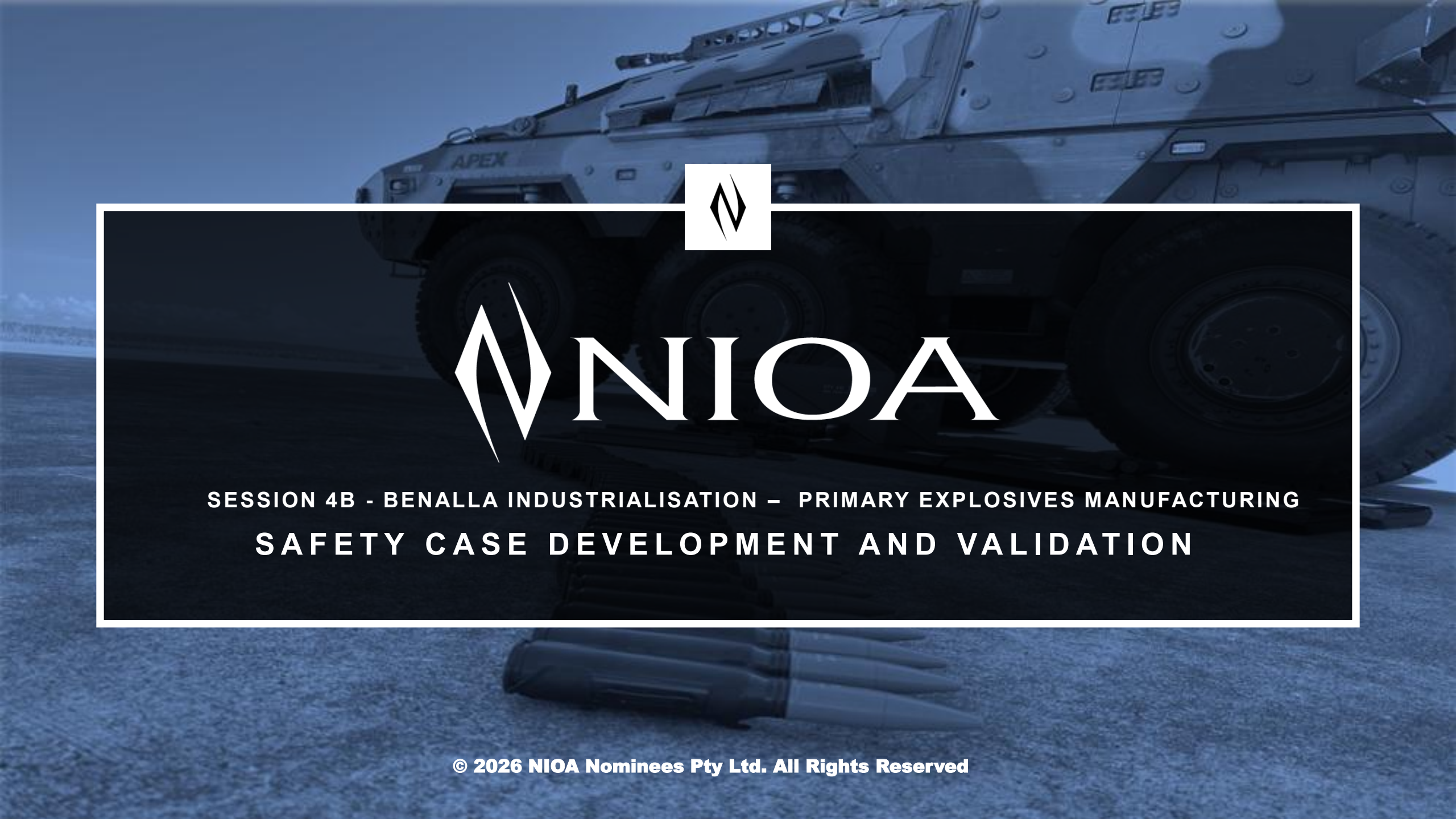


NIOA

SESSION 4B - BENALLA INDUSTRIALISATION – PRIMARY EXPLOSIVES MANUFACTURING

SAFETY CASE DEVELOPMENT AND VALIDATION

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PRESENTERS / AUTHORS

Sam Brugliera

Department of Defence

- **Proof & Experimental Organisation** (now JPEU).
- **Land Engineering Agency**
- **CASG-LSD-SPOs (GBADR, ARMT & CS)**

Defence Industry

- **BAE System**
- **Elbit System**
- **NIOA**

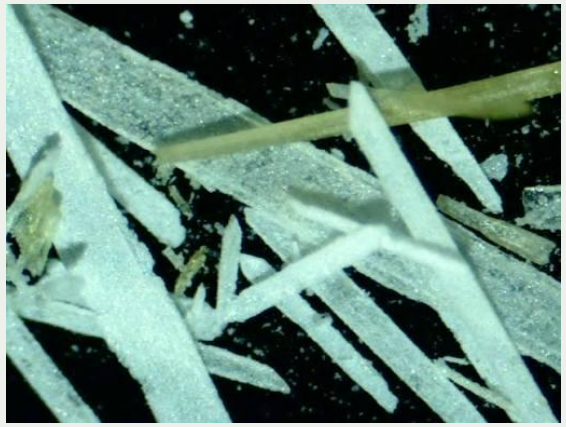




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INTRODUCTION

Making the argument that the
facility encompassing plant, process and people
has reached an acceptable maturity and level
which will enable the safe production of
Primary Explosives.





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SYSTEMS SAFETY

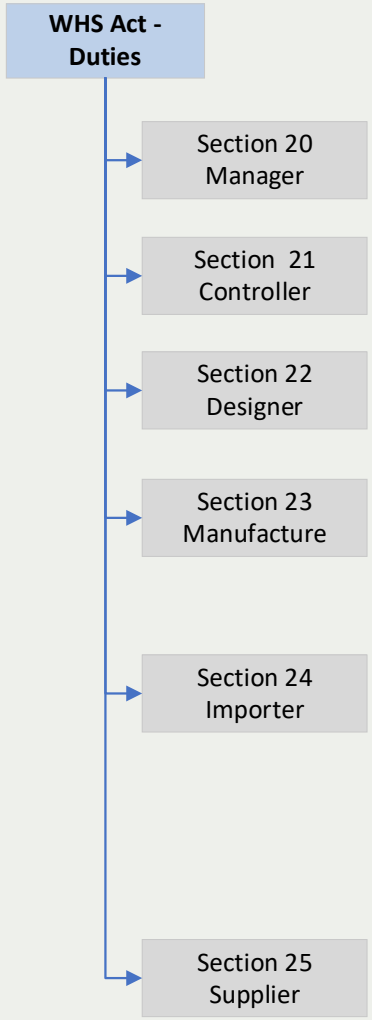
1. Application of System Safety Process
    a. Grassroots Hazard identification.
    b. Hazard Analysis.
    c. Hazard Mitigation.
    d. Safety Verification.



