

Powering Your Performance



INNOVATION

ENGINEERING

OPTIMIZATION

Integration of process safety/explosion protection and prevention within international/national BTS-projects

Konrad Brehm
BTS-Engineering
Key Expert Explosion Protection

Chemical (Industrial) Disaster Management (CIDM)
Mumbai 15-16 February 2010



Bayer Technology Services

Contact

Konrad Brehm

Bayer Technology Services

Engineering

Bldg. K9

D-51381 Leverkusen

Phone: +49 214 30 43516

konrad.brehm@bayertechnology.com

- Are measures of process safety and high reliability of process plants a contradiction?
- How can process safety be integrated part of the engineering of process plants?

Content

- Introduction
- Requirements for process plants
- Mechanical equipment for explosive areas

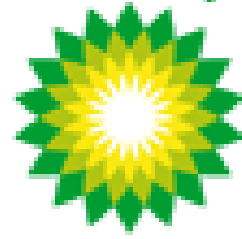


Standardization Groups for Mechanical Equipment

- **NASG AA 2.2** Mirror group of CEN/TC305/WG2 (Chairman)
- **CEN/TC305/WG2** Non electrical equipment intended for use in explosive areas (Member)
- **IEC SC31M AHG2** Non electrical equipment for explosive areas
Measures of Ignition protection (Chairman)



bp



Audi



Content

- Introduction
- Requirements for process plants



Requirements for Process Plants

- Economical Aspects

Requirements for Process Plants

- Economical Aspects
- Fulfillment of
 - legal requirements
 - company directives and requirements

