) witness them in action and (c) potentially apply them in process safety related tasks. These competencies will be recognised in your diary at the completion of your IT to serve as a record that can be presented to future employers. You may also be required to develop a report based on your experiences, refer to your university for details on this.

The guide will provide you with advice and suggestions for the various stages of the scheme. If you are not familiar with it, you should first read the background to this document (see [here](#)). Figure 7 provides an overview. Advice is provided for the six key stages of the scheme which are:

1. **Preparation** before the work placement starts.
2. Preparation of your **Industrial Training Plan** (IT plan) with your placement supervisor.
3. **Doing the work** assigned to you during placement.
4. Receipt of the **diary form** at the end of the IT (signed by the workplace supervisor).
- 5a. Preparation of your IT report.
- 5b. **Submission** of your IT report and **diary form** to your university.



# A STUDENT'S GUIDE TO THE DIARY SCHEME

## BENEFITS OF COMPLETION



Stand out in future job applications



ISC recognised programme

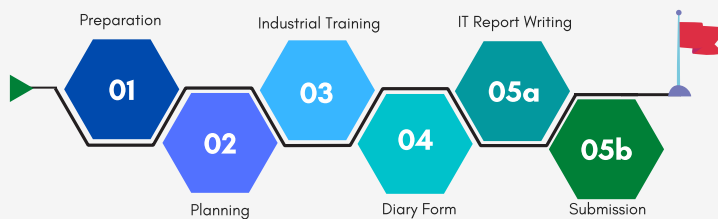


Have a say in planning your Industrial Training



Increased understanding of process safety

## THE 6 KEY STAGES



## MAKING SURE YOU'RE ON TRACK

<b>01</b>	<p><b>BEFORE THE WORK PLACEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Read the ISC Overview document.</li> <li><input type="checkbox"/> Understand the elements attached to the Student Competency Matrix.</li> <li><input type="checkbox"/> Read up on incident history reports or case studies.</li> <li><input type="checkbox"/> Think about aspects of process safety that interest you. (ie Design standards, Safe work practices, Hazard identification and risk assessments).</li> </ul>
<b>02</b>	<p><b>PREPARING THE IT PLAN FOR YOUR PLACEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Discuss with your supervisor process safety elements you want to see in action.</li> <li><input type="checkbox"/> Ask lots of questions about the work tasks and projects set by your supervisor: <ul style="list-style-type: none"> <li><input type="checkbox"/> will you have enough time to complete the tasks?</li> <li><input type="checkbox"/> do the activities allow process safety elements to be explored?</li> </ul> </li> <li><input type="checkbox"/> Enter the agreed activities in the appropriate competency column of the IT Plan Form, against the relevant process safety element. (Note: It's not necessary to have activities against every process safety element, and that these may change during the work placement).</li> </ul>
<b>03</b>	<p><b>DURING INDUSTRIAL TRAINING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Ask lots of questions. Especially if you aren't sure or don't understand.</li> <li><input type="checkbox"/> Learn as much as you can (this will help you in future job interviews).</li> <li><input type="checkbox"/> Read the detailed Student Guideline to have a better idea of some of the questions to ask your supervisor.</li> </ul>
<b>04</b>	<p><b>COMPLETING YOUR DIARY FORM</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Review your competency level criteria for the activities you planned and ensure they have been completed.</li> <li><input type="checkbox"/> Remind your supervisor to fill out the Diary Form at the end of the work placement. If necessary, ask for time to discuss it with them.</li> <li><input type="checkbox"/> Refer to your notes to remind your supervisor of any activities or observations you made to attain a competency level.</li> </ul>
<b>05a</b>	<p><b>WRITING YOUR INDUSTRIAL TRAINING REPORT (OPTIONAL)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Write your IT report and ensure that it complies with your university requirements.</li> <li><input type="checkbox"/> Review your report and check that it also complies with placement requirements. (ie company confidentiality and personal details should be respected).</li> </ul>
<b>05b</b>	<p><b>SUBMISSION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Submit your IT Report and Diary Form to your university.</li> <li><input type="checkbox"/> Diary is issued and states all the competencies you achieved during placement. (The industrial training supervisor completes a form acknowledging the student has completed process safety competencies and is willing to be contacted to verify this - this is the Diary).</li> <li><input type="checkbox"/> Attach the diary to your resume and get a job!</li> </ul>

Figure 7. Overview of the process for students.

