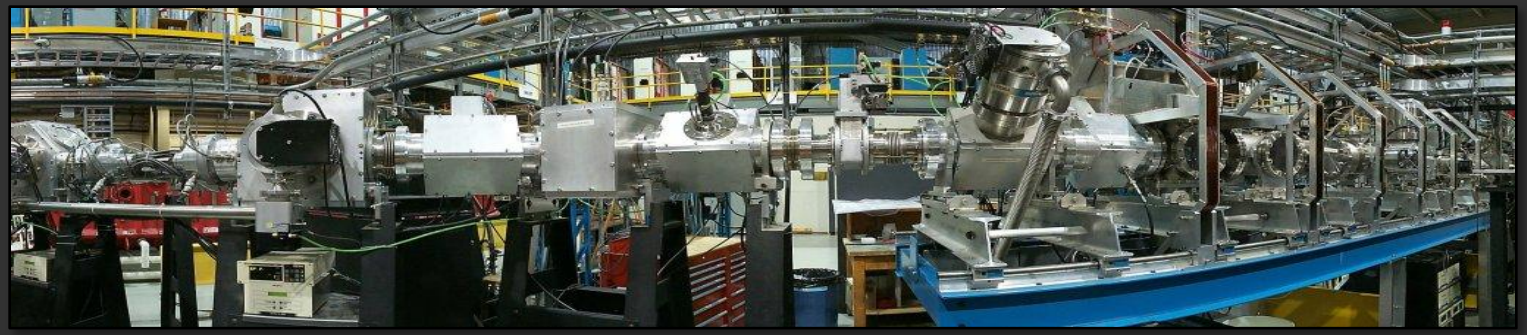
Maintenance Coordination at TRIUMF's Cyclotron & ISAC Facilities

