

HAZOP**JGS 210-120-1-79E**

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1. SCOPE

This procedure mainly covers the standard roles of JGC's process engineers for HAZOP studies.

2. GENERAL

The Hazard and Operability (HAZOP) Study technique has been developed to identify hazards and operability problems in a process plant which could achieve designed productivity of the plant's ability.

The HAZOP Study should be applied to process hazard identification in refinery plants, chemical plants, petrochemical plants, gas plants and other related plants.

The common objectives will include the following:

- (1) To identify all possible deviations from the design intent, their causes and consequences, and the potential hazards or operation problems resulting from these deviations.
- (2) To decide whether action is required to control the hazard or the operation problem considering present safeguards.

3. WORK PROCEDURE**3.1 Documents to be Prepared Before HAZOP Study Session**

- (1) The documents to be prepared for the HAZOP study session are listed in paragraph A.5.2 as follows :

- Process Flow Diagram
- P&I Diagram (Including UFD)
- Electric Single Line Diagram
- Plot Plan
- Design basis
- Material Selection Basis
- Piping Material Specification
- Process Safe Guarding Flow Sequence
(Process Flow Diagram can be used as substitution of Process Safe Guarding Flow Sequence.)
- Cause and Effect Chart
- Flare Load Summary

- (2) In addition to the above item (1), the following documents will be referred to by the process engineers for the smooth execution of the HAZOP study session.

- Process description
- Equipment data sheet (Skeleton drawing)
- Calculation sheet of flare load
- Basic philosophy of flare load calculation
- Liquid hold-up time
- Operation Guide

While it is not always obligatory to issue the above documents for the HAZOP study session, they are prepared for the smooth execution of the HAZOP study session.

3.2 Points Requiring Particular Attention for The HAZOP Study Session

The following points should be carefully studied and prepared by process engineer and related discipline engineer prior to the study session for the smooth execution of the study session :

- (1) Plot plan
The explanation of the reasons for the elevation of each equipment, if necessary.
- (2) Equipment data sheet
The reasons for changes, if the data are different from those specified in the licensor's design package.
- (3) Process Safeguarding Flow Sequence
It is necessary to prepare an adequate explanation of each cause and its effects. For major rotary machinery and furnaces, close cooperation with each discipline engineer is important.
- (4) Cause and effect chart
It is necessary to prepare an adequate explanation of each function. For major rotary machinery and furnaces, close cooperation with each discipline engineer is important.
- (5) Calculation sheet of flare load
Calculation sheet of flare load shall be prepared for the smooth explanation of flare load of individual safety relief valves, if requested.
- (6) Basic philosophy of flare load calculation
Each scenario of utility failure or any other undesirable situations shall be examined, such as cooling water conditions at electrical power failure.
- (7) Liquid hold-up time
 - The basis of hold-up time determination
 - How has such basis been applied ?
 - The specialty of the equipment, if the equipment shall be operated in special conditions.

3.3 Potential Problem Areas

The following shall also be considered by process engineer and related discipline engineer for the HAZOP study session.

- (1) Design criteria for design conditions
 - ITB
 - Design criteria of Owner, licensor, and JGC
 - Consistency of design criteria at the tie-in points in the case of revamping project or there being a battery limit boundary with other facilities.
 - Capacity margin
 - Turn down ratio
 - Philosophy of determination of design conditions
- (2) Design criteria for flare system
- (3) Potential failures and their consequences of instrumentation
- (4) Design basis for flushing oil and slop oil system
 - Reliability of flushing oil
 - Usage of each flushing oil
- (5) Design criteria for sewer system and slop oil system
 - The destination and conditions of each fluid flowing into sewer system
 - Special consideration during start-up and shut down operation
- (6) Line class break
 - Start-up and shut down line
 - Connection points between individual units
- (7) Operation philosophy
 - Start-up and shut down
 - Catalyst loading/unloading/regeneration of reactor
 - Major rotary machinery
 - Furnaces

- (9) Chemical summary
- (10) Material safety data sheet
- (11) Rotary machinery and drivers
 - Seal type
 - Seal oil system

3.4 Process Engineer's Work After HAZOP Study Session

HAZOP worksheet and HAZOP Action Status Form shall be issued to the Client by HAZOP team and Project group respectively, immediately after HAZOP study session.

Process engineer shall take the following actions.

3.4.1 HAZOP Action Status Form

Fill in the brief description column in the HAZOP Action Status form, proposing the practical solution for the problems or clarifying the raised questions, if responsible department is process.

As to the items impacting the Project execution significantly, consult with the Project engineer as required.

3.4.2 Follow-up Official Documents

The following documents shall be revised and formally issued in accordance with the results of HAZOP Study session which have been agreed by the Client.

- (1) Process Flow Diagram
- (2) P&I Diagram(including UFD)
- (3) Design basis
- (4) Equipment data sheet (Skeleton drawing)
- (5) Material Selection Basis
- (6) Process Safeguarding Flow Sequence
(Process Flow Diagram can be used as substitute for Process Safeguarding Flow Sequence.)
- (7) Cause and Effect Chart
- (8) Flare Load Summary