

Barrier Management Using BowTie Based Readiness Reviews for Critical Task Analysis

a. Identify Task

b. BowTie based Risk Review Workshop

c. Go/No-Go Checklist

d. Complete task

Technique

BowTie diagrams are shaped in the form of a bowtie to provide a simple, visual explanation of a risk.

BowTie diagrams can be compared to the Swiss cheese accident causation model. The main hypothesis of the Swiss cheese model is that hazards can be prevented from materializing into losses (consequences) by having multi layers of protection.

BowTie based Risk Assessment is a lean, qualitative risk assessment process that helps differentiate proactive and reactive risk management. The proactive risk management (threats/prevention) is identified by the left side of the BowTie diagram and the reactive risk management (consequences/recovery) is identified by the right side of the BowTie.

Barriers are then put in place to ensure that the threats do not cause the top event, or the top event do not escalate into further undesired consequences

BowTies also help in qualitative / quantitative estimation of risk to validate the identified barrier mitigations in addition to risk governance.

Tool

A critical task analysis (CTA) is a tool used to evaluate considerable risk tasks that have the potential to cause extensive harm. Examples of critical work are, but not limited to:

- Confined space entry
- Excavations
- Work on high voltage electrical equipment
- Crane lifts near capacity of the crane
- Work on oxygen equipment
- Hot taps and re-torquing flanges on live process lines and equipment, etc.

CTAs involve multidisciplinary teams working together using a structured process to identify barriers for preventing an event or undesired outcome, as well as mitigating actions should the event or undesired outcome occur.

Since BowTies visually represents the causes, barriers, undesired primary event, mitigations, and undesired outcomes, it is the primary tool used for CTAs. BowTies help to ensure that all the activities associated with task execution (where hazards may be present or created) are executed safely using a standardized identification assessment, review, mitigation, and action tracking process.

Process

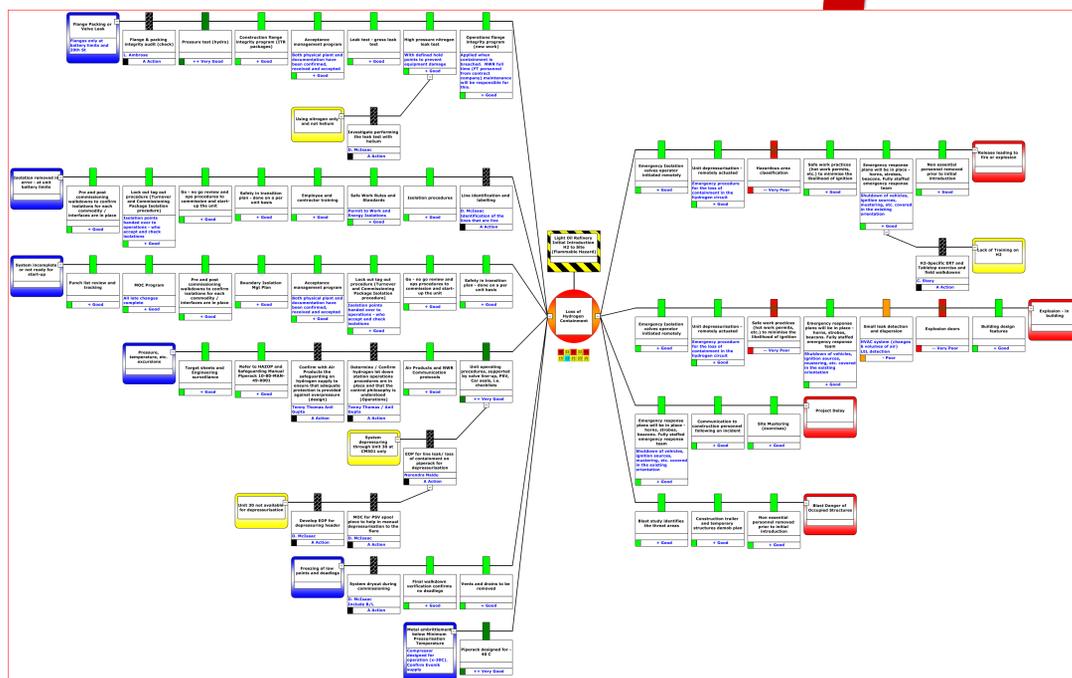
Go/No-Go is a task based readiness review (checklist) process that is used ensure that all the activities (barriers) associated with task execution (where hazards may be present or created) are executed safely as an output from the bowtie based risk assessment process.