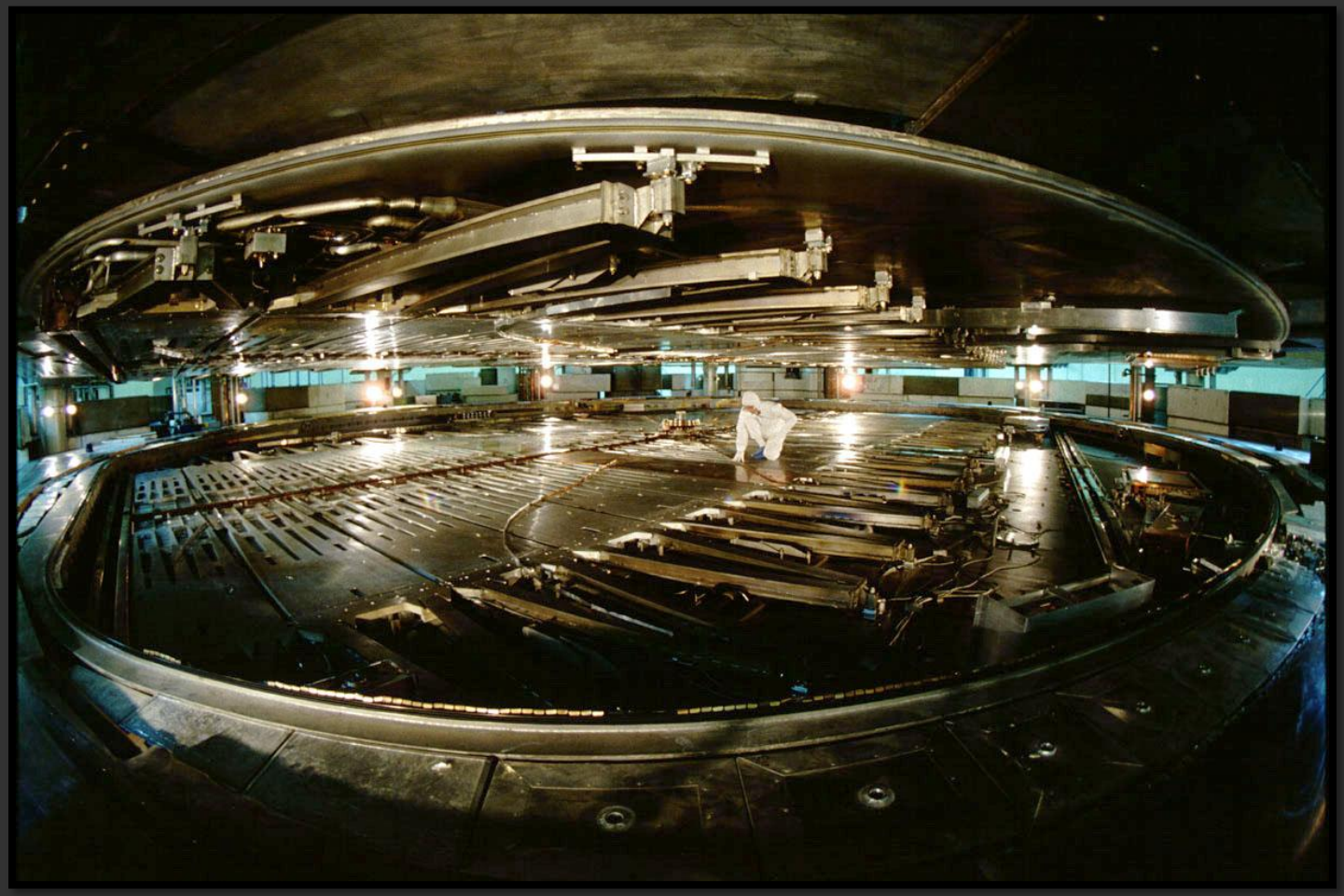


Rene Tanaja, TRIUMF, Vancouver, Canada, magua@triumf.ca

The TRIUMF Cyclotron

- A collaboration of 13 Canadian universities
- At University of British Columbia (U.B.C.), Vancouver, Canada
- 18 m (59 ft) in diameter
- Protons accelerated to 520 MeV
- December, 1974: first beam

