



NAM

WARFFUM INCIDENT, 31th May 2005

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Process Safety Conference

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Presentation permitted by NAM



NAM



**31st May 2006; one year after.
The monument on the Warffum production location**

INVESTIGATION RESULTS AND FOLLOW-UP

AGENDA

- Summary of the incident
- Investigation method
- TRIPOD results
- Conclusions and Recommendations

COMMUNICATION OF RESULTS OWN INCIDENT INVESTIGATION

1. Families of victims have been informed on 18/10/2005.
2. Directly involved Warffum staff have been informed on 18/10/2005.
3. Land Asset line has been informed on 18/10/2005.
4. Shell internal informed on 19/10/2005.
5. Press statement and regional press and TV on 19/10/2005.

The independent report of the Dutch Safety Board was presented in September 2007.

The lawsuit was finalised in October 2007

AERIAL VIEW OF LOCATION

Warfum base



THE INCIDENT

- Time and date : 31st May 2005 09:00
- Executed work : Installation of a Vapour Recovery System (VRS) on the roof of Tank T3
- Two fatalities
- One injured person

TANK T3 AFTER THE EXPLOSION



RECOVERED SPOOL PIECE



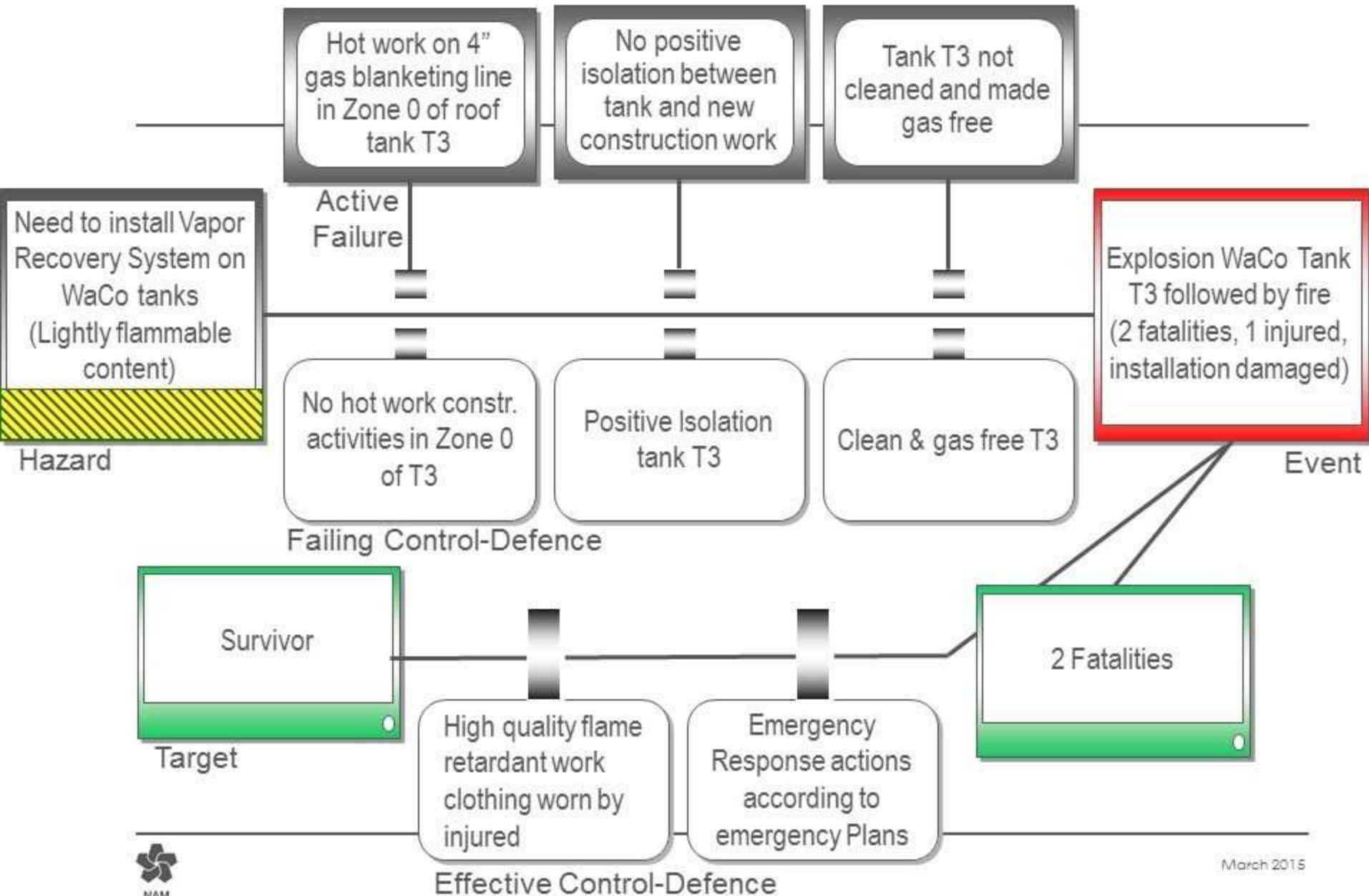
Remains of tack welds



THE INVESTIGATION METHOD

- 37 interviews
- 9 reflection interviews
- 3 visits to sites with similar activities
- 3 enquiries – also outside Land Asset
- Review of 100+ documents
- Consideration of Time-Out for Safety data
- Analysis done with TRIPOD method

INCIDENT DIAGRAM



ACTIVE FAILURE - T3 NOT CLEANED

Latent Failures

Contractor staff, though encouraged to do so, do not intervene effectively on HSE issues

EC

Blind faith in NAM safety measures

EC

LOP (integrated service contractor) Start instruction only addressing "generic HSE" risks

TR

Lack of direct communication between PtW parties: applicant, validator, Issuer, Holder

CO

Lack of Single Point Responsibility (on site)

OR

HSE Audit & Review system inadequate/ ineffective

OR

HSE coordinators (Design & Constr.) role as defined in Generic HSE Plan LOP not effective

OR

Design philosophy in "the pre-design report" not translated into detailed execution plans

PR

Need for cleaning T3 not uniquely identified by people involved in design & construction

PR

Earlier condensate smell reporting not deemed necessary

Lack of awareness field workers to identify HC Hazards

