EMERGENCY SEALING & SURFACE FAN PROTECTION

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PIKE RIVER DISASTER, 2010

PIKE RIVER – ISSUES RELEVANT TO N.S.W. MINES

	NSW MINES
RESCUE STRATEGIES, eg SELF ESCAPE	OK
EMERGENCY MANAGEMENT, eg I.M.T.	OK
INFRASTRUCTURE/EQUIPMENT, eg INERTISATION	OK
EMERGENCY SEALING	X
SURFACE FAN EXPLOSION PROTECTION	X

PIKE RIVER – IMPROVISED SEAL AT PORTAL

PIKE RIVER
– INEFFECTIVE EXPLOSION PROTECTION

STANDBY FAN

BEFORE

AFTER

EMERGENCY SEALING – OBJECTIVES

- NOT TO SAVE LIVES
- TOOL FOR I.M.T. TO CONTROL SITUATION
- TO AVOID COMPLETE LOSS OF MINE
- TO ENABLE SAFE RE-ENTRY
- TO AVOID ONGOING NEGATIVE PUBLIC RELATIONS

EMERGENCY SEALING – PREVIOUS NSW LEGISLATION

Coal Mine Health and Safety Regulation 2006, Clause 45(b):
- mine has to have facilities for:

"*(x) the rapid and effective sealing of the mine (while at the same time allowing for re-entry to the mine),"*

THIS WAS ONLY RIGOROUSLY COMPLIED WITH AT MINES LIABLE TO SPON COMBUSTION, eg ULAN, WAMBO, BLAKEFIELD SOUTH.

EMERGENCY SEALING – QUEENSLAND REGULATIONS

- **70kPa RATING**
- **WHEN DEPLOYING, NO PERSONNEL EXPOSURE TO "LINE-OF-FIRE"**
- **PROVISION TO ATTACH AN INERTISATION SYSTEM**
- **PROVISION FOR MONITORING BEHIND SEALS**
- **AIRLOCK FOR RE-ENTRY**
- **ANNUAL TESTING OF OPERABILITY**
- **FOR SHAFTS, SEALS CAN BE AT SEAM INSETS**

MOST QLD MINES APPEAR TO (GENERALLY) COMPLY,

ALTHOUGH WITH SOME SHORTCOMINGS.

EMERGENCY SEALING – CURRENT NSW LEGISLATION

WHS (MINES) REGULATION, 2014: CLAUSE 68

- **NO kPa RATING SPECIFIED**
- **RISKS OF SEALING ACTIVITIES TO BE MANAGED**
- **ANNUAL TEST OF AIRLOCKS & INERTISATION CONNECTIONS**
- **ANNUAL MODELLING - SUITABILITY OF INERTISATION LOCATIONS**

RECOMMENDATION: USE QUEENSLAND'S AS THE STANDARD !

EMERGENCY SEAL – BARE DOWNCAST SHAFT "LID"

