



RP 48-1

PROJECT HEALTH, SAFETY AND ENVIRONMENTAL REVIEWS (PHSER) PROCEDURES

July 1996

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BP GROUP RECOMMENDED PRACTICES AND SPECIFICATIONS FOR ENGINEERING																											
Doc. No. RP 48-1		Issue Date July 1996	Latest Amendment Date																								
Document Title PROJECT HEALTH, SAFETY AND ENVIRONMENTAL REVIEWS (PHSER) PROCEDURES																											
APPLICABILITY Regional Applicability: International																											
SCOPE AND PURPOSE This Recommended Practice replaces the previous BP Corporate (dated 1984) and BP Engineering (dated 1988) Guidelines that have been widely used as the basis for Project Safety Review procedures. This Recommended Practice also formally includes Health and Environmental aspects, and a new Part 3 that addresses re instrumentation projects. It provides adequate guidance and information for the efficient and consistent implementation of PHSERs for major projects, to assist in complying with BP Group HSE policy. Nevertheless, the responsibility for implementing BP Group policy is with the Businesses and local conditions, including organisational, regulatory and customary practice may dictate that other approaches are more appropriate. Where a Business or Operating Company has derived its own procedures, this Recommended Practice may provide helpful background but should not be used directly.																											
AMENDMENTS <table border="1"> <thead> <tr> <th>Amd</th> <th>Date</th> <th>Page(s)</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>July 1996</td> <td>1</td> <td>Objectives revised - Para.1</td> </tr> <tr> <td></td> <td></td> <td>3</td> <td>PHSER Scope - Para 2</td> </tr> <tr> <td></td> <td></td> <td>6</td> <td>Chairman's Role - Section 9.3</td> </tr> <tr> <td></td> <td></td> <td>10, 13, 18</td> <td>All Objectives - Stages 1 to 6 in</td> </tr> <tr> <td></td> <td></td> <td>22 & 29</td> <td>Sections 10.1.2, 10.2.2, 10.3. 2, 10.4.2 10.5.2 and 10.6.2</td> </tr> </tbody> </table>				Amd	Date	Page(s)	Description	1	July 1996	1	Objectives revised - Para.1			3	PHSER Scope - Para 2			6	Chairman's Role - Section 9.3			10, 13, 18	All Objectives - Stages 1 to 6 in			22 & 29	Sections 10.1.2, 10.2.2, 10.3. 2, 10.4.2 10.5.2 and 10.6.2
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CUSTODIAN (See Quarterly Status List for Contact) Operations, Safety																											
Issued by:- Engineering Practices Group, BP International Limited, Research & Engineering Centre Chertsey Road, Sunbury-on-Thames, Middlesex, TW16 7LN, UNITED KINGDOM Tel: +44 1932 76 4067 Fax: +44 1932 76 4077 Telex: 296041																											

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FOREWORD

Introduction to BP Group Recommended Practices and Specifications for Engineering

The Introductory Volume contains a series of documents that provide an introduction to the BP Group Recommended Practices and Specifications for Engineering (RPSEs). In particular, the 'General Foreword' sets out the philosophy of the RPSEs. Other documents in the Introductory Volume provide general guidance on using the RPSEs and background information to Engineering Standards in BP. There are also recommendations for specific definitions and requirements.

Value of this Recommended Practice

This Recommended Practice updates and consolidates previous guidelines which have been widely used..

Application

The document is procedural, and has therefore not been constrained to the usual format for BP Group Recommended Practices and Specifications for Engineering of 'Essential Requirements' and 'Commentary'.

Where given, Commentary is in italics. Commentary provides background information which supports the requirements of the Recommended Practice, and may discuss alternative options.

This document may refer to certain local, national or international regulations but the responsibility to ensure compliance with legislation and any other statutory requirements lies with the user. The user should adapt or supplement this document to ensure compliance for the specific application.

Feedback and Further Information

Users are invited to feed back any comments and to detail experiences in the application of BP RPSE's, to assist in the process of their continuous improvement.

For feedback and further information, please contact Standards Group, BP International or the Custodian. See Quarterly Status List for contacts.



PART 1 - GENERAL

1. INTRODUCTION

It is BP Group policy to be an Industry Leader in appropriate Health and Safety practices and Environmental standards and to strive to create a working environment where accidents will not occur and in which employees, customers, contractors and the public will not be exposed to health hazards. This is contained in the Group Policy Statement 1990 (Appendix C), and is supported by the ten HSE Focused Programmes (Appendix D).

One way of helping to implement the Policy is by carrying out a PHSER.

The responsibility for implementing BP Group Policy, including the ten HSE Focused Programmes, is with the Businesses. Local conditions, including organisational, regulatory and customary practice may dictate that other approaches are more appropriate. This Recommended Practice is offered as one way in which Project Health, Safety and Environmental Reviews (PHSERs) can be carried out.

This Recommended Practice replaces the Corporate Guidelines on Project Safety Reviews, dated 1984, and the BPE Guidelines Manual dated September 1988, both of which have been widely used.

2. OBJECTIVES

The objective of a PHSER is to provide assurance to the Client that sensitive areas have been identified and confidence that the appropriate project, engineering and operational procedures, including those for Occupational Health, Safety, Environmental Control and Energy Efficiency, have been or will be developed to control the identified risks. The PHSER is not a guarantee that the installation will meet these objectives.

The objective of a PHSER team is to conduct, within an agreed timetable and budget allocation, a qualitative audit at a level of enquiry which generally avoids getting involved in detail. The team must review the information as presented and avoid the temptation to indulge in 'opinion engineering'. The responsibility for design, construction and commissioning of facilities rests at all times with the pre-Project and Project organisations, including the contractors involved, acting on behalf of the Client. The responsibility for subsequent operation rests with the Client's Operator. Any aspects which the PHSER team consider unsatisfactory must be referred back to the Project or the Client for action.



3. PHSER STAGES

The PHSER procedure is in six stages and follows the traditionally recognised stages of a project:-

PHSER Stage	Project Stage	Project Phase
1	Conceptual design/statement of	Pre-Project requirements
2	Front-end engineering design	Pre-project
3	Detailed engineering design	Project
4	Construction/Pre Commissioning	Project
5	Commissioning	Project/Operator
6	Post-commissioning	Post Project/Operator

It is recommended that at an early stage of the project development a programme of PHSERs is developed and adhered to as part of the Project HSE Plan (Appendix F).

The timing and implementation of stages should be such as not to cause delay to the overall project timetable. This requires the agreement to clear Terms of Reference by the Client, timely stage initiation by the Initiating Authority, firm chairmanship, competent team membership, full Project/Operator co-operation in providing the necessary documentation and responses to team enquiries, and prompt issue of the PHSER report and recommendations on completion.

The programme of a typical project indicating activity, technical definition, phase and typical timings of PHSERs and HAZOP studies is shown in Figure 1.

When a project is similar to one that has been carried out before it might be appropriate to combine Stages 1 and 2 of the Review.

Some projects begin their construction activity well before the detailed design has been completed. In such cases the Stage 3 and 4 Reviews might overlap and their chairmen will need to co-ordinate their activities appropriately. Likewise pre commissioning might begin well before site construction finishes. In these cases Stages 4 and 5 might overlap.

The different skills required by Stage 3, 4 and 5 teams makes it very unlikely that these stages can be combined successfully.

4. PHSER SCOPE AND APPLICATION

The PHSER procedure is intended to be applied, in either the following or a suitably adapted format, to all projects involving the provision of new facilities or the expansion of existing facilities.

Each PHSER stage will review documentation relevant to the particular Project phase, agreed actions arising from previous stage report(s), and any specialised studies such as CSE/QRA, HAZOPS, HAZANS, Environmental Impact Assessments, Occupational Health Reviews and Energy Studies. (The latter are design and/or



decision making tools which may be used in project development and are specifically not part of the PHSER procedure). See Appendix E which identifies the position of HAZOPs and HAZANs with respect to some recent Projects and PHSERs. The role of the PHSER team is to satisfy itself that studies have been conducted properly and to confirm that any health, safety or environmental recommendations arising have been given adequate consideration. QA/QC procedures are project systems concerned only in part with health, safety and the environment and the PHSER team should check whether such systems are in place and how well they are being implemented with respect to health, safety, environmental and energy issues only.

The PHSER team will not demand the preparation of any special documents for its own use but may reasonably request sight of additional, existing information available within the project which it considers relevant.

The depth to which a review team will delve will differ from project to project and will be controlled by the Chairman who needs sufficient experience, skill and authority to do this. The team is limited by the documentation available, by the time the Chairman chooses to make available to complete the task and by the absolute necessity of not going outside its HSE remit. Small, skilled and experienced teams operating with an effective chairman will invariably add more value to the project than a similar, or larger team, without some or all of these advantages. Experienced personnel also obtain information from what they see and hear going on around them. It is not possible to reduce the PHSER process to checklists sent out from offices and completed by projects to be reviewed again back at the office.

At each Stage, the PHSER Team should attempt to close out as many of the findings as possible. However, it is not unusual in practice for unresolved items to be passed on to the next Stage. Subsequent PHSERs will review previous PHSER reports as a matter of course.

Detailed guidance on the implementation of PHSERs is given in Sections 10, 11 and 12 of this Recommended Practice.

5. JOINT VENTURES

Many projects are undertaken on behalf of a joint venture. Experience has shown that in general there are no problems in involving partners' representatives as team members or observers for PHSERs. It will be for the Client to decide whether or not to invite partner representatives. If full team members, they should however have the appropriate experience to contribute. Review reports, as always, will be classified confidential and will be subject to the confidentiality arrangements established by the joint venture.



6. THIRD PARTIES

Where a third party does not have the project and client organisations suitable for a BP style PHSER to be mounted, the appropriate Business Centre is available to offer advice and to suggest modified procedures for carrying out the review.

A report for a third party will note, in a prominent position that it is not a certificate confirming the installation will be safe but is assurance to the Client that Health, Safety and Environmental matters are being addressed adequately. It is assumed that sound engineering and operational practices will be followed by the owner.

In this context Third Party means an organisation in which BP has no financial holding, but with whom there will be an agreement to supply services such as the performance of, or assistance with, a PHSER.

7. APPROACH AND CONDUCT OF A PHSER

The approach and conduct of a PHSER will depend on the particular requirements of the Client and Project. However some general recommendations from experience are given in Appendix 'M'.

8. PHSER TEAM MEMBERSHIP

The Chairman and team membership will be selected according to the requirements of each PHSER stage and the nature of the Project. Section 10 defines typical team compositions for each PHSER stage. Each stage will usually include a Client's Operator representative, and a Technical Safety specialist.

A Project Representative, who is not a team member, will be provided by the project to perform a liaison role to ensure the interfaces between the PHSER and the Project are operating smoothly. (See Section 11 - Role of the Project Representative)

The PHSER team can co-opt members and may wish to seek the advice of various specialists on aspects of the Project. These specialists are not considered PHSER team members.

Project personnel are not normally included in the PHSER team in order not to compromise its independence. If it is unavoidable that the project does provide major skills to the team it is important that one of the team members is also familiar with that field of speciality.

Continuity between PHSER stages is desirable, to maintain knowledge gained in previous Stages. This can be achieved by selecting, for example, the same Chairman, Client's Operator representative, or Technical Safety specialist to serve on successive stages. The Project representative might also work with more than one review stage team.



The PHSER team should be independent, especially the Chairman, Client's Operator representative and the Technical Safety specialist. Independence in this context means not being directly associated with the Project and being released to the PHSER from the normal line management relationship, but not insulated from it. The Chairman, and other team members should have knowledge of the particular technologies or activities under review and should preferably have had formal training on PHSER techniques. Where the experience of individuals on the PHSER team is exceeded and specialist advice is needed, the Chairman should be free to obtain this from any appropriate independent source by co-option of relevant specialists on to the team.

9. ROLES

9.1 Client/Operator

The responsibility for the initiation of PHSERs rests with the Client.

It is usual for a Client to make a direct request for the Stage 1 review to be carried out, since a 'Project' does not usually exist at Stage 1.

The responsibility for initiation of Stages 2, 3 and 4 is often delegated to the Project Manager who acts on behalf of the Client. Nonetheless, the Client is the Accepting Authority and as such has the final word regarding the acceptance of the final report.