2. Application of Proportional Safety.
    a. The Goldilocks effect:
        - **Too Small** – An under emphasis on safety. Not enough time, effort & resources
        - **Too Much** – Overindulgence on safety. Safety for safety sakes.
        - **Just Right** – An equilibrium balance is achieved between safety and practicality

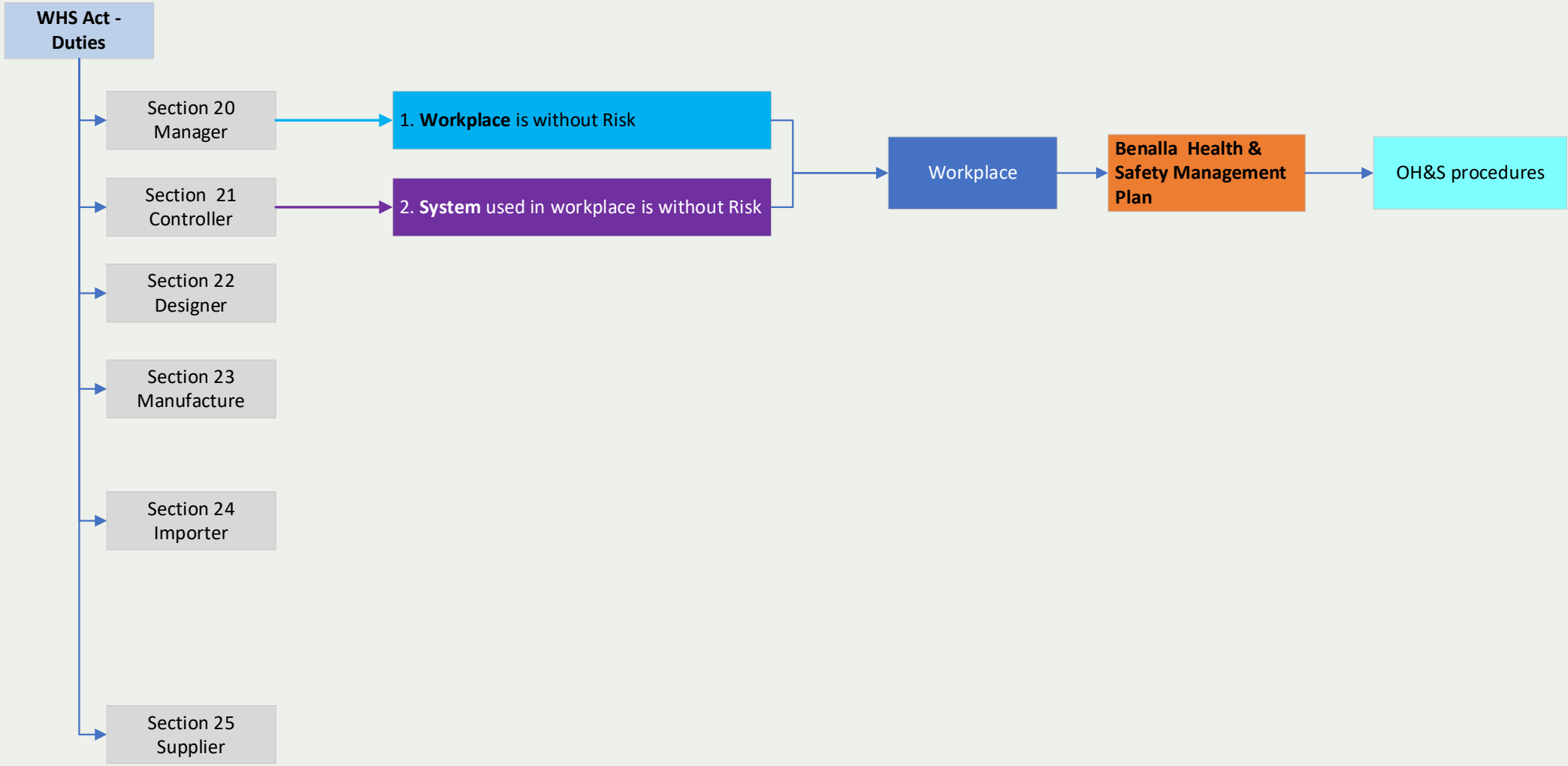
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SAFETY PROCESS



