Technical Presentation

Dealing with Confined Spaces

Winery Engineering Association Ltd

Conference & Exhibition 2009

Nuriootpa South Australia

GETEX

Presenter

- Anthony Camus BE (Chem)(Hons)
  Co-founder & Director of GETEX
- GETEX:
  - Privately owned Australian company
  - OHS & environmental testing & consulting
  - OHS assessment & management systems
  - Waste & hazardous materials management
  - Air, water & soil contamination
  - Workplace training

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Presentation Outline

1. Legislation, Standard, Codes of Practice & guides
2. Confined space definition
3. Typical winery confined spaces
4. Duties of manufacturers, suppliers & modifiers

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Presentation Outline

5. Safe working in Confined Spaces
    a. Hazard identification & risk assessment
    b. Risk control measures
    a. Entry procedures
    b. Training
    c. Record keeping

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Presentation Outline

6. Case Studies

7. Summary

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State Legislation

- SA:
  OHS & Welfare Regulations 1995 (Division 2.4)
- WA:
  OSH Regulation 1996 (Division 8)
- NSW:
  OHS Regulation 2001 (Part 4.3, Division 9)
- VIC:
  OHS Regulations 2007 (Part 3.4)

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Australian Standard & Codes of Practice

- **AS/NZS 2865:2001 – Safe Working in a Confined Space**
- WA Wine Industry OSH Code of Practice 2002
- NSW Wine Industry Code of Practice for Workplace Health & Safety (under review)
- WorkSafe VIC Compliance Code Confined Spaces

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Guides

- WorkSafe SA Guidance Sheet
  GS38 Working in Confined Spaces
- Department of Commerce WA – Wine Industry Facts Sheet
- WorkSafe VIC – Your Health & Safety Guide to Confined Spaces
- WorkSafe Vic Info Sheet
  Confined Spaces on Farms

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Best Practice

Compliance hierarchy:

1. Applicable Legislation (mandatory)

1. Codes of Practice

1. Australian Standard AS/NZS 2865:2001

   Essentially covers major requirements of Legislation, Codes of Practice & Guidelines

4. Guidelines

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Confined Space Definition

- AS/NZS 2865:2000

An enclosed or partially enclosed space that is at atmospheric pressure during occupancy & is not intended or designed primarily as a place of work, and:

(a) Is liable at any time to:

(i) Have an atmosphere which contains potentially harmful levels of contaminants;

(ii) Have an oxygen deficiency or excess; or

(iii) Cause engulfment; and

(b) Could have restricted means for entry & exit.

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Confined Space Definition

Some subtle differences in definition between AS/NZS & State Legislation:

- SA & NSW: essentially same as AS/NZS
- WA & VIC: must have restricted entry/exit

i.e. definition more limiting

However practically all confined

in the winery have

r entry/exit to some

e

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Typical Confined Spaces

- Fermentation tanks
- Storage tanks & vats
- Presses
- Open top spaces: pits, wells, trenches, sumps, open fermentation vessels

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Manufactures, Suppliers & Modifiers

Duties

- Manufacturers & Suppliers:
  - Eliminate need for entry if possible; else
    (WA, SA & VIC OHS Regulations)
  - Ensure safe entry/exit
    (WA & SA OHS Regulations)
- Modifiers:
  - Modifications must not increase OHS risk
    (WA OHS Regulations)

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Working in Confined Spaces

Hazard Identification & Risk Assessment

- Must be in writing (e.g. SWMS, JSA)
- Done by work team:
  - Trained in confined space work & AS/NZS Standard
  - Competent in tasks to be undertaken
  - Have knowledge of the space/process
- Regularly reviewed & revised for changes in conditions or work

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Hazard Identification & Risk Assessment

Must include:

- Hazards & nature of confined space
- Detail work required & need to enter
- Range of possible work methods
- *Hazards & risks for <u>each stage</u> of selected work method*
- Emergency procedures
- Required competency of workers

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Hazard Identification

Atmospheric:

1. *Oxygen Deficiency* ***(<19.5%)***

   via oxygen consumption or asphyxiant gases

   - Consumption: fermentation, organic breakdown, welding, metal corrosion
   - Asphyxiant gases:
     - Carbon dioxide (fermentation: produces approx 40X volume of must, organic breakdown, antioxidant)
     - Nitrogen (antioxidant)
     - Methane (organic breakdown)

Examples: Fermentation vessels, storage tanks/vats, metal tanks/vessels, presses, composting/waste compounds

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Hazard Identification

Atmospheric:

2. *Oxygen Rich* ***(>23.5%)***

- Increases risk of fire or explosion
- Can be caused by: oxygen injection systems, oxygen system leakage, oxygen producing chemicals e.g. Hydrogen Peroxide

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Hazard Identification

Atmospheric:

3. Toxic Gases

- Carbon monoxide ***(>30ppm)***

  combustion engines e.g. forklifts & generators; welding; organic breakdown

- Hydrogen sulphide ***(>10ppm)***

  anaerobic microbial activity

- Welding fumes, refrigerants (e.g. ammonia), cleaning products, coating materials

Examples: spaces/vessels near combustion engines, fermentation vessels, tanks/vats, composting/waste compounds

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Hazard Identification

Atmospheric:

4. Flammable Gases/Liquids ***(>5% LEL)***

- Methane (organic breakdown)
- Welding gases
- Spirits
- Cleaning products, coating materials

Examples: Fermentation vessels, tanks/vats, composting/waste compounds

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Hazard Identification

Physical:

1. Activation of Electrical or Mechanical Equipment

   crushers, presses, mixers, refrigeration

2. Introduction of Material

   solids & liquids via pipes/hoses e.g. must, water - fermenters, storage tanks, presses

3. Falling Objects from Above

   via top/high access hatch or open top - f*ermenters, storage tanks*

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Hazard Identification

Physical:

4. Temperature Extremes

   hot & cold: steam cleaning, refrigeration – fermenters, storage tanks, presses

5. Wet or Slippery Surfaces

   falls & electrocution: must, liquids/solids, cleaning - fermenters, storage tanks, presses

6. Noise

   amplified by space & can effect communications - fermenters, storage tanks, presses

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Hazard Identification

Physical:

7. Fall from Height

top/high access – fermenters, storage tanks

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Risk Control Measures

- *All risks are to be eliminated where possible, else minimised to an acceptable level by control measures*
- Must be in writing
- Controls selected using the Hierarchy of Controls:

  1) Elimination, 2) Substitution, 3) Isolation, 4) Engineering controls, 5) Administrative controls, 6) PPE
- Regularly reviewed to maintain adequate control of risks or as per revision of risk assessment

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Risk Control Measures

- <u>Isolation of Services</u>

  To prevent:

  – Introduction of material or contaminants; and

  – Activation of equipment or services

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Risk Control Measures

Isolation Methods

Hazardous Services:

1. Removal of service section & capping of open end, OR
2. Insert full pressure spade between flanges
3. If either of above not practicable, then close & lockout/tag at least two valves

Examples: Lines connected to fermenters, storage tanks, presses

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Risk Control Measures

Isolation Methods

Moving Parts:

1. Circuit break or switch locked/tagged open
2. If power can't be controlled then remove a mechanical part/linkage
3. If either of above not practicable, then movable components locked & switches, clutches & other components tagged

Examples: crushers, presses, mixers

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Risk Control Measures

Cleaning

- Clean as much as possible from outside to minimise/eliminate entry
- All hazardous substances removed prior to entry
- Not to be purged with gas >21% oxygen

Examples: Hose/shovel out fermenters, storage tanks, presses

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Risk Control Measures

Flammable Contaminants & Electrocution

- Equipment used must be intrinsically safe
- Ensure no ignition source from inside/outside space e.g. no smoking, no hot work or live electrical systems
- Low voltage waterproof

  electrical devices used in wet conditions
- Welding gas bottles kept outside space