Construction details (welding) not known/ recognised by PtW issuer ('verstrekker')/ Operations

T3 kept in normal operation (Storage to drain effluent)

Preconditions

Tank T3 not cleaned and made gas free

Active Failure

Clean & gas free T3

ACTIVE FAILURE - POSITIVE ISOLATION T3

Project Plan 5.3: 'Generic ISO VRS construction:
No spool sections / lengths or field welds
specified

DE

Cross discipline checks only required for old/new,
not for new/new tie-ins

PR

Competence of staff in charge

TR

Poor communication leading to design starting
point: 'Plant out of production'

OR

Designers and operators
unaware of tie-in character

Insufficient awareness of
need for positive isolation

[Narrative]
Repeat PC: T3 kept in
normal operation

Precondition

No positive
isolation between
tank and new
construction work

Active
Failure

Positive Isolation T3

Latent Failures

ACTIVE FAILURE – NO HOT WORK ON T3 (1)

No RI&E compliance checks and proper monitoring of Review action data base

PR

Lack of systematic exact communication PtW applicant (aanvrager) & Issuer (Verstrekker)

CO

HSE audit & compliance check system inadequate

OR

No structure for coaching & counseling PtW issuers (verstrekkers)

OR

No detailed scope definition on task level provided by LOP (=integrated service contractor)

PR

HSE coordinators (Design & Constr.) role as defined in HSE Plan LOP not effective

OR

LOP HSE Plan by Projects without sufficient input from Operations

OR

Conflict welding actions and RI&E 7.6 (not noticed by anyone involved in RI&E)

Inadequate gas testing (as to times & locations) deemed sufficient

PtW not specific as to open systems & hot work, area & other scope details

Lack of awareness conflicting activities: Open systems & hot work

START Safety toolbox induction not addressing HC Hazards

Active Failure

Hot work on 4" gas blanketing line in Zone 0 of roof tank T3

No hot work on T3

Latent Failure

Precondition

ACTIVE FAILURE – NO HOT WORK ON T3 (2)

Unclear roles between Operations support and project support during projects

OR

Shortage of competent resources, in relation to high workload

IG

Project Plan 5.3 'Generic ISO' VRS construction: no spool sections/lengths or field welds specified

PR

Lack of availability of original spool materials

HW

Lack of JSA (TRA) at task level, causing lack of focus on risk of tasks at hand (e.g. welding)

OR

(Site) supervision focus predominantly on operational Risks rather than Process (safety) Risks.