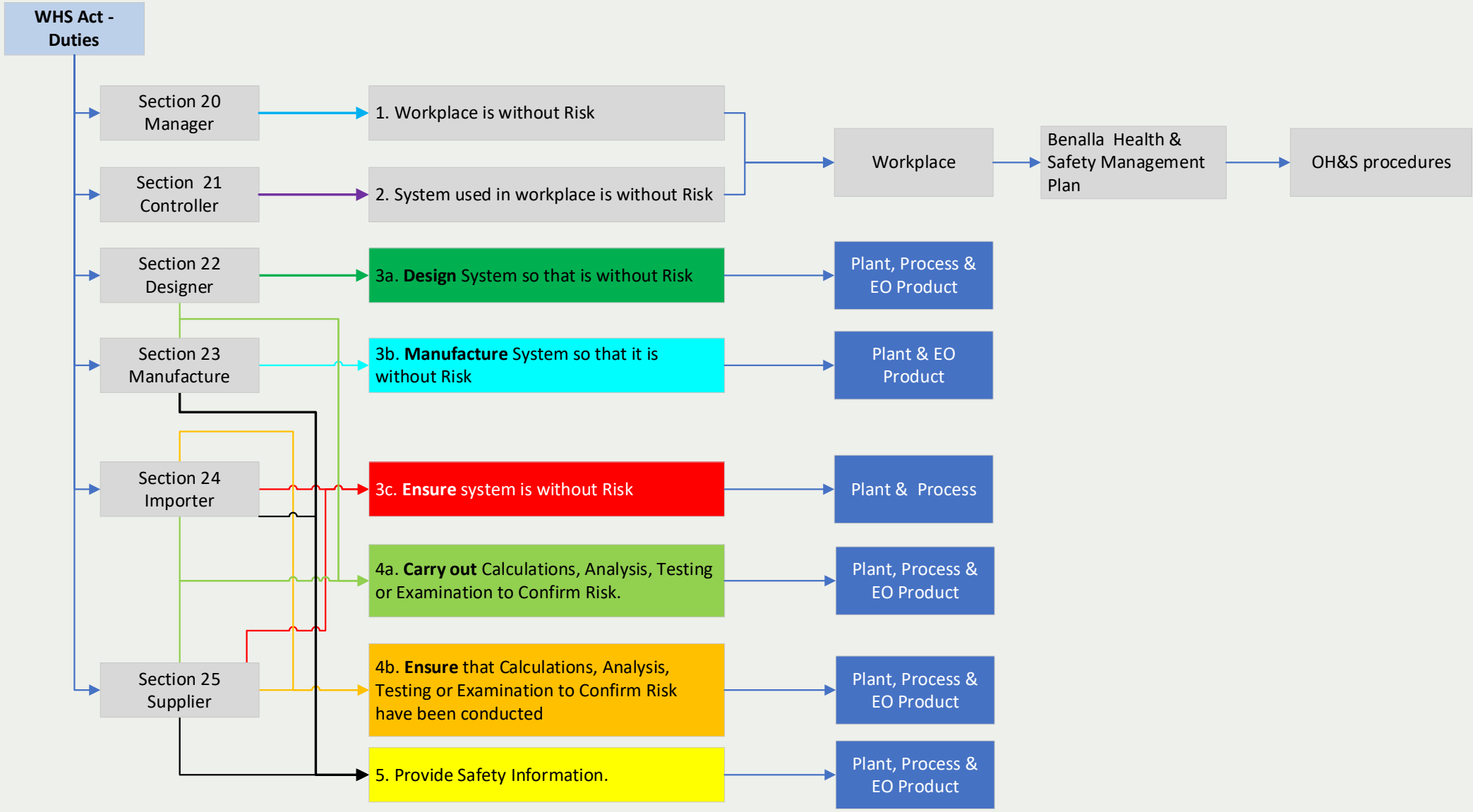
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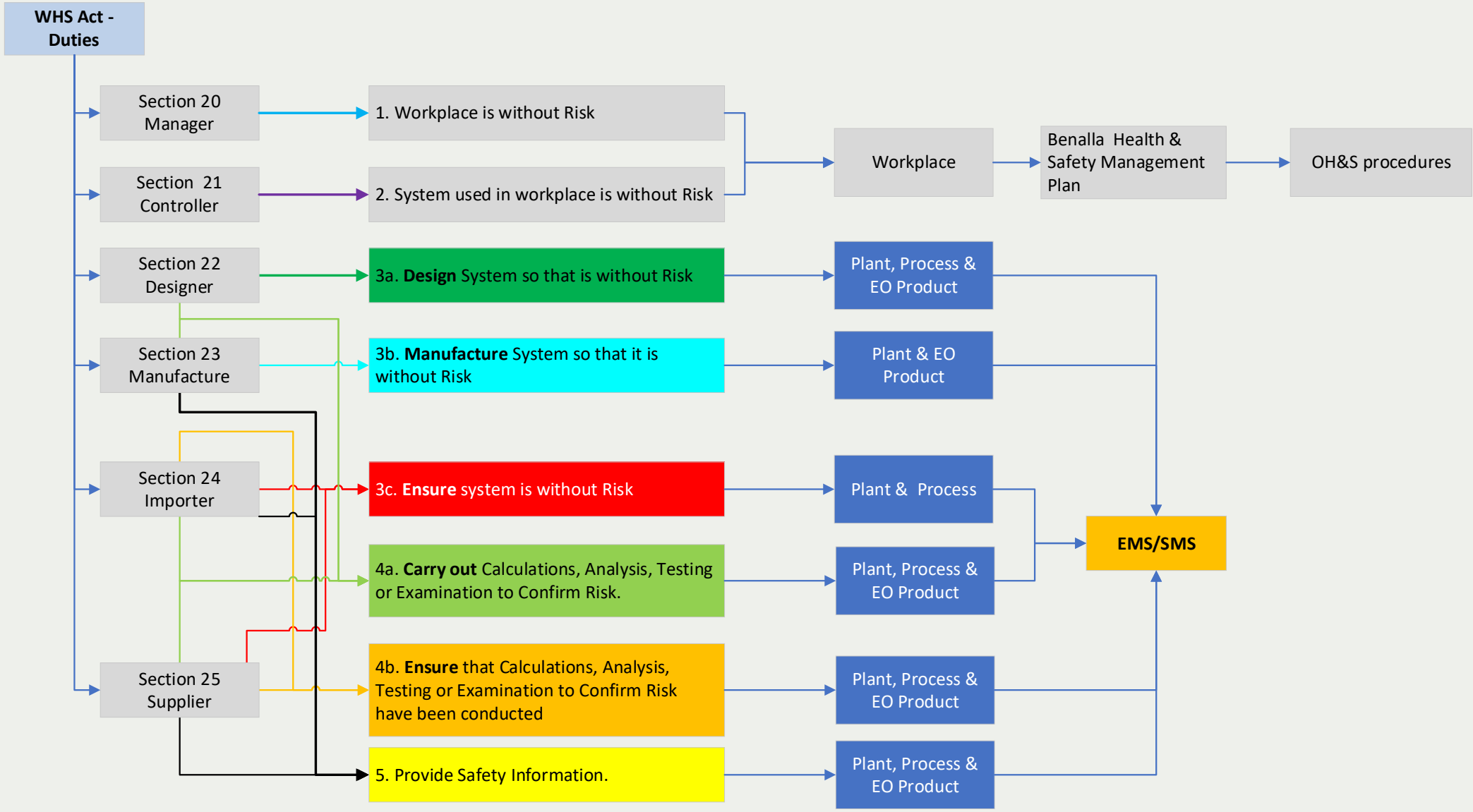
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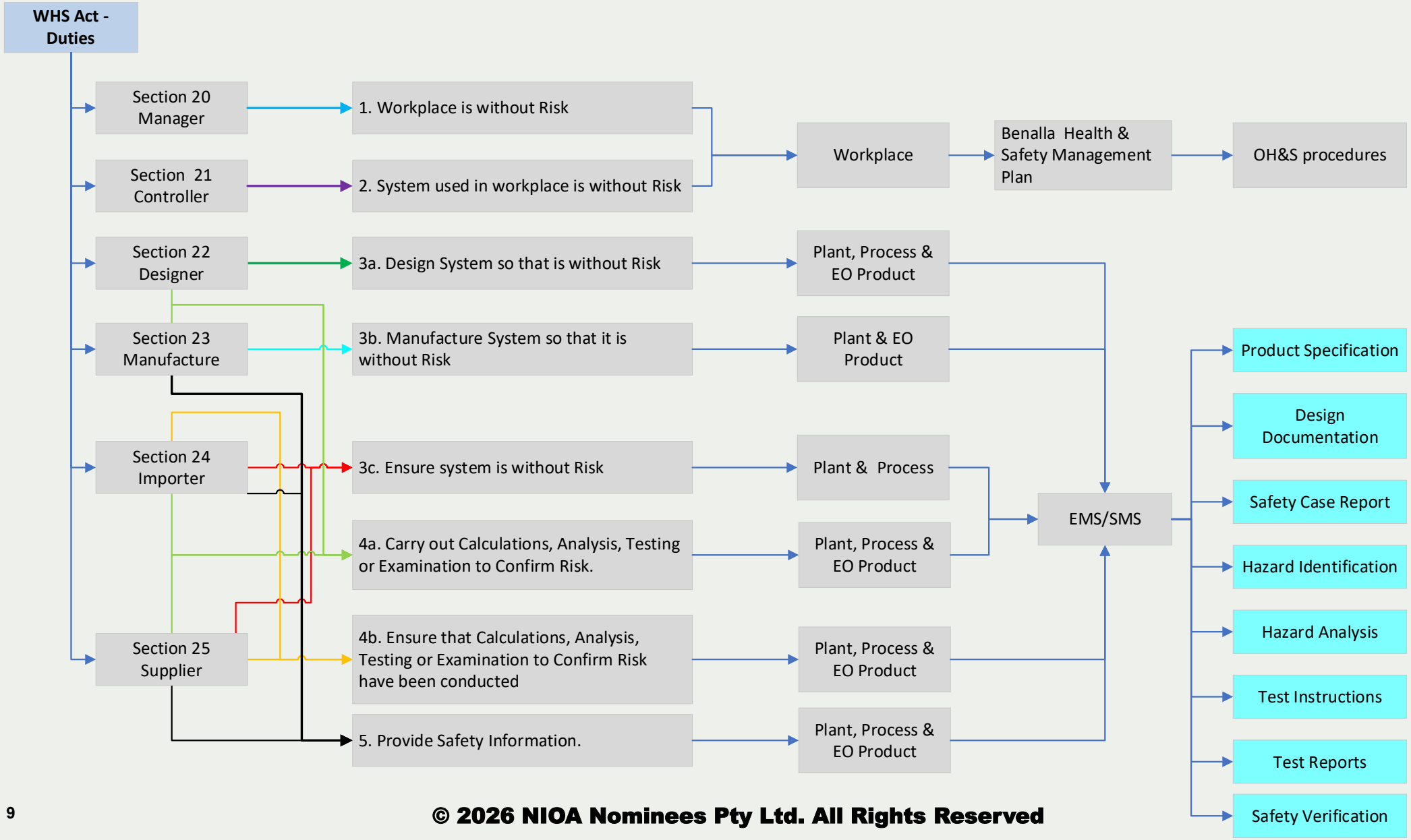
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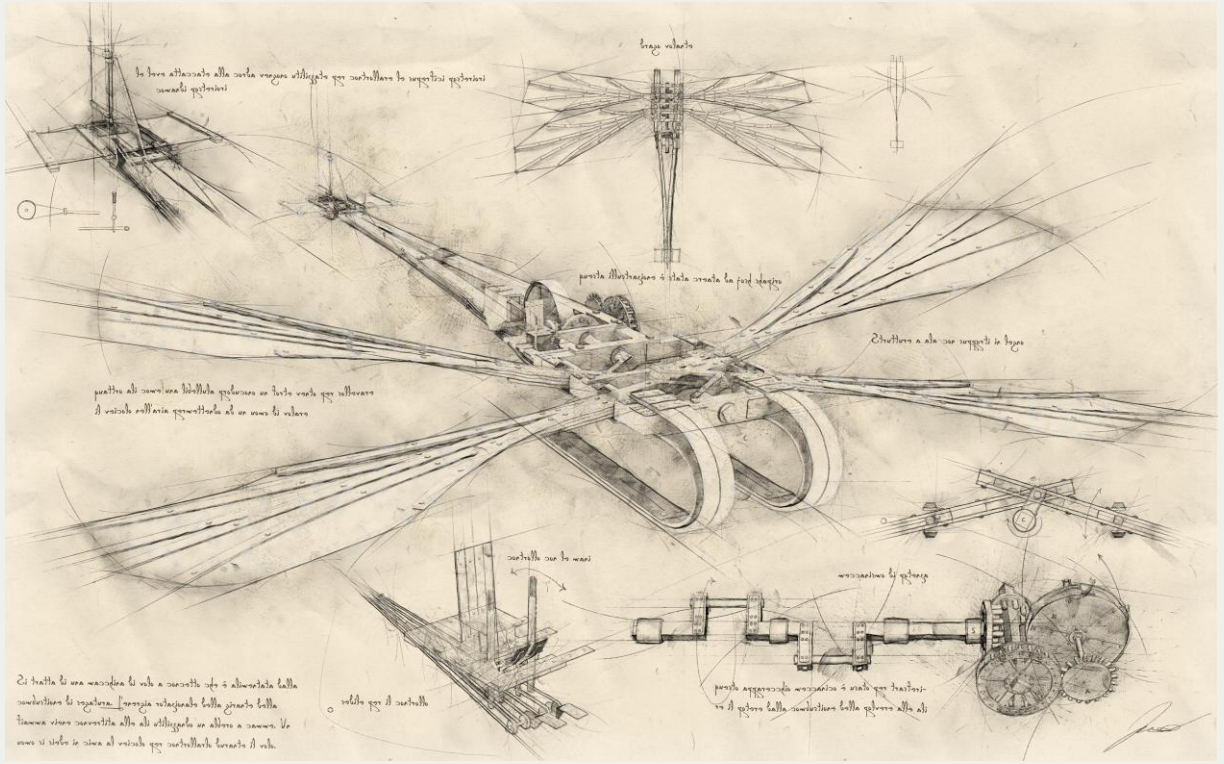
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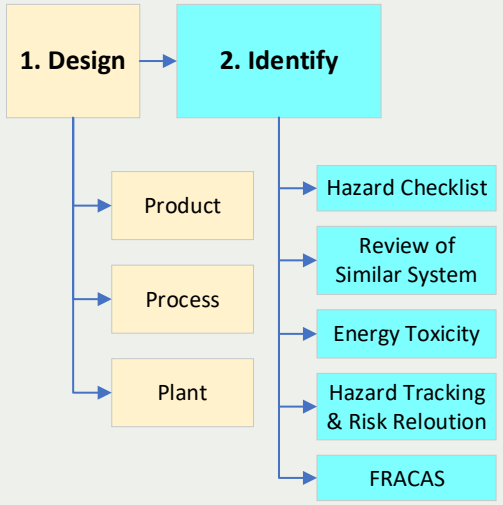
SAFETY PROCESS