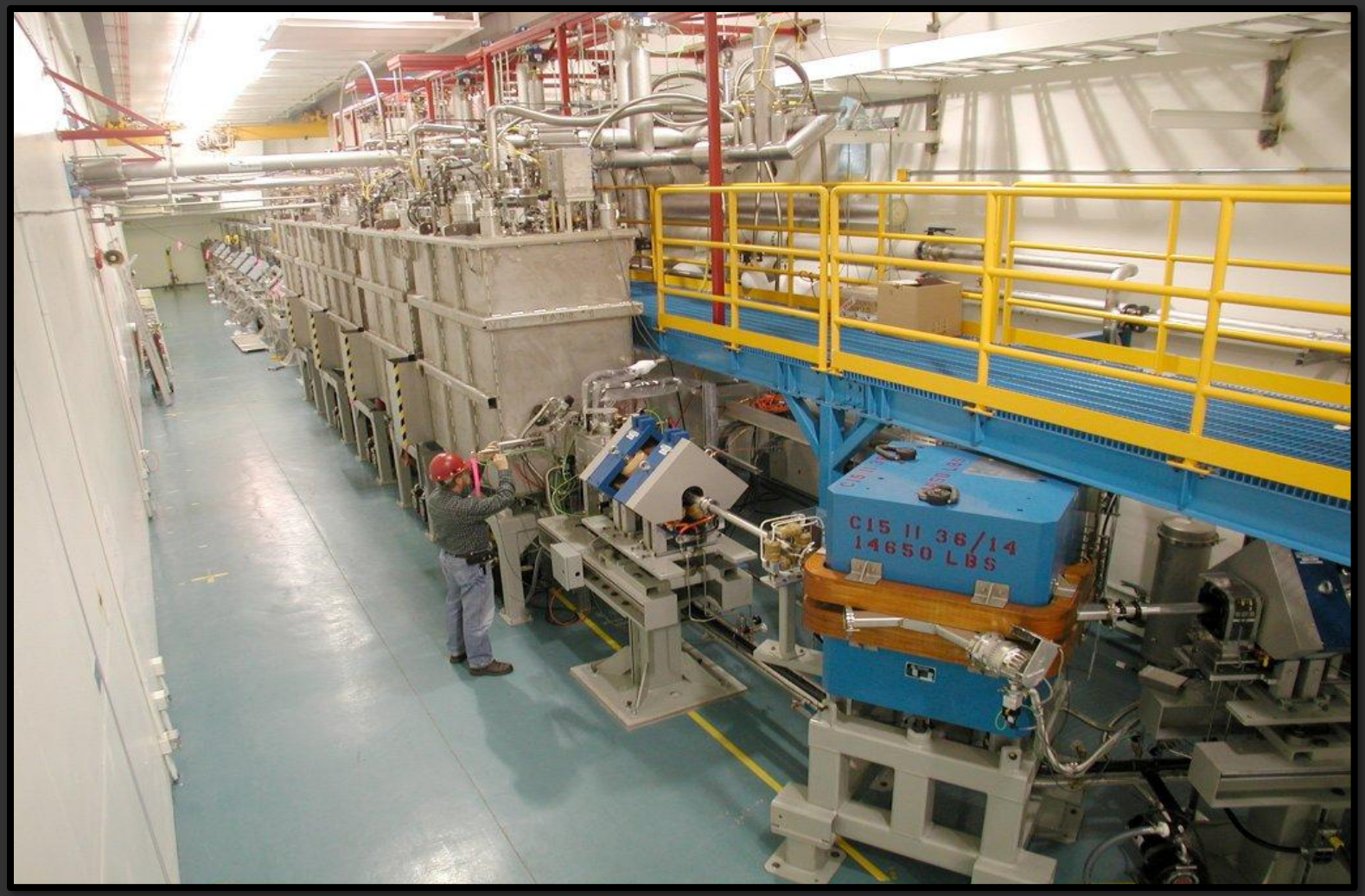
The TRIUMF Cyclotron



The ISAC Facility

- ISAC target treated as “experiment” for the cyclotron
- Heavy ions are separated, accelerated, delivered to experiments
- 2001: First accelerated radioactive ion beam (RIB)
- 2006: First RIB through superconducting accelerator
- Expected maximum acceleration > 6.5 MeV/u

ISAC Superconducting Linac



Maintenance Coordination

- Organized at ISAC or TRIUMF control room (some activities require work permits from both)
- Operators:
  - Document maintenance activities
  - Can assist if needed

Maintenance at TRIUMF

- Three periods:
  - Winter shutdown
  - Scheduled maintenance days
  - Autumn mini-shutdown

- More maintenance days scheduled as issues arise

Winter Shutdown

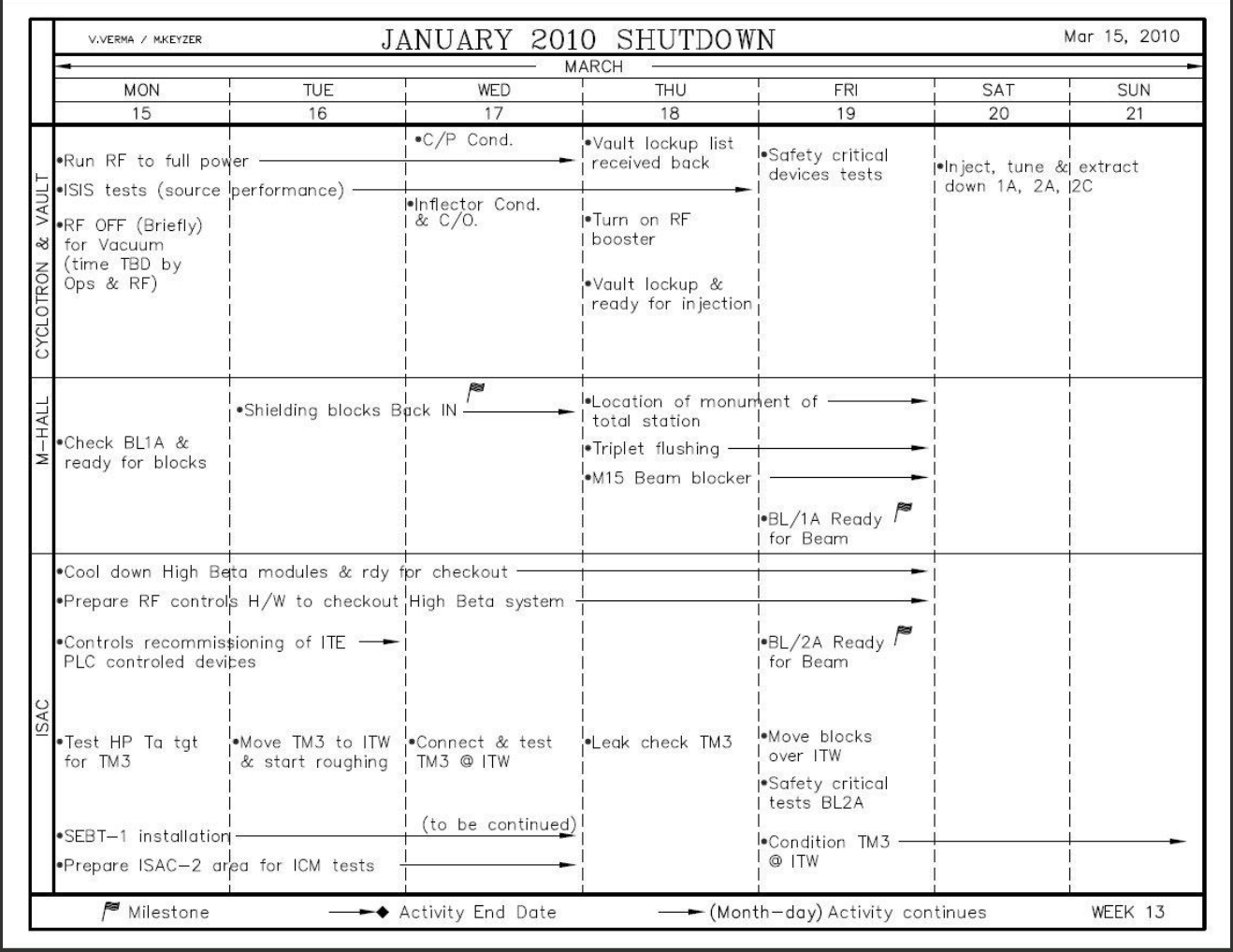
- Over 2 or more months, starting in January
- Most significant & time–consuming jobs
- Installations & upgrades
- Experiment changes