In the cases of Stages 5 and 6 the Client/Operator may wish to have a majority representation on the team, but it is still often organised and led by an independent body.

Items still unresolved when a PHSER report is issued should be discussed and reconciled with the Client. Correspondence regarding these and/or other items relevant to the report should be incorporated in a Working Paper File and reviewed by the subsequent PHSER stage team.

9.2 Project

The PHSER is an integral part of the overall project strategy and programme. Consequently, timely initiation and completion of the stages is essential. The Project HSE Plan will demonstrate how the stages fit in with other HSE activities. (Appendix F)

The Project Manager, acting on behalf of the Client, usually initiates PHSER Stages 2, 3 and 4, confirms the Terms of Reference and sets the PHSER timetable. It is his responsibility, through the Project Representative, to ensure the necessary co-operation of Project personnel in support of the PHSER stages..



It is usual to appoint a Project Representative for the PHSER and this role is described in Section 11. He is responsible for arranging the timely provision of documentation, project personnel and administration facilities for the PHSER and for progressing the Project Responses to the PHSER team's enquiries. The Project Representative also has the positive roles of drawing the PHSER team's attention to safety related matters of concern to the Project and to ensuring that agreed Project actions resulting from PHSER recommendations are being carried out.

9.3 Chairman

The Chairman's responsibility is to achieve the Objective defined in Section 2. This requires being involved in finalising the review scope based on the Terms of Reference being involved in selecting PHSER team members, leading and motivating the team and meeting the agreed Terms of Reference and timetable. Through the Secretary he must ensure timely meeting minutes and final PHSER report.

The task of chairing a PHSER meeting involves the usual chairmanship skills with added emphasis on reaching agreed conclusions as quickly as possible and ensuring their accurate recording.

The attributes/skills required of a PHSER chairmen are included in Appendix 'M' of this Recommended Practice.

At the initial meeting, the Chairman must brief the team thoroughly on the Terms of Reference, the review scope, the timetable, the budget and the general conduct of the review (see 9.6). He should set his stamp on the meeting at the outset making clear particularly that the PHSER is concerned solely with acceptable levels of health, safety, environmental and energy performance.

It is not the function of the review to improve the design or operability of the installation.

The Chairman's leadership must be firm without destroying the consensus requirements of a PHSER meeting.

The Chairman is the formal point of contact of the PHSER team with both Project and the Client. He must be prepared to discuss with them any difficulties of interpretation which may arise. When he is unable to fulfil his Terms of Reference or when issues are raised which require urgent resolution, every effort must be made to resolve the issues with the Project. As a last resort he must be prepared to write a Chairman's

letter to the Client Principal Recipient detailing the reasons for failure or the issues as appropriate.

9.4 Secretary

The Secretary must liaise closely with the Chairman and provide the necessary general administrative support. This might include arranging meetings, timely supply and prompt return of required documentation, arranging the attendance of appropriate specialists, production of minutes, drafting of the PHSER report and upkeep of records and documentation for long-term storage in the Working Paper Files.

It is advisable for the Secretary to record all main points raised during meetings and informal discussions as this provides a memory jogger and a cross check on findings raised. More detailed administration duties are covered in Section 12 and Appendices 'L' and 'M'.

9.5 Team Members

Team members should remind themselves constantly of the PHSER objectives defined earlier in Section 2. They must not use the review meeting to propound alternative design solutions or to evaluate non-health, safety or environment related aspects of the design. They should draw on their particular experience and skills in assisting the Chairman to reach well considered conclusions and recommendations in timely fashion.

PHSER team members should individually feel free to bring any health, safety or environmental matter which is not within the review scope to the attention of the PHSER Chairman. The Chairman will judge the relevance of this and transmit the matter as appropriate, independent of the PHSER in progress if necessary.

9.6 Review Team - General

The following are some guidance notes on the role of the Review Team as a whole with regard to the conduct of the review:-

- (i) Communications should be via the Project Representative for Stages 2, 3 and 4 and not with the Client, Operator or Contractor. For the other stages the Client should nominate a single point of contact through whom the review team will communicate.
- (ii) Findings/recommendations should not be disclosed to non-Project personnel prior to the official Project response on the

infactual and technical accuracy. However, the Project can transmit these to the Client/Operator if considered necessary.

- (iii) The independence of all team members must be maintained and the confidential classification of the written comments adhered to.
- (iv) The Chairman should ensure that the PHSER team members and their line management are kept informed of changes in commitments and programme.

9.7 Line Management of PHSER Team Members

Line Management have a role to play in encouraging participation on PHSERs and recognising the importance of these reviews in the context of other activities. Consequences of this are that line management must be prepared to release appropriate staff for training and/or review work, this having been agreed beforehand with the Business custodian of the PHSER process.

An implication of the provision of an efficient PHSER is that generally, Chairmen and Secretaries of PHSERs should have received appropriate training including taking part as ordinary Team Members prior to their appointment. (There is the possible use of engineers, less experienced in technical safety, as secretaries but this increases the onus on the Chairman to guide them). The independence of the PHSER team members must be maintained throughout the review and line management should not expect feedback during the review from team members unless agreed by the Project Management.

9.8 PHSER Administration

It is important to provide appropriate resources, at the correct times, and to control the budget for the PHSER. The Client, in discussion with the Project Manager may decide to use the Business Centre to act on behalf of the Client for this initial organisation of the PHSER, and its ongoing administration. This includes the selection of suitable team members for the approval of the Client, and their release to the PHSER at the appropriate times.

Project Managers should not be expected to indicate preferences for review team Chairmen or team members as this could be construed as removing the independence of the team which ought to be one of its strengths. The administration for setting up a PHSER is shown in tabular form in Appendix H. See also Section 12 for administration organisational details.



9.9 Quality Assurance (QA)

It is common policy to have a specific Quality Assurance function within the Project. One important role of this function is Quality Auditing which provides assurance that management systems, controls and procedures exist and are implemented and operating satisfactorily. The PHSER is a function of total Quality Assurance and should not duplicate the audit activities undertaken by the Project Quality Assurance function but, especially at stages 3 and 4, should satisfy itself that the Quality Assurance procedures are adequate and are being followed by the project.

9.10 Businesses - Feedback

It is desirable that Clients provide feedback on design, engineering standards, and safety/health/environmental related aspects of operational facilities. This feedback should be communicated to the Custodian of this Recommended Practice to ensure that lessons learnt can be relayed to the appropriate Business, design and project personnel within BP and incorporated in the BP RPSEs, PHSER guidelines and training..



PART 2 - IMPLEMENTATION

10. IMPLEMENTATION - OBJECTIVES AND GUIDANCE

(Stage 1 through to Stage 6)

Each stage section contains the following six headings:-

- Project Stage
- Objectives
- Team Composition
- Information Requirements
- Typical Review Method
- Guidewords (Aide-Memoire)

10.1 Stage 1 - Conceptual Design

10.1.1 Project Stage (Pre-Project)

The Stage 1 review should be carried out during the conceptual design phase leading to a Class III level of technical definition i.e. prior to financial pre-release. It has to be carried out sufficiently early in the proposed development for all the basic assumptions to be questioned and changed if necessary. If fundamental concept decisions are irreversible the review has taken place too late.

A Concept Safety Evaluation, probably of a quantitative nature might be available to a Stage 1 review to demonstrate the acceptability of a concept.

A preliminary Environmental Impact Assessment (EIA) or equivalent should be carried out before or during the Stage 1. The EIA should focus on establishing the options for alternative locations, process schemes and environmental controls based on corporate guidelines and local requirements.

Where appropriate, a preliminary Energy Study indicating probable energy efficiency of the process schemes under consideration and their impact on the overall site should have been carried out.

Since there is unlikely to be a project organisation in place at the time of a Stage 1 review, the Client will initiate the PHSER.

NOTE: If the project is a repetition of previous projects or involves negligible innovations, consideration may be given to combining Stages 1 and 2.



10.1.2 Objectives

To review the health, safety and environmental hazards inherent in the proposed development (including occupational hazards during the construction phase) to ensure adequate identification of those hazards that warrant special attention or further investigation such as a QRA, HAZAN, Occupational Health Review or Energy Study. This will include the following:-

- (a) To confirm that the project has recognised and assimilated into its activities BP's Policy on Health, Safety and the Environment and the associated ten HSE Focused Programmes.
- (b) To be satisfied that acceptable solutions are available or are capable of being developed within the time scale and organisation of the proposed project concerning identifiable hazards.
- (c) To confirm that health, safety, - environmental and energy issues have been addressed adequately in such basic- topics as choice of process and site.
- (d) To review the inherent risks associated with the project in the widest sense which includes topography, process routes, inventories, hazardous substances/materials in feed, products, - intermediate streams and discharges together with evaluation of alternative processes and sites, damage by external influences and the consequences of failure.
- (e) To confirm that compliance with local, national and international standards and regulations does not pose difficulties.
- (f) To confirm that the health, safety and environmental hazards inherent in the substances/materials handled, the chemistry of the process and the operating conditions have been recognised. To establish that acceptable solutions have been proposed.
- (g) To confirm that energy efficiency has been considered adequately in the selection of processes for the project.
- (h) To review significant hazards likely to be encountered during Construction, including use of substances/materials hazardous to health and also the application of special Health, Safety and Environmental legislation.



- (j) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

10.1.3 Team Composition

To include the following skills or disciplines as appropriate:-

Chairman:-

Usually BP-based with relevant experience on the setting up and development of projects at this early stage. Local knowledge of the site would be an advantage.

If this role entails dealing with senior managers in other Businesses and the Project, the Chairman should be selected for his general knowledge and experience and have appropriate status. Prior, formal training and experience on PHSERs would be an essential requirement for this position.

Secretary:-

Usually BP-based and preferably at the same location as the Chairman. Specific technical knowledge is not essential but personnel should have had prior experience and training on PHSERs. The use of less experienced engineers as secretaries is permissible at this stage but, will increase the onus on the Chairmen to guide them.

Team Members:-

Team composition is very dependent on the nature of the project but might include the following:-

Client's Operator representative.
Technical safety specialist.
Process specialist.
Occupational health specialist.
Construction Health and Safety Specialist.
Environmental specialist.
Co opted members as necessary.

Others:- (not considered team members)

Pre-project representative.
Appropriate specialists as necessary.

10.1.4 Information Requirements



- (a) Description of the proposed development including the processing route if applicable and Statement of Requirements if available.
- (b) Project location.
- (c) Proposed Standards and Recommended Practices for Engineering.
- (d) Where applicable, acceptability criteria for quantified risk assessment.
- (e) Substances/Materials used, properties and inventories.
- (f) Drawings, plans, if relevant at this stage.
- (g) Studies concluded regarding choice of plant, process and location and Concept Safety Evaluations.
- (h) Information on similar projects, if applicable. Past PHSER reports of the same stage on similar developments.
- (i) General statement of policy and requirements on Occupational Health and Safety during construction.
- (j) Environmental Impact Assessment or equivalent.
- (k) Client's HSE policy for the proposed development.
- (l) HSE compliance standards.
- (m) Energy efficiency studies on the selected processes.

10.1.5 Typical Review Method

For Stage 1, it is usually sufficient to perform the review by pre-reading the information supplied and having follow-up meetings to discuss the findings of each individual. The latter should then be modified according to the input from the rest of the team and any specialist observations.

Information not immediately available should be requested formally using the PHSER Information Request format, shown in Appendix K.

There may be a need for individual team members to follow up specific points outside the formal meetings. In such cases any



findings/recommendations which arise should be recorded on the Finding/Recommendation/Response format shown in Appendix 'G', and forwarded to the Secretary for the Chairman's review and signature prior to transmitting them to the Project. These should be discussed at the next formal meeting together with any Project responses to date.

Depending upon the size and complexity of the facilities or development being reviewed, the coverage may be split into easily recognisable sections, e.g. Process, Utilities, Storage and so on. At this stage, it is unlikely that further splitting into even smaller sections such as Electrical/Control, Machinery, Mechanical Handling will be necessary or even possible owing to a lack of detailed information.