Examples: spirit storage tanks, welding, cleaning vessels, waste pits

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Risk Control Measures

Ventilation

- Where required use natural, forced or mechanical ventilation to ensure safe atmosphere
- Must be continually monitored to ensure working & tagged/locked to ensure no interference

Examples: fermenters, presses, welding, lining & cleaning vessels

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Risk Control Measures

Atmospheric Testing

- To be carried out consistent with the risk assessment

  i.e. if there is a potential for unsafe level of oxygen, hazardous atmospheric contaminants, explosive gas

- Best practice: practically conducted prior to any entry
- Where possible conducted from outside space prior to entry
- May require continual monitoring while space occupied

Examples: fermenters, presses, storage tanks, pits

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Risk Control Measures

Atmospheric Testing

Must test for:

1. **Safe level of oxygen** **>19.5% & <23.5%**
2. **Hazardous contaminants**

   Typically at least: *Carbon monoxide:* **<30ppm**

   Hydrogen sulphide: **<10ppm**
3. **Explosivity** *Prior to entry:* **<5%LEL**

   Must exit space: **>10%LEL**

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Risk Control Measures

Personal Protective Equipment

- Supplied air respiratory protection must be used if not possible to ensure:
  - Oxygen >19.5%; OR
  - Atmospheric contaminants are at a safe level

  Note: No entry regardless if Oxygen >23.5% or LEL>5%

- Fall arrest must be used if risk of fall

Examples: fermenters, presses, storage tanks

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Risk Control Measures

Entry Protection

- Appropriate warning signage & barricades to prevent unauthorised entry
- Ensure items/equipment cannot fall or accidentally enter space
- Ensure items do not obstruct entry/exit

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Risk Control Measures

Stand-by Person(s)

- Person remaining outside & in close proximity to space to:
  - Monitor & communicate with persons inside space
  - Initiate emergency response
  - Operate safety equipment

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Risk Control Measures

Requirement for Stand-by Person(s)

1. AS/NZS: Required if risk assessment indicates there is a risk to OHS
2. SA & WA Regulations: As per AS/NZS
3. NSW Regulation: Always required
4. VIC Regulation: Non-specific but there must be continuous communication with persons inside

- ***Best Practice***: *Ensure Stand-by is always present when persons inside space*

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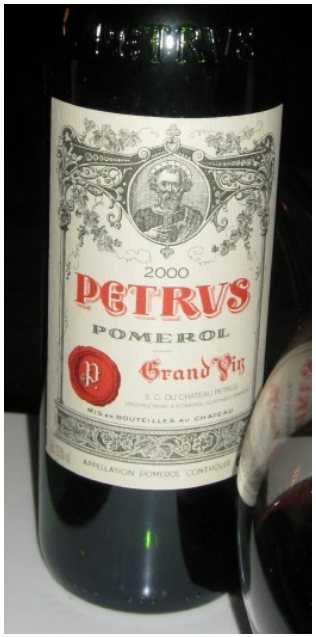
Risk Control Measures

Communication

1. Must be continuous communication between stand-by & persons inside space
2. Must establish communication system:
   - Voice
   - Radio
   - Hand signals
   - Hard wire communication



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Risk Control Measures

Emergency Response

- Procedure must be planned, established & rehearsed prior to entry
- Include rescue & first aid procedures
- Initiated by Stand-by person(s)
- Must ensure emergency equipment readily available
- Ensure adequate room for egress to permit rescue
- If rescue by direct route (horizontal or vertical) is possible fit rescue harness, lines & lifting/pulling equipment
- ***Spontaneous reaction to entre space for rescue may lead to death/injury***

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GETEX REPORT NO.
00151 RIAS
GETEX.Form.Field.004 Edition 1, 24.05.06

RISK ASSESSMENT

Client Company:.....

Project Address:
.....
.....

Location/Vessel Name/Number:
.....
.....

Date of Assessment: ...../...../.....

Time of Assessment: .....:.....

Description of Work to be Undertaken:
.....
.....
.....

Assessment Completed By:
.....
.....

