Introduction to the PSAC Oilwell Perforators' Safety Training & Advisory Committee

CEAEC AGM - Ottawa

Steve Wierenga – PSAC OWP Co-Chair

November 17, 2021

Introduction

Who is PSAC

- The **Petroleum Services Association of Canada (PSAC)** is the national trade association representing the service, supply and manufacturing sectors within the upstream petroleum industry.
- PSAC is Working Energy and as the voice of this sector, advocates for its members to enable the continued innovation, technological advancement and in-the-field experience they supply to energy explorers and producers in Canada and internationally, helping to increase efficiency, ensure safety and protect the environment.

Introduction

Oilwell Perforators' Safety Training and Advisory Committee

The Committee will have the following broad goals:

1. Continually improve health and safety performance in energy well perforating operations in the service sector of the industry (oil, gas and geothermal).
2. Operational
   - Encourage collaboration among members and the other energy industry trade associations on oil and gas well perforating safety, training, and regulatory issues
   - Reduce duplication and redundant requirements
   - Alignment, between provincial and national regulatory agencies of regulations governing oil and gas well perforating operations

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Introduction

Perforating Industry

- Wireline Perforating & Completions of Energy Wells *(including Oil, Gas & Geothermal)*
- Tubing Conveyed Perforating
- Explosive Fracturing
- Pipe Recovery
- Explosive Service Tools

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Introduction

Members of the PSAC OWP Committee

Baker Hughes
CENCO WIRELINE INC.
BONNETTS Energy Corp.
DEVILFISH TOOL COMPANY
Downton's COMPLETION SERVICES LTD. DIVISION OF Downton's TRANSPORT LTD.
BGES
BIG GUNS WIRELINE SERVICES
SureShot Wireline Inc.
EDGE WIRELINE
VOLTAGE WIRELINE INC.
HALLIBURTON
DynaEnergetics
SUMMIT WIRELINE INC.
CANFISH SERVICES INC
Magnum Perforating Services Inc.
LIBERTY CANADA
TechnipFMC
MULTI-LINE WIRELINE SERVICES LTD.
CoreLab RESERVOIR OPTIMIZATION
BOSS WIRELINE SERVICES
SPECTRUM WIRELINE SERVICES LTD.
RPM Specialty Services Ltd.
VERSA-LINE SERVICES
Wesco
Schlumberger
RELIANCE OILFIELD SERVICES
TIER 1 ENERGY SOLUTIONS
High Mark Wireline
pulse wireline services ltd
Weatherford

Participating Agencies

Natural Resources Canada
ENERGY SAFETY CANADA
Alberta
WORK SAFE BC

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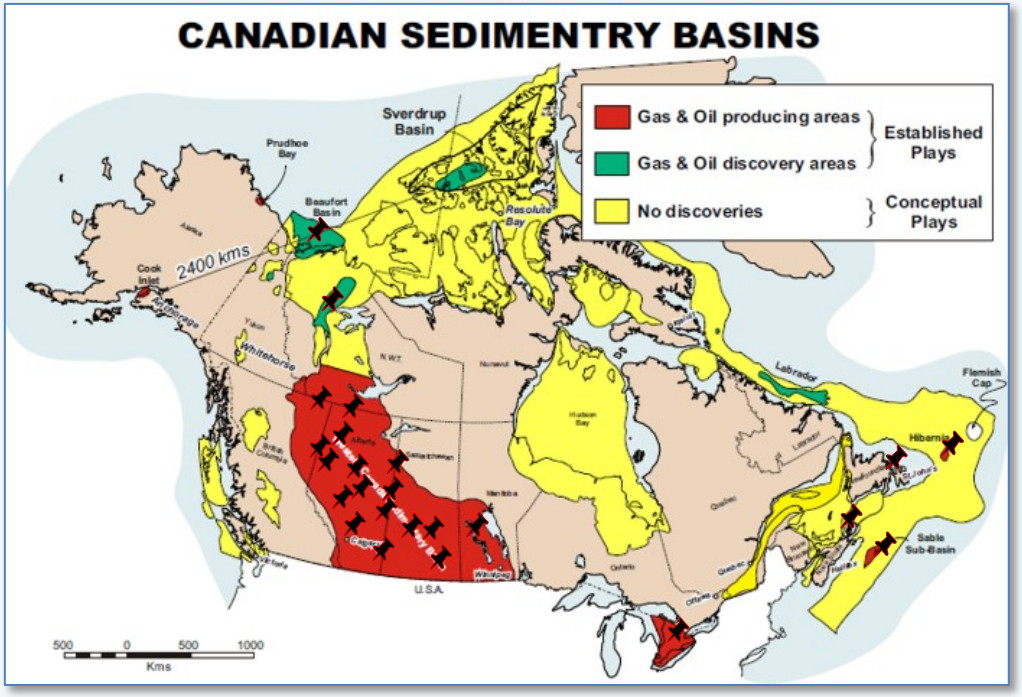
The Oilwell & Geothermal Perforating Industry