1. Design
   - Product
   - Process
   - Plant



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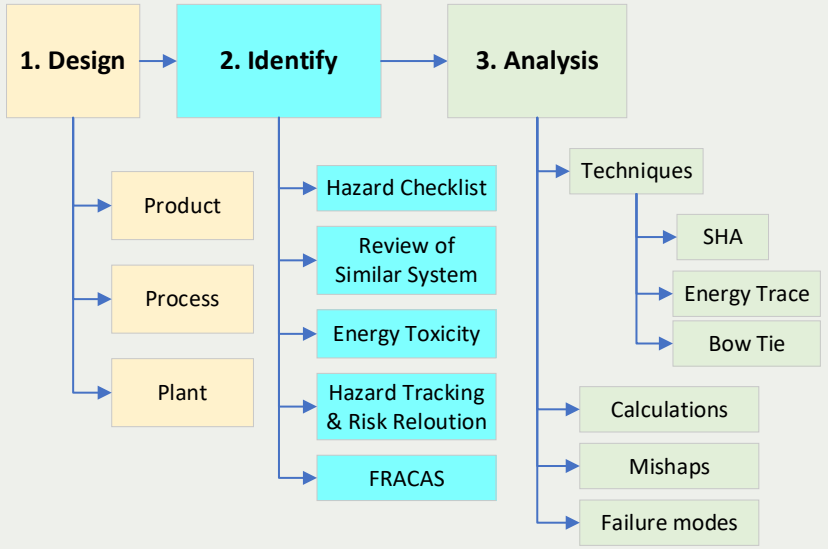
SAFETY PROCESS