Table 1: Risk Evaluation & Controls

Identified Hazard	Risk Score	Controls in Place	Risk Score After Control In Place

Entry Procedures

No entry until:

- Risk assessment completed
- ***Entry Permit*** completed by person in *direct control of work*
- All persons understand & comply with Entry Permit
- Space has a safe oxygen range, all atmospheric contaminants below standards, explosivity <5%LEL

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Entry Procedures

Entry Permit

- Must contain information & control measures appropriate for risk assessment:
  - Location & description of work
  - Required control measures
  - Isolation check list
  - Atmospheric monitoring results
  - Reference to working procedures
  - Record of each person entering & exiting the space
  - Clothing & equipment required
  - Required personnel [e.g. number of persons to enter, stand-bys, persons for rescue & first aid]
  - Other precautions [e.g. signage, barricades, no flame/smoking, communications between stand-by & back up person(s)]
  - Emergency procedures

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GETEX REPORT NO. 00402CSEP

GETEX.Form.Field.005/A
Edition 1, 5.06.06

CONFINED SPACE ENTRY PERMIT FOR GETEX STAFF

Confined Spaces Issuing Person: _____ _____ Date _____
Print Name Signature

Location of Confined Space: _____

Description of Work: _____

_____

Project/ship _____

Work requested by: _____ Date _____

Isolation:

Tank/other needs to be isolated from:

Water/gas/steam/chemicals (pipelines)	☐ Yes	☐ No
Mechanical/electrical drives	☐ Yes	☐ No
Warning Notices, Locks or tags have been affixed to isolation points	☐ Yes	☐ No

Tag Nos: _____

_____

_____

Personal Protective Equipment:

The following personal protective equipment must be worn:

1. Respiratory Protection ☐
   Type:
   Supplied Air Breathing Apparatus ☐
   Self Contained Emergency Breathing Apparatus ☐
   Disposable Mask ☐
   Canister Respirator ☐
   Type: _____
   _____
   Scuba gear ☐
2. Safety harness/lifeline/fall arrest ☐
3. Communications equipment ☐
   Type: _____
4. Torch ☐
5. Head Protection ☐
6. Other

_____

_____

_____

Emergency Response Procedures / Equipment:

Refer to SWMS & Risk Assessment _____

_____

_____

_____

_____

Atmosphere:

The atmosphere has been tested

_ Oxygen _____% (19.5-23.5)
_ LEL _____% (< 5)
_ H_2S _____ppm (< 10)
_ CO _____ppm (< 30)
_ VOC _____ppm
_ Other _____

_____

Other Precautions:

Warning Notices / barricades in position	☐ Yes	☐ No
Smoking forbidden	☐ Yes	☐ No
Forced Air Ventilation	☐ Yes	☐ No
No hot work permitted	☐ Yes	☐ No

Other _____

_____

_____

Stand-by Personnel:

_____

_____

_____

_____

AUTHORITY TO ENTER

1. This space is safe for entry to do the work described above provided all precautions are observed fully.
2. All persons working on the job have been briefed.

_____
Signature of Project Manager

Time: _____ Date: _____

This authorisation is valid until:

_____

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GETEX REPORT NO.
00402CSEP

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PERSONS REQUIRED TO ENTER CONFINED SPACE

I have been advised of and understand the control measures and precautions to be observed with the entry and work in the confined space

ENTRY			EXIT		
Print Name	Sign	Date Time	Sign	Date Time	Sentry

MONITORING

Date	Time	O_2	LEL	H_2S	CO	VOC	Other	Sign

WITHDRAWAL OF WRITTEN AUTHORITY

All persons and equipment accounted for: Yes ☐ No ☐
Equipment checked and restored correctly: Yes ☐ No ☐
Signed by Stand-by Person: _____

Date: _____ Time: _____

Remarks or Comments: _____
_____
_____
_____
_____

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Entry Procedures

Entry Permit

- To be revised if:
  - Change in person in direct control of work
  - Significant break in work continuity
  - Change in risk assessment
- Must be displayed in a prominent place
  – usually next to entry of space
- Required even for entry to test atmosphere