Relevant Directives and Guidelines within Bayer

Bayer



Directive
Process and Plant Safety

Scope: Bayer Group
Group Regulation No. 13-1
Effective: October 01, 2004

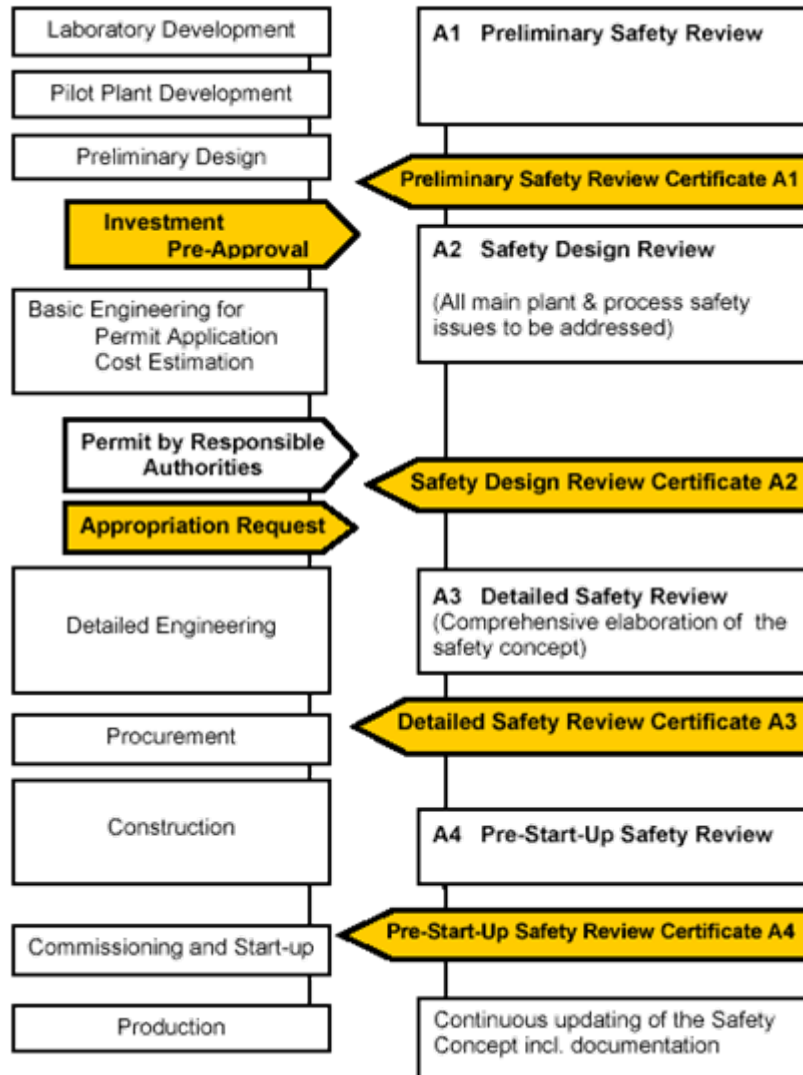
Bayer



Guideline
Process and Plant Safety Compendium

Scope: Bayer Group
Group Regulation No. 1928
Effective: July 01, 2007

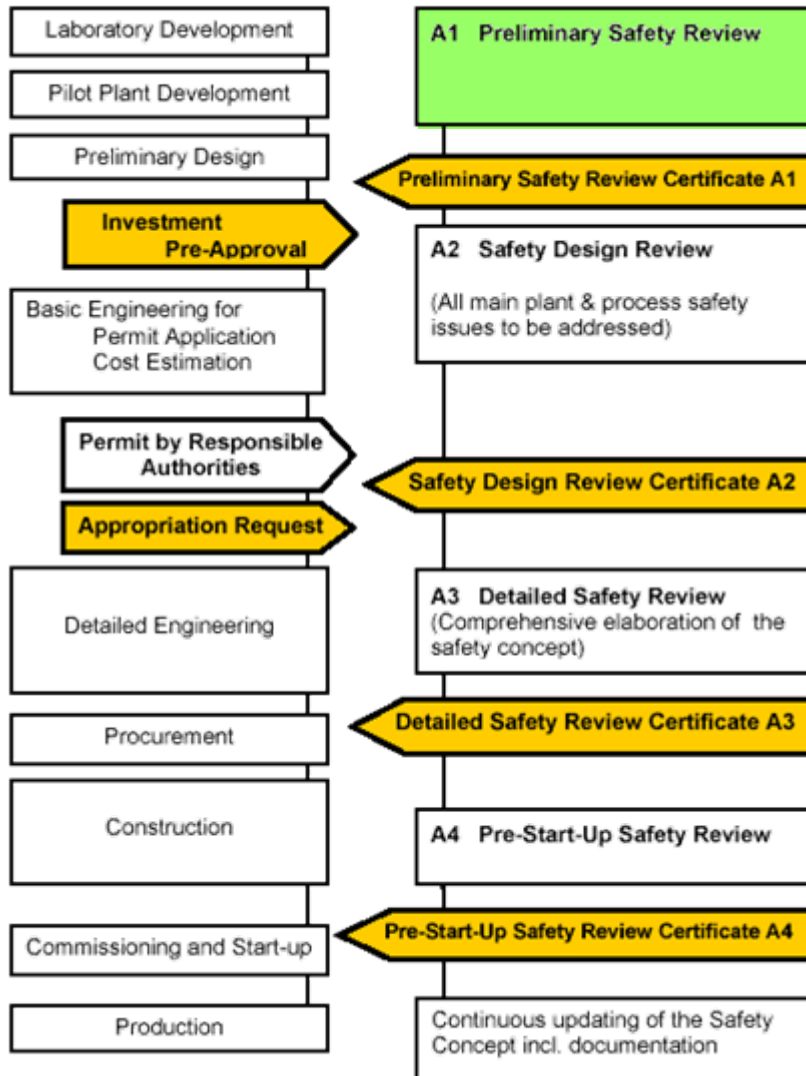
Safety reviews for new plants or after fundamental changes



Requirements for a Process Plant

- Economical Aspects
- Fulfillment of
 - legal requirements
 - company directives and requirements
- **High availability/reliability**