Areas of active Energy operations across Canada



- Conventional Gas & Oil, *BC, Alta & Sask*
- Deep Basin Gas, *BC & Alta*
- Heavy Oil, *Alta, Sask & MB*
- Horn River Gas, *BC & NWT*
- Methane Shallow Gas, *Alta & Sask*
- Bakken Basin, *Sask & MB*
- Norman Wells, *NWT*
- Oil Springs/Petrolia, *Ont*
- Sable Island, *NS*
- Hibernia, *NFL*
- Marcellus/Utica, *Ont, Que & NB*
- Beaufort Sea, *Yuk & NWT*
- Solution Potash, *Sask*
- Geothermal, *BC, Alta & Sask*
- Helium, *Sask*

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Industry Guidelines & Codes of Practice

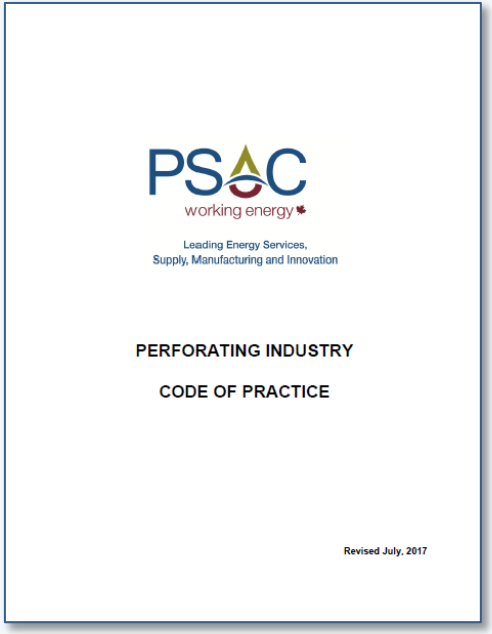
PSAC Code of Practice (PSAC COP)

Developed jointly by PSAC - Oilwell Perforators Committee and NRCan-ERD.

Condition of Factory Licence for assembly of Jet Perforating Guns.

Establishes minimum industry safety standards:

- Licence Holder Responsibilities
- Storage & Transportation of Oilwell Explosives
- Gun Assembly Area – General Notes
- Emergency Response & Reporting Procedures



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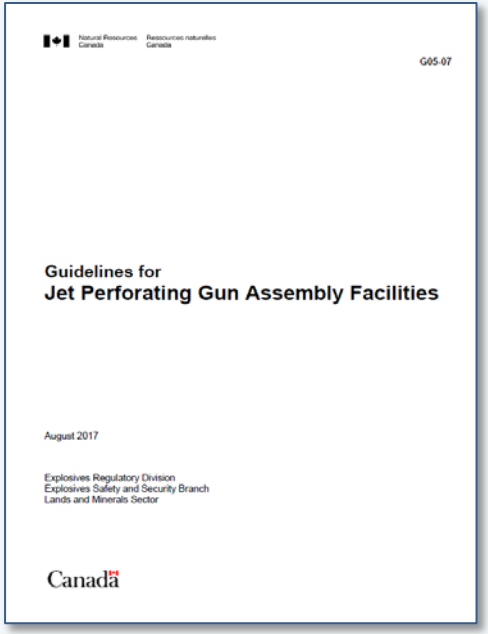
Industry Guidelines & Codes of Practice

ERD - Guidelines for Jet Perforating Gun Assembly Facilities

The assembly of a jet perforating gun requires a Division 1 Factory Licence in accordance with Part 5 of the Explosives Regulations, 2013.

These guidelines are intended to assist a licensee to meet regulatory requirements necessary to obtain and maintain a Division 1 licence for jet perforating gun assembly facility from NRCan-ERD



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PSAC – Energy Safety Canada

Oilwell Perforators Safety Training

The Oilwell Perforators Safety Training course instructs workers who are engaged in well operations such as wire line perforating and completions, TCP perforating, explosive fracturing, pipe recovery and tool services to learn the basics of oilwell explosives.

This two-day course covers Safe Storage, Transportation, Shop Handing, Wellsite Handling and Regulations pertaining to Oilwell Explosives operations and intended for Blaster's In-Charge.

Upon Completion

Energy Safety Canada issues an interprovincial Oilwell Blaster's permit, valid throughout the Yukon, Northwest Territories, Alberta and British Columbia to those who successfully complete the course and associated Interprovincial Oilwell Blaster's examination.