EMERGENCY SEAL – STEEL DOORS AT PORTAL

EMERGENCY SEAL – STEEL DOOR IN DRIFT

EMERGENCY SEAL – DRIFT AIRLOCK FOR RE-ENTRY

EMERGENCY SEAL – INERTISATION CONNECTION

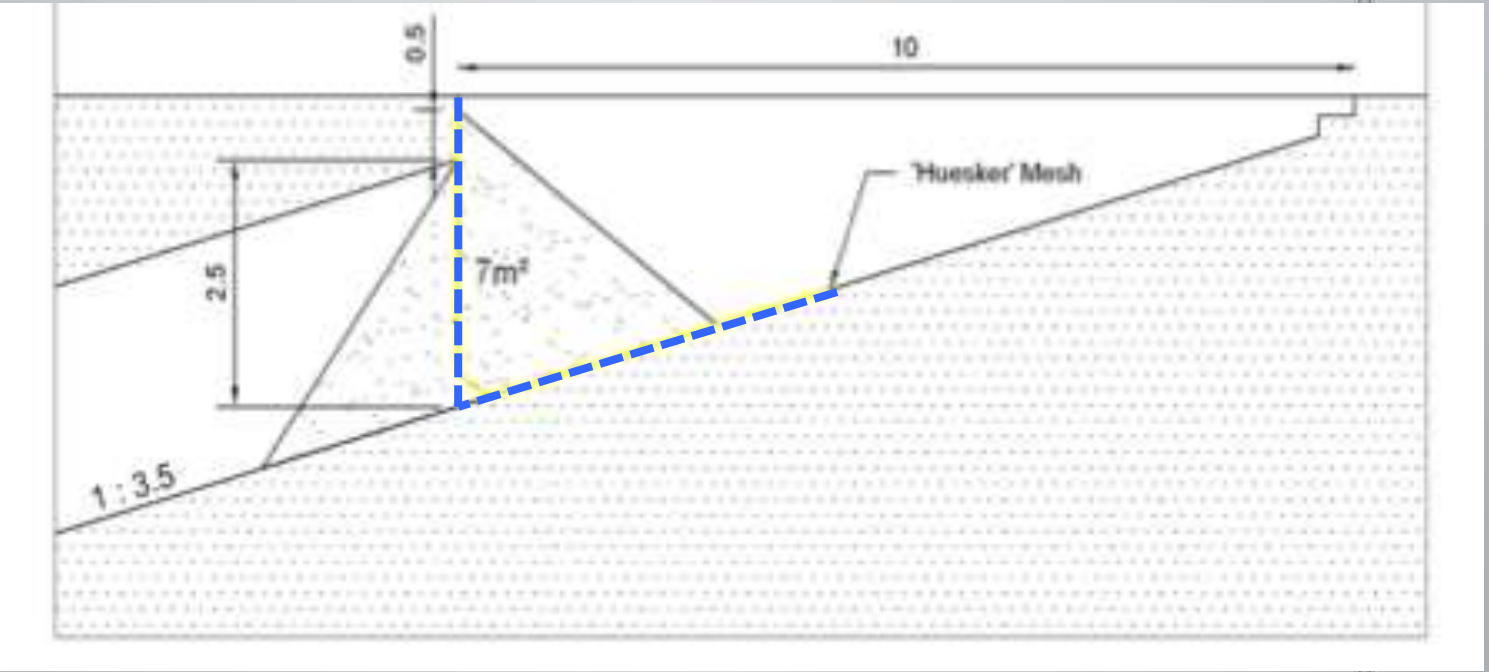
EMERGENCY SEAL – "AIRBAG" FOR ROADWAY

EMERGENCY SEAL – INFRASTRUCTURE IN DRIFT

EXAMPLE – "PROFILED" DOORS

EMERGENCY SEAL – INFRASTRUCTURE IN DRIFT

EXAMPLE: PRE-INSTALLED FRAME FOR FREE-FLOWING MATERIAL



EMERGENCY SEAL – INFRASTRUCTURE IN DRIFT

EXAMPLE: PRE-INSTALLED FRAME FOR FREE-FLOWING MATERIAL

EMERGENCY SEAL – INFRASTRUCTURE IN DRIFT

QLD EXAMPLE: PRE-INSTALLED FRAME FOR FREE-FLOWING MATERIAL

INTAKE SHAFT WITH WINDER, etc – SEAL OPTIONS

1. CLAD HEADFRAME

- EXPENSIVE (70 kPa RATING)
- MAJOR VENTILATION RESTRICTION
- ENABLES RE-ENTRY USE (WITH AIRLOCK)

