

HSE (Health, Safety & Environmental) on Projects



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Organization Of This Presentation



1. **Background**
2. Defining HSE
3. Roles of the HSE Group
4. Project Work and HSE
5. The HSE Professional

Background to This Presentation



- HSE Literature / Regulations often Oriented toward Operations
 - HSE work often on projects
 - Operations personnel often on projects
- Large Projects
- Grass-roots / Greenfield
- Interfaces
 - Piping
 - Instruments
 - People
- Structured Project Management
 - Phase / Gate System
 - Project Execution Plan
- HSE a Separate Function

'Safety' to 'Operational Excellence'



- Safety / Environmental
 - Up to 1990s
 - Occupational focus
 - Environmental rules
- Process Safety Management
 - 1990s
 - Management systems
 - Not just 'safety'
 - Performance-Based / Non-Prescriptive
- HSE
 - 1990s to present
 - Integration of elements
 - Broader concept of risk
- Operational Excellence

Project Environment

Continuous / Steady Operations	Project
Steady State	Dynamic / Changing

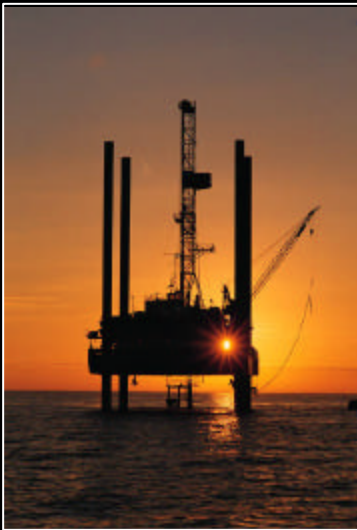
Project Environment

Continuous / Steady Operations	Project
Steady State	Dynamic / Changing
Commodity-Like Product	Unique Product or Service

Project Environment

Continuous / Steady Operations	Project
Steady State	Dynamic / Changing
Commodity-Like Product	Unique Product or Service
On-Going / Long Duration	Finite Time / Shorter Duration

Representative Projects



- Design, fabrication, construction, installation, commissioning and start-up of a new facility;
- Retrofit or revamp of an operating unit or of a major equipment item – possibly due to an HSE issue;
- Major maintenance or turnaround activity;
- Implementation of a new management system - say Management of Change

HSE Issues and Goals



- The Role of the HSE Professional
 - Delivering Analyses / Reports
 - Project Management Support
 - Auditor / Reviewer
 - Independent auditor
 - Ombudsman
- Overlap with Other Disciplines
- Integration with the Project Execution Plan

Overlap With Other Disciplines



- Everyone Is In HSE
 - Structural: Design for Personnel Safety
 - Instruments: Design to Avoid Environmental Release
 - Piping: Insulate for Noise to Avoid Health Problems
- Other HSE-Related Disciplines
 - Human Factors
 - Quality
 - Security
- HSE Often Has a Holistic View of the Project
 - Can identify interface difficulties
 - Can help identify needs
 - HSE manager can help with multi-disciplinary coordination

Example of Overlap (Fire Protection) – 1

HSE (Fire Protection) Responsibility ⁽¹⁾	Engineering Discipline Responsibility
Fireproof structural steel	Structural
Layout for escape routes	Facilities
Fire water systems	Piping / Facilities
Fire-fighting equipment	Facilities
Alarm and shutdown systems	Instruments and Control
Vapor detection systems	Instruments and Control

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Example of Overlap (Fire Protection) – 2

HSE (Fire Protection) Responsibility	Engineering Discipline Responsibility
Heating / ventilating (smoke)	Civil / Structural / Facilities
Electrical classification	Electrical
Emergency response plans	Operations / Maintenance
Fire size / duration	Process
Fire and blast simulations	Structural / Civil
Regulations / standards	Contracts

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Defining HSE



- Health / Safety / Environment
- HSE / HES / SHE / EHS
- Human Factors
- Quality: HSEQ
- Security: HSEQS

Environmental



- Affects Everyone, Everything (all life forms), Everywhere
- Timeline: Years to Decades
- Tends to be regulatory driven:
 - EPA
 - MMS
 - World Bank
- Usually Prescriptive