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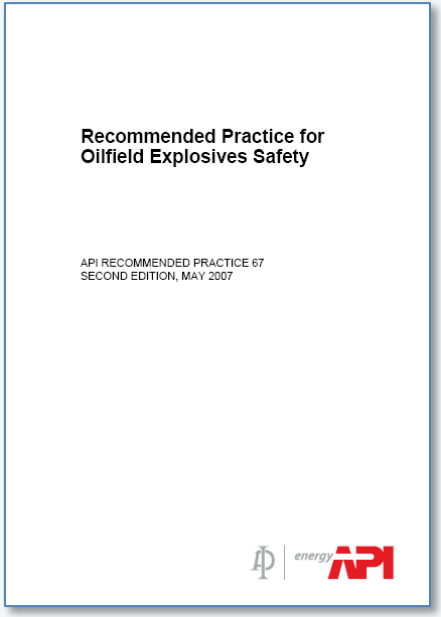
Industry Guidelines & Codes of Practice

API – Recommended Practice for Oilfield Explosives Safety (RP 67e3)

- This internationally recognized publication is applicable to oilfield explosives used as an energy source to do work in oil and gas producing operations, and more specifically to explosives intended for use inside a wellbore.
- The purpose of this recommended practice (RP) is primarily to prevent the inadvertent initiation of these explosives at the wellsite but also includes some recommendations for safe and secure storage and transportation and handling, as well as requirements for design and manufacture of selected equipment.



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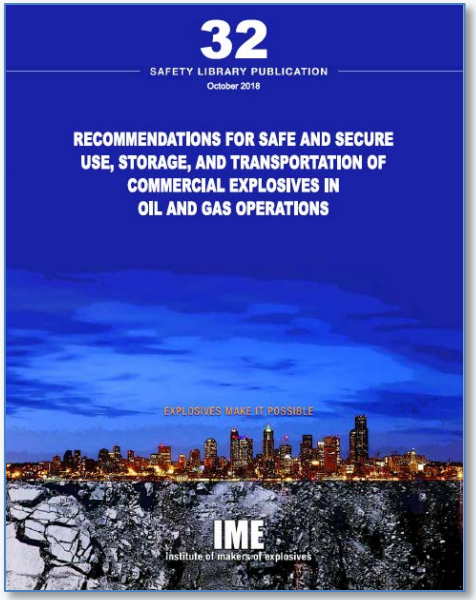
Industry Guidelines & Codes of Practice

IME – Safety Library Publication 32

- The ***Recommendations for Safe and Secure Use, Storage, and Transportation of Commercial Explosives in Oil and Gas Operations*** outlines the Transportation configurations for Jet Perforating Guns and defines the types of electric detonators are available in the Oilwell Industry.
- For Canadian transport configurations, the industry, through PSAC, tested UN 0124 Jet Perforating Gun systems for approved transport under Transport Canada 1.1D classification in 2005.



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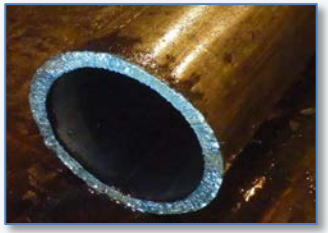
Common Uses of Energetics

- Creating Jet Perforation tunnels to access formation fluids by penetrating casing, cement & formation rock.
- Pipe severing tools for casing retrieval operations
- Hydraulic tool actuation using low explosives for downhole tool setting and retrieval.

Jet Perforation Tunnel



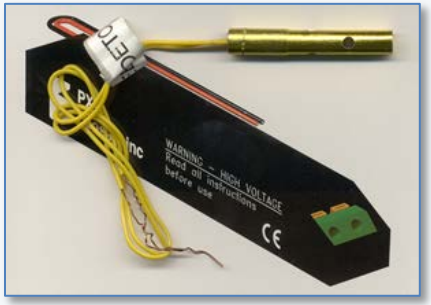
Jet Cut Casing

Hydraulic Actuated Tools

Common Types of Explosive Materials

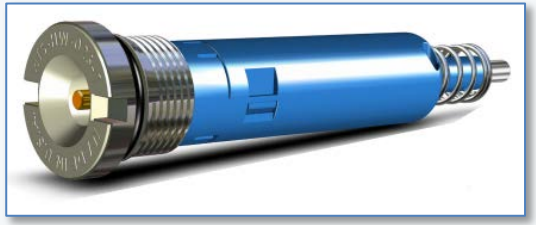
ERD Classification Type I – Initiation Systems

50 Ohm Safe Detonators



High Energy RF Safe Detonators

Percussion Detonators



Cartridge RF Safe Detonators

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Common Types of Explosive Materials