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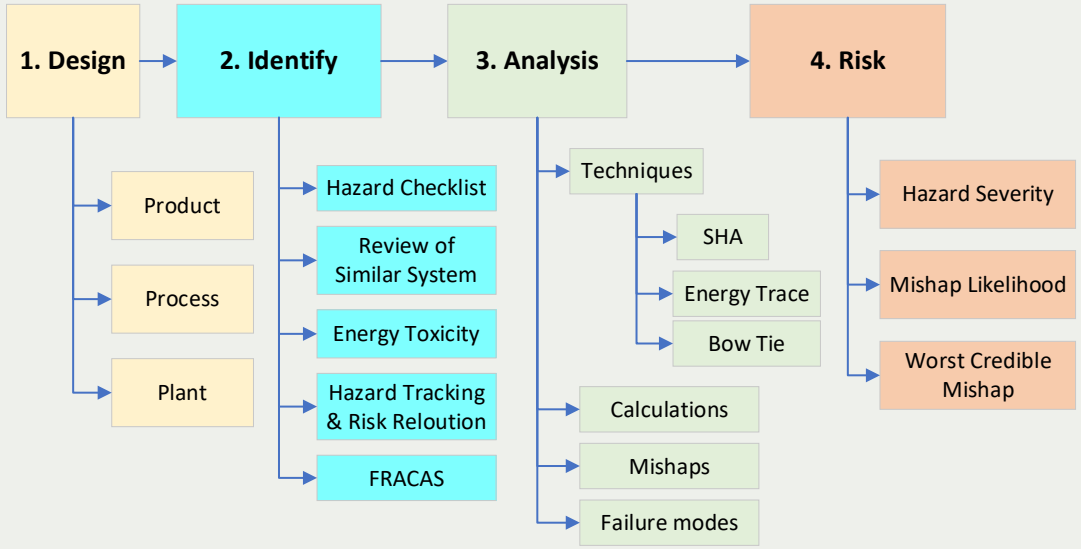
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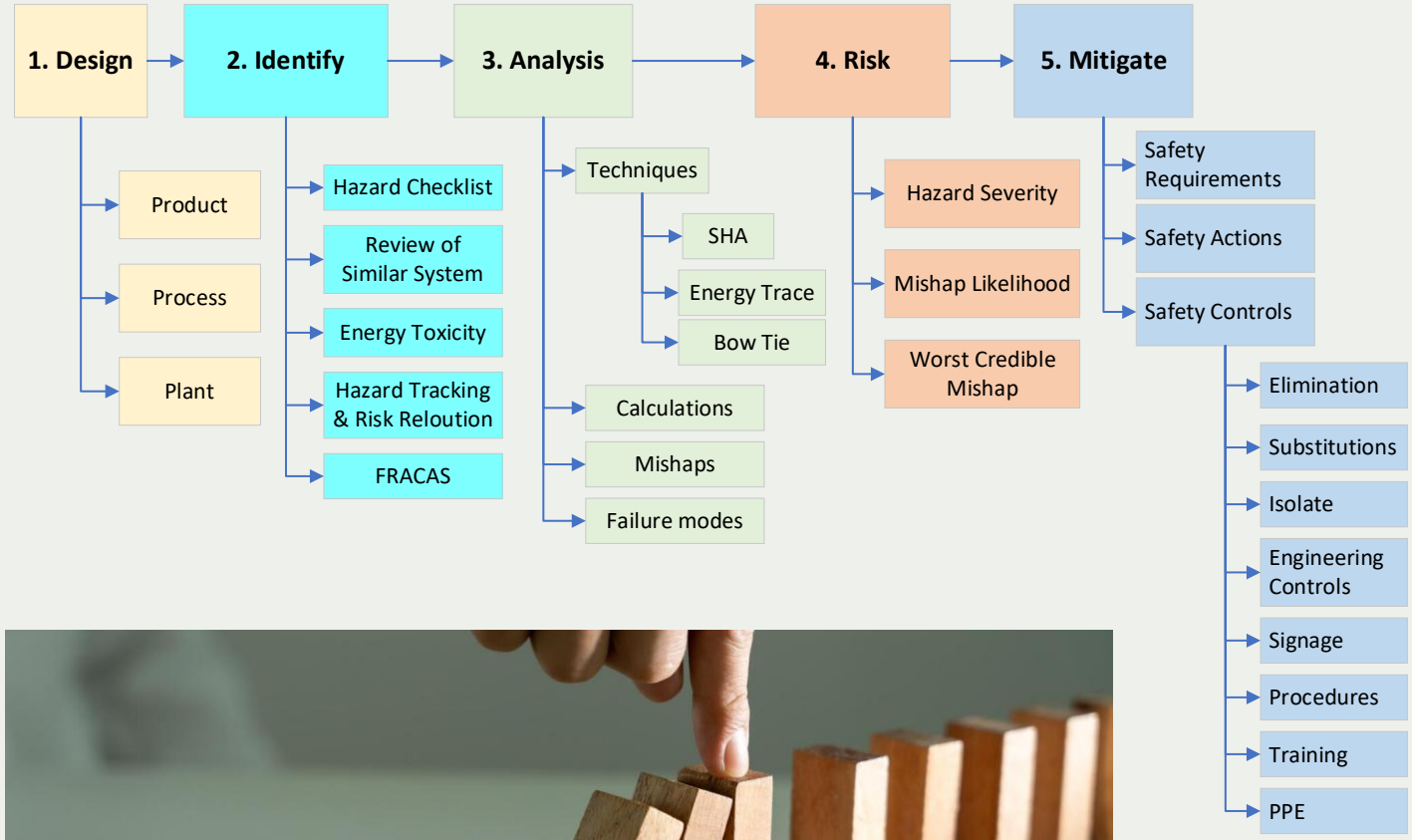
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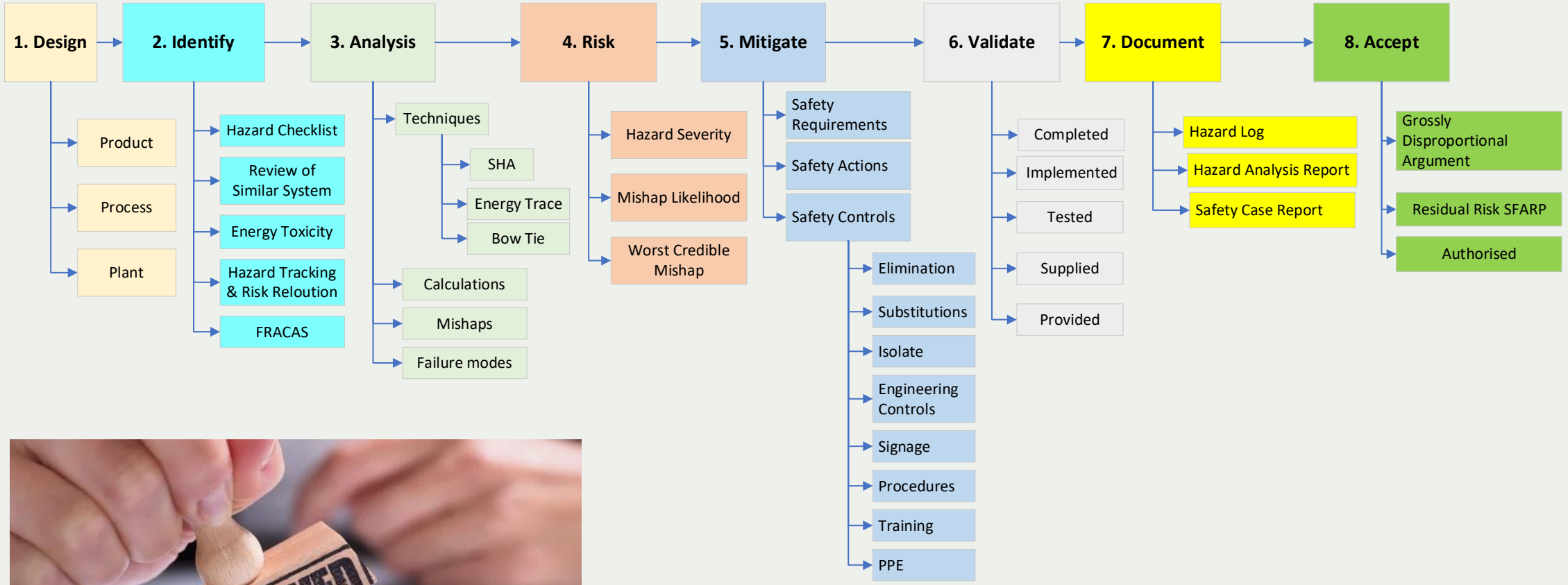
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SAFETY PROCESS





