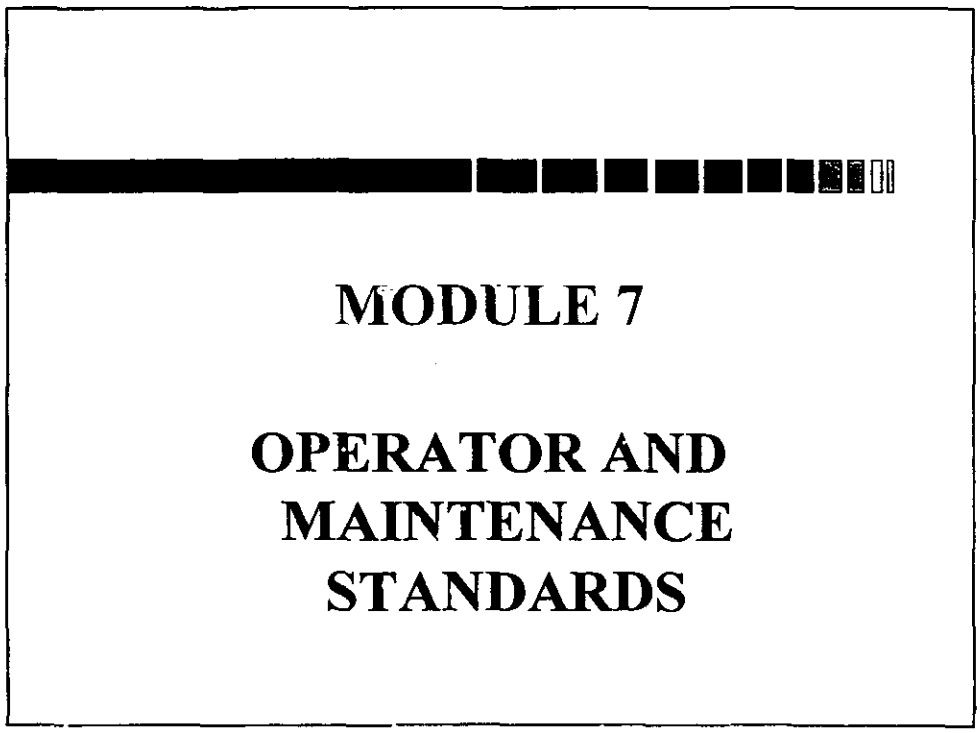


MODULE 7

OPERATOR AND MAINTENANCE STANDARDS

MODULE 7 OBJECTIVE

- To present the message(s) from the Production Manager, Shift Supervisor and Maintenance Superintendent and communicate to the reporting staff.
- To show how corporate principles and criteria are translated into standards for the staff.

OBJECTIVE

- To understand the mechanism of communication and the message being communicated.
- To understand the challenges to the managers (PM, SS, MS) in getting the standard clearly understood by their staff such that the standards are met.

TOPICS TO BE DISCUSSED

- Operator standards
  - What do operators do?
  - Operating philosophy
  - Conduct of operations
  - Safety issues
  - Task / Activities
  - Behaviors

TOPICS TO BE DISCUSSED

- Maintenance standards
  - Professionalism
  - Conduct of maintenance
  - Maintenance standards and principles
  - Quality principles
  - Safety issues

THE CHALLENGE TO MANAGEMENT

- The easy part is writing all the objective, criteria and standards.
- The hard part is having staff adopt an attitude that incorporates the prescribed standards, as the only acceptable way everyday on every job.

THE CHALLENGE TO MANAGEMENT

- Assessing the performance of oneself and staff in the degree of compliance with the various standards.
  - Initiating effective corrective actions where appropriate.
- The assessment is most objectively done by a peer review

OPERATOR STANDARDS

- Nuclear excellence
- Operators will achieve and maintain "nuclear excellence in safety, production, and cost."
- Production managers message

OPERATOR STANDARDS

- A positive attitude of commitment, integrity, innovation and diligence brought to our job each day, will ensure the success of our station.
- Remember: The most important thing each of us control is our attitude.

WHAT OPERATORS DO

- Place equipment and systems in and out of services.
- Monitor to ensure systems conditions are in the operation range.
- Take action to avoid emergencies.
- In an emergency mitigate the situation.

OPERATOR PHILOSOPHY

- Statement of philosophy

OPERATING PHILOSOPHY

The Operations Coordinators at Darlington NGD recognize the high degree of *public and professional responsibility entrusted to the Operator family. This* booklet contains specific performance expectations to support this responsibility and is consistent with our goal to safely produce electrical power at the lowest possible cost. Including:

- Applying the safety basics to ensure safe work.
- Minimizing our radiation dose by applying ALARA principles.
- Using approved procedures, observing all regulations and operating equipment in the manner intended.
- Paying attention to detail, doing it right the first time and self-checking the result using the STAR method.
- Maintaining a questioning mindset and expecting the unexpected.
- Respecting, cooperating and communicating with others in a positive manner, realizing we are all valued team members with important contributions to make.
- *Constantly improving our skills and knowledge.*

REMEMBER: The most important thing each of us controls is our attitude. A positive attitude of commitment, integrity, innovation and diligence brought to our job each day will ensure the success of our station.