PR

Ambiguous/overlapping tasks, Roles & Resp. LOP-NAM, ops internal, Ops-Project

OR

Fragmented attention for the WRF project by key staff due to multiple location assignments & multiple handovers

OR

Multiple replacements of key players

Earlier condensate smell reporting not deemed necessary

In situ constr. detail decisions incl. temp. pieces left to constructor staff

No warnings/interventions by supervisors on site

Lack of awareness workers to identify HC Hazards

Inadequate Supervision

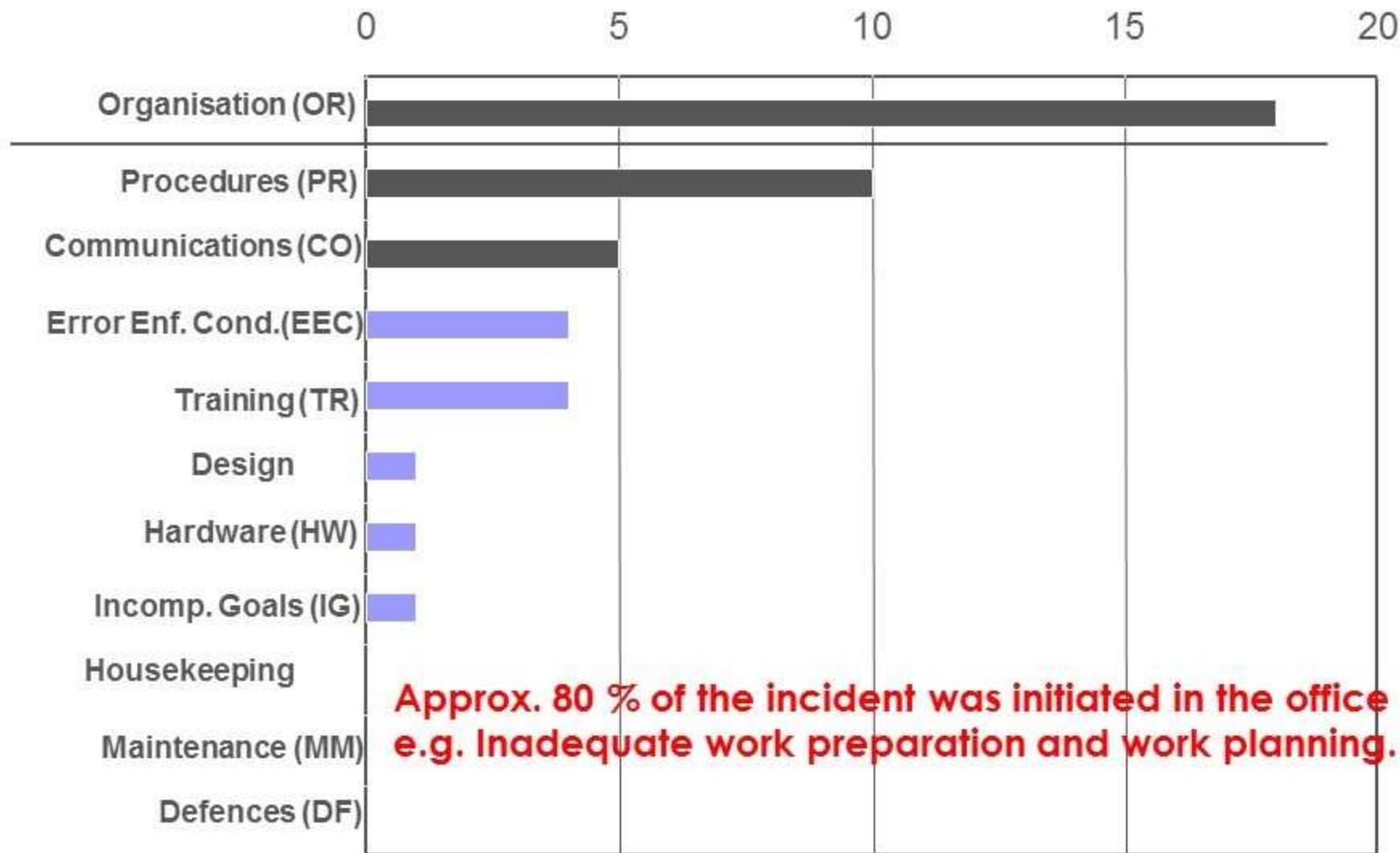
Hot work on 4" gas blanketing line in Zone 0 of roof tank T3