ERD Classification Type E.1 – Blasting Explosives

PETN / RDX / HMX / HNS / PYX Detonating Cords

Bi-Directional Boosters

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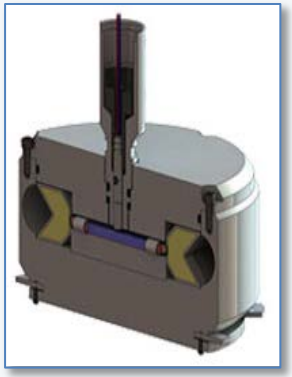
Common Types of Explosive Materials

ERD Classification Type E.2 – Perforating Explosives

Shaped Charges

Jet Perforating Guns



Pipe Severing Tools

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Common Types of Explosive Materials

ERD Classification Type S.1 – Low Hazard Explosives

Hydraulic Setting Tool Power Charges

Secondary Ignitors

Ballistic Time Delays

Ignitors

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The Oilwell Perforating Industry

Licensee Self Transportation to Point of Use

Most common form of transport is via service truck or trailer specially configured as per ERD-Jet Perf Guideline and PSAC COP requirements:

- Guns secured w/ tie down every 2 m
- Min 2 tie downs/gun
- Guns locked to vehicle/trailer
- Approved padlock & security system
- 5/16” diameter Grade 40 deck chain
- Chain not considered as one of the tie downs
- Only fifth wheel trailer with steel bulkhead design
- Placards as required

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The Oilwell Perforating Industry

Commercial Transport to Point of Assembly

- Commercial transportation company or commercial hot shot company.
- Approved packaging as per explosive type and transportation classification.
- It is typical for small batch shipping of either components or fully assembled Jet Perforating Guns throughout Canada.

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The Oilwell Perforating Industry

Gun Loading Facilities (GLF) – Division 1 Factory Licensed

- Jet Perforating Guns are assembled at permanent bases in a Type 12 Magazine qualified Gun Loading Facility
- or on remote oilwell sites under ERD Licence conditions and as per PSAC COP and Provincial regulations

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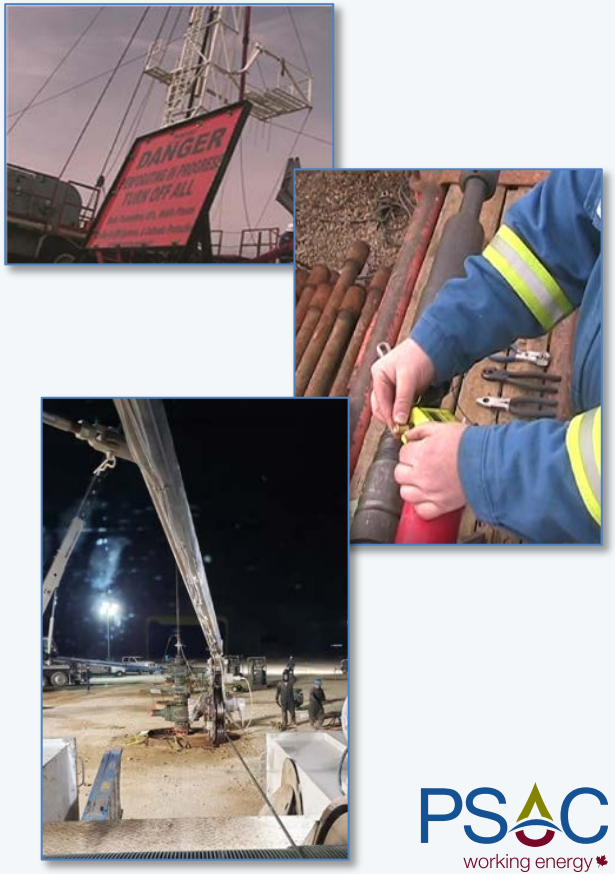
The Oilwell Perforating Industry

Filed Operations

- Explosive devices are deployed into well bores from as shallow as 60m to over 4,500m in either a vertical, deviated or horizontal configuration. There are horizontal wellbores that are in excess of 9,000m measured depth.
- The devices are armed on location at the last practicable opportunity before deploying into the well bores.



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The Oilwell Perforating Industry

Various Deployment Methods

Service Rig Operations
(Wireline or Tubing Conveyed)

Rigless Operations

Crane Deployment Operations

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The Oilwell Perforating Industry

Safety is Our Top Priority

All of our members hold Certificates of Recognition in Workplace Safety in their provinces of operations.

Authorized and extensively trained personnel are the most critical component of our operations.

The PSAC/ESC Interprovincial Oilwell Blaster Permit is recognized throughout Canada by several provincial regulators.

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Leading Energy Services, Supply, Manufacturing and Innovation

Petroleum Services Association of Canada

Thank you

For more information, please visit

psac.ca