"Nuclear Excellence"

CONDUCT OF OPERATIONS

- Operational activities are conducted in a manner that ensures safe and reliable plant operation.
  - Safety is foremost consideration.
  - Operator adhere to procedures.
  - Safety systems and safety related systems are not taken out of service or reduced in capacity or redundancy without appropriate approval of the Shift Supervisor.
  - Station equipment is effectively monitored.

CONDUCT OF OPERATIONS

- Interpret and respond conservatively.
- Businesslike and professional.
- ALARA and minimize the spread of contamination.
- Oral communications are clear, concise and confirmed.
- Accountable
- Self checking

SUPPORT - CONDUCT OF OPERATIONS

1. **Safety**
   See Pg. 8-21 for guidelines on Safety.
2. **Procedural Adherence**
   Procedures reflect a conservative approach to safe and reliable operation.
   Operators must confirm current rev before using a procedure.
   See Pg. 40 for guidelines on Procedural Adherence.
3. **Safety Systems**
   When components are disabled, the length of time is to be minimized.
4. **Station Systems And Equipment**
   Ensure systems and equipment is capable of meeting its design intent.
   Identify and correct deficiencies (DR - be accurate & concise).
   See Pg. 24 Routines.
   Equipment status changes are appropriately documented and communicated.
   See Pg. 26 Control of Field Device Positions.
   The number of alarms in the alarm state are to be minimized.
   See Pg. 32 Alarms.
5. **Interpret And Respond Conservatively**
   Never proceed when faced with uncertainty.
   See Pg. 38 Conservative Approach.
   See Pg. 42 Self Checking.
   See Pg. 32-35 Alarms, Upsets, and Emergency.
6. **Businesslike And Professional**
   Each operating unit functions effectively as a team in handling routine and emergency situations.
   See Pg. 3 Operating Philosophy
   See pg. 44 Teamwork.
7. **ALARA, Minimize The Spread Of Contamination**
   Apply strict adherence to radiological protection procedures and practices.
   See Pg. 12 Radiation Protection.
   See Pg. 20 Pre-job Briefing.
8. **Oral Communications**
   See Pg. 46 Verbal Communications.
9. **Accountability**
   Every operator is accountable for doing their best in accomplishing assigned tasks. SNOs routinely monitor individual performance.

"Achieve/Maintain Nuclear Excellence"

SAFETY

- Safety is first priority.
  - All operators must be aware of and vigorously pursue safety objectives and standards to ensure that safety gets first consideration. We must set good examples by compliance with safety rules and practices. Interest must be vocal, visible and continuous in all our activities. Safety leads all other factors involved in the production of electricity from nuclear power. **"No work is so important or urgent that it cannot be done safely"**

SAFETY

- Safety is everyone's responsibility.
  - Safety is everyone's job and everyone has the authority, responsibility & duty to maintain safety.
- All accidents are preventable.
  - Apply the safety basics; Identify, Eliminate, Control, Protect, Minimize.
- Safety is recognized as good business
  - The safe way is the best way for the protection of personnel, the public, the environment, for minimizing costs and maximizing production.

SUPPORT - SAFETY

1. **Safety Is First Priority In Doing Work**
   Place safety before production or cost.
   Operator decisions will consider potential risks and maintain adequate margin from plant limits.
   Maintain housekeeping standards to assist in providing a safe and orderly working environment.
   Remember no job is complete until the cleanup is finished.
   See Pg. 38, Conservative Approach.
2. **Safety Is Everyone's Responsibility**
   A SNO must inform the NO of all known hazards.
   The NO must immediately notify supervision of all safety concerns.
   Actively encourage and support safety.
   Be an example.
   Demonstrate good work practices, adhere to safety requirements and act on safety concerns in a timely manner.
   Aggressively pursue why a change in plant equipment, hazard or hazard level has occurred.
   Increase monitoring of equipment suspected of abnormal behaviour, potential malfunction or being operated under abnormal conditions.
   Communicate hazards and levels to others (signs, Rad Log, SS, directly to other Work Groups).
   Actively be involved / participate in investigations and follow-ups.
3. **All Accidents Are Preventable**
   Appropriate personal protective equipment must be worn at all times.
   Personnel safety equipment must be kept in good condition.
   Strict adherence to procedures is fundamental.
   Ensure unusual events or activities are passed on to supervision.
   Proper application of the Work Protection Code helps establish and control safe working conditions.
   Look ahead anticipate what could happen and be ready.
   Questions or discrepancies must be resolved and corrected before proceeding.
   Use of self-checking practices to minimize errors and heighten attention to details. Avoid complacency.
   Ensure you know what your doing before you start.
   See Pg. 20, Pre-job Briefing.
4. **Safety Is Recognized As Good Business**
   A good safety culture provides others (i.e. public, regulator) with the assurance and confidence that the plant is being operated in a safe and efficient manner.

"Safety is Good Business"

WORK PROTECTION CODE

The ultimate goal of the Work Protection Code is to establish conditions which, when combined with appropriate work practices, procedures and work methods will provide you and your fellow employees with a safe work area.

The proper application of OPERATOR administered work protection requires:

- **Responsibility/Accountability**
  Your mistake could result in death or injury.

- **Uncompromising Attention To Detail**
  You must personally condition your actions to reflect a zero tolerance for error.

- **Questioning Attitude**
  Never proceed when faced with uncertainty. Ask yourself "would you touch that piece of isolated equipment?"

- **Independence**
  Ensure independence between preparation and checking phases of OTO production.

- **Self-Checking**
  Always adhere to the STAR concept - Stop, Think, Act, Review when executing OTOs.