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FOOTSCRAY/MARIBYNONG





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BENALLA FACILITY





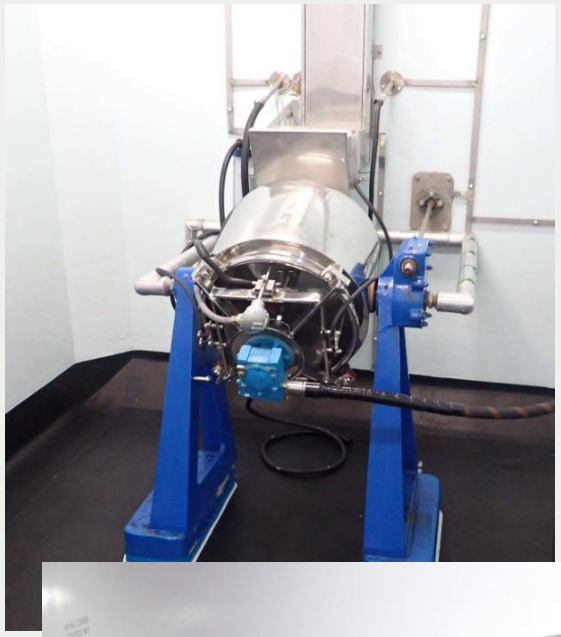
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D01 BUILDING







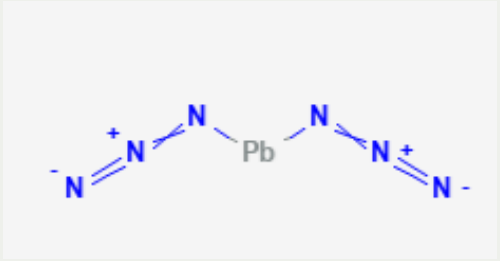


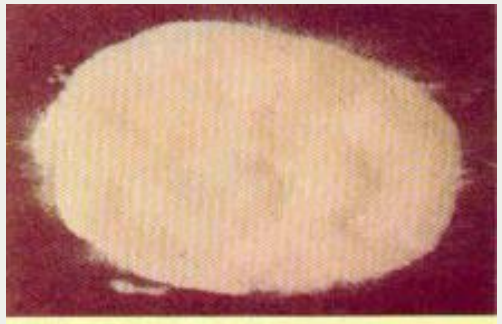


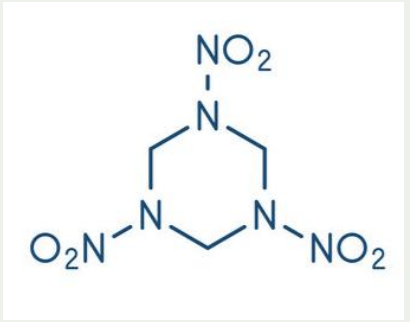
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PRIMARY EXPLOSIVES

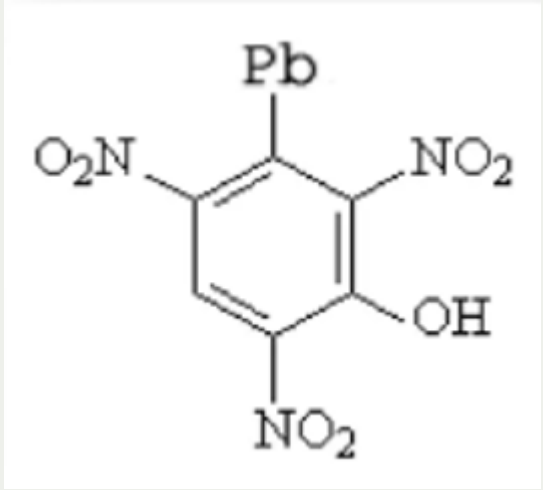
1. RD1347
2. Lead Styphnate.
3. Dextrinated Lead Azide