10.1.6 Guidewords (Aide-Memoire)

Accessibility
Disposal, Venting
Siting, Spacing, Population distribution
Flooding
Meteorological
Adjacent activities
Utilities
Occupational Health
Noise
Transportation
New Process - health, safety and environmental hazards identified
Similar facilities - feedback
Deviation from normal operation
HSE legislation
Local labour restrictions
Inventories
Innovation
Visual impact
Special operating techniques
Special construction techniques
Timing of phases
Modification to live plant.
Environment
Environmental Impact Assessment
Occupational Health and Safety during Construction
Incident Prevention

10.2 Stage 2 - Design Specification

10.2.1 Project Stage (Pre-Project)

The Stage 2 review should take place during the pre-project stage where the SOR, process heat and material balance and project technical specification are sufficiently detailed to lead to a Class II level of technical definition prior to full Board sanction. Therefore, the timing of this review is crucial in ensuring that all health, safety and environmentally related changes which might affect capital expenditure estimates have been identified. It should not take place until the Front End Engineering Design (preliminary design) is virtually complete.

A detailed Environmental Impact Assessment (EIA) and a quantitative Concept Safety Evaluation will normally have been carried out by the project prior to the Stage 2 review.

Note: The Project Manager and some of this team will normally be in place at this stage.

10.2.2 Objectives

- (a) To confirm that the proposed development is consistent with both the BP and the Business HSE Policy and the ten HSE Focused Programmes.
- (b) To follow up issues passed on by the Stage 1 review team.
- (c) To provide assurance that adequate identification of the health, safety, - environmental and energy - issues associated with the materials, substances, (feeds, products, - intermediate streams and discharges), processes and the location has been carried out.
- (d) To confirm that the SOR (Terms of Reference for the Project), project technical specification and project scope consider adequately the impact of these health, safety and environmental hazards and their influence on detailed design, procurement, fabrication, construction, testing, commissioning, operations, maintenance and abandonment.
- (e) To confirm that the health, safety, environmental and energy requirements for all aspects of the facility are adequately defined in the project descriptions and that fully acceptable solutions have been reached for operations under commissioning, normal, transient and emergency conditions.
- (f) To confirm that the requirement for a Register of Safety Related Devices has been specified.



- (g) To make a written report of the review team's findings/recommendations to the Client Principle Recipient and an agreed distribution.

10.2.3 Team Composition

To include the following skills or disciplines as appropriate.

Chairman:-

Usually BP-based with relevant experience of design specification and the technology of the facilities under review. Local knowledge of the site would be an added advantage.

Prior formal training and experience in PHSERs is essential and familiarity with HAZOP studies would be useful. Status level of at least senior engineer is required.

Secretary:-

Usually BP-based and at the same location as the Chairman. For this stage technical knowledge is essential and the Secretary should be a discipline engineer with at least three years design or field experience. Previous experience/training on PHSERs is necessary for this appointment.

Team Members:-

Team composition is very dependent on the nature of the project, but might include the following:-

Clients Operator representative.
Technical safety specialist.
Process engineer.
Control/Instrumentation/Electrical engineer.
Vessels, Piping, Rotating Equipment engineer.
Operator/Client/Sponsor where applicable.

Others: (not considered team members)

Pre-project or project representative.
Appropriate specialists as necessary.

10.2.4 Information Requirements

- (a) Project organisation and schedule.



- (b) Stage 1 PHSER report and Project responses.
- (c) Statement of Requirements.
- (d) Location and layout of facilities.
- (e) Technical Specifications, including process design package.
- (f) Individual study reports, e.g. surge analysis, reliability analysis, surveys (soil, flooding, etc.), mass and energy balances, properties of process substances, corrosion/environmental aspects, occupational health aspects, QRA.
- (g) Identification of package units.
- (h) Operation and Maintenance Philosophy.
- (i) HSE philosophy.
- (j) HSE plan (See Appendix F).
- (k) Environmental Impact Assessment.
- (l) Preliminary or coarse HAZOP study report and follow up information.
- (m) Relief philosophy.
- (n) Isolation philosophy.
- (o) Emergency shutdown philosophy.
- (p) Fire and Gas detection philosophy.
- (q) Fire Protection philosophy.
- (r) Concept Safety Evaluation.
- (s) Outline Registrar of Safety Related Devices.
- (t) Hazardous Area Classification Drawings.

10.2.5 Typical Review Method

This Stage involves a more technical appraisal than Stage 1 but will be limited by the detail available.



The amount of documentation can be very large and it may not be practical to distribute all the documentation to every member. Instead it has been found preferable to hold an introductory meeting of all the review team and relevant project personnel at which the current project position and scope is discussed in general terms. At this meeting all the available documents may be gathered and allocated to team members depending on the discipline and the split of the project areas.

Information not immediately available should be requested formally using the PHSER Information Request format, shown in Appendix 'K'. Findings/Recommendations/Responses should be recorded on the format shown in Appendix 'G'.

Similar to Stage 1 and, depending on the size and complexity of the project, the areas covered can be split up into smaller sections and can be more detailed and involve actual disciplines.

Depending upon the type of project and the proposed location there may be a need for a site visit although this is not usually necessary at this stage. If, however, the project interfaces with existing facilities or the location is particularly sensitive and unique, then a site visit may be considered necessary.

10.2.6 Guidewords (Aide-Memoire)

- Follow-up (Stage 1 PHSER report and project responses)
- Standards (Engineering)
- Deviation
- Innovation
- Philosophies (Operation, Maintenance, Safety, Relief, Venting, Environmental)
- Materials (Hazardous Chemicals, Radioactive)
- Hazardous Areas (for Electrical Equipment)
- Emergency (ESD, Fire and Gas, Evacuation)
- Vents
- Flares
- Effluents
- Drains
- Winterisation (lagging, tracing, walkways)
- Noise
- Inventories
- Leakage
- Ignition
- Separation
- Buildings
- Explosion
- Fire



- Instrument Control
- Electrical Control
- Utilities (Steam, Air, Nitrogen, Water, Fuels)
- Machinery
- Mechanical Handling (Cranes, Hoists, Fork Lift Trucks)
- Safe Site Access-Egress
- Exclusion of the Public
- Perimeter Fencing
- Welfare Facilities
- Adjacent Hazardous Plant
- Buried Services
- Overhead Cables
- Impact on Community of Construction
- Soil Conditions

Environmental: Consideration of:-

- Temperature
- Barometric Pressure
- Freezing Fog
- Chill Effects
- Prevailing Wind
- Tides
- Wave Height
- Rainfall
- Flooding
- Discharges - Gaseous and Liquid
- Solid waste disposal.



10.3 Stage 3 - Detailed Engineering Design

10.3.1 Project Stage

The Stage 3 review should be carried out towards the end of the detailed design phase when engineering and equipment specifications are substantially firm but not yet frozen and any HAZOP, Occupational Health or other HSE studies, where appropriate, have been completed. This will occur after capital authorisation and, often, before the commencement of procurement and construction planning activities.

10.3.2 Objectives

- (a) To confirm that the design requirements specified at the Stage 2 PHSER have been implemented correctly.
- (b) To follow up issues passed on by the Stage 2 review team.
- (c) To follow-up any safety (including HAZOP), occupational health or environmental study findings/recommendations to ensure these have been considered by the Project and, where necessary, included in the project specification.
- (d) To confirm that the Register of Safety Related Devices has been prepared.
- (e) To confirm that atmospheric emission, water pollution, soil and groundwater contamination and site waste disposal aspects of the design have been addressed adequately.
- (f) To confirm that the energy efficiency of the design meets with the aims of the second item of the HSE Focused Programme (Appendix D) and meets corporate guidelines on energy management.
- (g) To confirm that fabrication, occupational safety during construction, maintenance of design intent and integrity during construction, pre commissioning, commissioning, normal and emergency operation have been fully considered in the detailed design.
- (h) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

10.3.3 Team Composition

To include the following skills or disciplines as appropriate:-

Chairman:-

Usually BP-based with a good working experience of the technology predominant in the project, e.g. Cryogenic Processes, catalytic Cracking, Hydrotreating, etc.

Prior formal training and experience on PHSERs is essential and familiarity with HAZOP studies would be useful. Status of at least senior engineer is required.

Secretary:-

Usually BP-based at the same location as the Chairman. For this stage, involvement is essentially full time especially on large and complex projects. The Secretary must be a discipline engineer with practical experience of design and/or operations. Previous experience and training on PHSERs is necessary for this appointment.

Team Members:-

Team composition is very dependent on the nature of the project, but might include:-

Client's operator representative.
Technical safety specialist. (see note 1).
Process engineer
Control/Instrumentation/Electrical engineer.
Maintenance engineer
Vessels, Piping, Rotating Equipment engineer.

Others: (not considered team members)

Project representative.
Appropriate specialists as necessary.

Note that the appropriate specialists may include representatives from contractors, vendors and licensors.

Note 1: The Safety Specialist might also cover the occupational and environmental health considerations, calling on expert advice where required.



10.3.4 Information Requirements

- (a) Stage 2 PHSER report and Project responses
- (b) Any special evaluation studies
- (c) HAZOP study report
- (d) Designers response to the HAZOP study report
- (e) Detailed layout drawings incl. P and ID, flow sheets and single line electrical drawings
- (f) Area classification drawings
- (g) Engineering Specifications
- (h) Equipment specifications
- (i) Package specifications
- (j) Scale model (if available)
- (k) QA manual (Designers - BP or Contractor)
- (l) Document/Certification Control Dossier
- (m) Quality Audit reports on Design Office
- (n) Actions arising from EIA
- (o) Register of Safety Related Devices
- (p) Deviations Register
- (q) Occupational Construction Safety Plan
- (r) QRA Reports

10.3.5 Typical Review Method

This Stage involves reviewing the detailed design to ensure that the health, safety and environmental hazards identified have been catered for and that the equipment is fit for the purpose intended. Changes to design and innovations added should be of particular interest.

Often it will be sufficient to witness results of studies and be assured by project designers that certain areas have been covered. At other times there will be a need to see documentary evidence to prove that adequate coverage of a particular health, safety or environmental design concern has been carried out.

Information not immediately available should be requested formally using the PHSER Information Request format, shown in Appendix 'K'. Findings/Recommendations/Responses should be recorded on the format shown in Appendix 'G'.

Procedures within the design office, whether it be BP or Contractor, should provide the necessary assurance that self checking, discipline and interdisciplinary checking are taking place. Usually reliance on the QA and Project personnel to monitor these functions and provide quality audit reports will satisfy the needs of the PHSER team.



The execution of a P&ID based HAZOP study is strongly recommended for new plant and where modifications or extensions to existing plant are involved. It should be performed according to a recognised practice, formally accepted by the Business.

The Stage 3 reviews the HAZOP study report and outcome, commenting as necessary and checking that the HAZOP actions follow-up is taking place. The PHSER team should satisfy itself that the HAZOP has been properly conducted.

Stage 3 also covers the fabrication, construction, pre commissioning, operations, maintenance and abandonment aspects of the installation and ensures that these have been adequately addressed in the detailed design or in proposed operating procedures. The Occupational Construction Safety Plan and the Construction Site Safety Procedures should be available for inspection or should be in preparation so that their contents lists can be reviewed.

Site visits are unlikely at this stage but visits to vendors may be necessary in some cases. The formal meetings should be held in, or very near to, the design office.

As with Stage 2, the documentation tends to swamp the review team and it has been found necessary in the past to allocate individuals with the task of looking after specific areas. This works well on areas such as electrical, control, machinery, mechanical handling, but in other areas such as process facilities, utilities, workover, pipelines the whole team needs to be involved.

All findings/recommendations arising from individual's informal meetings, technical discussions, visits should be transmitted to the chairman on the proforma record/finding sheets (Appendix G) and should be discussed at the formal meetings with all members of the PHSER team present.

On larger, more complex projects it may be necessary to form into separate teams for specific areas of the Project. These teams will have a main core consisting of for example the Chairman, Secretary, Safety and Operations with differing co opted members depending upon the area being reviewed e.g. Process, Environment, Occupational Health etc.