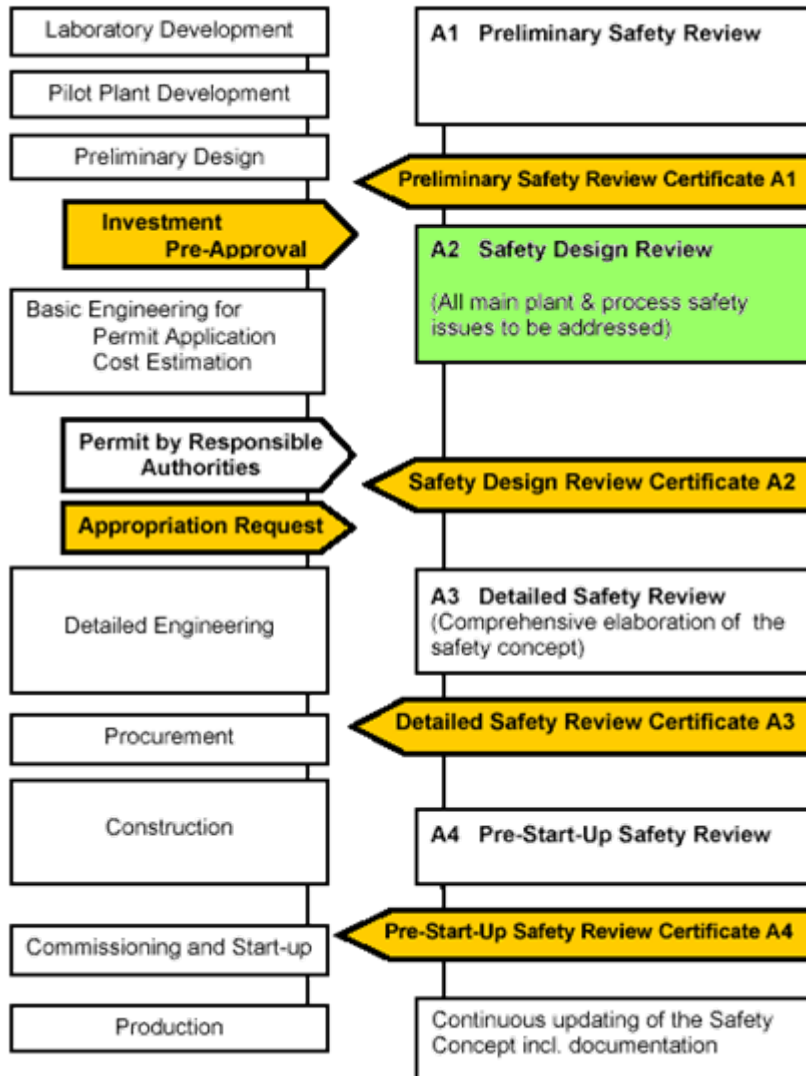
Safety reviews for new plants or after fundamental changes



Determine whether the Safety Concept is feasible in principle

- compilation, evaluation of safety data
- examination of possible alternatives with fewer hazards
- check of alternative safety
- concepts, consideration of incidents concerning similar plants