- **Procedural Adherence**
  Level -A compliance means... "Word for Word".

- **Due Diligence**
  Take every precaution reasonable for the protection of the workers.

"Zero Tolerance For Error"

SUPPORT - WORK PROTECTION CODE

Work Protection documentation is fundamental to the Operator's role in administering the work protection process. Documents must be completed accurately and vigorously to support our safe work environment because:

- Correctly completed documentation minimizes opportunity for error.
- The documents are a contract between two separate authorities. One controlling the workforce, the other controlling the equipment.
- Positioning of field devices and a knowledge of work area activities is fundamental to the role of the control room operator.
- The WPAM requires level A procedural adherence.

In general each section of the WPC forms must be completed or marked N/A (not applicable) and all entries must be legible and durable (i.e. in ink). Identifying signatures should appear as printed name plus written initial.

ESM is a powerful tool that allows OTOs to be prepared quickly and accurately. The associated database contains templates that operators may use when preparing OTOs. Do not become complacent when using this information, things may have changed since this template was last used. Remember that "Your" name will appear at the bottom of the OTO as the preparer. You are still held responsible for the quality of what you prepare.

Remember, as an operator, when you hang a yellow PC3 tag that ..... **"personnel protection ..... means People".**

"Zero Tolerance For Error"

RADIATION PROTECTION

Strict adherence to radiological protection procedures and practices as well as complying with the principles of ALARA are required to minimize dose and prevent the spread of contamination.

- **Carry out assigned radiation protection responsibilities, and make every reasonable effort to minimize dose to yourself and others.**
  Maintain doses ALARA (within administrative limits).
  Minimize/prevent the spread of contamination.

- **Identify inadequacies and suggest improvements** in the radiation protection program to your supervisor.

RADIOACTIVE EFFLUENTS

Operators recognize their responsibility to exercise good environmental stewardship.

- **Minimize the generation of radioactive liquid waste.**
  Non radioactive liquid discharge into radioactive waste systems are minimized.

- **Recover liquid waste and reuse** to the maximum extent possible.

- **Waste streams are properly segregated** during collection and processing, e.g. discharge sumps to appropriate Active Liquid Waste tank.

- **Process waste is properly sampled, analyzed and recorded prior to discharge.**
  Allow adequate recalculation time and obtain representative samples.
  Ensure labels are used.

"Maintain Radiation Doses ALARA"

SUPPORT - RADIATION PROTECTION

- **Doses ALARA, Minimize The Spread Of Contamination**
  Apply the basic elements of radioactive work planning.
- **Identify Radioactive Work**
- **Anticipate The Hazard And Hazard Level**
  Based on system and unit status, area or location.
  What changes in hazards do you expect as a result of the task being performed
  Previous surveys, FAAGM, FAATM, past experience, Rad Control, etc.
- **Assess The Hazard**
  Perform appropriate surveys based on anticipated hazards.
  Communicate results (update signs and Rad Log).
- **Use Proper Dosimetry**
  Submit bioassay samples, record DRD and Pad results.
  Are additional head and trunk badges required or extremity TLDs, thyroid monitor, etc needed.
- **Wear Appropriate Personal Protective Equipment**
  Based on hazard analysis and the work being performed.
  Dress and wear equipment properly.
  Air Supplied plastic suits - DO NOT lift hoods and minimize unplug time.
  Use additional techniques TIME, DISTANCE, DECAY, SHIELDING, DECONTAMINATION, VENTILATION.
- **Personnel And Source Movement Control**
  Monitor at zone changes, personnel and equipment.
  Proper exit from a rubber area.
  Use of appropriate signs.
  Obey signs and barriers.
  Adherence to access control requirements.
  Exit area in the event of a FAAGM or FAATM alarming, and do not re enter area until cause determined and rectified.
  Properly label and dispose of active waste (in appropriate container).
- **Radioactive Work Planning**
  Estimate exposures prior to performing task.
  Adhere to administrative limits.
  Backouts and contingencies properly considered prior to starting the job.
  Use of approved REP
  In the event of an emergency report to your assembly area.

"Maintain Radiation Doses ALARA"

13

ROUTINES & EQUIPMENT INSPECTION

Operators complete routines to identify and correct safety hazards, equipment deficiencies and out of specification system conditions or parameters in a reasonable time period. The quick correction of abnormalities in the field minimizes the threat such circumstances pose to employee safety, public safety, the environment and plant equipment reliability.

1. Determine and **be aware of current plant configuration.** An exchange of pertinent information shall take place between the SNO and the nuclear operator.

2. **Determine alarms or conditions that the ANO / SNO want investigated** and the priority in which they should be addressed.

3. **Determine routines to be completed.**

4. The **SNO will conduct a pre job briefing.**

5. **Complete routines** as scheduled, **ensure deficiencies are identified** and corrective action initiated.

6. The SNO will keep the nuclear operators **informed of changes in the unit/plant status.**

7. **The SNO will routinely monitor the nuclear operators' performance** of routines and feedback to the operator.

8. **Operators report end of shift status to the SNO** and sign off routines. Highlight items to be turned over to the next shift.

9. **Ensure Radiation Log updated and complete dosimetry requirements.** Submit bioassay and update dose information system (e.g. drd results).