## 1. Before the work placement

This stage is all about ensuring that you understand how the scheme works so that you can provide suggestions of competencies you would like to complete to your supervisor in the IT plan meeting. As you might not have enough time to be able to thoroughly explore the process safety competencies, it is suggested that you focus on understanding:

- the overview document so that you have a clear idea about how the scheme works;
- the different competency levels in the competency matrix and what is required to achieve them (see Appendix 1).

Once you have understood the two points above, think about process safety aspects that interest you. A good place to start would be to have a look at incident history reports or case studies, such as those on the [ISC website](#), [ISC YouTube channel](#) or those issued by the US Chemical Safety and Hazard Investigation Board ([www.csb.gov](http://www.csb.gov)) that highlight the importance of process safety management. Be aware that process safety work at different types of workplaces tends to focus on different areas and that there are limits to what can be covered in your short IT placement. Some examples of process safety work conducted by specific workplaces include:

- design standards etc are a major focus of work in a design office;
- safe work practices are very important in operating facilities;
- hazard identification and risk assessment are important matters for risk engineering consultancies.

Even though you might not know which aspects will be most applicable during your IT, it is still a good idea to identify areas you are interested to discuss potential opportunities with your supervisor. Do not worry about identifying specific activities that will enable you to achieve certain competencies as the supervisor will do that for you based on what can be done at their workplace.

## 2. Preparing the plan

At this stage it is strongly recommended that you work with your IT supervisor to develop a plan that will enable you to achieve process safety competencies. The IT supervisor should provide you with an overview of the process safety elements which apply to their workplace and identify activities which you can take part in to achieve the different levels of competencies. The work tasks and projects will be set by the IT supervisor, so you do not need to worry about developing them. During this stage it is best to:

- ask lots of questions, such as:
  - how long will the various activities take to complete?
  - what will the activities involve?
- tell the IT supervisor about the additional process safety elements you would like to see in action;
- ask how these are managed at this workplace and if it is possible for you to witness them in action while you are there.

The aim of the meeting and the IT plan is to develop a list of activities that will:

- a) give you enough time to complete the work the IT supervisor wants done;
- b) allow a manageable number of process safety elements to be explored.

The supervisor will complete the IT plan with you by entering the agreed work tasks or activities in the appropriate competency column of the form, against the relevant process safety element.

Note: It is not necessary to have activities against every process safety element, and that the plan may change during the IT if other opportunities arise.

### 3. During the industrial training

During your IT, there are two main objectives:

1. Complete the work activities you said you would do in the IT plan.
2. Learn as much as you can about process safety while doing this.

To get the most out of your IT, a few things to do and think about while you are doing your activities include:

#### Completing the work/activities

- be sure you understand what is being asked of you;
- ask to see examples of that sort of work has been done before;
- if it is not clear why something is done a certain way, ask why etc;
- keep notes of suggestions and information other people give you.

#### Learning about process safety

If you are looking into the safety aspects of **design and installation** of a small project (such as MoC):

- how is it done at this workplace?
- why are there so many steps in the process?
- why do all these people need to review and approve the project documents?
- can you see (and understand the basis) of some recent examples of the system being followed?
- are there any examples of the system not being followed? What happened? Why?

If you are looking into **safe systems of work at an operating facility** (such as permit to work or safe isolation procedures):

- how is it done at this workplace? Ask for someone to show you through the process, step by step;
- what checks and balances are there in the system to make sure they are done correctly?
- can you see an example of the system being used at present, or recently completed examples?
- are there any examples of the system not being followed? What happened? Why?