10.3.6 Guidewords (Aide-Memoire)

- Follow-up (Stage 2 PHSER)
- Deviation (Standards, Changes)
- HAZOP



- QA (BP and Contractors)
- Fabrication
- Construction
- Precommissioning
- Commissioning
- Operation
- Maintenance
- Abandonment
- Integrity (Vessels, structures, pipework)
- Reliability (Machinery, shutdown system, power supplies)
- Abnormalities (starting up, shutting down, reduced flow, unmanning, emergency shutdowns).
- Environmental
- Environmental Impact Assessments
- Occupational Health - Construction
- Occupational Health - Materials
- Modular Construction
- Design of Major Lifts
- Steel Erection Methodology
- Toxicity of Construction Materials
- Flammability of Construction Materials
- Demolition Safety
- Excavations/Tunnelling
- Lighting
- Special Regulations
- Fire Prevention
- Adjacent Live Plant
- Phasing of Work

10.4 Stage 4 - Construction (including pre commissioning)

10.4.1 Project Stage

The Stage 4 review should commence after the completion of Stage 3 and cover the construction phase up to the final handover to Operations after all agreed health, safety and environmental related design modifications have been fully implemented.

10.4.2 Objectives

- (a) To confirm that the findings of the Stage 3 review have been addressed adequately.
- (b) To confirm that no dilution of the design intent introducing additional hazards has occurred during fabrication and construction and that any changes have been authorised



properly including, where appropriate, approval by the designer.

- (c) To review the procedures for site change control and materials handling and to check that overall systems for inspection, testing and document control are in place and being implemented in accordance with accepted engineering and HSE practices.
- (d) To review the arrangements in place to ensure that the facility can be constructed without injury to personnel, including the public, their long term health or the environment.
- (e) To review at an early stage the 'Occupational Construction Safety Plan' or equivalent and later the outcome of an 'Occupational Construction Safety Audit'. The audit will assess the level of compliance with the aforementioned plan. (See Definitions Appendix A)
- (f) To make a written report on the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

Stage 4 covers the construction phase of a project including construction related pre commissioning and commissioning activities which occur prior to handover to the Operator.

10.4.3 Team Composition

To include the following skills or disciplines as appropriate.

Chairman:-

Usually BP-based and familiar with design aspects, construction activities and QA/QC procedures. Past Resident Engineers or Project Managers would make suitable chairmen. Continuity of Chairman over an often very protracted construction phase is a critical requirement.

Training and experience in the PHSER process is essential.

The role of the Stage 4 Chairman is particularly demanding in its scope and requires sound common sense and clarity of purpose.



Secretary:-

Usually BP-based and familiar with project site procedures, terminology and organisation. Past Project Engineers are suitable. Full time availability is essential, especially on large projects with multiple geographical locations. Previous experience and training on PHSERs is essential for this appointment.

Team Members:-

Team composition is very dependent on the nature of the project, but might include:-

Technical safety specialist
Client's operator representative
Maintenance engineer
Process design engineer
Control/Instrumentation/Electrical engineer
Construction specialist
Occupational health specialist

Others: (not considered team members)

Project representative
Appropriate specialists as necessary

10.4.4

Information Requirements

- (a) Stage 3 PHSER report and Project responses
- (b) Information not available for Stage 3 PHSER
- (c) Design changes
- (d) Certification/Inspection documentation procedures
- (e) Site co-ordination procedures
- (f) Site organigrams (BP/Contractor)
- (g) QA audit reports on Vendors, Contractor, BP
- (h) QA Programme and bar chart of construction activities
- (i) Overview of responsibilities and functions of BP, Contractor, Subcontractor, Agencies, other third party involvement, suppliers, stockists.



- (j) Additional reports, surveys
- (k) Planning permission
- (l) Local statutory regulations
- (m) Impact of EIA on construction
- (n) Construction site Safety Procedures
- (o) Occupational Construction Safety Plan
- (p) Occupational Construction Safety Audit report

10.4.5 Typical Review Method

This Stage is split between meetings and site visits with site visits taking priority. In every case a detailed itinerary should be drawn up showing:-

- Dates/Location - meetings
- Dates/Location/Duration - Site Visits
- Number of personnel and disciplines - Site Visits
- Specific site areas to be covered - Site Visits
- Specific site personnel to see - Site Visits
- Date/Location/Duration - Vendors (packages etc.)

This itinerary must be agreed with the Project who will be responsible for arranging the site visits and site personnel availability. It may be necessary for some of the meetings to take place at the site office but usually they will take place at the Main Contractor's office.

Information not immediately available should be requested formally using the PHSER Information Request format, shown in Appendix 'K'. Findings/Recommendations/Responses should be recorded on the format shown in Appendix 'G'.

The Stage 4 review covers the entire construction period and makes availability of personnel and good planning extremely important.

The Stage 4 review also covers the standards of occupational Health and Safety to be applied or being applied during the process of construction and pre commissioning. This is achieved by performing Occupational Construction Safety Audits at intervals during the Construction period. These audits will assess the level of compliance with:-



- (a) The Occupational Safety Construction Plan.
- (b) Relevant legislation and established good practice on Occupational Health and Safety.

Because of the extended duration of this review, interim reports should be written at predetermined intervals to suit the natural divisions of the project programme. They also provide information for the Principal Recipient and the Project on the progress of the review.

Typical natural divisions are:-

- Civil Preparation
- Fabrication/Construction Major Structures
- Buildings.

During the review it is likely that the Stage 5 review will commence and co-ordination of the two stages is important to avoid clashing on visits and ensuring that there is no overlapping of activities.

Construction activities continue up to final handover to the Operator and, therefore, the Stage 4 PHSER must include these activities in the scope of work.

The Stage 4 Review is predominantly concerned with the construction phase of the project to provide assurance that the design has not been diluted during all the construction activities, that construction personnel will not be exposed to unacceptable health, safety or environmental risks, and that associated systems and controls are in place and will continue to operate through the pre commissioning phase and handover to the Operator.

Precommissioning activities which form an integral part of the construction phase are covered by the Stage 4 PHSER in the same way as the NDT of welds and pressure testing and certification of pressure vessels. They include the testing of machinery, instrument loop checks, piping security, flushing cleaning, inspection of internals, electrical equipment and cable checks and testing.

10.4.6 Guidewords (Aide-Memoire)

- Follow-up (Stage 3)
- Changes (Design)
- Punch Lists
- Procedures (QA, Co-ordinating, etc.)
- Documentation (Control)
- Inspection
- Certification
- Weight Control
- Dimensional Control
- Statutory
- Precommissioning
- Liaison (Stage 5)
- Construction Regulations
- Enforcement Agency
- Prohibition/Improvement Notices
- Contractor Pre qualification and Control
- Health and Safety Training
- Scaffolding Standards
- Safe System of Work
- Incident Rate
- Substances Hazardous to Health
- Safe Access/Egress
- Electrical Safety
- Housekeeping
- Fire Protection Standards
- Cranes and Lifting Gear
- Work over Live Plant
- Permits to Work
- Noise Control
- Personal Protective Equipment
- First Aid
- Excavation Safety
- Demolition
- Site Radiography

10.5 Stage 5 Commissioning

10.5.1 Project Stage

The Stage 5 review should be started when construction is nearing completion and the facilities are approaching the commissioning phase. Where extensive operational pre commissioning is involved, Stage 5 might be started before Stage 4 is complete. The different approach and skills required means combining the two Stages is not a recommended approach.



10.5.2 Objectives

To confirm the preparedness of the facilities for commissioning and the preparedness of the Operating Unit to commission, operate and maintain these facilities. This will include:-

- (a) To review the adequacy of manning levels, skills and procedures for commissioning, maintenance and operation under normal and emergency conditions.
- (b) To follow up issues passed on by the Stage 4 review team.
- (c) To confirm the adequacy of operator and maintenance personnel training. This should include, where appropriate, training in energy management and environmental aspects of the process equipment.
- (d) To review the emergency procedures and the links to local and national emergency services such as fire, police, rescue, etc.
- (e) To confirm that the recommendations arising from earlier reviews have been incorporated or otherwise resolved.
- (f) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

10.5.3 Team Composition

To include the following skills or disciplines as appropriate:-

Chairman:-

Should be a senior operating specialist having prior knowledge of the type of facility under review and completely independent of the Project. Experience of previous PHSERs is essential as is knowledge of health, safety and environmental concerns in operability and maintenance.

Secretary:-

Usually from Client's Operator's site and having relevant operational and PHSER experience.

Team Members:-



Team composition is very dependent on the nature of the project but might include:-

Client's Operator representative
Safety Specialist
Operations engineer
Maintenance engineer
Process design engineer

Others: (not considered to be team members)

Project representative
Appropriate specialists as necessary.

10.5.4 Information Requirements (In addition to previous Stages)

- (a) Stage 4 PHSER report and Project responses
- (b) Precommissioning and test dossier.
- (c) Plant/facilities organisation and manning.
- (d) Commissioning plan.
- (e) Operating instructions.
- (f) Maintenance instructions.
- (g) Emergency procedures (internal and external).
- (h) Safety and firefighting procedures and instructions.
- (i) Punch list of incomplete construction items.
- (j) List of items unaccepted by Operator.
- (k) Project commissioning engineers report.
- (l) Operator training manual.
- (m) Operator selection and training records.

10.5.5 Typical Review Method

This Stage is primarily concerned with operability and maintenance auditing and personnel training including health, safety and environmental issues. As such it must be organised and controlled in close consultation with the Operator.

Process design engineers should be involved where novel processes and equipment are being commissioned and in this case it is customary for them to be represented in the PHSER team.

The handover and commissioning period is a sensitive time for both the Project and the Operator and the PHSER team should recognise this in carrying out their review. Thus a short opening meeting with the Operator to be told the status of commissioning progress, to decide on the review programme and the provision of a permanent Operator representative for the team should suffice. Thereafter, individual team



members can be allocated specific areas for review. Each day should end with a PHSER progress meeting to discuss findings/recommendations.

Information not immediately available should be requested formally using the PHSER Information Request format, shown in Appendix 'K'. Findings/Recommendations/Responses should be recorded on the format shown in Appendix 'G'.

The PHSER team should avoid visiting the plant facilities in numbers and should acquaint themselves with the emergency and safety procedures in force on site at the time.

10.5.6 Guidewords (Aide-Memoire)

Follow-up (Previous stages)
Liaison (Stage 4)
Precommissioning (Test results)
Procedures (Commissioning, Operating, Maintenance)
Instruction (Safety, accident, firefighting)
Punch List
Permits (Hot work, vehicle access)
Safety Audit
Support (Laboratory, workshops, stores, spares)
Manning
Training (Operation, maintenance, emergency, health, safety and environment, support services)
Compliance (Local statutory requirements)
Access
Documentation (Completeness of hand over package from Project)
Design (Changes to and problems with design experienced during commissioning and running).

10.6 Stage 6 - Post Commissioning

10.6.1 Project Stage (Post Project)

The Stage 6 review is normally carried out after the facility has been in operation for some time, typically 12 months. Since the project has been disbanded by the time it is initiated the Operator has to initiate it and provide the financing. The requirement for the review should have been identified in the HSE Plan. The review stage is an excellent mechanism for identifying and recording the lessons learned to build into future developments. Without this stage being performed the review process is incomplete.

10.6.2 Objectives



- (a) To review the health, safety, - environmental and energy aspects of the facility as an operating unit including the standards of operation, maintenance and inspection.
- (b) To follow up in issues raised by previous review teams and assess the effectiveness of measures taken to resolve them.
- (c) To confirm that the plant is being operated in the manner intended by the designers, and where there have been deviations, that the HSE aspects are not thereby compromised.
- (d) To identify any design, operations or maintenance related problems and incidents and the measures taken to overcome them.
- (e) To feed back the lessons from the development including those relating to project, design, construction, commissioning, operation and maintenance.
- (f) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

10.6.3 Team Composition

Normally composed of Client/Operator personnel under the Client-nominated Chairman who might be from outside the site. In addition, outside participation by design representatives may be requested to provide continuity from the design stages of the Project.