"Routines Detect / Anticipate Problems"

SUPPORT - ROUTINES

1. **Current plant configuration**

Hazards & Hazard Levels - particularly any recent changes.
Unusual Events that have occurred - during the last 24 hours.
Unit/plant status - changes in state that are in progress or planned.
Equipment configuration.-unusual lineup, faults, isolations, etc.
Documentation Changes - which impact on the completion of routines.
Planned work for the upcoming shift.

5. **Ensure deficiencies are identified & corrected**

Equipment And Systems Checks

Recognize out of spec. parameters and abnormal equipment conditions.
Report out of specification or abnormal conditions to SNO.

General Area Checks

The following highlights the types of checks that should be carried out.
No obvious fire hazards present and fire fighting equipment free from obstruction.
Oil and water leakage identified, contained and cleaned up (prevent release to environment). Monitor leaks to see if they are getting worse.
Any leak under insulation must be assumed to be a potential pressure boundary failure until the insulation is removed to prove otherwise.
Radiation and contamination identified and contained
Radiation hazard signs posted/updated, Rad Log updated.
Noise and vibration consistent with plant state.
No unusual smells or signs of arcing near electrical equipment.
Walking surfaces clear of oil and other slippery substances.
Walk-ways free from obstruction, handrails and gratings in place.
Steam proof doors closed and electrical box covers closed and secured.
Vent and drain caps installed and insulation in place and undamaged.
Temperature and humidity conditions normal for the area being inspected.
Housekeeping duties performed to keep areas clean, or notify appropriate trade.

Initiate Corrective Action

Correct abnormalities via approved procedures.
Post hazards signs / limit access to the area to protect others.
Initiate a detailed deficiency report (accurate and concise), tag deficiency in the field.
Ensure others(ANO/SNO/SS) recognize the priority if problem warrants immediate attention.

8. **Report end of shift status and sign off routines**

Completed routines are verified by the SNO.
Incomplete routines will be logged in the area log and turned over.
Ensure all documentation complete and filed appropriately.

"Routines Detect / Anticipate Problems"

CONTROL OF FIELD DEVICE POSITION

Controlling the position of manually operated field devices ensures the plant configuration is maintained within the design requirements and that the operating shift knows the status of plant equipment and systems.

1. **All changes to systems states, must be recorded** on ESM. This is not required if the device is to be returned to its normal position within the existing shift.

2. **Adhere to verbal operating instruction restrictions.**

3. **Ensure ESM updated for Jumper Records requiring flowsheet changes.**

4. **Hang Caution Tags** to provide a temporary communication means when tests or workplans are in progress.

5. **Hang Caution Tags** to control operation of devices in order to prevent equipment damage.

6. Immediately **replace bar code ID tags** found to be missing or in error.

7. Ensure **Abnormal Position Binder** maintained as a backup. Once each midnight shift printout a list of out of position devices and file in binder.

8. Altering the state of a Position Assured Device requires the approval of the controlling authority or delegate.

"All System Changes Are Recorded"

SUPPORT - CONTROL OF FIELD DEVICE POSITION

1. **All changes must be recorded**
   Verbal instructions, Jumper Records, or caution tags require the device position to be updated on ESM via the manual status change feature.
   Master flowsheets are on ESM, Mylar flowsheets are retained in MCR for information and backup purposes only.
2. **Verbal instruction restrictions**
   No more than two devices may be requested at any one time.
   The complete device identification (Unit-SCI-Device) and end state must be specified. When a verbal request is received, the complete device identification (Unit-SCI-Device) and end state must be repeated back for verification.
   See Pg. 46, Verbal Communications.
3. **Jumper records requiring flowsheet updates**
   Record jumper record number and a short description of the change.
   Initial the "FLOWSHEET UPDATE" area of the jumper record.
   Ensure JR filed appropriately.
   If ESM is out of service DO NOT FILE until ESM updated.
   When a jumper is being removed ensure all references to the Jumper have been removed.
4. **Caution tags**
   The crew having housekeeping responsibility for an area must ensure that caution tags are current and reflected accurately in the database.
   Upon removal ALL C/Ts including invalid and ones made in error must be placed in the removed caution tag box located in WCA (MCR or TRF).
   They are not to be discarded.
7. **Abnormal position binder**
   If ESM is not available, record out of position devices in the Abnormal Position Binder including copies of OTOs associated with Work Protection. If ESM fails Work Protection deferral should be considered.
   The SS can approve manual OTO preparation based on Mylar flowsheets in conjunction with the Abnormal Position Binder and Master Jumper Records.

"All System Changes Are Recorded"

PROCEDURAL ADHERENCE

The plant will be operated in accordance with written approved procedures. The objective of the "Procedural Adherence Policy" is "FULL ADHERENCE TO HIGH QUALITY PROCEDURES".

- Operators shall adhere to this policy.
- Observe the procedure Compliance Level (A, B or C).
- Operators recognize that procedures have limitations.
- If during the execution, the procedure does not seem correct or appropriate STOP! Place the system or component in a safe condition and contact your supervisor.
  Never proceed when faced with uncertainty.
- Deviations will be marked up and approved consistent with the level of compliance required.
- Operators will follow-up on deviations to initiate corrections and improvements to procedures.