Winter Shutdown Coordination

- Weekly meeting with group representatives
  - Discuss progress
  - Plan coming week

- Weekly schedule updated & posted online

Winter Shutdown Schedule



Scheduled Maintenance Days

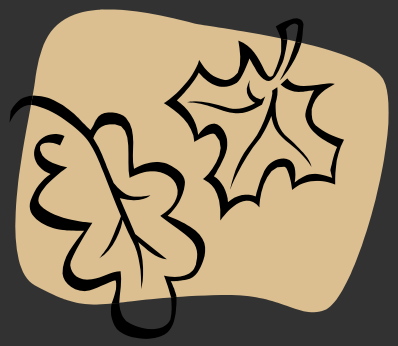
- About every 3 weeks, when cyclotron proton source filament needs to be changed
- Sometimes scheduled with cyclotron development or training day
- Scheduled for 12 - 36 hours

Scheduled Maintenance Days

- Sometimes additional ~ 4 hour maintenance day scheduled if needed
- Organizers and department heads meet to decide if this is necessary, and for how long

Autumn Mini-Shutdown

- A week in September
- Like a longer “scheduled maintenance day”
- For some major maintenance issues that can’t wait until winter shutdown
- Also used to plan the operating schedule for the remainder of the year



Cyclotron Control Room

(circa 2005)

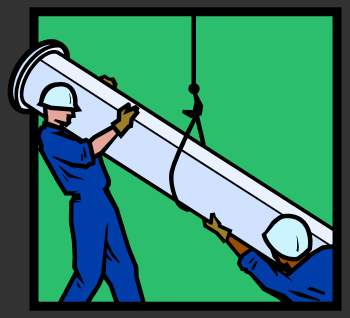
Cyclotron Facility Maintenance

- Issue permits for work in TRIUMF cyclotron area
- Maintain cyclotron, ion source, other equipment
- Replace, upgrade old equipment