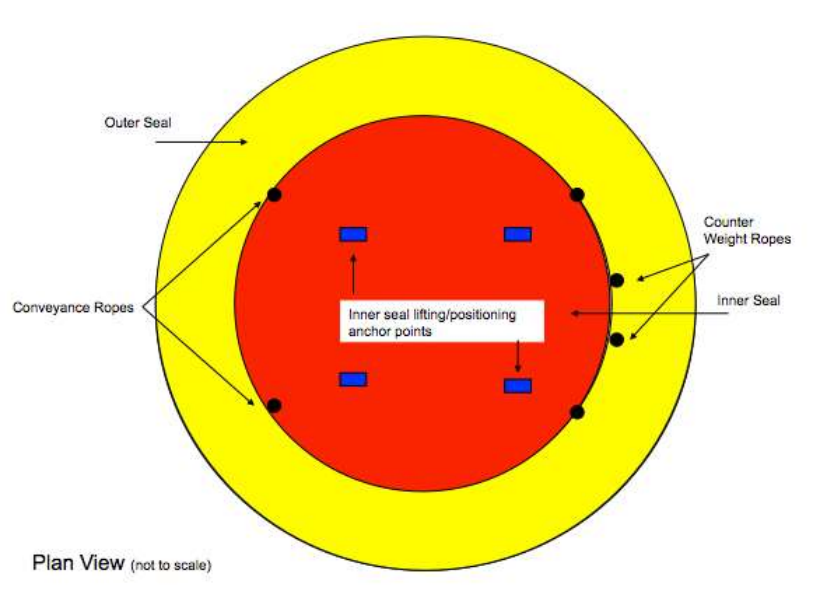
2. AIRBAG SEAL

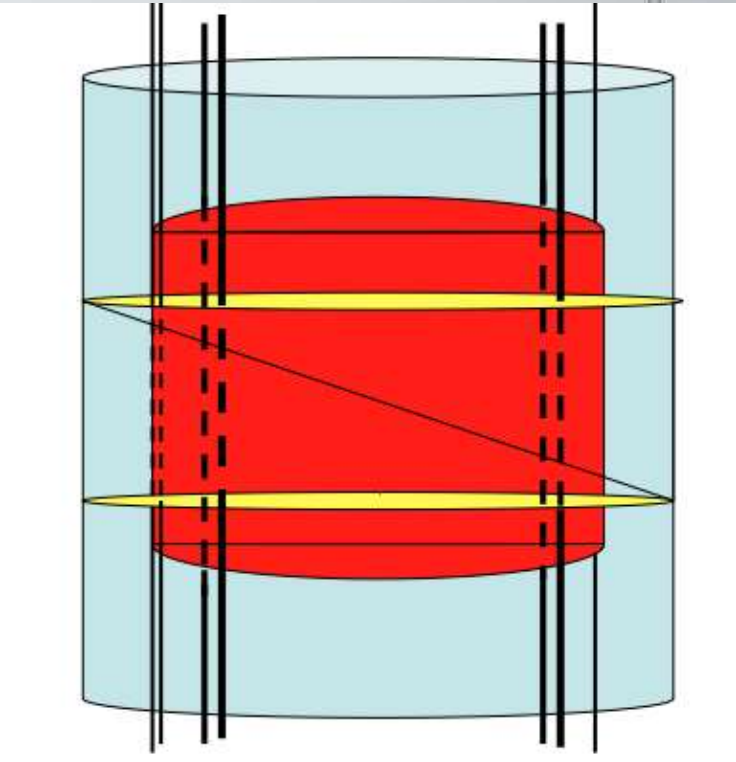
- THEORETICALLY POSSIBLE, BUT UNLIKELY IN REALITY
- PREVENTS USE OF SHAFT FOR RE-ENTRY

3. AT SEAM ENTRY (STEEL DOORS, AIRBAGS, etc)

- CHEAPEST OPTION
- ENABLES USE OF WINDER FOR RE-ENTRY (WITH AIRLOCK)

INTAKE SHAFT WITH WINDER, etc – AIRBAG OPTION





UPCAST/FAN SEAL EXAMPLE – REPLACE ELBOW WITH "LID"

UPCAST/FAN SEAL – "GUILLOTINE" DOOR IN FAN DUCT (CHINA)

FAN EXPLOSION PROTECTION – DESIGN CRITERIA

CURRENTLY, NO AUST. REGS OR STANDARDS FOR RATINGS:

- **EXISTING PRACTICE DEPENDS ON WHAT INCLUDED IN FAN APPROVALS (CONSISTENCY?), BASED ON RISK ASSESSMENT.**
- **DERIVED FROM EXPERIENCE(?) &/OR PRACTICE.**

BEST "STANDARD" APPEARS TO U.S.B.M. GUIDELINE:

- **STILL LACKING SPECIFIC NUMERICAL DESIGN CRITERIA, eg:**

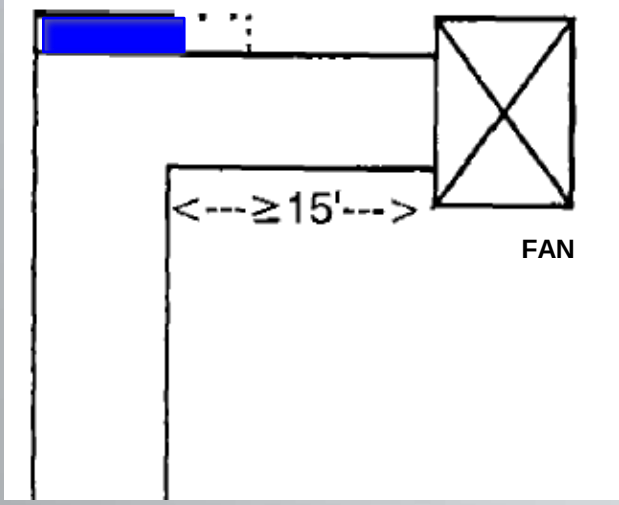
" Each main mine fan shall be protected by one or more **"weak"** walls or explosion doors."