"Adhere To Approved Procedures"

SUPPORT - PROCEDURAL ADHERENCE

The use of approved procedures ensures that an appropriate review process occurs(Technical and Operational), all system interactions are considered and that there is no deterioration in any physical barrier to the release of radioactivity.
Simply:

a) Employee safety aspects of an activity or task have been considered.
b) Layers of defense are maintained to the release of radioactivity.
c) Plant will be operated in accordance with laws and standards.
d) Ensures systems / equipment operated within limits.
e) Provides clear and accurate guidance to support plant operation.
f) Incorporates conservative practices and ensures adequate margins to safety.
g) Avoids operating errors and takes advantage of past experience.

- **Absolute Compliance(A)**
  Word for word compliance where actions are taken in the sequence indicated and each step is executed exactly as written.
- **Compliance With The Sequence and Intent Of Each Step (B)**
  Actions are taken in the sequence indicated. Deviations from the wording of steps is acceptable provided the intent or objective of the step is achieved.
- **General Compliance(C)**
  Deviations from the wording or sequence of the steps is acceptable provided the intent or objective of the procedure is achieved.
- **Recognize that procedures have limitations**
  Field conditions may not be the same every time, nor can the author consider every possible circumstance. Therefore, the operator must constantly evaluate the current situation relative to the direction provided in the procedure and must challenge each step to ensure it is correct and applicable.
- **Follow-up on deviations to initiate corrections**
  File a DR against the deficient CM SCI and send supporting material (e.g. marked up copy to SCI responsible member of Technical Unit).

"Adhere To Approved Procedures"

MAINTENANCE STANDARDS

- Before detailing the standard it is worth considering three questions:
  - What is maintenance?
  - Why is NPP maintenance different for other industries?
  - What is expected from NPP people that differs from their counterparts in other industries?

WHAT IS MAINTENANCE?

Maintenance is the business processes which examines all aspects of plant systems and equipment; to identify and execute the work which is required to mitigate deterioration and ensure the systems and equipment will perform their intended function when required.

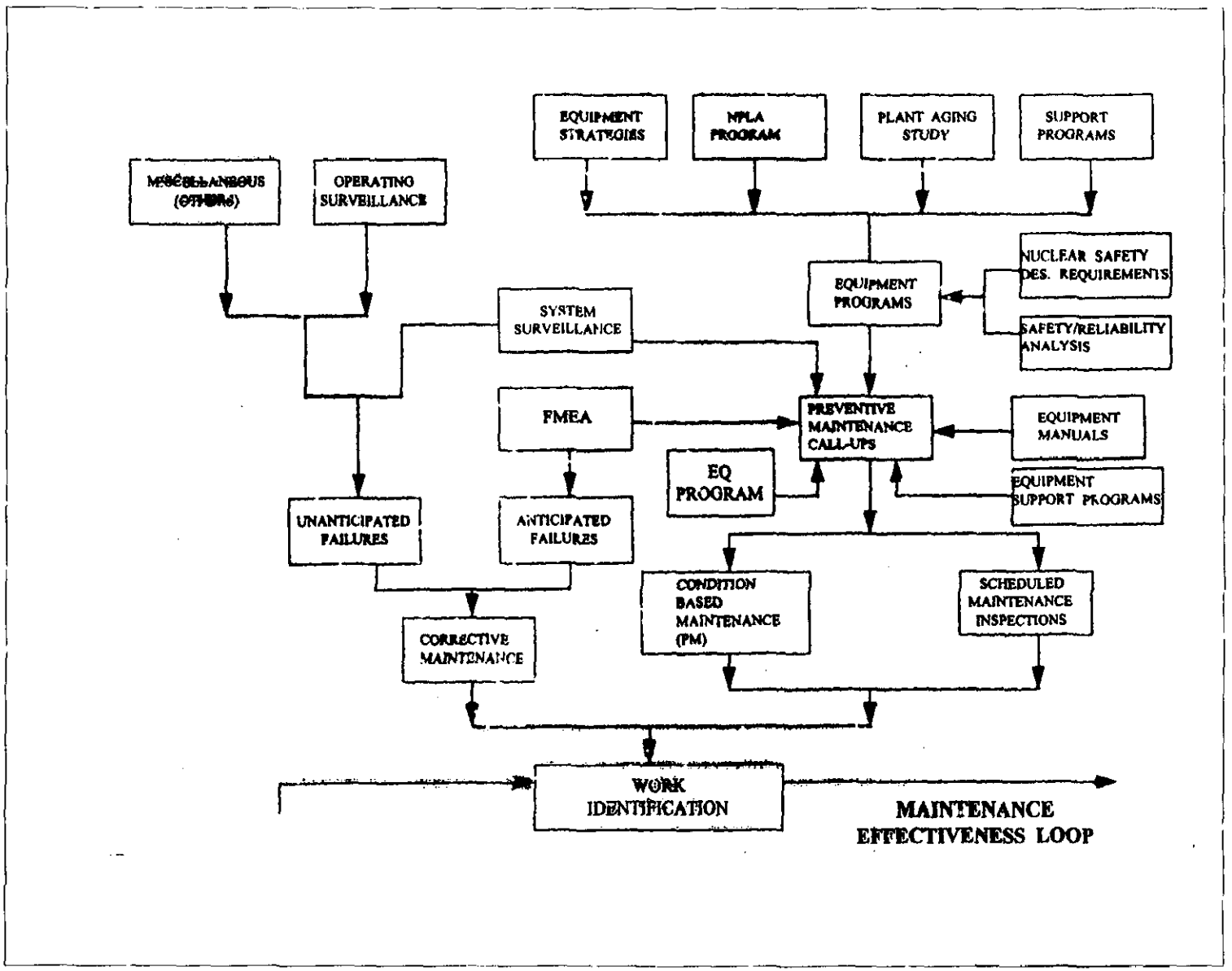
The diagram 'Maintenance effectiveness loop' shows some of the business processes.