Health



- Workers and the immediate community
- Timeline: months to years
- Wide range of regulations
 - OSHA
 - EPA
- Often driven by litigation (*e.g.*, asbestos)

Safety



- Generally Workers Only
- Timeline: immediate
- Types of Safety:
 - Occupational
 - System
 - Behavior-based
- Regulations Often Non-Prescriptive / Performance-Based

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Roles of the HSE Group



1. Project Support

1. Develop project standards, e.g., philosophies
2. Prepare deliverables
3. Support other disciplines
4. Understand latest external standards / regulations
5. Safety on the project

2. Formal Risk Assessment

3. Independent Reviewer

1. Verify standards being met
 1. External (regulations / codes)
 2. Internal
2. Ombudsman

HSE: Safety on the Project



- Office Safety
- Fabrication
 - Control can be a problem
 - Directly related to number of inspectors
- Construction
- Installation

Independent Reviewer



■ Verification / Audit

- External standards
- Internal standards
- Report outside the normal project management chain

■ Professional Review

■ Ombudsman

- Information provided by others
- Allows for free and open communication of issues and opportunities
- Strive for an atmosphere that is:
 - Fair
 - Open
 - Accountable

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HSE Project Matrix

	HSE Management Elements	Project Phase				
		I	II	III	IV	V
1	Participation					
2	Information					
3	Hazards Analysis					
4	Management of Change					
5	Procedures					
	↓					
16	Regulations/Codes/Standards					

Matrix Elements



- Project Phase
- HSE Management Element
- HSE Activity

Project Phases

Phase I – Concept Selection

Phase II – Preliminary Design (FEED)

Phase III – Detailed Engineering

**Phase IV – Fabrication, Construction,
Installation**

Phase V – Commissioning, Start-Up

Phase I: Concept Selection

- Pre-Front End Engineering Design, or pre-FEED
- Identify and Assess Opportunities
- Process Selection
- Evaluation of Economic Feasibility
- 'Go' / 'No-Go' Decision
- Determine if safety or environmental factors are likely to have a major effect on the project, or on the schedule.
- Environmental Impact Statements can take a long time to complete, and substantially change the scope of the project

Phase I - Typical HSE Activities

- HSE Plan
- HSE Aims and Goals
- Safety Critical Issues
- Risk Acceptance Criteria (ALARP)
- Risk Assessment of Major Concepts
- Risk Matrix
- Risk Register
- Process Hazards Analysis Plan (What-If)
- Regulatory Issues
- Codes and Standards
- Simultaneous Operations Issues
- Human Factors Criteria
- Flaring Criteria
- Behavioral Safety Philosophy

Phase II: Select From Alternatives

- Preliminary or Front End Engineering Design (FEED)
- Establish Design Basis
- All major HSE issues that could affect the project should have been resolved

Phase II – Typical HSE Activities

- Preliminary Noise Study
- Preliminary Fire Study
- Preliminary Explosion Study
- Preliminary Toxic Gas Dispersion Study
- Preliminary Smoke Study
- Preliminary Hazardous Area Classification
- Preliminary Health Program
- Checklist Studies (say 30)
- What-If Studies
- Third Party Interfaces
- HSE Audit Plan
- Project Behavioral Safety Plan

Phase III: Final Design / Detailed Engineering

- Detailed “nuts and bolts” design
- All FEED issues should be resolved
- Final HAZOP

Phase III – Typical HSE Activities

- Design HAZOP
- Gas Dispersion Study
- Fire / Explosion Study
- Noise Study
- Smoke / Ventilation Study
- Hazardous Area Classification
- Management of Change program

Phase IV: Fabrication / Construction / Installation

- Multiple Contractors
- Ultimately Have to Accept Lack of Control
- HSE mostly concerned with occupational and behavioral issues

Phase IV – Typical HSE Activities

- Safety Induction Program
- Inspection Program
- Record-Keeping
- HSE Audit

Phase V: Commission / Start-Up

- Facility On-Stream
 - Operating Procedures
 - Training
 - Management of Change
 - Prestartup Safety Review

Phase V – Typical HSE Activities

- Operating Procedures
- Maintenance Procedures
- Training Records
- HSE Audits
- Prestartup Safety Review

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16	Regulations/Codes/Standards					