10.6.4 Information Requirements

- (a) PHSER reports 1 to 5
- (b) List of modifications carried out since commissioning
- (c) Data on accidents, incidents
- (d) Operations and Maintenance monthly reports
- (e) Daily running logs of facility
- (f) Occupational health data
- (g) Health Safety and Environmental monitoring reports

10.6.5 Typical Review Method

This review takes place at the facility and usually comprises examination of operating and maintenance records of the preceding operating period and meetings with operating, maintenance and inspection personnel to discuss problem areas.



Information not immediately available should be requested formally using the PHSER Information Request format, shown in Appendix 'K'. Findings/Recommendations/Responses should be recorded on the format shown in Appendix 'G'.

10.6.6 Guidewords (Aide-Memoire)

- Changes - Design
- Changes - Operations
- Safety, Environmental and Occupational Health reports
- Operating logs
- Maintenance logs
- Documentation update
- Compliance - Statutory requirements
- Reliability

11. **ROLE OF PROJECT REPRESENTATIVE**

This role is largely one of liaison acting under the authority of the Client, and includes the following:-

- (a) Assist the Project Manager in prompting the initiation of the PHSER as required by the programme.
- (b) Assist the Project Manager in liaising with the PHSER Chairman, Secretary and PHSER Coordinator regarding the formulation of a precise programme, scope of the review and confirm team members.
- (c) Provide the project documentation as required by the PHSER.
- (d) Provide the project liaison for the organisation of meeting rooms, project personnel and the co-ordination of project responses to the findings/recommendations of the PHSER team.
- (e) Provide the continuity on the project between the various PHSER stages and maintain full documentary records of project actions and the discharging of them.
- (f) Prepare, in conjunction with the cost engineer and PHSER Chairman/PHSER Coordinator, the paperwork necessary to authorise/release funding for the PHSER.
- (g) If necessary, be the point of contact with the Project on unresolved PHSER items.

- (h) Ensure, after the issue of the final report, that the Client (Accepting Authority) has officially responded to the project accepting or otherwise the PHSER report.

12. ADMINISTRATION

12.1 PHSER Organisers Duties

- (a) In response to an initiator's request for a PHSER the PHSER Organiser will prepare a draft package which will include the following:-
 - (i) Terms of Reference
 - (ii) Method of Review
 - (iii) Team Members, Principal Recipient, Client and Project representative
 - (iv) Suggested Programme
 - (v) Budget Estimate
 - (vi) Initial documentation required by the PHSER team
 - (vii) Administration, reporting etc.
- (b) In parallel with (a) above, the PHSER Organiser will prepare a list of possible Chairmen based on the type of project and experience on previous PHSERs. This list is discussed with the Client/Initiator and an appropriate Chairman is selected.
- (c) In conjunction with the Chairman (elect) the PHSER Organiser will discuss the size of the team, the individual disciplines and the quality of the remaining PHSER team members and will prepare a tentative list. Respective line managers are approached for agreement to release the nominees and made aware of the time scale and commitment involved.

Involvement on the team of non BP personnel (e.g. Partners, Consultants) is raised with the Client/Initiator/Project Manager.

The final list of team members including Chairman and Secretary is included in the draft package as described in (a) above and sent to the Client/Initiator/Project Manager for acceptance.
- (d) On confirmation of the draft package and agreed amendments the final package is prepared by the PHSER Coordinator including all the agreed changes to the draft package and any particular information to non BP participants regarding charge

out and budget controls on the PHSER. This final package is sent to the initiator under a covering memo from the PHSER Chairman confirming commencement and programme. This is copied to all PHSER team members.

12.2 Reporting

12.2.1 Format

The format for the report will, in general, be based on the Business guidelines report, summarised as follows:-

- | | |
|---------------|--|
| Front Cover | - Confidential markings, copyright
BP logo and report number. |
| Contents Page | - |
| Summary | - a concise half to one page review of the report conveying the essential parts and in particular identifying the main conclusions, findings and recommendations. |
| Introduction | - to include:- <ul style="list-style-type: none">- Scope of the facilities- Initiation and Accepting Authority- Terms of Reference- Scope of the Review- Team Membership- Review Programme/Procedures- Working Papers (indication of action taken to retain) |

Findings/Recommendations; These should include:-

- Key findings and recommendations that the Review wishes to highlight
- A listing of the findings which are not completed and/or to be referred to subsequent review stages
- Index of Findings (for ease of location of actual findings)



- Complete table or set of findings, recommendations, project responses, further PHSER comments. These may be placed in an appendix to the PHSER report if this is convenient e.g. for size. (Appendices F and H are examples of a finding sheet and tabular format respectively.)

Each finding shall be sequentially and uniquely numbered within each report. An example of a numbering system is attached (Appendix J).

- | | |
|--------------|---|
| References | - A listing of documents, drawings, reports etc. reviewed by the Review Team. |
| Appendices | - |
| Distribution | - To be agreed with the Client Principal Recipient but to include the following:- |

	No of Copies
Client:	
Principal Recipient	1
Project:	
Project Manager	1
Project Representative on PHSER	1
PHSER Team:	
Chairman	1
Team Members	1 (each)
Business Records	2 + original

12.2.2 Report Timing

At the end of his review stage the Chairman should agree and formally record, with a copy to the Client Principal Recipient, a timetable for issuing reports. This will be specific and not in terms of 'four weeks after the last project response has been received'. The Chairman will ensure this timetable is adhered to. If project falls behind the timetable then the findings sheet will note 'response awaited at time of publication' and the next stage of review will update that finding as part of its work.

12.2.3 Draft Report



The PHSER Team Members are sent the draft report for consensus agreement on the overall conclusions and proof reading of the technical contents. The draft report is sent to the Project Manager for review of the technical and factual accuracy of the text.

12.2.4 Interim Report

On extended duration reviews such as Stage 4 which covers the whole of the construction phase, the issue of Interim Reports is permissible. Interim Reports may be issued also when the PHSER team has been unable to comply satisfactorily with its Terms of Reference e.g. if it has been convened too early. These Interim Reports should include the Project responses and be issued to a reduced distribution approved by the Client and Project Manager. They will eventually form a part of the final overall report of the review when completed.

Interim Reports will have the same security classification as the final reports, i.e. Confidential and the approval and issuing authority will remain the same i.e. Chairman and whoever is required by the Business respectively.

12.2.5 Final Report - Approval/Acceptance

The Final Report, including the project responses and any further PHSER team comment, is approved by the Chairman, authorised for issue by the appropriate Business authority and sent to an agreed distribution list. The client Accepting Authority should formally accept the report on behalf of the Client and pass this acceptance to the Project Manager.

12.2.6 Final Report - Style

The final report presents the findings, recommendations and conclusions of the PHSER team. However well the team performed it will ultimately be judged on the quality of the Final Report.

Therefore, the style and format of the report needs to be agreed up front and this way, the team and especially the Chairman and Secretary can have the report in mind throughout the review. Intermediate written material such as minutes, finding sheets, visit notes and information requests can be written to slot easily into the report format.

The report should:-

- (a) Be clear, concise and have the proper tone.
- (b) Ensure all findings have recommendations.

- (c) Avoid trivia and hearsay.
 - (d) Avoid preferential engineering.
 - (e) Avoid emotive language.
 - (f) Stick to terms of reference and scope.
 - (g) Be technically and factually accurate.
 - (h) Avoid feelings, impressions and beliefs.
 - (i) Express opinions if based on clear reasoning.
 - (j) Only where necessary for clarity should detailed explanation be given.
 - (k) Do not name individuals, job titles should be used wherever possible.
 - (l) Reflect a consensus of all team members, which does not necessarily mean unanimity.
- The chairman, who approves the report, should assert a majority ruling on any issue not receiving 100% team support.
- (m) Not contain any new material or changes not previously seen by the project.
 - (n) Have page numbers.
 - (o) Include a list of abbreviations, if used.

12.2.7 Chairman's Letter

Lessons learned, either relating to the PHSER procedure/conduct or the technical content of standards, should be communicated in a Chairman's letter, addressed to the Custodian of this Recommended Practice. This letter does not form part of the PHSER report.

The Custodian of this Recommended Practice will address matters relating to the PHSER procedure, and will communicate comments on standards to the appropriate custodian/specialist. This process of feedback can accrue significant benefits to the BP Group as a whole.

12.3 Records

12.3.1 Minutes

Ideally the minutes should be written in a form which readily slots into the report format, i.e.:-

- (i) Brief description of area covered
- (ii) Main points
- (iii) Findings
- (iv) Recommendations/suggestions

During the early days of the review, there is usually a large requirement for information. To avoid cluttering up minutes and report with recommendations for the provision of information and to provide better control of information requested and received; it is suggested that all requests are written on proforma sheets (see Appendix K - PHSER Information Request) and copied to the Project. The Project will then return these sheets signed with their response or attached documentation to the Secretary.

12.3.2 Technical Notes, Discussions, Site Visits, Close-out Meetings

As with the minutes these should be written in a style which will easily convert into the report format of detailed findings and recommendations and Project responses.

The use of the proforma PHSER Record/Finding sheets (Appendix G) is encouraged which streamlines the reporting of findings/recommendations and eases the load on the Secretary/Chairman in conveying these to the Project in a timely fashion.

12.3.3 Project Responses

Project responses to information requests are not included in reports as these are part of the normal dialogue between the PHSER and the Project and in some cases could become findings. Where the project responses are in response to findings and recommendations then these will be entered into the draft report as such. It is understood that these responses may not be final and that the official project responses to the formally presented recommendations in the draft will be entered in the final response.

The inclusion of project responses does not influence the review report contents and independence but provides a more complete picture to the Client of the relative positions of the PHSER team and the Project.

12.3.4 Working Paper Files

All calculations, drawings, specifications, minutes of meetings, site visit notes are to be assembled and filed for long term storage as review report back-up information. The PHSER Secretary will assemble these and prepare an index of the contents of these files.

An example of a skeleton working paper index is as follows:-

- A. Review report
- B. Technical data generated by the review.
 - i Minutes of meetings
 - ii Finding and information request sheets
 - iii Visit notes
 - iv Technical discussion notes
 - v Calculations
 - vi Technical correspondence
- C. Review Control
 - i TOR
 - ii Scope of review
 - iii Programme
 - iv Team members/line management
- D. Administration General
 - i Correspondence
 - ii Budget control
 - iii Expenses, travel information

E. Reference Documents

- i Technical specifications
- ii Drawings
- iii Past Safety Review Reports
- iv HAZOP Study Reports
- v Briefing information on the project
- vi Engineering Reports
- vii Third party audit reports
- viii Local Regulations, Planning Permission, etc.
- ix Safety, Maintenance Philosophy
- x Operating manual
- xi Occupational Health review



PART 3 - RE INSTRUMENTATION PROJECTS

13. RE-INSTRUMENTATION PROJECTS - PROJECT HEALTH SAFETY AND ENVIRONMENTAL REVIEWS

13.1 Introduction

The foregoing procedures for PHSERs provide adequate guidance and flexibility to be adapted for this type of project. We recommend that these BP procedures are followed as the base documents and backed up with more specific guidelines appropriate to the particular re-instrumentation scheme.

It is emphasised that, unless otherwise advised by the Client, the PHSER must recognise that the process, plant and location are unchanged and there is a proven record of good safe operating practice. Therefore, care must be exercised not to extend the review into a complete retrospective study of the old system, but to consider only the imposed changes and their impact on

Where a HAZOP study has not been carried out on the plant it is recommended that this is done as part of the re-instrumentation project activities during the frozen P and ID stage and prior to Stage 3 review.

Where a HAZOP study has been carried out it is not necessary to repeat this and implementation of the instrumentation changes with respect to hazards and operability problems should be identified during Stage 3 by reviewing the loop-by-loop integrity check.

The following provides specific guidance for reviews on complete re-instrumentation schemes. It is not intended to be exhaustive or rigidly applied, but an aid to the review team in carrying out an effective and adequate review, with health, safety and environmental considerations paramount throughout.

Note: During the review, the application and design configuration of the existing (old) system, which is being modified, may be considered suspect or not meeting present day standards of safety and reliability. If this occurs, it should be highlighted immediately to the Client (Operator) and recorded in the report as observations. Other areas not affected by the re-instrumentation scheme but noted, in passing, as suspect, should also be treated as observations and passed on to the Client. These should not be included in the PHSER report.