WHY IS NPP MAINTENANCE DIFFERENT FROM OTHER INDUSTRIES?

It is different because the consequences or error are infinitely greater. It is different because of the diversity of activities involved and the high degree of skills required within a comparatively small group of people (staff). It is also different due to the difficulties or direct hands on examination of systems and equipment involving high radiation fields. This forces the use of 'indirect' inspection techniques and special safety provisions which make work more difficult eg. working in a plastic suit.

WHAT IS EXPECTED FROM NPP PEOPLE?

Professionalism; as discussed later in this module.


EQUIPMENT STRATEGIES
NPLA PROGRAM
PLANT AGING STUDY
SUPPORT PROGRAMS
MISCELLANEOUS (OTHERS)
OPERATING SURVEILLANCE
NUCLEAR SAFETY DES. REQUIREMENTS
EQUIPMENT PROGRAMS
SAFETY/RELIABILITY ANALYSIS
SYSTEM SURVEILLANCE
FMEA
PREVENTIVE MAINTENANCE CALL-UPS
EQUIPMENT MANUALS
EQ PROGRAM
EQUIPMENT SUPPORT PROGRAMS
UNANTICIPATED FAILURES
ANTICIPATED FAILURES
CONDITION BASED MAINTENANCE (PM)
SCHEDULED MAINTENANCE INSPECTIONS
CORRECTIVE MAINTENANCE
WORK IDENTIFICATION
MAINTENANCE EFFECTIVENESS LOOP

MAINTENANCE STANDARDS

- The following is an example of one mechanism used by a maintenance manager by setting out the required standards in a hand book.
- 'Introduction'
  - Emphasis placed on
    - » Foreign material exclusion
    - » Rigging practices
    - » Bolting practices

MAINTENANCE STANDARDS

- Forward
  - Mission statement
  - Corporate message

MISSION STATEMENT

"Pickering will be a world class Nuclear Generating station in which employees and the people of Ontario take pride for its safe production of reliable and economic electricity"

To accomplish this mission, Pickering must have an excellent maintenance program, one that consistently ensures that station systems and equipment continue to meet performance and safety targets. Excellence in maintenance performance can only be attained through teamwork, safe work practices, professionalism and a dedicated commitment to maintaining pace with today's increasing nuclear industry standards.

In particular, we all need to improve our quality of work and make conservative decisions when faced with uncertain situations. The nuclear environment requires us to work to high standards - standards which are being elevated every year. At PND, we not only want to meet these standards but exceed them is our daily work practices.

This handbook of maintenance standards is applicable to all phases of maintenance activities supporting PND plant operations. It was developed by building on and adapting similar handbooks already in use at Salem and Hope Creek Nuclear Power Stations (US), and Bruce-A and Darlington.

The Handbook brings together in one place information already available in various PND plant procedures and documents, ranging from Station Instructions to Maintenance Procedures.

Our purpose is to provide you with a ready reference to guide you in the right direction. Read each section. Refer to them frequently for guidance. Recommend any necessary changes to your supervisor or use the handy feedback coupon in the handbook. This is a living document, one which reflects our high work standards as PND employees. We need cooperation and participation from all employees to be successful.

PROFESSIONALISM

- Team work
- Setting and maintaining high standards
- Organized; knowledgeable
- Physically and mentally ready
- Self critical looking for improvement

PROFESSIONALISM

Professionalism applies to the conduct of work activities such as attention to detail, supervisor involvement and management concern for improved performance. It establishes an attitude that is a way of life in the best performing businesses. Maintenance performance is a TEAM function that operates best when supervisors, trades persons and support groups work together. Maintenance personnel should be viewed as individuals who:

- Meet commitments with quality work.
- Set high standards.
- Are organized, and physically and mentally ready to work.
- Consider themselves part of a professional TEAM that meets station objectives.
- Take full responsibility for ALL aspects of the job.
- Exhibit professional conduct.
- Have respect for TEAM members.
- Work together to correct problems.
- Want to grow, develop technically, learn additional tasks and realize their full potential.
- Are self-critical, looking for ways to improve performance.

We are committed to achieving success through teamwork and constant improvement of maintenance performance. Maintenance is not a one-time activity, but a dynamic, technically demanding endeavor. We expect to be ranked among the "world's best" nuclear power plants by virtue of our excellent performance and dedication to higher goals.

