



## HCA SCORING SYSTEM

### **PHASE 1 - 50 PTS**

**PHASE 1A** – GATHER AND ORGANIZE EVIDENCE/INFORMATION (30 PTS)

**PHASE 1B** – ANALYZE INFORMATION AND DEVELOP GREAT QUESTIONS (20 PTS)

**PHASE 1C** – QUESTIONS TO AVOID (SUBTRACT UP TO 5 PTS)

### **PHASE 2 - 40 PTS**

**PHASE 2A** – PREPARATIONS FOR CAUSAL ANALYSIS SESSIONS (5 PTS)

**PHASE 2B** – FACILITATING THE CAUSAL ANALYSIS SESSIONS (15 PTS)

**PHASE 2C** – IDENTIFYING & VALIDATING THE DEEPEST-SEATED CAUSES (10 PTS)

**PHASE 2D** – BRIEFING MANAGEMENT AND WRITE THE FINAL REPORT (10 PTS)

### **PHASE 3 - 10 PTS**

**PHASE 3** – CORRECTIVE ACTIONS TO PREVENT RECURRENCE (10 PTS)

**MINIMUM PASSING GRADE = 75 PTS**



# BLUEDRAGON HCA CHECKLIST

## PHASE 1A – GATHER AND ORGANIZE EVIDENCE/INFORMATION (25 PTS)

- (10 points)** Use the HCA guidance for Fact Findings and Critiques (with SME support) to:
  - > Develop a timeline (sequence of events).
  - > Identify applicable defenses (admin requirements and physical/cyber barriers).
  - > Brainstorm sources of performance data that can be analyzed (KPIs, reports, charts, graphs, process maps, etc.).
  - > Identify the applicable subsystems that have to interact together for a successful outcome (i.e. no event).
- (5 points)** Organize the timeline and defenses on the HCA chart. Include pictures of equipment, tools, materials, locations, etc.
- (5 points)** Make assignments to collect and analyze the additional performance data. Show the results of data analysis on the HCA chart.
- (5 points)** List the overall system you are evaluating and the subsystems that make the system work. For example:
  - > System: the conduct of site maintenance activities.
  - > Subsystems: all of the programs, processes, physical and virtual elements that combine to successfully execute maintenance activities.

Hydrofluoric (HF) Acid Significant Near-Miss

Admin      Systems Analysis      Equipment, Tools, Materials      Data Analysis, Surveys, Reports, Drawings, Charts & Graphs

**PROBLEM STATEMENT:**  
On December 24, 2019, at approximately 1105 a.m., a mechanic was injured by hydrofluoric acid while servicing a control valve on the A1 process line.

**Team Members:**  
1. Captain America  
2. Dr. Doom  
3. Iron Man  
4. Thor

**ADDITIONAL INFO:**  
HF - Hydrofluoric Acid  
CM - Corrective Maintenance  
WC - Work Control  
WP - Work Package  
LOTO - Lock-out Tag-out  
OSSE - On-Site Supervisor  
PPE - Personal Protective Equipment  
ERT - Emergency Response Team  
KPIs - Key Performance Indicators

**Systems to be Evaluated:**

- Work Control Procedure
- CM Work Procedure
- LOTO Procedure
- Control OPI Procedure
- Asset Management
- Training Procedure
- System and P&ID Document controls
- Hazardous Material Handling Procedure
- Management Observations

**Required PPE:** [Image of PPE]

**Wrenches:** [Image of wrenches]

**Valve HF-A1:** [Image of valve]

**Isolation Valve:** [Image of valve]

**Hydrofluoric Acid, aqueous**

Chemical: colorless liquid. Corrosive, causes severe burns to eyes/skin/ respiratory tract. Toxic! Pinn may not be immediate, but begins as hydrogen fluoride penetrates deep to the bone. Chronic exposure can cause irreversible bone damage.