Safety reviews for new plants or after fundamental changes

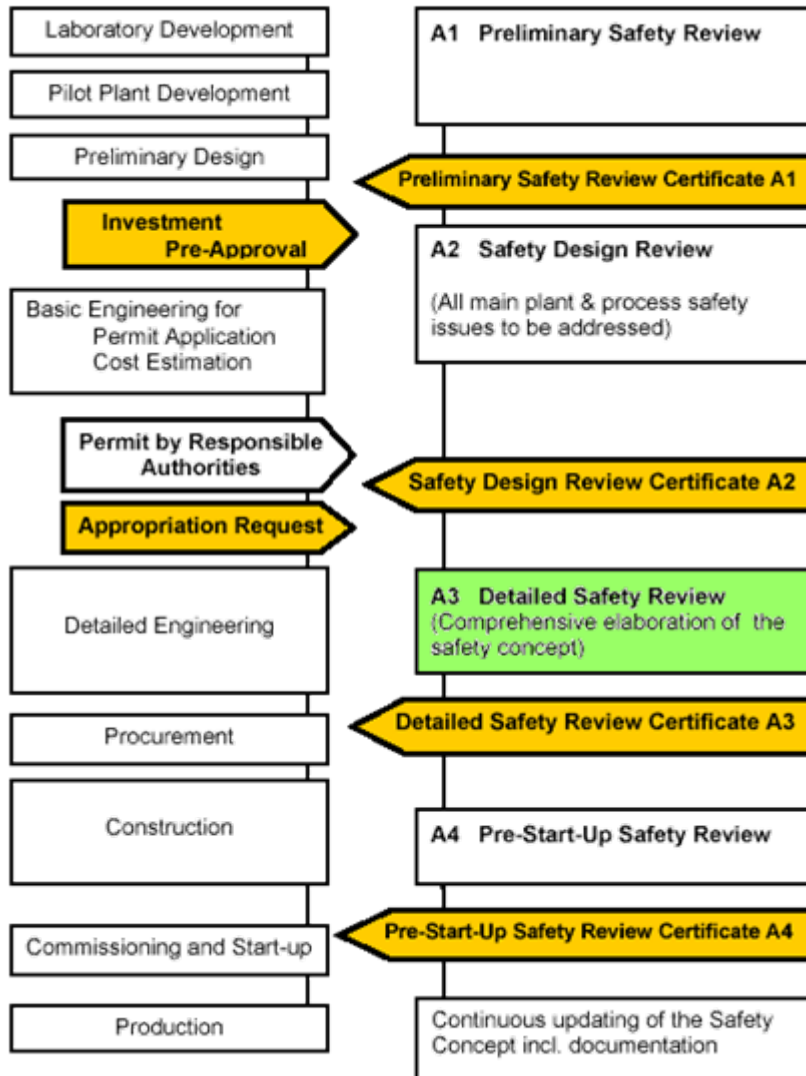


Generally used to obtain the authority permits for building or modifying a process or plant

- Collection of the safety-relevant substance data and process parameters
- Material safety data sheets
- Process flowchart and supplementary description
- Presentation of the disposal concept
- Provisional PI diagrams
- Draft of plant layout

By the end...the basic safety concept developed.

Safety reviews for new plants or after fundamental changes



Comprehensive Safety Review

- Detailed process description and substance information
- PI diagrams incl. PCT information, equipment and piping specification
- Plant layout plans
- Fire compartment plans
- Escape route plans
- Retention systems

Hazards / Deviations (with causes)

PS CC1 - EP 01 - H 03

Level too high due to

1. Feeding at reduced or closed outlet
2. Leakage of evaporator H005

Evaluation of Consequences

Liquid will flow via the vent line to the waste gas treatment plant. Overfilling of the liquid flame arrestor of the waste gas treatment plant.

Risk Reduction Reliability Demand / Task (Prevention of unacceptable process state)

Demand' M-VH-H-N	No.	Description of Demand / Task
H	1., 2.	Prevent overfilling of column

Measures (Description of main solution idea)