Management Elements - 1



- Derived from Industry-Standard Program
 - EPA
 - OSHA
 - API 75
- Many Organizations Adopted This Approach
- Modern Systems Expanded
 - Quality
 - Security
 - Human Factors

Management Elements – 2

1. Participation / Accountability / Leadership
2. Technical and Organizational Information
3. Hazards Analysis
4. Management of Change
5. Operating and Maintenance Procedures
6. Training and Education
7. System / Mechanical Integrity
8. Contract Work
9. Safe Work Practices
10. Prestartup / Restart Review
11. Emergency Planning and Response
12. Incident Investigation and Analysis
13. Audits and Assessments
14. Regulations, Codes and Standards
15. Reliability / Quality Control
16. Communication / Security

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HSE Activities Within Each Matrix

1. Who are the principal HSE 'customers / clients'?
2. What codes and standards apply?
3. What are the typical HSE deliverables and reports?
4. Is a formal risk analysis required?
5. What support can HSE provide to other disciplines, including record-keeping?
6. What documents and information generated by other departments are needed by the HSE group?
7. What impact could the HSE group could have on the cost and schedule of the overall project?
8. What resources (people and money) are needed at each phase for HSE work?
9. Is there an HSE audit protocol?
10. Is there an HSE review checklist?

Who Are The HSE Customers / Clients on a Project?



- Corporate
 - Regulations
 - Company Standards
- Project Director
- Project Managers
- Engineering Managers
- Facility Managers
 - Operations
 - Maintenance

Total Potential Activities



- Five Project Phases
- Sixteen HSE Elements
- Ten HSE Activities

$$\begin{aligned} \text{Total } & 5 \times 16 \times 10 \\ & = \mathbf{800 \text{ Items}} \end{aligned}$$

Organization Of This Presentation



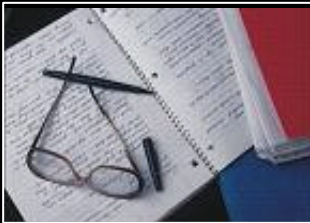
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The HSE Professional: A Paragon



"What a piece of work is man! how noble in reason! how infinite in faculty! in form and moving how express and admirable! in action how like an angel! in apprehension how like a god! the beauty of the world, the paragon of animals!"

The HSE Professional On A Project



- Eclectic
 - Understand many disciplines - but not an expert in them
 - Engineering background
 - Holistic
- Lots of Experience: Field and Design
- Good Communicator
 - Written reports
 - Oral presentations
 - Training
- Good Network
 - Consultants
 - Part-time workers
- Willing to Take a Stand
 - ‘Comfort the Afflicted / Afflict the Comfortable’
 - Needs to know the organization
- Self-Starter
 - “Crash” meetings

Conclusions



- Three Major Roles
 - Support to other disciplines
 - Technical work
 - Review / Assessment of the overall project
- Organize Around Three Elements:
 - Project phases
 - HSE management elements
 - Deliverables and activities
- HSE Management is Broad in Scope

Example 1

1. Phase I; 14. Regulations

4. Deliverable: Environmental Impact Statement

		Project Phase				
		I	II	III	IV	V
1	Participation					
2	Information					
	↓					
14	Regulations, Codes, Stds					
	↓					
16	Communication/Security					

Example 2

2. Phase II; 7. Mechanical Integrity

3. Risk Analysis: What-If / Checklist

		Project Phase				
		I	II	III	IV	V
1	Participation					
2	Information					
	↓					
7	Mechanical Integrity					
	↓					
16	Communication/Security					

Example 3

3. Phase III; 3. Hazards Analysis

8. Resources: HAZOP Team

		Project Phase				
		I	II	III	IV	V
1	Participation					
2	Information					
3	Hazards Analysis					
	↓					
7	Mechanical Integrity					
	↓					
16	Communication/Security					

Example 4

4. Phase IV; 4. Management of Change

4. *Support to Other Disciplines*

		Project Phase				
		I	II	III	IV	V
1	Participation					
2	Information					
3	Hazards Analysis					
4	Management of Change					
	↓					
16	Communication/Security					

Example 5

5. Phase V; 5. Operating Procedures

3. Deliverable

		Project Phase				
		I	II	III	IV	V
1	Participation					
2	Information					
	↓					
5	Operating Procedures					
	↓					
16	Communication/Security					