CAF No. 7664-98-2

**DWG1:** [P&ID Diagram]

**S1:** [Photo of worker]

**P1:** [Bar Chart]

**FACT FINDING:**

**DEFENSES:**

**ANALYSIS OF DEFENSES:**

**DEFENSE THEMES:**

**SYSTEMS THEMES:**

**LINES OF INQUIRY:**

PHASE 1 - DEVELOP LINES OF INQUIRY

3



# BLUEDRAGON HCA CHECKLIST

## PHASE 1B – ANALYZE INFORMATION AND DEVELOP GREAT QUESTIONS (25 PTS)

1. (23 points total) Use the factual evidence collected on the HCA chart to look for symptoms and irregularities. Using the next 4 steps below, generate focused, evidence-based questions to pursue these symptoms, which are the manifestation of the deeper-seated causes.
  - a) (Up to 12 points) Analysis of Defenses: Compare actual performance to the standards. Develop questions to evaluate the effectiveness of each requirement/defense.
  - b) (Up to 4 points) Timeline Analysis: After we complete the Analysis of Defenses, review the timeline and develop any additional questions about irregularities, gaps or deltas in performance that were not covered by the Analysis of Defenses.
  - c) (Up to 4 points) Data Analysis: Use the results of data analysis to develop insights on performance problems within the scope of our investigation. Develop questions from those insights to pursue what is causing the poor performance.
  - d) (Up to 3 points) Systems Analysis / Themes: Step back and review the chart thus far. Identify any subsystems that have not been evaluated and gather standards and performance data for each. Include the 5 basic themes already listed on the chart. Develop questions using any of the above approaches.
2. (2 points) Copy all questions from Phase 1 and paste them into a single line on the HCA chart in Phase 2.

HydroFluoric (HF) Acid Significant Near-Miss

Admin

Systems Analysis

Equipment, Tools, Materials

Data Analysis, Surveys, Reports, Drawings, Charts & Graphs

**Incident Information**

On December 24, 2019, at approximately 1105 a 3rd Mechanic was injured by hydrofluoric acid while servicing a control valve on the A1 process line.

**Team Members:**

- Case Analysts
- Site Foreman
- Dr. Doan
- Specialist

**Analysis Evidence:**

- Hydrofluoric Acid
- Control Maintenance
- Work Controls
- Work Package
- Lock-out Tag-out
- OSDs - Ops Ops Supervisor
- PPE - Personal Protective Equipment
- EPE - Emergency Response Team
- KPIs - Key Performance Indicators

**System:** everything in place at this site to ensure that performance activities are performed without incident.

**Subsystems to Evaluate:**

- Work Control Procedure
- Stop Work Procedure
- Lockout/Tagout Procedure
- Control OPIs Procedure
- Asset Management
- Training Procedure
- System and Field Instrument Controls
- Interaction Material Handling Procedure
- PL program
- Chem protocols for hazardous chemicals
- Emergency Response
- Management Observations

Required PPE

Wrenches

Valve HF-A1

Hydrofluoric Acid, aqueous

Clear, colorless liquid. Corrosive, causes severe burns to respiratory respiratory tract. Toxic! Pain may not be immediate, but begins as hydrogen fluoride penetrates deep to the bone. Chronic exposure can cause irreparable bone damage.

CAS No. 7664-39-2



# BLUEDRAGON HCA CHECKLIST

## PHASE 1C – QUESTIONS TO AVOID (- 5 PTS)

3. *(Subtract up to 5 points)* Check that your questions are focused on the facts and the evidence and avoid the following types, which can lead to a negative outcome.
  - > **CURIOSITY** - Don't ask questions that are not focused on symptoms
  - > **WHO** - Never come across like we are looking for someone to blame
  - > **KNOWLEDGE** - Don't ask questions that we should already know the answers to (perjury trap) - do your research
  - > **ACCUSATORY** - Don't use accusatory language or sound like we're presuming guilt
  - > **LEADING THE WITNESS** - Don't ask questions that validate the answers we want (our own biases)



## PHASE 2A – PREPARATIONS FOR CAUSAL ANALYSIS SESSIONS (5 PTS)

1. *(1 point)* Establish a neutral meeting place for all your sessions.
2. *(2 points)* Create a list of affected organizations and stakeholders to meet with, who are able to answer the questions.
3. *(2 points)* Start the sessions with those closest to the work and work your way up the management chain.
4. *(Subtract 5 points)* No management or regulators are allowed to be in the room during the sessions with the workers. (to avoid the Hawthorne Effect).