If you are looking into **risk assessment systems** at this workplace:

- do they look for process safety hazards regularly, or only when doing something different?
- how do they go about looking for process safety hazards, and how do they decide if or when a risk is manageable (and acceptable)?
- can you see an example of a risk assessment in progress, or one that has been completed previously?
- if safety concerns were raised in a previous safety assessment or risk review, how were they handled?
- if they rely on something like an automatic control or a procedure to manage a possible process safety risk, what do they do to make sure that it will always function properly?



If you are looking into **safety incident reporting and investigation** systems:

- what sort of incidents do they report and record? How?
- are they all investigated? How?
- can you see examples of previous incident investigations, including a process safety incident?
- you may need to reassure them that details of any incident will be kept confidential, and not discussed outside the workplace.

## 4. Competing the diary form

Upon completion of your IT, you and your industry supervisor will fill out part B of the diary form (see [Appendix 3](#).) If necessary, ask to arrange a meeting with your supervisor to discuss it. Before this discussion, review the competency level criteria again. Did you successfully use or apply the safety management system yourself (level 3)? Did you see it used successfully by someone else (level 2)? From what you saw during the work placement, are you at least aware that this aspect of process safety needs to be managed, and that there are means of doing this (level 1)?

Refer to your notes to see if there were activities or observations you made that the supervisor may have overlooked.

When satisfied with the diary for part B, your supervisor will record the results (ie the process safety aspects you covered during the IT and competency levels achieved) on part A of the form (see [Appendix 3](#)), sign it and give it to you. The summary form will become your diary.

## 5a. IT report (optional)

The final steps of the diary scheme (reporting on what you learned about process safety and completing the diary) may vary depending on how your university wishes to be involved in these stages. This section of the guide (5a) is written for students at universities which are fully participating.

At the conclusion of your IT, you need to prepare a report as per the requirements set by your university (eg length, submission deadline, stand-alone report or simply one part of a broader report) including what you have learnt from your experience. It is important that you respect company confidentiality, and do not divulge any proprietary information or personal details of people you met.

The focus of the process safety section of the report is to summarise your thoughts on process safety, not specific details of the activities involved. For example, if you were involved in something that brought a chemical on to the site that had not been used before, avoid specifically naming that chemical (particularly if it were proprietary technology). Focus the report on what steps needed to be taken to safely introduce it to the site, and your reaction to having to follow those steps. Companies are usually very careful about protecting their reputation and would not like details of problems or mishaps to be aired externally. You need to be aware of any company requirements for this report.

## 5b. Submission

Some universities may choose to not get involved in the diary scheme by deciding not to receive IT reports, or not to countersign the diary. If this is the case with your university, you can still use the diary to document your progress and learning.

In effect, the comments, and observations in the fourth column of the diary form part B (see: [Appendix 3](#)) become your IT report, so it is worth filling this out carefully.

If your university is participating, you need to submit the first part of the diary form part A (the summary section, signed by the workplace/IT supervisor) and your IT report to the university as per their requirements. The university will

review the diary and the report and, assuming there is enough in them to demonstrate that competency was achieved, complete the diary. The diary will state that during IT, you saw the following aspects of process safety management in action and achieved various levels of competency in them. Your diary is now complete, and you can attach it to your resume. Congratulations!

# Appendix 6 – Guide for industry supervisors and mentors

## Introduction

This guide has been prepared specifically for people who will act as supervisors and mentors for students during work in industry as part of their university courses. ISC has developed this diary scheme through which students can gain a better understanding of process safety during their work placement by seeing process safety in action. The success of the programme relies heavily on the member of the host employer's staff who will supervise and mentor the students. Thank you for taking on this role.

The guide is meant to provide you with advice and suggestions for the various stages of the scheme. If you are not familiar with it, you should first read the background to this document (see [here](#)). Advice is provided here for the first four stages:

- preparation before the work placement starts;
- meeting with the student to prepare the industrial training plan (IT plan);
- supervising and mentoring during the work placement;
- certifying the diary form at the end of the work placement.

The remaining two stages of the scheme:

- a report by the student on what they learned about process safety (the IT report);
- university certification.

A summary of the process is shown in figure 8.