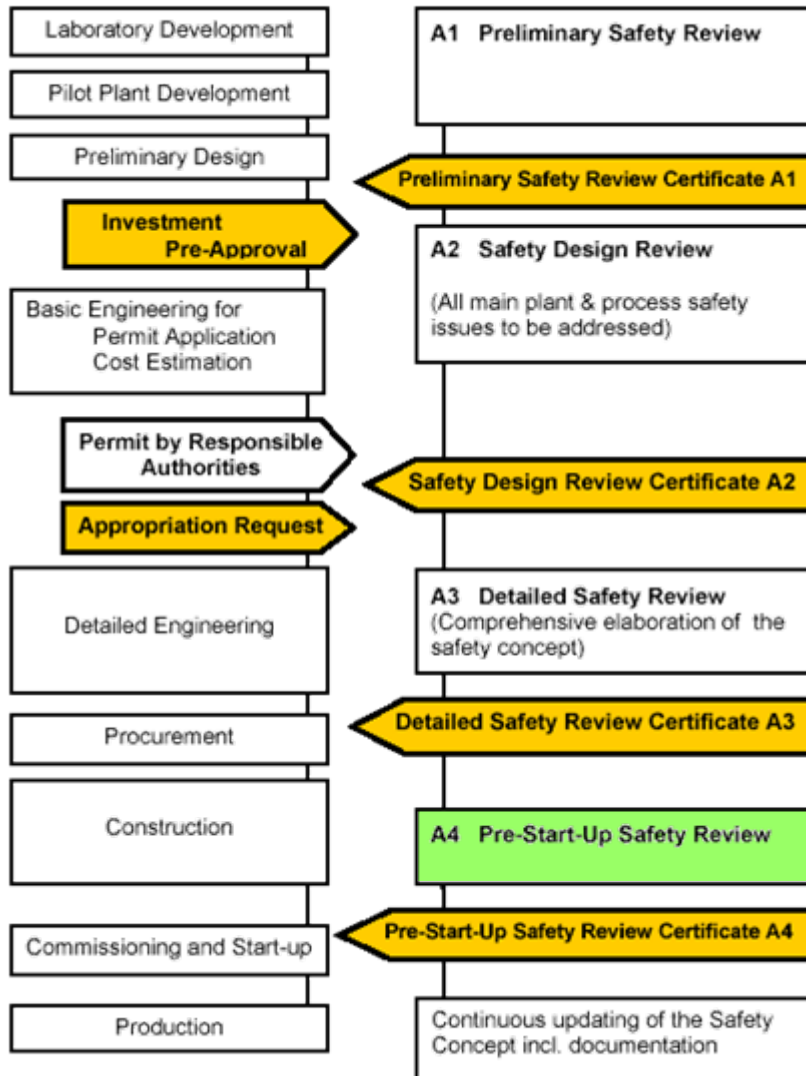
Mes. Nr.	Description
01	Two redundant level indicators close redundant feed valves and switch off feed pump.
02	Two redundant level indicators close redundant steam valves.

Realization of Reliability Demand (technical or organizational realization of measures)

M	VH	H	N	Mes. Nr.	Tag No.	Function	Description
		E		1.1	LT150	LIAS	<u>Level indicator</u>
			E			AH	Alarm
		E		01.1		SHH	Switch off pump P001. Close feed valves CV110, CV170 and XV100.
		E		02.1		SHH	Close steam valves CV140 and XV280.
		E		1.2	LS100	LSH	<u>Level Switch</u>
		E		01.2		SH	Switch off pump P001. Close feed valves CV110, CV170 and XV100.
		E		02.2		SH	Close steam valves CV140 and XV280.

Comments:

Safety reviews for new plants or after fundamental changes



Realization of the overall safety concept must be checked and certified

- Safety-relevant standard operating procedures
- Complete documentation of the detailed safety review
- Emergency response plan
- Certificates of testing and approval
- Approvals, notifications and permits issued by the authorities.

Content

- Introduction
- Requirements for process plants
- Mechanical equipment for explosive areas



Explosion Protection and Prevention within the European Community

- **Free Trade**
 - Directive 94/9/EC
("ATEX 100a")
mandatory since 1st July 2003
- **Safe Operation**
 - Directive 1999/92/EC
("ATEX 118a")
mandatory since 1st July 2003

Electrical and Non-Electrical (“mechanical” Equipment

... intended for use in potentially **explosive atmospheres**

... capable of causing an explosion through **their own potential sources of ignition**

...under **atmospheric conditions**

(temperature -20 °C to +60 °C, pressure 0.8 bar to 1.1 bar)

Mechanical Equipment within the MDI-Train



Conclusions

- High availability, high reliability and process safety are no contradictions
- Process safety should be integrated at an early stage into the engineering of the process
- Mechanical equipment for explosive atmospheres will harmonized globally