13.2 Scope

A review of all the aspects of the project from concept through to commissioning to ensure that the hazards identified have been catered for and the equipment and organisation are fit for the purpose intended with a minimum effect on the health and safety of personnel. To investigate whether the project complies with the Business's HSE Policy and its performance targets for the ten HSE Focused Programmes.

13.3 Method of Review

The review is based on the foregoing Procedures for PHSERs and follows these specific guidelines with regard to the unique technical requirements.

The review team, comprising operations, process design, control specialists, should have access to local expertise and project designers. It will review the changes to the facilities by applying brain storming tactics based on a wide knowledge and experience of safety review techniques. The avoidance of opinion engineering and concentration on the design as-is from a safety standpoint, is essential.

All findings and recommendations will be passed to the project without delay so that appropriate and timely action can be taken without having to await the report. Project responses to the findings submitted during the review are usually included in the final report for completeness.

13.4 Timing

The timing of the reviews should be similar to that of any other project.

The review stages follow the Recommended Practice but might be combined and modified as necessary.

Re-instrumentation projects may be phased for implementation over a long period, a year or more, with design, construction and commissioning stages happening at different times on different units/areas. In this case there may be a need to phase the PHSERs to suit the timing of the main units/areas involved e.g.:-

- (a) Common facilities, General policy, Phase 1 units/areas.
- (b) Phase 2 units/areas
- (c) Phase 3 units/areas

Stage	Description	Timing
1-2 (combined)	Concept and specification stages up to class II level of technical definition	End of Technical Specification stage and prior to full financial sanction.
HAZOP	Standard HAZOP study. (Where one has not been done on existing process plant)	Nearly Frozen P and ID Stage
3	Detailed design incl. Loop integrity check	End of detailed design prior to commencement of procurement and construction activities.
4-5 (combined)	Construction/Operation	During construction pre-commissioning and changeover (commissioning)
6	Operation/Maintenance	12 months after commissioning

13.5 Terms of Reference (TOR)

The following are typical Terms of Reference for the first five stages of PHSERs, adapted where necessary to suit the merging of stages and uniqueness of the project.

13.5.1 Stage 1-2

- (a) To confirm that health, safety and the environment has been addressed adequately on all the basic issues prior to design specification stage (e.g. control centre location).
- (b) To review the inherent risks associated with the project in the widest sense (location, environment).
- (c) To confirm that hazards inherent in the design and operation of the new scheme have been recognised and acceptable solutions specified which satisfy the client's HSE policies.
- (d) To be satisfied that the project specification including any proposals for construction, change-over and commissioning has considered adequately the impact of these hazards and their

influence on detailed design, construction, pre-commissioning, change-over, commissioning, operations including normal, transient, emergencies and on/off line testing and maintenance.

- (e) To confirm compliance with local, national, international standards and regulations and consequences of third party involvement are recognised and appreciated.
- (f) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

NOTE: The combining of stages 1 and 2 (Concept and Technical Specification) is considered desirable and adequate for this type of project and there is sufficient time to cover conceptual items prior to financial commitment as listed below:-

- (a) Location and construction of control room(s).
- (b) Acceptability of existing control rooms/buildings for re-use.
- (c) Facilities for, and number of, control room/field operators.
- (d) Operating philosophy (location of field operators, supervisors, etc.).
- (e) Impact of changes in local/national regulations since plant built.
- (f) To confirm that the equipment selected provides the necessary reliability and redundancy levels, and that the implications of known failure modes have been assessed.
- (g) Critical areas of plant requiring special attention (e.g. critical trips, noxious substances/materials handled,

13.5.2 HAZOP

This is a Hazard and Operability Study of existing process plant carried out prior to the stage 3 PHSER.

This HAZOP study, being a Project tool is carried out in the main by the design contractor team and led preferably by a senior member of the Client Organisation, with experience of the HAZOP study technique and independent of the project design team.



N.B. To be carried out only where a HAZOP study on the unchanged process plant has not been carried out or if there are significant changes to the process design or operation in addition to the re-instrumentation activities.

13.5.3 Stage 3 (including Loop Integrity Check)

It is considered necessary to include a loop integrity check procedure on critical controls and shut-down systems using a technique similar to HAZOP studies and using modified guide words. This structured approach will identify changes to loop reliability and operation and any hazards and operability problems arising from the changes.

- (a) To ensure that the Stage 1-2 recommendations and conclusions have been considered and necessary action taken relating to the detailed design.
- (b) To review by detailed, systematic study of the P&ID's to identify deviations from normal operation with regard to hardware changes and any resulting consequences on process conditions which may create potential hazard or operability problems.
- (c) To confirm that the detailed design has made adequate provisions for health, safety and environmental requirements during the construction, pre-commissioning, change over (live), commissioning, operating, emergency and shut-down phases. Also, items identified during the detailed P&ID review (item b above) are considered and if necessary included in the design specification.
- (d) To ensure that all the additions, philosophy and hardware changes and their effects on the continued safe operation of the plant and adjacent facilities have been identified and adequate measures taken in the design and/or operating procedures to ensure continued safe operation.
- (e) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

13.5.4 Stage 4-5

- (a) To ensure that the Stage 3 recommendations and conclusions have been considered by the project and incorporated where necessary.



- (b) To confirm that the design intent has been followed during fabrication, construction and hook-up phases up to handover to the operating department including construction-associated activities relating to pre commissioning, changeover and commissioning.
- (c) To review the internal controls (QA), in particular those relating to inspection, testing, material control and design changes and to ensure that they provide the necessary assurance that all construction activities are in accordance with accepted engineering and HSE practices.
- (d) To review the construction Site HSE Procedures and control in place during combined construction/production phases.
- (e) To confirm that procedures, equipment and resources are adequate so that the facilities can be tested, commissioned and operated safely to acceptable standards. (See note below).
- (f) To confirm the adequacy of operator and maintenance personnel training.
- (g) To ensure that the sensitive area of change over of critical equipment under 'live' operating conditions has been adequately addressed and planned to reduce health, safety and environmental risks to a minimum. (See note below)
- (h) To ensure that all design and construction records have been maintained and that the operator has satisfactory systems and procedures to receive such documentation.
- (i) To make a written report of the review team's findings/recommendations to the Client Principal Recipient and an agreed distribution.

Note: These areas can be of particular sensitivity and the need for a good liaison between operations and construction/commissioning personnel during all phases of work on the plant is stressed. The use of a dedicated task-force with a dedicated operations man as the general liaison point for the site activities is considered essential, especially when change-over of control centres and control/shut-down loops is being carried out on a 'live' and 'operating' plant.

As for any other Stage 6 review (see Section 10.6).

13.6 Aide-Memoire

The following should not be considered as a rigid tick list but more of a check list at the end of the day, to provide assurance that these items have been covered.

13.6.1 Philosophy Changes

- Failure modes of equipment
- Interfaces electrical/instrument
- Local (field) to remote control/monitoring
- Pneumatic to electronic
- Treatment of local (field) panels adjacent to equipment (compressors)
- Change of control actions
- Logging - local manual to remote data logging
- Local (field) manning
- Monitor: flares/drains; vibration; noise; security of unmanned plant if local manning reduced
- Detection/treatment of leaks, fire
- Firefighting policy changes
- Local (field) satellite control stations - protection
- Redundancy
- Load shedding
- Communication
- Hard wired (relay logic) shutdown to solid state/micro processor based
- Remote centralised control room
- Reliability (self repair, degradation, testing)
- Future expansion requirements
- Training (operations and maintenance)

13.6.2 Loop Changes

- Type of instrument
- Type of transmission
- Reliability
- Process parameters
- Location
- Interfaces (offshore equipment)
- Power supplies
- Speed and quality of response
- Common mode failures
- Failure mode and effect
- Maintenance and testing
- Identification of key loops

13.6.3 New (Additional) Changes

- Measurements
- Alarms
- Trips
- Analysers
- Advance control
- Event Recording
- Optimisation
- Data Logging/Transmission
- Machine Monitoring
- Displays - presentation
- Keyboard - operator/engineer
- Remote monitoring - TV, noise
- Remote actuation (shut-down, startup)
- Communications
- Local satellite operator's console

13.6.4 General: Effect on -

- Hazardous areas
- Relief systems
- Drainage
- Separation, fire-protection, access, lifesaving equipment
- Heat tracing
- Utilities supplies - air; power; nitrogen loading
- Reliability, frequency of trips
- Frequency of trip testing
- Manning - Quantity
- Manning - Quality
- Manning - Training
- Material specification



- Temperature/pressure ratings
- Flexibility, inter-changeability of plant and equipment
- Accommodation-operations/maintenance
- Codes and standards
- Interface with adjacent facilities (third party)
- Cable trenches, routes protection, redundancy
- Air conditioning, weatherstation of equipment
- Operating procedures, instructions and documentation
- Suppliers back-up and spares
- Existing structures/foundations
- Response time in emergency

13.6.5 Loop Integrity Check

- Open circuit (no signal)
- Impressed voltage (high signal)
- Short to earth (low signal or other signal)
- Pick-up distortion (other signal)
- Fire (outside influence)
- Physical damage (outside influence)
- Common mode failure (multiplexing, fuses, power supplies/air supplies)
- Slow response (overloading highways/length of cable)
- Failure mode/effect (P&ID review - what if)
- Interface with off-line equipment (interference)
- Interface with ESD system (inhibition)
- Interface with fire and gas system (reliability)
- Loss of remote monitoring (blind operation)
- Static electricity

13.6.6 Change Over ('Live')

- Procedures
- Responsibilities (task force)
- Detailed plans, drawings
- Co-ordination roles
- Communications new CR/old CR/field
- Contingency plans - emergency, shutdown, start-up
- Back-up services on stand-by
- Identification of critical loops
- Duplication of critical shut-down loops until new loops proven.



DEFINITIONS AND ABBREVIATIONS

Definitions

Standardised definitions may be found in the BP Group RPSEs Introductory Volume.

Health: freedom from disease, other chronic disability or nuisance arising from Group activities.

Safety: the absence of injury to people, or damage to physical assets both inside and outside a facility, as a result of Group activities.

Environment: the absence of harm to human and natural resources inside and outside the facility and the minimisation of degradation of air, water, groundwater and land as a result of Group activities.

Project Health Safety and Environmental Reviews (PHSERs):

the auditing, in stages, of the occupational health, safety and environmental aspects of a developing project from conception to post-commissioning (including construction activities) in order to determine any shortcomings or non-compliance.

Hazard and Operability Study (HAZOP): a systematic procedure for identifying the hazards and operability problems of a facility which could arise under abnormal operating conditions. (Appendix E)

Hazard Analysis (HAZAN): a quantitative method for assessing the hazard inherent in a facility where hazard is defined as the product of the consequences of an event and the likelihood of that event occurring. The method permits the ranking of hazards and can also be extended to the cost-benefit analysis of precautionary or remedial measures. (Appendix E)



Concept Safety Evaluation (CSE):	the preliminary assessment of hazards and their consequences at the concept stage of a project to optimise design for safety. This might be carried out in two stages using sound engineering judgement initially followed by quantified risk assessment.
Quantified Risk Analysis (QRA):	the quantitative evaluation of the likelihood of undesired events and the likelihood of harm or damage being caused together with the value judgements made concerning the significance of the results. This is normally used to consider the facility as a whole.
Incident:	(a) an accident (unplanned event which results in human injury, and/or property damage, and/or business interruption). (b) a near miss (unplanned event with no detrimental end result but with the potential for same). (c) a dangerous occurrence (as defined in the UK Reporting of Injuries, Diseases and Dangerous Occurrences Regulations). (d) a case of occupational illness or disease.
Quality Assurance/Quality Control (QA/QC):	All the systematic actions that are necessary during a project to ensure that the required quality is specified, obtained and maintained.
Client:	the organisation on whose behalf the PHSER is performed. Within BP this can be a Business, an Associate or an Operating Unit.
Project HSE Plan:	project health, safety and environmental plan. A diagrammatic representation of the planned HSE documentation and activities requirements at each stage of the project, including operation and abandonment of the facilities. It is the definition of how the Owner's HSE philosophy will be implemented in practice and will be subject to periodic review and revision. (Appendix F)



Occupational Construction Safety Audit:	a systematic qualitative and quantitative audit to assess both organisational and practical standards of Occupational Health and Safety during the Construction phase.
Occupational Safety Engineering Plan:	an engineering design plan to identify the more significant Health and Safety hazards likely to be encountered during the Construction phase together with the engineering methodology to minimise these.
Initiating Authority:	the person authorised by the Client to be responsible for the initiation of the various PHSER stages.
Authorising Authority:	the person designated to authorise for issue the final PHSER report.
Principal Recipient:	the most senior manager in the Client organisation receiving the PHSER report. This on occasions could be the Accepting Authority.
Accepting Authority:	the manager or organisation authorised by the Client to accept the findings/recommendations and Project responses of the formally issued PHSER report and reconcile any outstanding issues. Acceptance and/or actions arising will be conveyed to the Project Management by the accepting authority.