# A STUDENT'S GUIDE TO THE DIARY SCHEME

## BENEFITS OF COMPLETION



Assists in identifying higher calibre applicants



Participate in a university and ISC approved programme

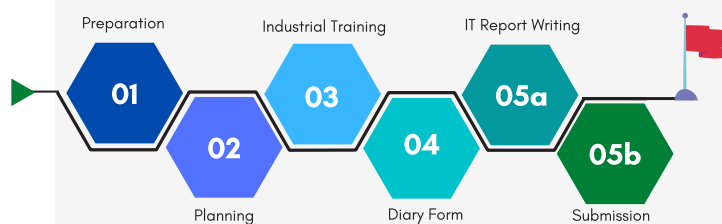


Ease in developing internship programmes using the framework



Confidence in graduate process safety competencies

## THE 6 KEY STAGES



## MAKING SURE YOU'RE ON TRACK

<b>01</b>	<p><b>BEFORE THE WORK PLACEMENT</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Read the ISC Overview document.</li> <li><input type="checkbox"/> Consider activities and tasks that will make the placement an effective learning experience for the student. <ul style="list-style-type: none"> <li>■ what aspects of process safety could be involved in those tasks or activities?</li> <li>■ how can you best explain or show the student the principles and practices of these process safety elements?</li> </ul> </li> </ul>
<b>02</b>	<p><b>SUPPORTING THE STUDENT IN PREPARING THEIR IT PLAN</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Brainstorm and provide the student with suggestions of process safety elements they may want to see in action. Consider the following questions: <ul style="list-style-type: none"> <li>■ will the student have enough time to complete the tasks?</li> <li>■ will the activities allow process safety elements to be explored?</li> <li>■ does the company have enough resources to allow the activities to be conducted.</li> </ul> </li> <li><input type="checkbox"/> Ensure IT plan is completed within a week of commencement.</li> <li><input type="checkbox"/> Promote an active learning environment that encourages the student to ask questions.</li> <li><input type="checkbox"/> With the student, enter the agreed activities in the appropriate competency column of the IT Plan form, against the relevant process safety element. <small>(Note: It's not necessary to have activities against every process safety element, and that these may change during the work placement).</small></li> </ul>
<b>03</b>	<p><b>DURING INDUSTRIAL TRAINING</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Be an amazing supervisor. <ul style="list-style-type: none"> <li>■ actively mentor and guide the student during their time working in industry.</li> <li>■ ensure that the planned work is done safely.</li> </ul> </li> <li><input type="checkbox"/> Be alert for company opportunities that may be of interest to the student. <small>Note: The plan may need to be adjusted during the IT placement to better reflect opportunities within the company.</small></li> </ul>
<b>04</b>	<p><b>COMPLETING THE DIARY FORM</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Fill out and sign the Diary Form at the end of the work placement. This certifies that: <ul style="list-style-type: none"> <li>■ the student has completed the activities or tasks on it.</li> <li>■ the student meets the Competencies Matrix.</li> </ul> </li> <li><input type="checkbox"/> Return the completed and signed form to the student.</li> </ul>
<b>05a</b>	<p><b>WRITING THE INDUSTRIAL TRAINING REPORT (OPTIONAL)</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <i>If necessary</i>, review the student's IT Report prior to submission and ensure that it complies with your company's confidentiality requirements.</li> </ul>
<b>05b</b>	<p><b>SUBMISSION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> You may be contacted by the university to confirm/clarify details on the Diary form or the student's IT Report.</li> <li><input type="checkbox"/> That's it! You've officially supervised for the ISC Diary Scheme.</li> </ul>

Figure 8. Overview of the process for supervisors.

## Before the work placement

You will need to give some thought before the work placement as to how you can make it an effective learning experience for the student. The first thing to consider is:

- what tasks or activities will you give to the student?

When that has been decided:

- what aspects of process safety (or elements) could be involved in those tasks or activities?
- how can you best explain or show to the student the principles and practice of those process safety elements?

Some advice on each of these matters follows.

## Tasks or activities for students

Experience has found that this sort of industrial training works best when students are given real work that needs to be done, and they can learn by doing. Obviously, the work needs to be something that a technically capable but inexperienced employee could do with a reasonable level of supervision and guidance.