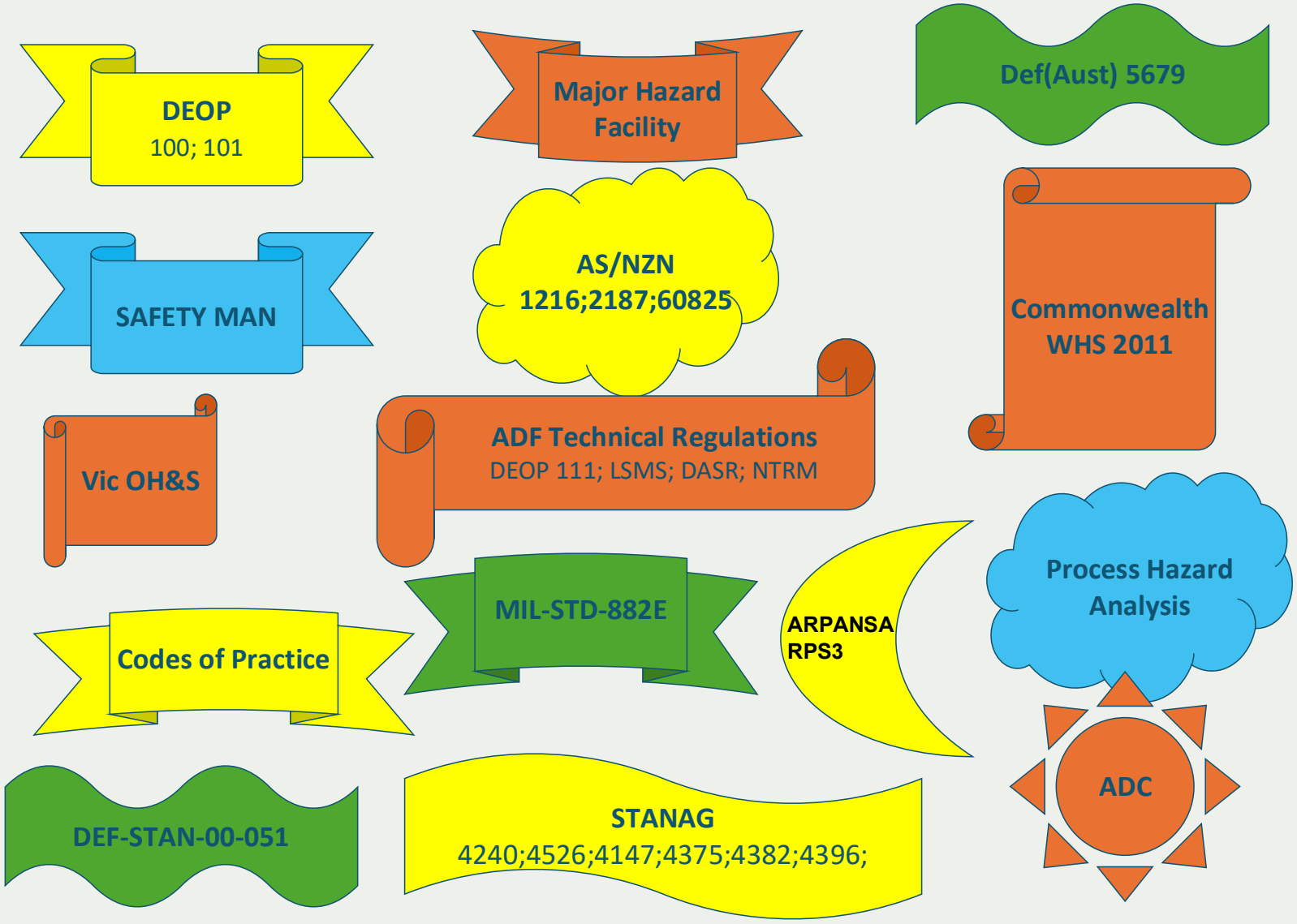






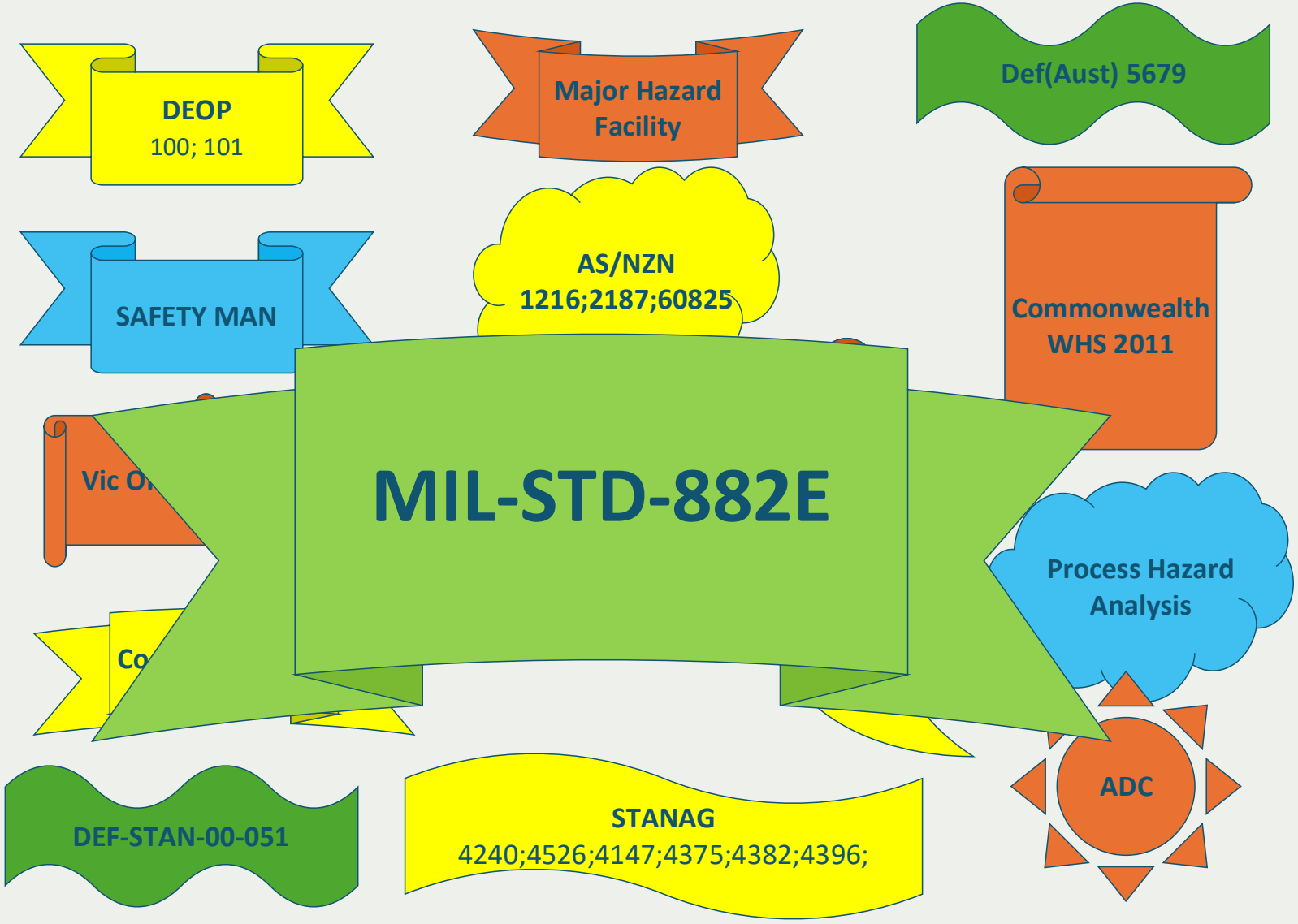
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SAFETY STANDARDS



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SAFETY STANDARDS



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HAZARD IDENTIFICATION







Knowing the Unknown





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HAZARD IDENTIFICATION

Constricted by the KABOOM Mishap

- Accentuating discipline expertise while marginalising our knowledge impartiality.