Active Failure

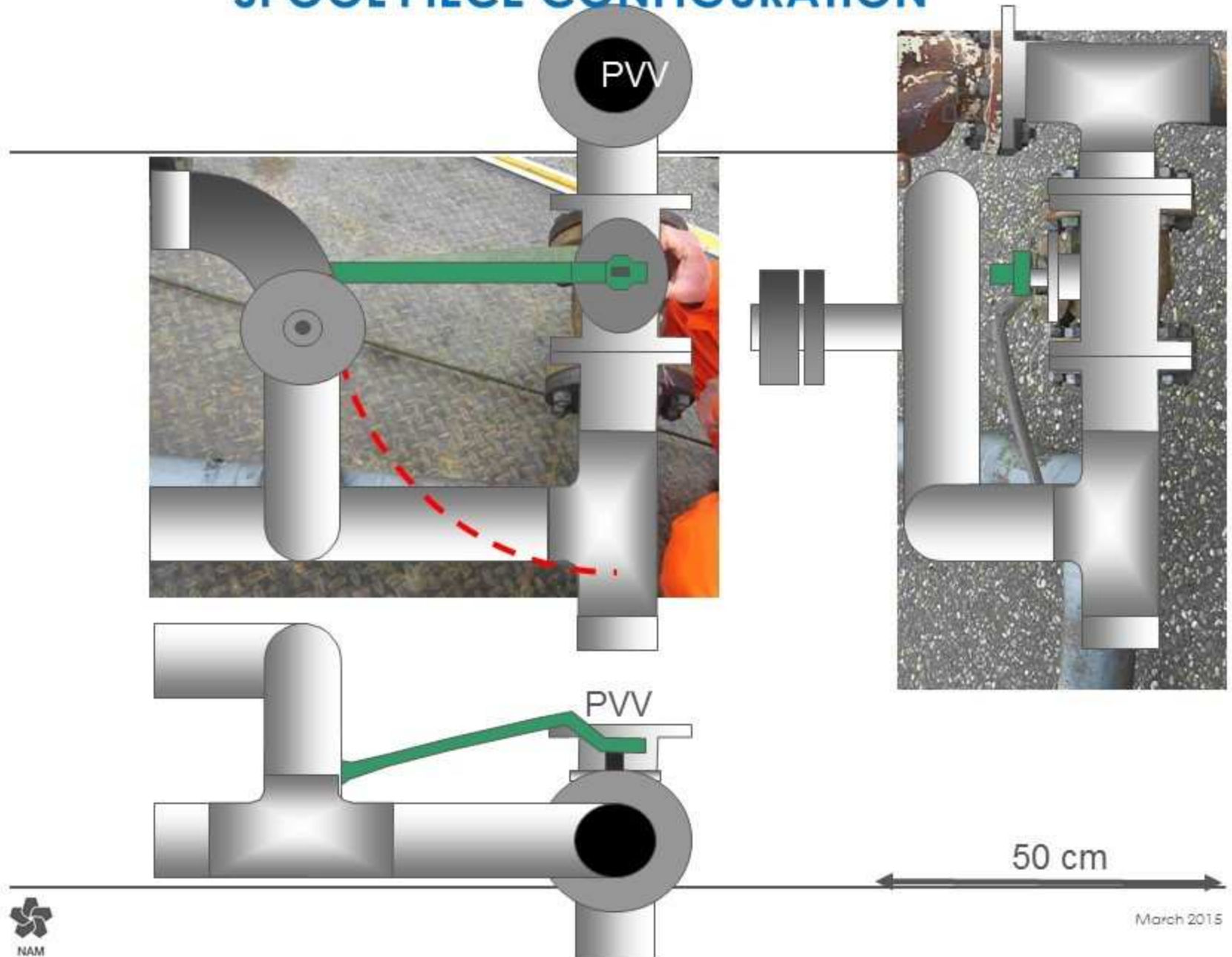
Precondition

No hot work on T3

BASIC RISK FACTORS - PROFILE



SPOOL PIECE CONFIGURATION



DISCUSSION