QUICK REFERENCE · RISK ASSESSMENT · CQE · CSSBB · CMBB

WHICH RISK TOOL DO I NEED?

Answer the yes/no questions from the top. The colour of your answer tells you which way the tool digs.

BLUE = TOP-DOWN · OUTCOME → CAUSES | AMBER = MIDDLE-OUT · EVENT → BOTH WAYS | TEAL = BOTTOM-UP · CAUSE → EFFECTS

START HERE
HAS THE FAILURE ALREADY HAPPENED?

YES → REACTIVE LANE

find the root cause

Is it one chain of cause and effect you can follow?

YES → TOP-DOWN · REACTIVE
5-WHY
Ask "why?" until you reach a fixable cause.

NO

Could two or more causes combine? Safety-critical?

YES → TOP-DOWN · REACTIVE
FAULT TREE
Test AND / OR combinations that explain the event.

NO → TOP-DOWN · REACTIVE
FISHBONE
Brainstorm causes on the 6M bones, then verify with data.

THEN: CAPA / 8D. Fix the cause and add the failure to your FMEA so the proactive tools learn from it.

STEEL EXAMPLE: "Why did this heat fail its Charpy test?" Start with 5-Why. If chemistry *and* rolling temperature could both play a part, build a fault tree.

NO → PROACTIVE LANE

find risks before they bite

Is there one specific catastrophic event you fear?

YES → TOP-DOWN · PROACTIVE
FAULT TREE (DESIGN)
Add a **BOW-TIE** for barriers, and **HAZAN** to put numbers on it.

NO

Continuous process with flow, pressure or temperature on a P&ID?

YES → MIDDLE-OUT · PROACTIVE
HAZOP
Guide words × parameters, node by node.

NO

Food, drug or product-safety hazards that need control points?

YES → BOTTOM-UP · PROACTIVE
HACCP
Hazards by step, then critical control points.

NO

Only a layout or early concept so far?

YES → BOTTOM-UP · PROACTIVE
HAZID · PHA · SWIFT
Scan the layout (HAZID), each part (PHA), or run a "What if…?" workshop.

NO → BOTTOM-UP · PROACTIVE
FMEA / FMECA
Every failure mode of every step. Rate S, O, D.

SAFETY-CRITICAL? Do both: a bottom-up PFMEA for full coverage, plus a top-down fault tree for each catastrophic event (e.g. "pipe ruptures in service").

SIDE BY SIDE

	TOP-DOWN	BOTTOM-UP
STARTS AT	A defined bad outcome	A part, step or failure mode
LOGIC	**Deductive**: outcome → causes	**Inductive**: cause → effects
BLIND SPOT	Causes nobody put in the tree	Combination failures
PAIRS WITH	RCA, CAPA, 8D	DFMEA, PFMEA action plans

Direction ≠ timing. Top-down tools can be proactive: a design-stage fault tree runs before anything fails.

HAZOP GUIDE WORDS

guide word + parameter = deviation

NO / NONE	MORE	LESS	AS WELL AS	PART OF	REVERSE	OTHER THAN
No flow	Higher flow	Lower flow	Flow + contaminant	Part of the mix	Backflow	Wrong material

HAZID layout → HAZOP P&ID → HAZAN size it

For each deviation, ask: **causes? consequences? safeguards? action?** Steel plant fits: caster cooling water, EAF off-gas, ladle argon stirring.

WHERE THEY FIT IN ISO 31000

ISO 31000:2018, clause 6

SCOPE: Context & risk criteria → 1 · IDENTIFY: HAZID · HAZOP · SWIFT · PHA · FMEA modes → 2 · ANALYZE: HAZAN · FTA · bow-tie · FMEA S/O/D → 3 · EVALUATE: HAZAN vs criteria · risk matrix · RPN / AP → 4 · TREAT: Actions · barriers · CCPs

↺ MONITOR & REVIEW: RCA + CAPA FEED BACK INTO THE ASSESSMENT

Steps 1–3 are "risk assessment". Communication & consultation and recording & reporting run through every step. IEC 31010:2019 is the companion catalogue of these techniques. ISO 31000:2018 is current; a revision is in progress.

EXAM TIPS

CQE · CSSBB · CMBB

1. **Known failure? Top-down. Blank page? Bottom-up.**
2. **FTA** is deductive with AND / OR gates. **Event tree** is inductive.
3. **Bow-tie** = fault tree (left) + event tree (right) around one top event.
4. FMEA's weak spot is **combination failures**: pair it with FTA.
5. **HAZOP** is filed both ways in the literature; it works out from the deviation.
6. **HAZID → HAZOP → HAZAN.** HAZOP identifies, HAZAN assesses (Kletz).

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