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HAZARD IDENTIFICATION

How we did it:

- Tailored Hazard Checklist
- Hazard Identification Workshop.
- Systematic Hazard Identification
- Compartmental Analysis => Bay by Bay
- Definition: “Hazard” vs “Failure” vs “Cause” vs “Risk” vs “Mishap”

NOT A RISK IDENTIFICATION EXERCISE

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HAZARD ANALYSIS

For each identified hazard, the following process was applied:

1. Manufacturing Process (i.e. RD1347, DLA, & Lead Styphnate).
2. Failure Analysis.
3. Degradation of System.
4. Impact of Human Error.
5. Safety Requirements.
6. Safety Controls.
7. Safey Actions.
8. System Design Changes
9. Mishap Assessment.
10. Severity Assessment
11. Likelihood Assessment
12. Risk Assessment.

No Harm = No Hazard

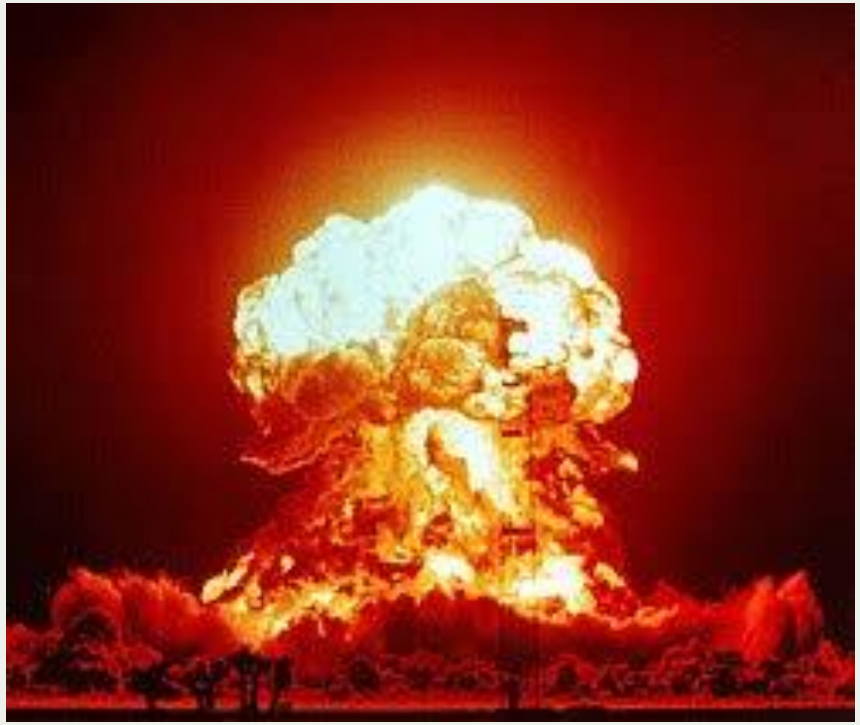
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HAZARD ANALYSIS

The Hazard/s directly associated with Manufacture of Primary Explosives.

KABOOM MISHAP

1. Drops and Mishandling.
2. Electrical.
3. Electromagnetic Radiation.
4. EMI.
5. ESD.
6. FOD.
7. Frication, Impact, Spark and Heat.
8. Improper Mix, Faulty Ingredients.
9. Interlock Failure.
10. Loss of Control of Manufacturing Process.
11. Slip, Trips and Bumps.



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HAZARD ANALYSIS

Rotating Machinery

- Number of mixers
- Remotely operated.
- No guarding.
- One mouse click function on the controls system to activate mixer







Toxic Materials

- Input Chemicals.
- Spill, Splash, Drop or release.
- Sieving causes Toxic Dust to be present
- Inadvertent synthesisation of chemicals - >Hydrazoic Acid.
- Failure of control system

WHS Regulated hazards

- Assessment of all regulated hazards for the existence.
- Asbestos, Confined Spaces, Electrical Safety, Falls, Lead Processing Hazard, Hazardous Manual Tasks , & Noise

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MITIGATING HAZARDS

1. **The What**
    1. Reduce Risk
    2. Lower Likelihood of Mishap
    3. Limit the Severity of Mishap

2. **The How**
    1. Safety Controls
    2. Safety Actions
    3. System Safety Requirements



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SAFETY CONTROLS

Safety Controls (in total about 160 identified)

1. Ventilation System, HVAC and Humidity Control.
2. Procedures.
3. Training.
4. Labels & Signage.
5. Permit-to-Work.
6. Explosive Limits & Personnel Limits in Bays
7. Infrastructure (Remote Processing, Transfer Windows, Structural strength, Destruction pits)
8. Tag out procedure
9. Quantity Limits
10. Rubber Pots & Carriage Height limit.
11. PPE
12. Manual Emergency Stops
13. Spill kits







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SAFETY ACTIONS

Safety Actions (in total about 20 identified)

1. Further investigation and analysis of hazards.
2. Requirements for testing to substantiate hazard (e.g. SPL).
3. Design Changes to facility.
4. Maintenance actions



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SYSTEM SAFETY REQUIREMENTS

System Safety Requirements

This was restricted to Safey Critical requirements that need to be re-certified

1. HVAC System.
2. Conductive flooring.
3. Humidity Control.
4. Earthing and/or bonding.
5. Hazardous Area Personnel Test Meter.
6. Anti-static or Conductive materials.
7. Tank lids.
8. Extraction Venting



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SAFETY VERIFICATION

- Inert Commissioning
- Review of Training material & Register
- Audits – Walk around.
- Periodic testing of Electrical Equipment
- Review of Action register with production team

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SAFETY ARGUMENT

Safety Argument is based on:

1. Adequate hazard identification has been conducted for the activity.
2. The identified hazards have been assessed and analysed.
3. Regulated hazards have been explicitly addressed
4. Safety Verification has been conducted.
5. Outstanding Safety Actions, Controls and Failed/Non tested system safety requirements have bene communicated.
6. Temporary work arounds have been identified and implemented
7. Key Risk have been highlighted to management.
8. The above has been reviewed by the NIOA Explosives Safety Board.
9. The risk of conducting the activity has been formally accepted by management

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CONCLUSIONS

When to Stop



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THANK YOU

Thank-you for attending today's session!

Other NIOA Presentations (Thu, 26 Nov)

Title	Presenters	Session Details/Presentation Time
NIOA Benalla Industrialisation: Environment test facility capability	Mr. Sam Brennan	Session 8C – S3 / Test Evaluation **Thursday,** Nov 26, 2026 1:20 PM – 2:50 PM Menzies Theatre [Presentation Time **1:50 PM – 2:20 PM**]

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