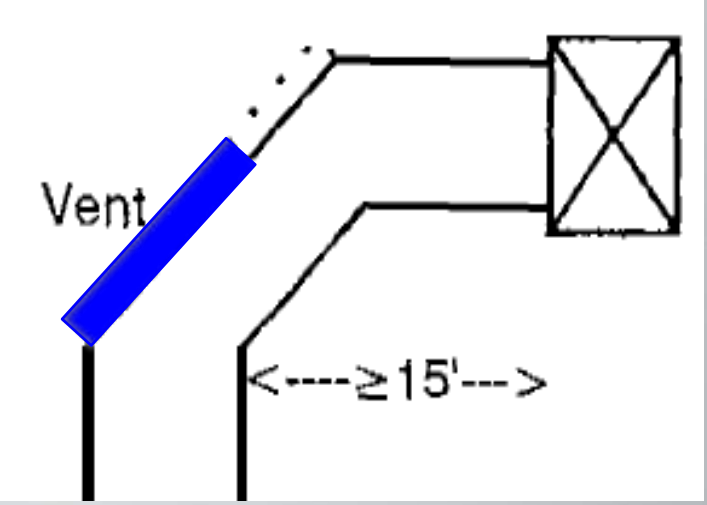
- **HOWEVER, THE DESIGN GEOMETRY SEEMS RATIONAL:**

SCOPE FOR DETERMINATION OF RIGOROUS STANDARD ! PhD TOPIC?