Are any of the following possible at your workplace?

- small projects or equipment changes that have been deferred because of low priority or lack of resources;
- testing or monitoring programmes requiring several people or extended time to complete (eg pipe support inspections, stop-button activation checks, noise surveys, electrical equipment inspections etc);
- assistance at a HAZOP or other form of hazard identification study scheduled during the work placement;
- checking that drawings, procedures, equipment manuals etc have been updated following change projects.

## Relevant process safety elements

Most work activities carry some health and safety risk, which would usually be mitigated in responsible workplaces by some form of safety management system. Having decided on the activities you want the student to do, you then need to give thought to what safety systems they might see in action in the course of that work.

For example, small projects involving changes to equipment, procedures or other conditions would give the student the opportunity to see your company's MoC system in action. It is also likely to involve some form of risk assessment and may involve consideration of design standards, materials handling and safe operating conditions.

Work that includes physical activities in an operating workplace (eg sampling or measurement) could require the student to follow safe work procedures such as permit to work, safe isolation, hazardous electrical area procedures etc.

The Competency Framework for students that was developed for the diary scheme (see [Appendix 1](#)) is a list of many different process safety elements that can apply in this industry. How many of these would be relevant for the tasks and activities you have chosen for the student?

## 1. Introducing the process safety element to the student

Give some thought also towards how you can explain the concepts and procedures for managing relevant process safety elements to the student. Is there information readily at hand? Such as:

- documented procedures that you could talk through with the student;
- in-house training packages for systems such as permit to work;
- relevant safety alert bulletins or incident reports that highlight the importance of the system;
- examples of previous use of the system.

You may also need to start the general arrangements needed for any new professional employee or contractor at your workplace, such as site induction, entry pass, and computer access etc.

## 2. Preparing the IT plan

The IT plan is prepared in a meeting with the student in which you discuss exactly what work and activities the student will do, and which process safety elements you will jointly focus on during the work placement. The meeting needs to be held very soon after the student commences.

This is probably your first opportunity to explain to the student what you want them to do in the coming weeks, and then what aspects of process safety would be involved, and how they could see the way those elements are managed in practice.

Before the work placement, students participating in the scheme would have been encouraged to think about aspects of process safety they would like to examine. Even though you may not have planned any work involving some of those aspects, you may be able to show the student how they would be handled at your workplace when necessary. The aim of the meeting should be to develop a list of activities that will (a) give the student enough time to complete the work you wanted done, and (b) allow a manageable number of process safety elements to be explored.

The final list is to be recorded in the format of the IT Plan template (see [Appendix 2](#)). The structure and format of the IT plan is similar to that of the competency framework for students which was discussed earlier (see [Appendix 1](#)). If you are not familiar with this matrix, it is strongly recommended that you examine it before the meeting, paying particular attention to the competency definitions in the preamble at the top.

To paraphrase these definitions, a student would be considered as having achieved competency level 1 if they had completed activities that would have made them aware of the purpose and concepts behind system(s) to manage that element of process safety. Level 2 would be achieved if the work had allowed the student to see how others had managed that aspect of process safety in your workplace. To achieve level 3 competency, the student would have to successfully use the particular safety management system themselves. The competency framework for students (see [Appendix 1](#)) lists a number of representative examples by which the various competency levels could be achieved. These are simply examples for comparison with activities you had in mind for the student. They are not prescriptive requirements.

To complete the IT plan you should enter the agreed work task or activity in the appropriate competency column against the relevant process safety element. Note that it is not necessary to have activities against every process safety element and, in the limited time available for work placements, may not be desirable either. It is most unlikely that a student would be able to complete enough different work activities to achieve level 3 outcomes in more than a small number of process safety elements.

Note also that the IT plan is meant to be flexible and can be amended during the work placement if there is good reason to do so.

## 3. During the industrial training

Your role during this phase is to be a supervisor (to see that the planned work is done safely) as well as a mentor and guide (to see that the student learns from the time working in industry).