ISAC Control Room

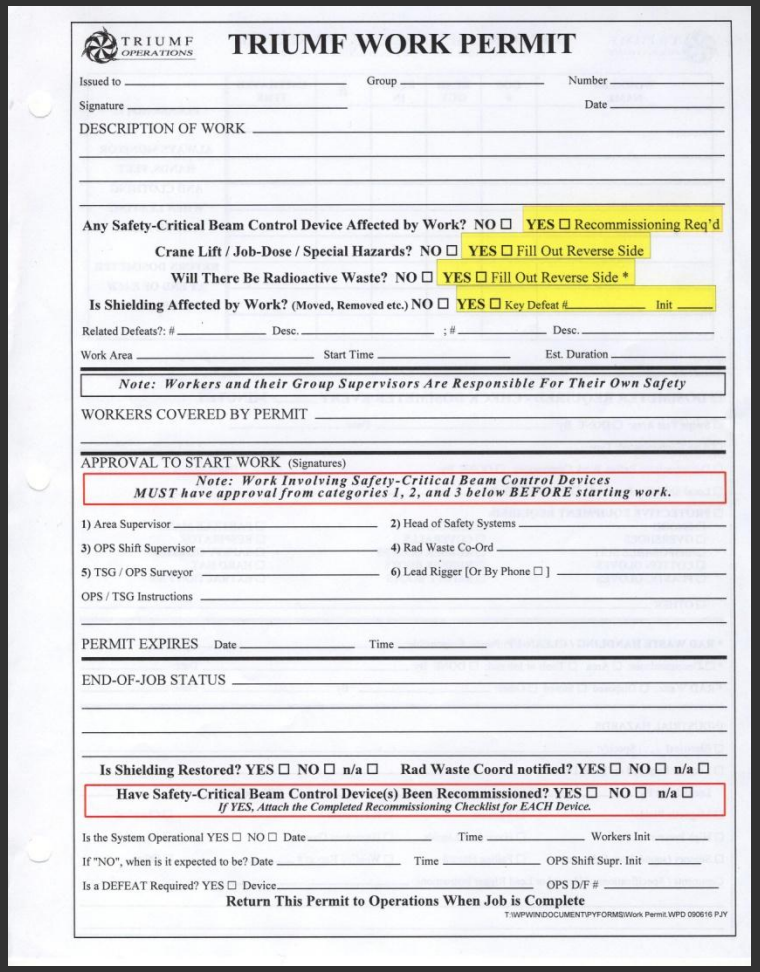
ISAC Facility Maintenance

- Issue permits for work in ISAC buildings
- Maintain equipment in ISAC facility
- Install new experiments and facility equipment
  - Components of superconducting accelerator & experiments
  - New diagnostics



Cyclotron Facility Work Permits

- Paper prior to March 24, 2010
- Permit filled the day of job
- Operations makes a copy
- Worker takes the original
- Operator enters details in database
- When work is finished, original completed & filed
- Copy is destroyed



TRIUMF OPERATIONS

TRIUMF WORK PERMIT

Issued to _____ Group _____ Number _____

Signature _____ Date _____

DESCRIPTION OF WORK _____

Any Safety-Critical Beam Control Device Affected by Work? NO ☐ YES ☐ Recommissioning Req'd

Crane Lift / Job-Dose / Special Hazards? NO ☐ YES ☐ Fill Out Reverse Side

Will There Be Radioactive Waste? NO ☐ YES ☐ Fill Out Reverse Side *

Is Shielding Affected by Work? (Moved, Removed etc.) NO ☐ YES ☐ Key Defeat #_____ Init _____

Related Defeats?: # _____ Desc. _____ ; # _____ Desc. _____

Work Area _____ Start Time _____ Est. Duration _____

Note: Workers and their Group Supervisors Are Responsible For Their Own Safety

WORKERS COVERED BY PERMIT _____

APPROVAL TO START WORK (Signatures)

Note: Work Involving Safety-Critical Beam Control Devices MUST have approval from categories 1, 2, and 3 below BEFORE starting work.

1) Area Supervisor _____ 2) Head of Safety Systems _____

3) OPS Shift Supervisor _____ 4) Rad Waste Co-Ord _____

5) TSG / OPS Surveyor _____ 6) Lead Rigger [Or By Phone ☐] _____

OPS / TSG Instructions _____

PERMIT EXPIRES Date _____ Time _____

END-OF-JOB STATUS _____

Is Shielding Restored? YES ☐ NO ☐ n/a ☐ Rad Waste Coord notified? YES ☐ NO ☐ n/a ☐

Have Safety-Critical Beam Control Device(s) Been Recommissioned? YES ☐ NO ☐ n/a ☐

If YES, Attach the Completed Recommissioning Checklist for EACH Device.

Is the System Operational YES ☐ NO ☐ Date _____ Time _____ Workers Init _____

If "NO", when is it expected to be? Date _____ Time _____ OPS Shift Supr. Init _____