# BLUEDRAGON HCA CHECKLIST

## PHASE 2B – FACILITATING THE CAUSAL ANALYSIS SESSIONS (15 PTS)

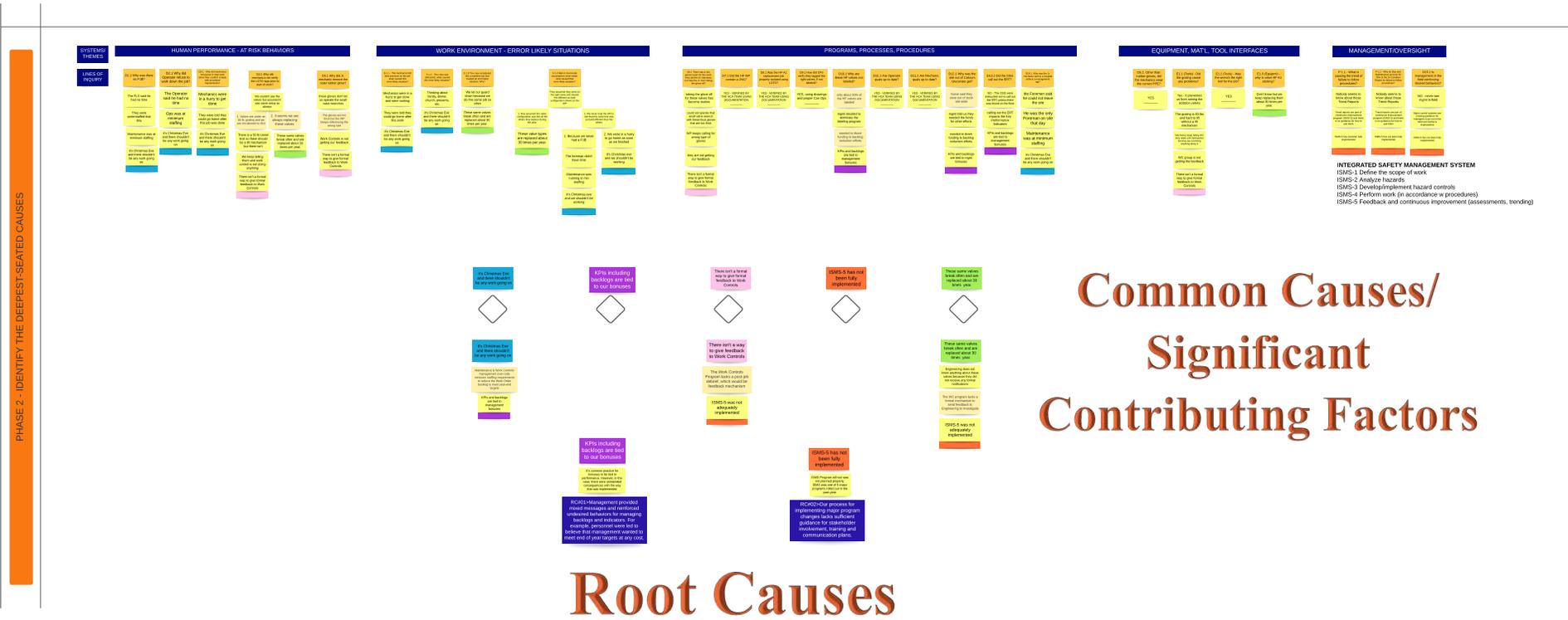
1. (2 points) Explain the HCA process to every group that comes in. Focus on key attributes of HCA:
  - > Neutral, unbiased, transparent approach that seeks causes, not who to blame
  - > Factual, evidence-based questions that come from performance data and reference standards
  - > Wholistic cause & effect analysis that uses both qualitative (human behavioral factors) and quantitative approaches
2. (2 points) Select a line of inquiry question and begin a dialogue. “Frame” each question by providing context as follows:
  - > Reference the standard (regulation or requirement)
  - > Reference applicable evidence from the timeline or other data on the chart
  - > Pose the question in narrative form (help us understand)
3. (2 points) Continue with each line of inquiry using Socratic follow-up questions.
  - > The most basic approach is to put a “why” in front of the previous answer.
  - > We can keep the dialogue going in the right direction by simply asking:
    - And why is that?
    - Can you elaborate some more?
    - Why would you say this is happening?
  - > Refer to the handout on Socratic follow-up questions for more information.
4. (2 points) The answers on the chart must be validated with the group in session.
  - > Paraphrase what you heard from the group and ask if that’s correct. If they affirm that you heard them correctly, they just validated what you are writing on the chart.
  - > The statement that you paraphrase is the statement that should be captured by the scribes.
5. (2 points) The current HCA chart must be validated as each new group first enters a session. Ask them to review the board and point out anything they disagree with.
6. (5 points) The final session to be scheduled must be with the group of senior managers representing all affected organizations.