Be alert for any other opportunities that may arise during the time with your company, such as seeing inside equipment that is open for maintenance, sitting in on a periodic hazard identification or risk assessment study, or observing routine testing of risk control measures such as fire protection equipment.

## 4. Diary form

At the end of the work placement, you and your student need to fill out and sign the diary form. The template for this is provided in **Appendix 3** and consists of two parts, part A and part B. Part A form the overall summary and sign off. This is discussed below. Part B is the is where the student and you document the activities that were undertaken and assess the level of competency achieved. You will see that it is overlaid with instructions for yourself and the student on how to fill out the various columns of the table.

In part B, ask the student to fill out the first four columns, and then discuss it with them. You may or may not agree with all of the student's comments and assessments of their own outcomes. You need to talk about any differences of opinion and resolve this before completing the fifth column.

Your conclusions on the process safety elements that were covered during the work placement, and the competency level achieved are then entered in part A for the form. You are then asked to sign part A in the bottom left corner.

By signing part A, you are certifying that (a) the student completed the activities or tasks shown on it, and (b) the activities were consistent with the criteria of the student competencies matrix. In your opinion, did completion of the activity demonstrate that:

- the student had successfully used or applied that element themselves (level 3);
- had seen the element used or applied successfully by someone else (level 2);
- was, at least, aware that this process safety aspect needs to be managed, and that there are means of doing so (level 1).

As discussed earlier, it is unlikely that the student would work on all process safety elements during their time with you, or that they would have been able to reach competency level 3 on many elements in the time available. The completed form should simply reflect what was actually done by the student in the time available. When you have completed the form, sign it, and give it to the student.

## 5a. IT report (optional)

The final phases of the scheme are carried out at the university and are not likely to involve you. It is possible that someone from the university may contact you to clarify details on diary form or the student's IT report. It is also possible that you could be contacted by someone considering employing the student if the student used the diary to support their application for employment.

## 5b. Submission

There is limited involvement at this stage for a supervisor or mentor, as this stage involved the final submission by the student to the university for grading.

# Appendix 7 – Glossary

C&E	Cause and Effect chart.
Competency level	Competencies on process safety elements that can be achieved by students during an industrial training. Three basic levels are defined (1) concept awareness, (2) observed in action, (3) applied successfully.
CPD	Continuing Professional Development.
Diary	A form describing the activities conducted by students to cover process safety elements and the associated competency levels achieved during an industrial training. This form requires input from the participating student and industrial training's supervisor or mentor.
Diary Scheme	A scheme described in this guide which is recommended by the ISC to increase students' understanding of process safety in practice.
HAZID	Hazard Identification, a structured study undertaken to identify possible hazards within a system [1].  Student has been informed why a system is needed to manage this aspect of process safety.
HAZOP	Hazard and Operability, a structured study undertaken to identify risks and operability problems [2].  Student successfully put the employer's system into practice during the work placement.
IEC	International Electrotechnical Commission, publishers of various standards.
Industrial training (IT)	Time spent in industry by students to familiarise them with how aspects of their course are applied in practice. This term emphasises the educational value of this time.
IT plan	A formal plan of activities which the participating student will undertake in the course of an industrial training. The plan includes a list of process safety elements to be covered and the corresponding activities to be undertaken.
JSA	Job Safety Analysis.
MoC	Management of Change.
PFD	Process Flow Diagram.
P&ID	Piping and Instrumentation drawing.
PSV	Pressure Safety valve.
Process safety elements	Specific matters which need to be managed in order to maintain the safety and integrity of operations at a workplace.
RA	Risk Assessment.
SCE	Safety Critical Equipment.
SIL	Safety Integrity Level, as defined in <i>IEC 61508</i> .
Work placement	A generic term for time spent in industry by students to familiarise them with how aspects of their course are applied in practice.



# References

1. S. Mannan, *Lees' Loss Prevention in the Process Industries: Volumes 1-3*, 4 ed., Oxford: Elsevier, 2012.
2. IEC, 2016. *IEC 61882 Hazard and operability studies (HAZOP studies) – Application guide*, s.l., International Electrotechnical Commission.

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