Go/No-Go checklists are developed to identify and record a list barriers that help execute the task in a safe and controlled manner. This process usually involves:

- Identifying and prioritizing all items required to complete the task as 'A' and 'B' priority items
- "A" priority items are completed and formally signed off before task execution begins.
- "B" priority items are tracked to completion in a timely fashion
- If an item is complete, mark it as 'Go' and if an item is incomplete, mark it as 'No-Go'.

The Go/No-Go process helps to validate that the barriers identified in the Bowtie based risk assessment diagram are in place. It also provides process safety assurance that the task can be completed safely to the appropriate leadership level of approval identified from the risk.

The Go/No-Go process complements and is used in addition to the planned Pre-Start-up Safety Reviews (PSSR's).



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22	Dan Marsal	CSU Manager	NWR	dmarsal@nwrpartnership.com	

SI No	Activity to be Completed	Dept.	Name	Priority (A/B)	Go/No Go	Signature	Status / Comments
1	Site Risk Assessment completed / approved for hydrogen introduction (Bowtie)	CSU	Trevors	A	go	[Signature]	signed off and archived
2	Risk Assessment Conducted for Unit 30 Start-Up Cases (flash fire contours by Baker)	HSE	Porter	A	go	[Signature]	completed and reviewed by senior Management
3	PRC Program implemented and enforced for all construction workers	Project	Langford	A	go	[Signature]	Implemented Oct 23rd site wide
4	Temp Trailer Staging/Occupancy Managed as per Baker Risk Blast Study recommendations	CSS	Braat	A	go	[Signature]	Construction in compliance with trailer staging as specified by CSU
5	Temp trailers not located on Hydrogen Inletline ROW	CSS	Braat	A	go	[Signature]	Trailer to be removed by Friday Oct 27th
6	PSSR completed / approved for Unit 30 Start-up	CSU	Naidu	A	go	[Signature]	signed off and archived
7	PSSR completed / approved for Hydrogen Pressurization Air Products	CSU	McIsaac	A	go	[Signature]	signed off and archived
8	Plan for restricted site access during initial pressurization implemented (essential personnel only)	Project/CSU	Langford / Marsal	A	go	[Signature]	Personnel requests directed to Langford/Marsal. Project essential mancount approved currently at about 50 people
9	Temporary gas detection equipment (PZD) installed at Unit 30 boundaries and response plan implemented	Project/CSU	Miller	A	go	[Signature]	Currently being tested in field. Required for feed introduction
10	Surveillance/calibration plan in place to ensure reliability of temporary gas detection equipment	HSE	Miller	A	go	[Signature]	24/7 coverage of temp gas detection to be managed by Unit HSE reps (i.e. routine battery charge-ups)
11	Wind socks / flags installed as per safety plan	HSE	Miller	A	go	[Signature]	9 installed and 4 more to be installed today (Oct. 27)
12	Unit/Site Master locations well marked, muster plans fully ready to implement/communicated to workforce	HSE	Miller	A	go	[Signature]	All muster point signs installed as of Oct. 26. Map has been updated and is in EOC. Needs to be issued to Permit trailers (Roper), Jeff T to update Maximo
13	Pipe rack traffic closure & temporary road closure plans defined and implemented	Project/CSU	Miller	A	go	[Signature]	Confirmation with Project as a go. Notices issued

BowTie process to identify the risk and map the safe execution of the task

Go/No-Go process to validate the barriers for safe execution of the task

Safe execution of the task