CONDUCT OF MAINTENANCE

- Maintenance is conducted in a safe and efficient manner.
  - Work is performed safely
  - Constant quality workmanship
  - Unexpected condition step
  - Persue deficiencies
  - All work, - authorized / controlled / documented

CONDUCT OF MAINTENANCE

- Pre-job briefing
- Adhere to 'controlled' procedures
- Follow good practices
- Post maintenance testing
- Non-Station personnel supervision

CONDUCT OF MAINTENANCE

"Maintenance is conducted in a safe and efficient manner to support safe and reliable plant operation"

This conduct can be judged by the following criteria:

- Work is performed safely, both for the person doing it and those in the vicinity.
- Maintenance personnel exhibit professionalism and competency in performing assigned tasks. This consistently results in quality workmanship (eg. work is done right the first time, with no rework).
- When unexpected conditions arise, personnel seek appropriate guidance before proceeding.
- Maintenance personnel identify and pursue corrective actions for plant deficiencies, with the goal of maintaining equipment and systems in optimal condition.
- Maintenance Managers, Supervisors and Maintainers actively use ALARA concepts to minimize personnel radiation exposure.
- Support groups, such as Operations, Engineering Services, Production Technical and Radiation Control are appropriately involved in maintenance activities.
- Maintenance work is properly authorized, controlled and documented. Documentation includes sufficient details of as-found and as-left conditions of the equipment and work performed, to support root cause analysis of problems.
- Ensure that pre- and post-job briefings are effectively used.
- Work activities are performed in accordance with controlled procedures, instructions and drawings as required by plant policy. Maintenance personnel will prove timely feedback to correct procedural problems.
- Good maintenance practices such as those listed below are followed:
    - Work practices are technically sound.
    - Proper tools, equipment and materials are used and stored correctly.
    - Foreign materials and contaminants are excluded from open systems and equipment.
    - Work locations are clean and orderly both during and after maintenance.

- Post-maintenance testing is performed, results are reviewed and corrective actions are taken as necessary.
- Maintenance rework is identified and documented. Corrective actions are taken as appropriate.
- Non-station personnel are properly supervised and work under the same controls and procedures - and to the same standards - as station maintenance personnel.

MAINTENANCE STANDARDS AND PRINCIPLES

- Safety
- Pre and post job briefings
- Self checking and peer verification
- Procedures used and compliance
- Lifting and rigging hardware
- Bolting practices

MAINTENANCE STANDARDS AND PRINCIPLES

- Foreign maintenance exclusion
- Radiation protection
- Proper use of tools and materials.

MAINTENANCE STANDARDS AND PRINCIPLES

Standards are essential to ALL maintenance activities. Proper maintenance practices are developed through constant attention to and application of the following standards.

- Maintenance is performed by or under the direct supervision of personnel who have completed applicable formal qualification for the tasks to be performed.
- If, during the performance of work, unexpected conditions develop, conflicts arise or the activity cannot be performed as described, work shall be stopped and the first-line supervisor/delegate informed.
- The latest approved revision of procedures will be used. The procedure will be referred to frequently enough to ensure proper technical use and compliance. Never proceeded when faced with uncertainty.
- Equipment will by properly isolated, tagged and drained of any potential energy or otherwise placed in a safe working condition.
- Equipment is accessible for maintenance activities. Fixed local are hoists and work platforms are provided, as needed, to facilitate access for maintenance.
- A laydown area, if required, will be established for equipment disassembly and will be maintained appropriately.
- Material used for maintenance will be approved for the job. Use of substitute materials will be allowed ONLY after proper authorization has been obtained using the "Material Engineering" procedure.
- All work shall be controlled through the first line supervisor. The responsibility for safety, quality and quantity rests with both the employee and the supervisor/delegate.
- It is essential that the impact of maintenance activities on plant operations be thoroughly understood by ALL involved parties. All maintenance staff are responsible for communicating the potential impact of work to Operations or other affected personnel.
- Work history documentation (eg. work reports; procedures) shall be thoroughly and clearly written to describe maintenance activities, with sufficient details to aid further problem analysis and troubleshooting. This information would normally include "as-found" conditions, maintenance and any post-maintenance checks performed.

QUALITY PRINCIPLES

- Define goals, objectives and policies and ensure they are understood.
- Specify roles and responsibilities and ensure they are understood and accepted.
- Specify and communicate results to be achieved, and identify and allocated resources to achieve them.

QUALITY PRINCIPLES

- Hold individuals accountable for the work they do:
  - Clearly define expected results and ensure they are understood and accepted.
  - Measure performance against expected results, and
  - Judge individual performance according to results achieved.

QUALITY PRINCIPLES

- Ensure people are competent at the work they do.
- Ensure the right people have the right information at the right time.
- Seek and use relevant experience.
- The four basic steps to quality work are: Plan/Do/Check/Act
- Use the right material, equipment and processes, and control any changes to them.

QUALITY PRINCIPLES

- Verify work to ensure that it meets requirements.
- Identify and fix deficiencies and their causes.
- Control essential documents and records.
- Periodically review effectiveness of management and work processes.

SAFETY

- No work is so important or urgent that it cannot be done safely.
- Safety is everybody's responsibility.
- Adherence to safely requirements is part of every job.
- Follow confined space guidelines.
- Follow the fall protection procedure
- Warning signs and barriers where a hazard is introduced.

SAFETY

- Procedural safety precautions reviewed prior to commencing work.
- Work planned to eliminate potential hazards.
- Appropriate personal protective equipment must be worn.

PRE AND POST-JOB BRIEFING

- Pre-job briefing is essential when assigning work. It is the workers right to be given an effective Pre-job Briefing prior to starting work.