FAN EXPLOSION PROTECTION – USBM LAYOUT GUIDELINES

- **AREA OF EXPLOSION PANEL(S) ≥ <u>PROJECTED</u> AREA OF APPROACH SHAFT/DUCT/ROADWAY**
- **FAN ≥ 15ft FROM PANELS**

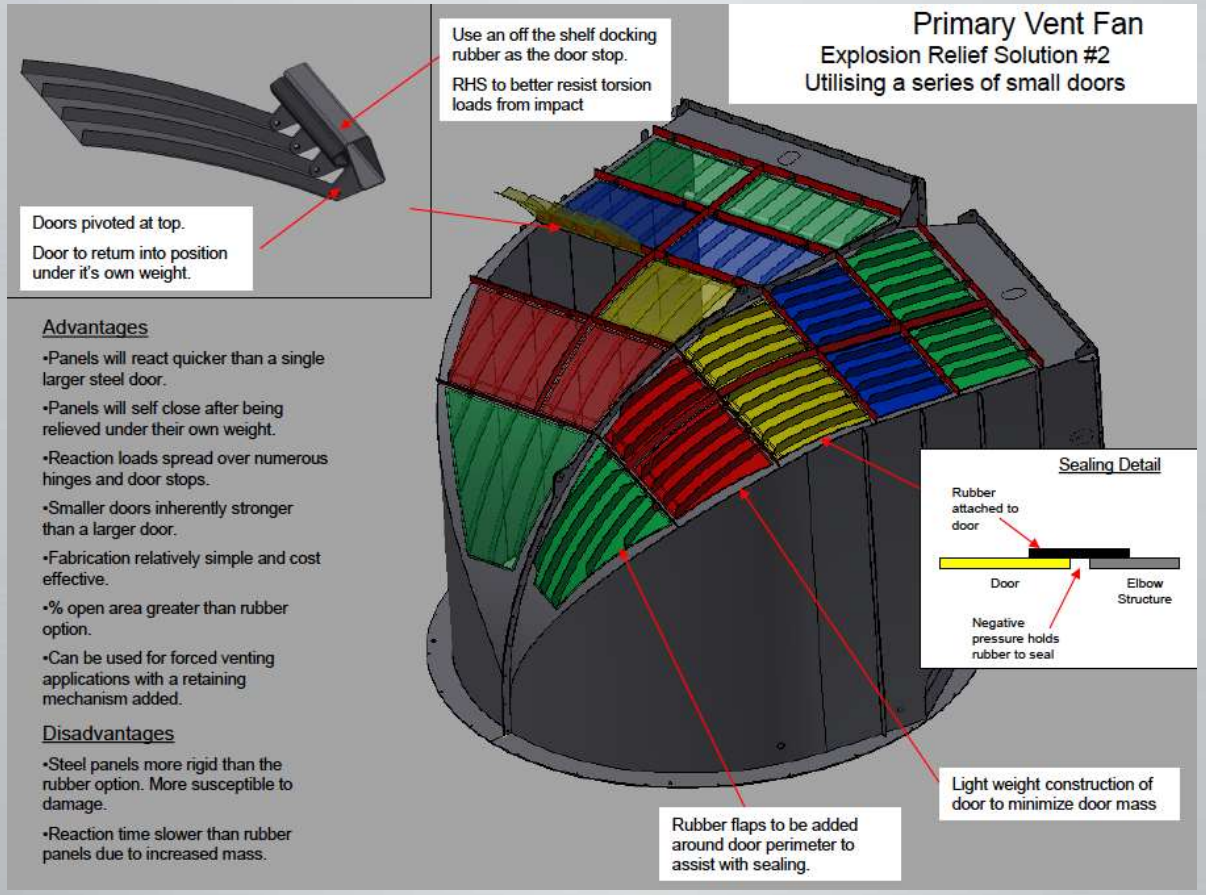




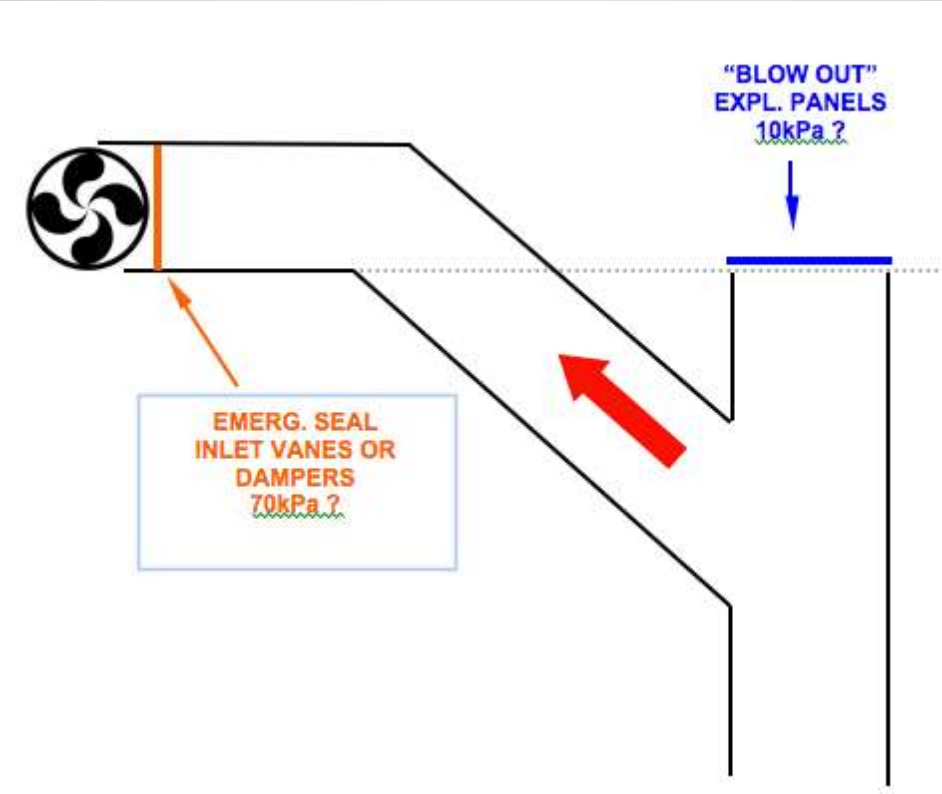
FAN EXPLOSION PROTECTION – EXAMPLE OF "BLOW OUT" PANELS

ABOVE UPCAST SHAFT, 10kPa "TRIGGER" PRESSURE

FAN EXPLOSION PROTECTION – IMPROVED "SURVIVABLE" DESIGN

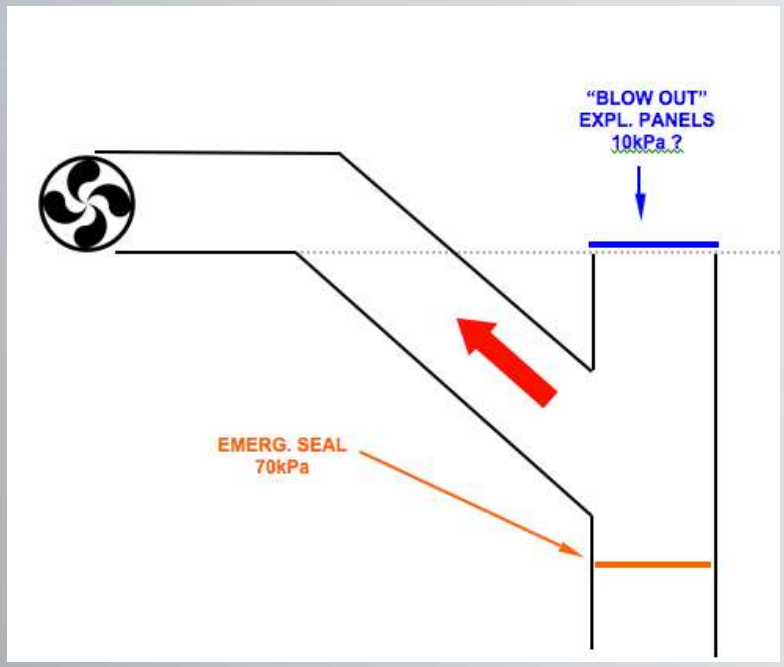


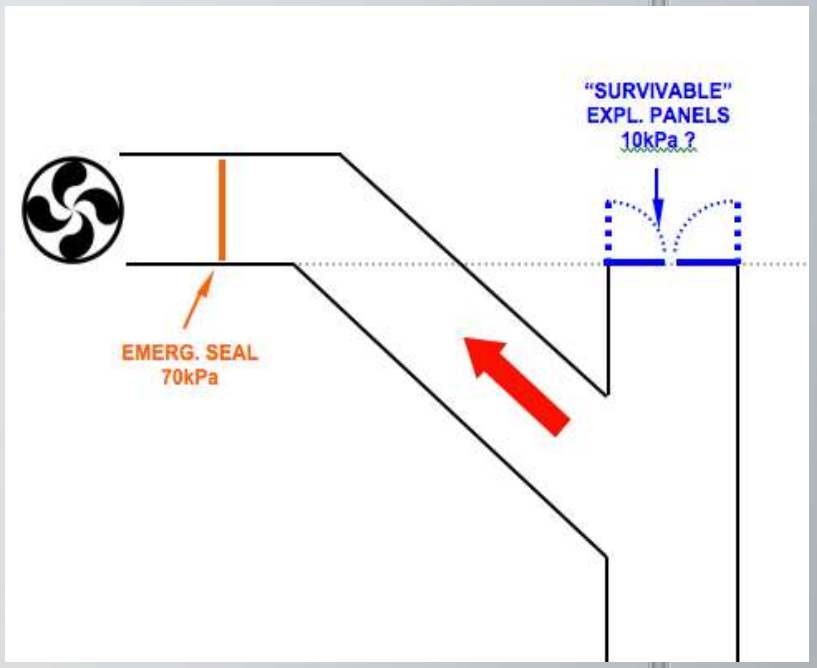
INTERACTION OF SEALS & EXPLOSION PROTECTION



THIS LAYOUT NOT RECOMMENDED !

INTERACTION OF SEALS & EXPLOSION PROTECTION





RECOMMENDED LAYOUTS

FAN EXPLOSION PROTECTION – SIMPLE, EFFECTIVE DESIGN (XUANDONG MINE, CHINA)

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SEALING & EXPLOSION PROTECTION SUMMARY OF RECOMMENDATIONS

SEALS

- **70 kPa RATING FOR SEALS**
- **NO "LINE-OF-FIRE" EXPOSURE DURING SEAL IMPLEMENATION**
- **ALLOW FOR RE-ENTRY & INERTISATION AT SEAL(S)**
- **ANNUAL TESTING OF OPERABILITY**

EXPLOSION PROTECTION

- **INTERACTION OF SEALS & FAN EXPLOSION PROTECTION MUST BE CONSIDERED, SO THAT EXPLOSION PROTECTION DOESN'T NEGATE SEALING**
- **"SURVIVABLE" EXPLOSION PROTECTION RECOMMENDED**

KEEP IT AS SIMPLE AS POSSIBLE