Abbreviations

COSHH	Control of Substances Hazardous to Health
CSE	Concept Safety Evaluation
EIA	Environmental Impact Assessment
ESF	Engineering Standards Forum
HAZAN	Hazard Analysis
HAZOP	Hazard and Operability Study
HSE	Health, Safety and Environment (BP internal usage)
NDT	Non destructive testing
PHSER	Project Health, Safety and Environmental Review
QA	Quality Assurance
QC	Quality Control
QRA	Quantified Risk Analysis
RPSE	Recommended Practices and Specifications for Engineering
SOR	Statement of Requirements



LIST OF REFERENCED DOCUMENTS

A reference invokes the latest published issue or amendment unless stated otherwise.

Referenced standards may be replaced by equivalent standards that are internationally or otherwise recognised provided that it can be shown to the satisfaction of the purchaser's professional engineer that they meet or exceed the requirements of the referenced standards.

None



HEALTH, SAFETY AND THE ENVIRONMENT

BP's POLICY

BP strives to be an industry leader in health and safety practices and in environmental standards. We believe that good HSE performance is an integral part of efficient and profitable business management. We therefore intend to improve our HSE performance, and will be guided by the following principles:-

Provide Safe and Healthy Operations

We will strive to create a working environment where accidents will not occur and in which employees, customers, contractors and the public will not be exposed to health hazards. Our employees and site contractors will be trained in workplace health and safety, and encouraged to adopt a healthy lifestyle.

Produce and Market Products that can be Used Safely

All products that BP makes for sale or use, and products re-branded by BP, will be evaluated to ensure that, despite inherent hazards, they can be stored, handled, transported and used safely. We will advise our customers on the safe use of our products, and on their disposal without adverse environmental impact.

Progressive Improvement of our Environmental Performance

We will protect the environment by seeking to minimise the impact of our activities. We will strive for progressive improvement in the environmental performance of our facilities by reducing emissions, wastes, and the use of energy. New facilities and plant will apply the best available pollution control techniques that are commercially viable.

Respect the Interests of our Neighbours and the World Community

We will communicate openly with those who live or work in the vicinity of our facilities to ensure their understanding of our operations, and our understanding of their concerns. We will also seek to participate actively with governments, other relevant bodies and the public in resolving HSE issues associated with our operations and products.

We will measure our HSE performance on a continuing basis against objectives established regularly for BP as a whole and for our individual businesses. We will have due regard for the concerns of our customers, employees, suppliers, local communities and the public in establishing our HSE standards and performance targets.



This policy applies to all BP group companies, and to all activities over which BP has control. In all other circumstances BP actively encourages the adoption of this policy.

This policy replaces the previous BP Group Health Safety and Environment Policy published in June 1982.

D.A.G. SIMON

March, 1993



HSE FOCUSED PROGRAMS**1. Pollution Prevention**

We will reduce the impact of our activities on the environment at all our facilities and throughout our operations. We will establish waste minimisation programmes and set goals for waste reduction through prevention, recycling or reuse. Our target is to minimise losses by generating less waste, preventing pollution due to accidents and waste disposal, and encouraging the avoidance of waste by users of our products.

2. Energy Conservation

The efficient use of energy will reduce energy wastage and thus limit emissions of greenhouse gases and other combustion products. We will continue to strive for high standards of energy efficiency within the company and will encourage the wise use of energy generally. We will identify opportunities for energy conservation, promote the efficient use of petroleum and petroleum based products and demonstrate measurable improvements in energy conservation at our facilities.

3. Product Stewardship

We will improve our product stewardship programmes to ensure the effective assessment, prior to marketing, of the hazards associated with our products and the consequential risks posed throughout the product's life. We will improve the standards of support services to customers regarding the safe use, labelling transport, storage and disposal of our products. Our product stewardship programmes will be periodically reviewed to ensure consistency throughout the Company.

4. Suppliers

We will assess the HSE implications of externally supplied goods and services, and will select and manage the relationships with contractors and suppliers to ensure that our expectations are met. We will encourage our contractors and suppliers to conduct their operations in a manner consistent with our own. We will monitor their performance and use this information as a key part of the future selection process.

5. Facilities Stewardship

We will assess and manage the HSE risks associated with our facilities, equipment and operations, from acquisition or design, through to abandonment or divestiture. Our aim is to address HSE concerns throughout the entire life of our facilities and operations. Management at all levels will demonstrate and encourage commitment to the control of HSE risk.



6. Safety and Loss Management

We will identify, assess and quantify potential major loss incidents and take action to manage risks. We will develop technical and managerial programmes to reduce injuries and identify, measure and control both potential and actual accident losses. Lessons learned from incidents will be used throughout the Company to reduce the potential for loss from similar events in current and future operations.

7. Health Protection and Promotion

We will reduce the health risks to employees and contractors by assessing the controlling exposure to workplace hazards. We will promote health awareness and the adoption of healthy lifestyles. Our aim is to increase the Company's effectiveness through a healthy workforce.

8. Communication

We recognise the need to anticipate, understand, and respond to the concerns of our stakeholders, especially our employees and those in neighbouring communities. Our aim is to build confidence and trust through our HSE performance by communicating clear and consistent messages openly and honestly, and by learning from the concerns and options of others.

9. Training and Awareness

Training and awareness programmes will aim to ensure that employees and contractors are aware of their HSE responsibilities and are competent to fulfil them. We will regularly review our HSE skills and ensure that HSE is an integral part of induction and development training.

10. Emergency Preparedness and Crisis Management

We will ensure that we are fully prepared for emergency response at all our facilities by appropriate assessment, planning, training and exercises, and by the provision or identification of sufficient human and physical resources. Our aim is to minimise adverse impacts on the public, the environment and BP.

Crisis management plans will be developed and maintained to ensure that we are prepared to deal with crises that could affect the viability of the Company.

D.A.G. SIMON
July, 1992



HAZOPS AND HAZANS

The purpose of this note is to identify the position of Hazard and Operability Studies (HAZOPS) and Hazard Analysis Studies (HAZANS) with respect to Projects in general and Project Health Safety and Environmental Reviews in particular.

It is not the purpose of this note to describe what a HAZOP or a HAZAN is full details are to be found in the admirable document published by the Institution of Chemical Engineers entitled 'HAZOP and HAZAN - Notes on the Identification and Assessment of Hazards'. However, a HAZOP can be defined as a rigorous and systematic examination of a system to determine whether the design will cope operationally and safely with possible deviations from normal operation. HAZAN is a technique for quantifying both the risk of occurrence and consequences of hazardous events, thus permitting an assessment of their acceptability or otherwise.

Dealing as they do with hazards, there is the potential that the place of a HAZOP or HAZAN may be confused viz a viz the PHSER Procedure. However, the latter is quite separate in approach and organisation.

The Health, Safety and Environmental Review Procedure is the means of 'providing assurance, that sensitive areas have been identified and confidence that the appropriate project, engineering and operational procedures will be developed to control the identified hazards'. The procedure is applied to most significant projects undertaken in the BP Group.

The Project Health, Safety and Environmental Review is specifically undertaken for the client, not the Project, and is of an audit nature.

HAZOPs are not audits but are quite specifically a project design tool and a part of project QA. It is up to the client or the project manager whether this tool is utilised. Having said this, BP commend the technique for consideration by all project managers.

HAZANs can be employed as a project design tool and, allied with suitable cost data, can be used to evaluate project options on a cost-benefit basis.

Clearly, the appropriate time for the HAZOP or HAZAN to be undertaken is reasonably early on in the design phase. Stage 1 of the Health, Safety and Environmental Review Procedures, for example, could identify the need for conceptual HAZAN. Stage 3, carried out at the detailed design stage, should review the outcome of HAZOP or HAZAN studies which may have been carried out.

The organisation and reporting of HAZOP and HAZAN studies is therefore a matter for the individual project. Specifically they do not follow the pattern of the Health, Safety and Environmental Review Procedure. It is, of course, to be hoped that any formally issued reports will follow the procedures outlined in BP Group RP 48 if the HAZOP report is to be a BP issued document.



SOME POSSIBLE COMPONENTS OF A PROJECT HEALTH SAFETY AND ENVIRONMENT PLAN

HSE ACTIVITIES	PHASE ACTIVITY PROJECT STAGES	PRE - PROJECT			PROJECT IMPLEMENTATION				POST PROJECT	
		CONCEPT/ FEASIBILITY	SCOPE/EVALUATION	FOR PROCESS SPEC.	PROJECT TECH. SPEC.	DEFINITION FRONT END ENGINE DESIGN	DETAILED DESIGN	PROCUREMENT CONSTRUCTION	PRE- COMMISSIONING	COMMISSIONING & OPERATIONS DECOMMISSIONING & ABANDONMENT
FORMAL SAFETY ASSESSMENTS		■								
HSE PHILOSOPHY		■								
HSE SCREENING STUDY		■								
HSE PLAN						■		■		
EIA				■ (1)				■ (2)		■ (3)
CSE (ORA)				■						
PHSER - 1				■						
CONCEPT SAFETY CASE SUBMISSION						■				
PRELIM. HAZOP STUDY										
PHSER - 2						■				
ORAMAZAN (SPECIFIC)						■				
ENVIRONMENTAL BASELINE STUDIES						■				
REGISTER OF SAFETY RELATED DEVICES						■				
HAZOP STUDY						■				
PHSER - 3						■				
MODIFICATION REVIEW						■				
OCCUPATIONAL SAFETY ENGINEERING PLAN						■				
OCCUPATIONAL CONSTRUCTION SAFETY PLAN							■			
CONSTRUCTION SITE SAFETY PROCEDURES							■			
OCCUPATIONAL CONSTRUCTION SAFETY AUDIT								■		
CONTRACTOR TRAINING								■		
PHSER - 4								■		
ENVIRONMENTAL MONITORING								■		
PHSER - 5								■		
OPERATIONS PERSONNEL TRAINING								■		
SAFETY CASE SUBMISSION								■		
OPERATING PROCEDURES								■		
MAINTENANCE PROCEDURES								■		
EMERGENCY PROCEDURES								■		
PHSER - 6								■		
LOSS CONTROL AUDIT								■		
OIL SPILL CONTROL/EMERGENCY TRAINING/EXERCISES								■		
HSE & E ASSESSMENTS								■		
CONTRACTOR & SERVICES AUDIT								■		
EMERGENCY PREPAREDNESS								■		
COMPLIANCE MONITORING								■		
SAFETY ENVIRONMENTAL MANAGEMENT AUDIT								■		



PHSER REVIEW RECORD PROFORMA-
FINDING/RECOMMENDATION/RESPONSE

REF NO

REVIEW TITLE/STAGE:-

AREA OF FINDING:-

FINDING:

RECOMMENDATION:

RAISED BY CHAIRMAN DATE

PROJECT RESPONSE:-

BY: DATE

REVIEW TEAM COMMENT:

BY: DATE



SETTING UP A PHSER

ACTIVITY	DETAILS	PARTICIPANTS
1. FORMAL INITIATION	REQUESTING A PHSER	PRINCIPAL RECIPIENT PROJECT MANAGER PRE PROJECT LEADER & PHSER ORGANISER
2. ACKNOWLEDGEMENT	AGREEMENT TO CARRY OUT A PHSER AND PREPARE DRAFT PACKAGE FOR INITIATOR'S APPROVAL	PHSER ORGANISER - INITIATOR
3. PREPARATION OF DRAFT PACKAGE FOR APPROVAL SENT TO INITIATOR N.B. TEAM MEMBERS AND THOSE MADE UP FROM CLIENT/OPERATOR AND PARTNERS DECIDED AT THIS STAGE, CHAIRMAN NOMINEE(S) FOR ACCEPTANCE BY CLIENT - RANGE OF EXPERIENCE AND DESCRIPTIONS DEPENDING ON TYPE OF PROJECT AND STAGE OF PHSER.	INCL. SCOPE OF PROJECT PHSER INITIATION TERMS OF REFERENCE SCOPE OF REVIEW TEAM MEMBERS/CLIENT CONTACTS PROGRAMME BUDGET DOCUMENTATION (INITIAL REQUIREMENTS) ADMINISTRATION:- CORRESPONDENCE MINUTES FINDING) SHEETS IR) BUDGET CONTROL REPORTS	PHSER ORGANISER/PROJECT REPRESENTATIVE
4. BUDGET CONTROL	JOB NUMBER OPENED BY ORGANISER WHO ADVISED CHAIRMAN	PHSER ORGANISER/ PHSER CHAIRMAN
5. PREPARATION OF FINAL PACKAGE - SENT TO INITIATOR PHSER TEAM	AS '3' ABOVE BUT INCORPORATING CLIENTS COMMENTS AND INCLUDING INPUT FROM CHAIRMAN-ELECT. PROGRAMME, SCOPE FIRMED UP.	PHSER ORGANISER/PHSER CHAIRMAN/PROJECT REPRESENTATIVE
6. FINAL PHSER PACKAGE CLIENT ACCEPTANCE	CHAIRMAN TAKES OVER RESPONSIBILITY FOR RUNNING THE PHSER AS A STAND ALONE TEAM INDEPENDENT OF THE PROJECT AND LINE MANAGEMENT	PHSER CHAIRMAN /SECRETARY/ TEAM MEMBERS/PROJECT REPRESENTATIVE

EXAMPLE OF TABULATION OF FINDINGS

ACTIVITY	DETAILS	PARTICIPANTS
1. PRE-REVIEW	OBTAINING INITIAL DOCUMENTATION PRE-READING BY PHSER TEAM PREPARATION FOR FIRST MEETING	PHSER SECRETARY PHSER TEAM PROJECT REPRESENTATIVE
2. REVIEW - PROJECT REPRESENTATIVE RESPONSIBILITIES	TO PROVIDE:- - SUITABLE OFFICES WITH TELEPHONES ETC - PHOTOCOPYING FACILITIES - AVAILABILITY OF RELEVANT PROJECT STAFF - SECURITY OF SENSITIVE INFORMATION - PROVISION OF PROJECT DOCUMENTATION - CO-ORDINATION OF PROJECT RESPONSES TO FINDINGS AND INFORMATION REQUESTS	PROJECT REPRESENTATIVE
3. REVIEW - PHSER CHAIRMAN ROLE	- LEADING MEETINGS - DIRECTING QUESTIONS - MAINTAINING WITHIN SCOPE/TOR - INVOLVING ALL TEAM MEMBERS - APPROVING FINDINGS - ASSISTING SECRETARY - COMPILING & MEETING PROGRAMME - RESPONSIBILITY FOR OVERALL TEAM, QUALITY & TIMING OF THE REVIEW & REPORT	PHSER CHAIRMAN
4. FIRST MAIN MEETING (ALL STAGES)	- (PRE) PROJECT PRESENTATION - QUESTIONS/ANSWERS - RAISING FINDINGS/INFORMATION REQUESTS ON PREFORMAT SHEETS - AGREE FUTURE PROGRAMME - AGREE NEW DOCUMENTATION REQUIREMENTS - ALLOCATE RESPONSIBILITIES	PHSER TEAM (PRE) PROJECT MANAGER & PROJECT SPECIALISTS
5. COMMUNICATIONS	FINDINGS/IRS/MINUTES TO BE ROUTED TO PROJECT REP. FROM PHSER CHAIRMAN/SECRETARY FINDINGS/IRS TO BE COMPLETED ON PROFORMA SHEETS & FINDINGS APPROVED BY PHSER CHAIRMAN PRIOR TO TRANSMITTAL TO PROJECT REPRESENTATIVE FINDINGS & IRS TO BE UNIQUELY NUMBERED FOR RECORD & CONTROL PURPOSES FINDINGS ARE NORMALLY DIVIDED INTO AREAS AND/OR DISCIPLINES & REFERENCED ACCORDINGLY IRS ARE USUALLY NUMBERED CONSECUTIVELY AS THEY ARISE ALL WRITTEN IN A STYLE TO READILY SLOT INTO REPORT FORMAT	PHSER SECRETARY/PROJECT REP. PHSER SECRETARY
6. REPORTING	DRAFT REPORT COMPLETE WITH INITIAL PROJECT RESPONSES TO BE ISSUED TO PROJECT REP. & PHSER TEAM FOR CONFIRMATION OF FACTUAL TECHNICAL ACCURACY. DISTRIBUTION OF FINAL REPORT TO BE AGREED AT THIS STAGE FINAL REPORT WITH FINAL PROJECT RESPONSES TO BE APPROVED BY PHSER CHAIRMAN ACCEPTANCE OF THE FINAL REPORT IS PROVIDED BY THE CLIENT/PRINCIPAL RECIPIENT. THIS IS CONVEYED TO THE PROJECT MANAGER	PHSER CHAIRMAN/SECRETARY PHSER TEAM PROJECT MANAGER CLIENT SAFETY MANAGER CLIENT/PRINCIPAL RECIPIENT
7. FEEDBACK - PHSER CHAIRMAN'S LETTER	SUMMARISE LESSONS LEARNT WHICH HAVE GLOBAL IMPACT ON CODES, DESIGN, FUTURE PROJECTS	PHSER CHAIRMAN

FINDINGS NUMBERING SYSTEM

A typical numbering system for findings can be made of three parts :- xx/yy/zz, where 'xx' corresponds to the Stage number of the review, 'yy' corresponds to the Category Number shown below, and 'zz' is the sequential number.

e.g. 04/05/06 refers to the sixth finding on Process Design in Stage 4.

Categories	Category Number
General	01
Layout	02
Civils/Buildings	03
Chemicals use/Storage/Handling	04
Process Design	05
Engineering Design	06
Control/Inst./Electrical	07
Relief Systems	08
Emergency Shutdown Systems	09
Fire and Gas Systems	10
Operations and Maintenance	11
Inspection	12
Health	13
Safety	14
Environment	15
Project Organisation/Management	16
Fire Engineering/Firefighting	17
Construction	18
Utilities	19
Miscellaneous	20

PHSER INFORMATION REQUEST PROFORMA

REF NO

REVIEW TITLE/STAGE:-

AREA OF REQUEST:-

REQUEST:

BY:

DATE

PROJECT RESPONSE:-

BY:

DATE

TEAM ACTION:-



TABULATION FOR RUNNING A PHSER

REF NO.	AREA DESCRIPTION/ FINDING	PHSER RECOMMENDATION	PROJECT RESPONSE	FURTHER PHSER COMMENT
1. 1.1 (TYPICAL STAGE 1)	PROCESS PLANT PLANT LAYOUT BOUNDARY FENCE OF NEW PLANT IS ADJACENT TO HAZARDOUS AREA. FENCE IS ADJACENT TO PUBLIC RIGHT OF WAY.	HAZARDOUS AREAS ADJACENT TO SUCH BOUNDARY FENCES SHOULD BE AVOIDED. THIS ASPECT OF SAFETY AND SECURITY TO BE REVIEWED BY THE PRE PROJECT DESIGN TEAM	AGREED. THE WHOLE ASPECT OF HAZARDOUS AREA CLASSIFICATION IS BEING REVIEWED AT PRESENT	STAGE 2 PHSER TO FOLLOW-UP.
2. 2.1 (TYPICAL STAGE 2)	OFFSITES RLPG TANKAGE THE ANNULUS SPACE IS TO BE N2 PURGED TO PREVENT LIQUID BUILD UP.	THE ADEQUACY OF USING N2 PURGING ALONE IS QUESTIONED AND IT IS RECOMMENDED THAT ADEQUATE MEASURES ARE MADE AVAILABLE TO WARN OF LIQUID BUILD-UP AND DISPOSAL OF SUCH LIQUID	ADEQUATE INSTRUMENTATION AND DRAINAGE WILL BE FITTED.	
3. 3.1 (TYPICAL STAGE 3)	PIPELINES PIG LAUNCHERS SINGLE BALL VALVE ISOLATION FITTED. P&IDS DO NOT INDICATE TYPE OF TOPE WORKS OR ANY INTERLOCKS BETWEEN ISOLATING VALVES AND LAUNCHER DOOR	POSITIVE MEANS OF MECHANICALLY LOCKING THE VALVES SHUT IS DESIRABLE AND THE FITTING OF INTERLOCKS IS NOW COMMON PRACTICE IN BP.	TOPWORKS ARE TO BE DOUBLE ACTION. HYDRAULIC PISTONS. NO MECHANICAL LOCKING DEVICES FITTED. INTERLOCKS ARE NOT CONSIDERED NECESSARY.	METHOD OF ENSURING INTEGRITY OF VALVE CLOSURE IS IMPERATIVE AND LACK OF INTERLOCKS MUST NECESSITATE STRINGENT OPERATOR INSTRUCTIONS AND HEAVY SUPERVISION. CLIENT (OPERATOR) TO FOLLOW UP WITH THE PROJECT.
4. 4.1 (TYPICAL STAGE 4)	JACKET CONSTRUCTION SINGLE SIDED WELDING NO INFORMATION AVAILABLE FROM DESIGN ON FATIGUE SENSITIVE JOINTS	THESE SHOULD BE IDENTIFIED BY THE PROJECT/DESIGNER AND APPROPRIATE DEFINITIONS OF WELD QUALITY PROVIDED.	AGREED. THIS WILL BE CARRIED OUT.	

RECOMMENDED APPROACH AND CONDUCT OF PHSER TEAM

(Some points to consider)

Protective versus Investigative (Policing)

A policing attitude can lead to discord and jeopardise PHSER/Project relationship.

The protective approach encourages participation of the project and encourages co-operation which is essential.

Protecting the Project against unforeseen health, safety and environmental problems.

Common objectives of obtaining a healthy safe and environmentally friendly plant.

Overcome novelty of engineers being audited.

Co-operation

Expertise lies with the Project.

PHSER Team skill lies in auditing, sampling and awareness of critical health safety and environmentally sensitive areas and issues.

Feedback of project responses to findings, recommendations and information requests, freely given, is essential.

Integrity

PHSER Teams have a privileged position.

Strict communications routes maintained.

Reporting of findings outside PHSER Team and Project to be avoided.

Security of working papers and confidentiality maintained throughout.

Credibility

Well structured and organised review appreciated. Correct initial setting up of PHSER essential.

High calibre of Team Members, especially of Chairman.



Correct blend of experience, independence (no axe to grind) and relevant knowledge of the technology involved.

Attitude

It is not a design review.

Be aware that Project Engineers have been living with the project for months or even years

Concentrate on HSE aspects of design.

Avoid Opinion Engineering.

Summary

The PHSER approach should be perceived to be protective and concentrate on the Health, Safety and Environmental aspects of a project using Auditing Techniques.

Attributes/Skills Required of PHSER Chairman

Business awareness and meeting of objectives and scope.

Meeting timescales and budget.

Awareness of skills requirements.

Maintaining integrity and approach.

Ensuring full team involvement.

Meeting TOR

Maintaining independence.

Maintenance of security classification.

Awareness of project and client roles.

Avoidance of hearsay.

Be accurate and factually correct.

Avoidance of opinion engineering.

Avoidance of 'motherhood ' statements.

Have relevant technical competence.



Be comfortable with brainstorming.

Have final report in mind during review.

Maintain dialogue with project management.

Ensure report quality.

Write Chairman's letter covering lessons learned.

Secrecy and Confidentiality

On occasions Clients require the PHSER team members to sign secrecy agreements. It is a task of the PHSER Coordinator to clarify this issue and advise the Review Team Chairman accordingly.