PRE AND POST-JOB BRIEFING

- Expectations of a First Line Supervisor/Delegate:
  - Give a Pre-job briefing
  - Ensure workers have a clear understanding of the intent.
  - Address safety concerns
  - Jobsite inspection
  - Independent verification

PRE AND POST-JOB BRIEFING

- Expectations of those performing work:
  - Satisfied that procedures are appropriate
  - Learn the purpose of the job
  - Review safety considerations
  - Ensure Independent verification
  - Review the requirements for Post Maintenance Testing

PRE AND POST-JOB BRIEFING

- A Post-Job Briefing will ensure:
  - Equipment was returned to its "as designed" state
  - Post maintenance test successful
  - Procedures updated to incorporate lessons learned
  - Any abnormal conditions
  - Communicate to those "who need to know"
  - Work area was left free of dirt, debris, tools, parts

SELF CHECKING AND PEER VERIFICATION

- Remember the "**STAR**" concept:
  - **S**top - to enhance attention to detail
  - **T**hink - and understand
  - **A**ct - on confirmed task
  - **R**eview - and verify response

SELF CHECKING AND PEER VERIFICATION

- Peer verification: is done through the use of the "verification plan".
- This method of Peer inspection provides the opportunity to check highly critical conditions.
- It is essential to develop a "questioning attitude".

PROCEDURE USE AND COMPLIANCE

- Failure to follow procedures are MAJOR contributors to nuclear industry events.
- Procedures are written to help workers through complex work. eg. "intelligent" compliance.
- Three designations for procedure usage:
  - In-hand use
  - Reference use
  - Available use

PROCEDURE USE AND COMPLIANCE

- In-hand use requires to perform each step in the order given.
- Reference use requires workers to read the procedure prior to performance.
- Available use may not be in the field.
- At least one person must be qualified to perform the task.
- "Never proceed when faced with uncertainty."

LIFTING AND RIGGING HARDWARE

- Legal compliance
- Rigging practices more likely to cause accidents than equipment failure.
- Before use perform pre-operational checks
- Defective devices returned immediately to stores.
- Overhauled lifting devices functionally tested prior to use.
- Rated capacity must be clearly identified.

LIFTING AND RIGGING HARDWARE

- Determine the weight of the load to be lifted.
- Do not exceed capacities.
- Inappropriate rigging practices to be avoided at all times.

BOLTING PRACTICES

- Leak tight bolted joints:
  - Reduced dose
  - Safe working conditions
  - Reduced plant downtime
  - Reduced repair cost
- Use the Maintenance Procedures
- Use the approved drawing/manufacturers manual.

BOLTING PRACTICES

- Mechanical maintainers will be trained in specific techniques and procedures.
- All torque wrenches have a current calibration tag attached.
- Flogging and impact wrenches only used for loosening off.

CHEMICAL HANDLING

- Maintenance staff required to handle various types of chemicals.
- The term "chemical" also applies to less obvious products such as lubricating oils, greases, soaps, and detergents.
- Chemicals must not be purchased using low dollar value purchase orders.
- Flammable materials and chemicals must be labelled and stored appropriately.

RADIATION PROTECTION

- Effective radiation protection is assured using ALARA principles (including):
  - Detailed job planning
  - Use of mock-ups and rehearsals
  - Good housekeeping
  - Correct use of protective clothing
  - Establishing a rubber area
  - Correct use of portable radiation instruments.
  - Correct dosimetry
  - Use of exposure control practices

FOREIGN MATERIAL EXCLUSION

- Major equipment damage can occur from foreign material.
- Maintenance personnel are expect to:
  - Comply with all FME requirements
  - Use good work practices
  - Notify his/her supervisor or problems
  - Ensure all openings into systems are controlled to prevent unwanted material entering.

ENVIRONMENTAL QUALIFICATIONS

- This equipment is identified in WMS equipment database.
- Not substituting parts without approval
- Ensuring that EQ'd panels sealed properly
- Keeping steam doors closes & in good repair

MAINTENANCE HISTORY

- Information must be accurately captured in documentation and should include the following:
  - As-found condition
  - What problems were encountered
  - Repairs were made
  - Other information helpful in future
  - What post-maintenance testing was done

COMMUNICATIONS

- Effective communication is essential for safe plant maintenance.
- Radio communication will be used when appropriate.
- Regular safety meetings to communicate safety issues.
- Discuss concerns with supervision.
- Elected employee representatives have the right of access to management supervision.

PLANT CONDITION

- Key indications of a well-maintained plant is appearance, cleanliness and housekeeping can only be established and maintained by knowledgeable individuals who assume OWNERSHIP.

PLANT CONDITION

- The following guidelines apply:
  - Tools and equipment will be properly stored.
  - Walkways maintained free from obstruction.
  - Tradespersons to maintain cleanliness in the work area.
  - Contaminated materials properly stored and posted.
  - Shop areas maintained clean, neat, orderly.

POST MAINTENANCE AND TESTING

- Post-maintenance testing (PMT) ensures systems perform intended functions.
- A satisfactory test is one that verifies that the original deficiency has been corrected and no new or related problems have been created by the maintenance activity.
- Maintenance testing following maintenance to ensure proper functioning.
- On Special Safety Systems, relevant Safety System Test will be performed

PROPER USE OF TOOLS

- Use the proper tools for the job.
- Tools requiring periodic maintenance returned to stores.
- Knives will not be used for stripping cables.
- Only hammers will be used for hammering.

PROPER USE OF TOOLS

- Screwdrivers must be used properly.
- Mechanical advantage provided by the used of multipliers, not makeshift extension arms.
- Lifting devices must not be fabricated or modified without engineering approval.

CHANGE CONTROL

- There are five processes used to make changes:
  - Normal maintenance
  - Pressure boundary repair
  - Temporary change under a jumper
  - Substitute parts
  - Permanent change process.