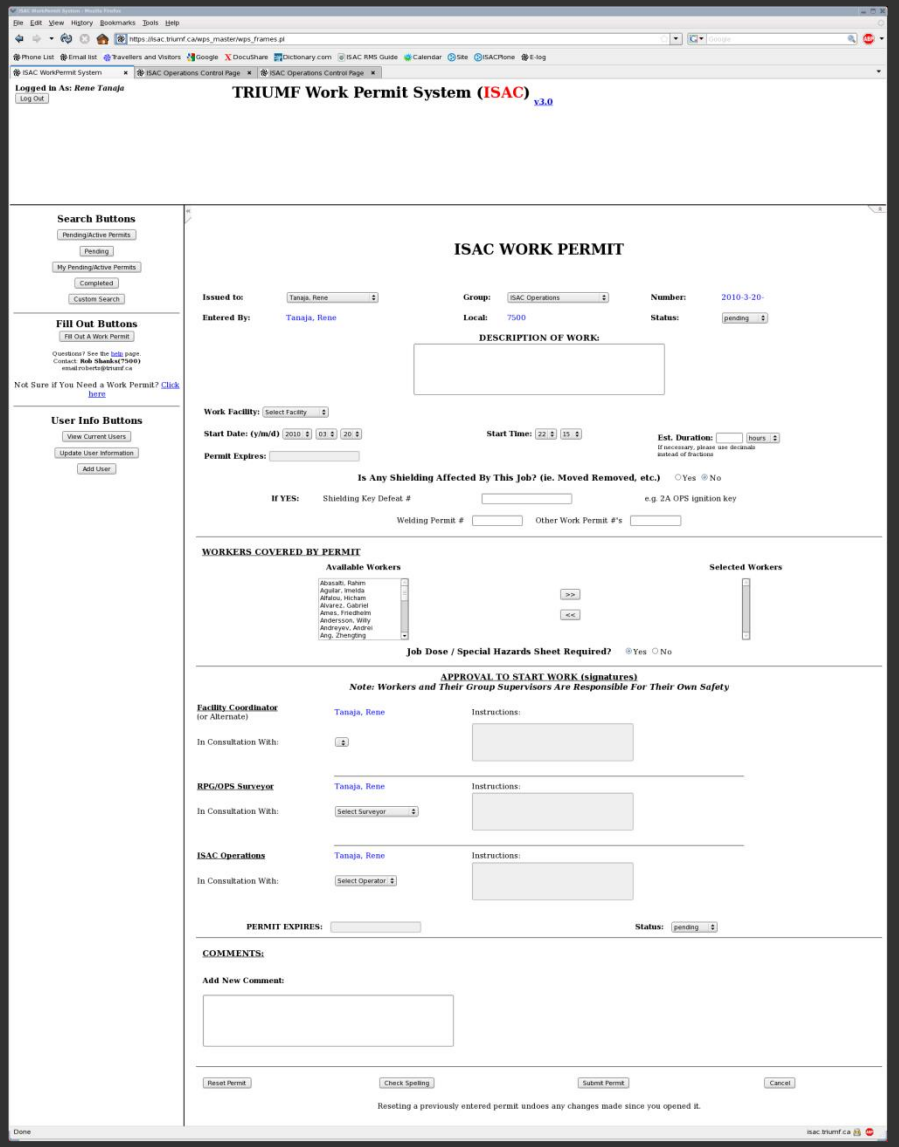
Is a DEFEAT Required? YES ☐ Device _____ OPS D/F # _____

Return This Permit to Operations When Job is Complete

T:\WPWIN\DOCUMENT\PYFORMS\Work Permit.WPD 080616 PJY

ISAC Work Permits

- Online work permits
- Permit required 1(+) day in advance
- Requestor contacts approving personnel
- Operations activates permit if approved
- Before work starts, worker:
  - Makes sure permit active
  - Reviews comments
- When finished, worker completes permit with description of what was done



The Two Work Permit Systems

Electronic

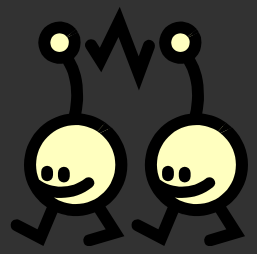
- Can be filled, viewed & adjusted from anywhere on site
- Details immediately filed
- More efficient

Paper

- Face-to-face interaction allows direct instruction to workers
- Worker keeps information at hand while working
- Easier to notice overdue work permits

Combining Operations Groups

- Cyclotron and ISAC operations groups recently joined into one group
- Cyclotron log book and work permit system both online as of March 24, 2010
- Looking for a way to combine advantages of paper and electronic permits
- Discussing assimilation of electronic facilities of both control rooms



Summary

- Maintenance coordinated from each facility's control room
- Three main maintenance times, plus more if needed
  - Winter maintenance most extensive
- Work permit systems are now all online
- Combining the two operations groups means harmonizing the systems of the two control rooms
  - Efforts in progress