

**The Chemical and Non-Nuclear
Safety Basis Process
used by
Bechtel Jacobs Company LLC***

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BJC Safety Basis Process Overview

- **Safety basis documents developed to address all hazards**
 - Documented Safety Analysis (DSA) and Technical Safety Requirements (TSRs) for Category 2 and 3 nuclear facilities
 - Process Hazard Screen (PHS) for less than category 3 facilities with low chemical hazards
 - Safety Analysis Document (SAD) for less than category 3 facilities with moderate or high chemical hazards
 - Others

BJC Safety Basis Process Overview (cont)

- **DOE approves the DSAs and TSRs**
- **DOE approves special case less than category 3 documents that adjust airborne release fractions (ARFs) and respirable release fractions (RFs)**
- **BJC is granted the approval authority for all other chemical and non-nuclear less than category 3 safety basis documents**

BJC Safety Basis Process Overview (cont)

- **Application guides developed to provide instructions to the document preparer**
- **Qualification Program**
 - Education and experience requirements
 - Classroom training and examination
 - Oral board review
- **Implementation Validation Reviews (IVR) to verify implementation**

BJC Safety Basis Process Overview (cont)

- **All BJC safety basis documents classify chemical hazards**
 - Other industrial – hazards typical of industry
 - Low – low chemical consequences not exceeding ERPG/TEEL 1 at the facility boundary
 - Moderate – chemical consequences may exceed ERPG/TEEL-1 at facility boundary
 - High – chemical consequences may exceed ERPG/TEEL-2 at site boundary

Historical Screening of Chemical Hazards

- **Previously screened chemical and toxicological hazards using limits established in 40 CFR 302.4, Appendix A, Reportable Quantities (RQs)**
- **Screened by comparing the chemical inventory to the RQs**
- **Use of RQs results in a conservative screening process resulting in many chemicals requiring further evaluation**
- **Many BJC approved safety basis documents use this approach**

Revised Process to Screen Chemical and Toxicological Hazards

- **BJC modified the process to screen chemical hazards by crediting the Emergency Management Hazard Surveys (EMHSs) results**
- **The nuclear safety analyst is not required to conduct a separate chemical screen**
- **Local DOE involved and concurred with the change in chemical screening**
- **The revised screening process is available for use in all safety basis documents**

The EMHS Chemical Screening Process

- **DOE approved DOE O 151.1C in November, 2006**
- **A companion guidance document also prepared**
- **Contractors required to be in compliance with the revised order within one year**
- **The EMHS process was significantly revised by this revision**
 - EMHS technical requirements established
 - All facilities and activities must develop an EMHS
 - DOE must approve all EMHSs

The EMHS Chemical Screening Process (cont)

- **Five separate criteria used to screen chemical and toxicological hazards in an EMHS**
 - Public use
 - Dispersibility
 - Human health hazard
 - Laboratory scale quantity
 - Consequence

EMHS Screening Criteria – Public Use

- **Eliminate hazards commonly available to the public**
 - **Must be same formulation, use, and concentration as available to the public**
 - **Must not be restrictions on public use**

EMHS Screening Criteria - Dispersibility

- **Eliminate hazards that do not present an airborne exposure hazard**
 - Consider material form and interaction with energy sources
 - Solid at normal temperatures with no significant fraction of particles less than 10 microns
 - Liquid with a vapor pressure of less than 1mmHG at 25 deg C

EMHS Screening Criteria – Human Health Hazard

- **Eliminate chemicals with a National Fire Protection Association (NFPA) rating of 0, 1, or 2**

EMHS Screening Criteria – Laboratory Scale Quantities

- **Laboratory Scale Quantities**
 - One pound for acute and toxic hazards
 - Five gallons for liquids
 - 10 pounds for compressed gasses
 - 40 pounds for solids

EMHS Screening Criteria - Consequence

- **Eliminate hazards not expected to result in classification as an alert in the Emergency Management Program**
 - Consequence analysis permitted
 - Can not exceed ERPG 2 / TEEL 2 at 30 meters
 - Analysis may use the National Release Advisory Center (NARAC) computer software

EMHS Screening Criteria – Final Clause

- **The Companion DOE O 151 Guidance document provides one additional factor to consider**
- **Consider the material as an initiator or promoter of another more hazardous material's release**
 - explosion
 - combustion
 - corrosive
 - others
- **The “do-not-be stupid test”**

Practical Considerations

- **Proceed in order with the first and simplest criteria to the last and more complex criteria**
- **Use results from the EMHS directly and do not try to recreate the evaluation within the safety basis document**
- **Nuclear Safety must be involved in the EMHS development to ensure that the all hazards are addressed**
- **It is preferred to continue to use RQs to screen some hazards for simple facilities with low inventories**
- **A combination of screening using the EMHS and RQs is possible**

Benefits

- **The EMHS screening process is a DOE defined process**
- **The EMHS is approved by the DOE**
- **The EMHS are required to be kept up-to date**
- **The EMHS is required for all facilities**

Benefits (cont)

- **The EMHS screening is more closely associated with processes used to develop safety basis documents than those for the RQs**
 - EMHS is based on protection of the human receptor, where-as
 - The RQs is associated with protection of environmental receptors such as soil and air
- **Using the EMHS results in a more realistic screen, e.g. more hazards will screen out**
- **Promotes consistency between Emergency Management and Nuclear Safety documentation**

BJC Hazard Screening Criteria

BJC Hazard Screening Criteria	
Hazard	Criteria/Measure
Radiological Hazards	Exceed RQs from 40 CFR 302.4.
Criticality	Exceeds exemption criteria as defined by the BJC Criticality Safety Program.
Non-Radiological, Chemical and Toxicological Hazards	Any chemical or toxicological hazard that requires additional review as identified by an EMHS. As an alternate, comparison to RQs contained in 40 CFR 302.4 may be used.
X-Ray Equipment	Does not meet ANSI X-ray standards.
Flammable Materials	Consider any that may act as a contributor or initiator for fire events.
Reactive Material	Materials that may exceed RQ, TQ, TPQ screening values or SARA #00-26.
Chemical Compatibility	Materials that may exceed RQ, TQ, TPQ screening values or SARA #00-26.
Lasers	Class III non-enclosed beam Class IV Lasers.

BJC Hazard Screening Criteria (cont)

BJC Hazard Screening Criteria	
Hazard	Criteria/Measure
Electrical	>600 volts or >600 volts and >24 milli-ampere or >50J stored energy at 600 volts.
Kinetic Energy	Unique or Unusual” high kinetic energy sources (such as high energy flywheels, large centrifuges).
Pressure	Stored energy > 0.1 lb TNT(1.4×10^5 ft-lb _f) or Pressure > 3000 psig.
Temperature	Temperatures which could act as an initiator to other events such overpressure, fires, or creation of toxic bi-products.
Biohazards	As identified by HP or Industrial Hygiene.
Asphyxiants	Oxygen content less than 18 %.

Table Acronyms:

ANS American Nuclear Society

EMHS

RQ Reportable Quantity

TLV Threshold Limit Value

TQ Threshold Quantity

ANSI American National Standard Institute

NEC National Electric Code

SIH Standard Industrial Hazard

TPQ Threshold Planning Quantity