# BLUEDRAGON HCA CHECKLIST

## PHASE 2C – IDENTIFYING & VALIDATING THE DEEPEST-SEATED CAUSES (10 PTS)

- (5 points)** Look for common causes and significant contributing factors (which could be one and the same). Common causes indicate that these causal factors are the drivers of many cause and effect sequences.
- (5 points)** Determine and validate whether the deepest-seated causes are root causes.
  - > The demonstrable rigor on the HCA chart is commensurate with the significance of the event.
  - > They are at the end of all of the cause and effect sequences at the bottom of the HCA chart.
  - > True root causes are the source of many problems, not just the single event being investigated. (Addressing “single event” root causes will not stop recurring events).
  - > Because true root causes are the source of many problems, Extent of Cause Reviews will be required.
  - > If we address the root causes and significant contributing factors on the HCA chart, there will be a high likelihood\* of preventing recurrence. (\*Because of the human interfaces, there is no 100% guarantee).





## PHASE 2D – BRIEFING MANAGEMENT AND WRITE THE FINAL REPORT (10 PTS)

### 1. (5 points) Guidelines for briefing management.

- > No surprises! Ensure that the managers of the affected organizations, particularly those that are likely to own the root causes and contributing factors, have had the opportunity to “sit in the chair” and participate in the cause & effect analysis.
- > Prior to the Exit Briefing, anticipate some of the questions that the executives may pose to the HCA Team or the Managers, so that they can think about their responses in advance.
- > Walk-down the chart and explain the HCA process prior to the start
- > Start with a summary of participating organizations, the systems and defenses that were evaluated, and the high-level results.
- > Trace cause & effect pathways from the root causes to the symptoms
- > Always end with a dismount: “and that’s how the event happened”
- > Use language executives understand: the impact of not solving these causal factors on RISK, COST, SCHEDULE

### 2. (5 points) Guidelines for writing the final report.

- > Write a section for each root cause and use the causal factors that lead up to them as supporting information.
- > Follow the cause & effect pathways from the root causes up to the symptoms.
- > Bulletize supporting information. You do not need to use all of the examples if there are a great many lines of inquiry leading to common causes.
- > Write a paragraph with supporting bullets for the common causes and significant contributing factors.
- > Create a final paragraph that summarizes how that deepest-seated cause resulted in a sequence of events that bypassed current defenses and resulted in the event, citing some of the symptoms that were the manifestation of that root cause.
- > Create a separate section for Opportunities for Improvement (OFIs).
- > Use addendums for timelines, references, personnel contacted, team biographies, etc.
- > Incorporate sentences that speak to the impact of the root causes on risk, cost and schedule when possible.





# BLUEDRAGON HCA CHECKLIST

## PHASE 3 – CORRECTIVE ACTIONS TO PREVENT RECURRENCE (10 PTS)

1. (5 points) Work with SMES from affected organizations to develop the corrective action recommendations on the chart.
  - > Effective corrective actions that prevent recurrence are SMART (Specific, Measurable, Actionable, Realistic, Timely).
  - > Focus on non-administrative controls (i.e. avoid the excessive use of signs, “reinforcing” or “clarifying” expectations, “reviewing” or “evaluating” options, and training, memos, procedure changes and briefings and other admin controls that have a very short half-life).
  - > Recommend Extent of the Cause Reviews - to address the extent of the root causes and significant contributing factors.
  - > Cost Considerations – with SME input, take into consideration the affected organization’s budget constraints.
2. (2 points) Use the Hierarchy of Hazard Controls as a guide for the most effective types of corrective actions. Color code your corrective action post-its using the same colors as the chart.
  - > Elimination, Substitution, Isolation, Engineering Controls, Administrative Controls, Personal Protective Equipment
3. (2 points) Use the “Preventive” Mistake Proofing guidelines from Lean as a guide for the most effective types of corrective actions:
  - > Eliminate or remove the risk/problem altogether.
  - > Make it hard or impossible to make an error (fail-safe).
  - > Make it possible to reverse the error.
  - > Make the process pause or stop when there is an error.
4. (1 point) Go through the chart and identify additional deficiencies that should be addressed at a lower priority.