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Entry Procedures

Conclusion of Work

1. Person in direct control of work must:
    1. Ensure & note on Entry Permit that:
        - ✓ All work is finished; AND
        - ✓ All persons & equipment have exited space
    2. Withdraw the Entry Permit
2. No controls or isolations may be removed until above is completed

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Training

Persons who undertake the following activities require confined space training:

- Work in/on a confined space
- Confined space assessment
- Issue of Entry Permits
- Design & layout workplace
- Management or control work
- Maintenance of safety equipment
- Provide, fit, wear & maintain PPE
- Stand-by
- Emergency procedures & first aid providers

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Training

- Trainees must be:
  - Assessed as competent
  - Reassessed at appropriate intervals to ensure ongoing competency
- Training is to include:
  - Hazards
  - Risk assessment
  - Risk controls
  - Emergency procedures
  - PPE
  - Legislation

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Training

Best Practice:

- Ensure training provided by a Registered Training Organisation (RTO) holding Nationally Recognised Training accreditation for the course

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Record Keeping

AS/NZS – following records to be kept for the time specified:

- Entry Permit 1 month
- Risk Assessment 5 years
- Training Records Length of employment

  [SA Regulations: 5 years after training]

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Case Studies

1. In November 2002, two men died at a winery near Oliver, in the Okanagan Valley. One of them, the owner of the winery, collapsed when taking a sample from a large tank of fermenting wine. The second man entered the tank to try to rescue him. The Owner & the would-be rescuer both died.

2. In 1997 in NZ, a winemaker inspecting a vat was suffocated by fumes from fermenting wine.

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Case Studies

3. On January 29, 1986, a 35 year old worker was hosing down the interior of an open top fermentation tank from the outside. The worker entered the tank (likely to retrieve his hat) & was confronted with an atmosphere of 6% Oxygen & 48% Carbon Dioxide.

   The foremen entered the plant & heard the victim trying to get out of one of the tanks. Unable to reach the victim he secured a rope around the victim's arm but was unable to pull the victim out. The rescue squad was called but it was 2 hours from when the victim was discovered until his removal from the tank. The victim was dead when removed.

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Case Studies

- The victim had been on the job for 3 weeks & had only received on the job training which focused on plant operation & little on safety.
- Only training provided regarding confined spaces was a warning not to entre tanks because of Carbon Dioxide.
- All on the job training was taken from the plant operations manual which had extremely basic safety recommendations.
- The plant had no written safety policies or confined space entry procedures.

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Summary

For entry:

1. Hazard Identification & Risk Assessment
   - Atmospheric & physical
2. Risk Control Measures
   - Isolation, cleaning/purging, ventilation, *atmospheric testing, stand-by person(s),* emergency response procedure
3. No entry without Entry Permit

- All workers need to be confined space trained

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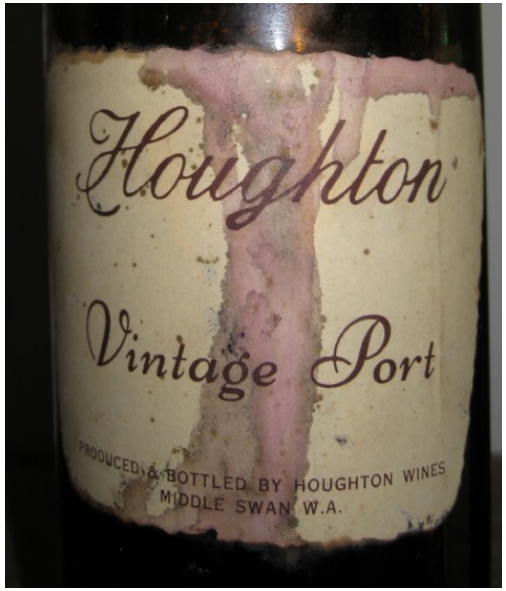
Summary

Required paper work:

1. In house Confined Space procedure
2. Hazard Identification & Risk Assessment
3. Entry Permit
4. Training Records



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Questions ?

all welcome

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