

CONTROL MAINTENANCE TRAINING PROGRAM

FOR

SPECIAL SAFETY SYSTEMS AT BRUCE B

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HISTORY

It was recognized from the early days of commissioning of Bruce B that Control Maintenance staff would require a level of expertise to be able to maintain Special Safety Systems in proper running order. In the early 80's this was achieved through hands-on experience during the original commissioning, troubleshooting and placing of the various systems in service. Control Maintenance Procedures were developed and implemented as the new systems came available for commissioning, as were operating manuals, training manuals etc. A Production Section Instruction (PSI 3.03) was written to define the requirements for Shift Control Technicians to become qualified, as well as define the need for requalification.

PSI 3.03 also identified a need for a qualification binder to be maintained in the station that would list all "qualified" Shift Control Technicians for each of the Special Safety Systems, i.e. Shutdown System #1 (SDS#1), Shutdown System #2 (SDS#2), Emergency Core Injection (ECI), and Negative Pressure Containment (NPC).

Originally, most of the Shift Control Technicians (SCT's) who had been involved in the commissioning of Special Safety Systems were "Grandfathered" into the new system. Their names were placed into the Qualification Binder and were allowed to continue

working. New SCT's wishing to work on Special Safety Systems were required to meet the guidelines as set out in PSI 3.03. This included completing various procedures, attending system specific training, as well as working on the various systems while accompanied by a qualified SCT until he or she had gained sufficient knowledge and skills as to be able to safely work on their own. At that time the SCT would be added to the Qualification Binder.

There were a number of flaws with the original plan.

- Formal training objectives were not well defined. The course was usually delivered by the System Engineer. The material presented to the SCT tended to be technical in nature and did not readily help the SCT with the day to day job in the field. The usual course length was one half day or a full day. The actual amount of useful knowledge transfer was questionable.
- System specific Training Manuals were put together and distributed to SCT's entering the Qualification Program but the material consisted mainly of sections cut and pasted from other documents, i.e. Operator training manuals, Operating Policies & Procedures (OP&P's), Design Manuals etc. The final product was a mix of information that was not specific to the job of an SCT.

HISTORY (CONTINUED)

- Although PSI 3.03 stated that each SCT must requalify annually for each Special Safety System, no requalification program was ever developed or put in place.
- There was no formal way of tracking an SCT's development through the qualification process. Record keeping of procedures completed and field experience obtained was the responsibility of the individual.

Very little attention was given to the qualification process during the mid to late 80's as units were coming on line and commissioning was a top priority. Priority was on production - not on training.

During this same time frame, internal and external audits started to identify weaknesses in our Maintenance Program. We questioned our ability to

qualify personnel, as well as maintain their qualification.

We were not doing a good job of tracking our program, and had no process in place that would allow us to be able to show what was being done. We believed we should be able to show the status of any qualified SCT or that of an SCT in the process of becoming qualified. This status would include procedures completed, courses taken, requalification dates, as well as accurate records of when the next requalification was due.

Under the direction of the Maintenance Manager, a Conduct of Maintenance section was organized. One of the responsibilities of this section was to develop a series of Maintenance Administrative Procedures (MAPs) that set the standards for maintenance activities including training.

QUALIFICATION PROGRAM DEVELOPMENT PROJECT

The first step in the process to a better qualification program was to develop a MAP which would clearly define each qualification, the process required to obtain that qualification, as well as how that qualification would be maintained. The MAP would also clearly define ownership of the program.

A team was assembled in the winter of 1995 to work on the project. The team consisted of Shift Control Technicians, a Senior Shift Control Technician, System Engineer, Shift Maintenance Supervisor - Control, as well as a Shift Superintendent. Over a short period of time, MAP 2.001, "Control Maintenance Safety System Qualification Program" was developed.

The final product consisted of the following:

- New training manuals for SDS, NPC and ECI
- Refresher training packages for SDS, NPC and ECI

- A fully traceable accounting system for all SCT's in the Qualification Program
- New forms for the inputting of information from the field supervisors to the Training Information Management System (TIMS)
- All qualified personnel trained to meet requalification standards

As part of the implementation plan, a program schedule was developed which allowed all parts of the new process to be put in place by March 31, 1997. All training programs would be developed, training would be presented and the TIMS accounting system would be in place. This gave BNGS "B" roughly 18 months to get everything in order.

DETAILS OF MAP 2.001

The Qualification Program is designed to provide maintenance personnel with the highest level of knowledge and skills so their performance can contribute to safe and reliable plant maintenance and operation. MAP 2.001 specifies how this will be done.

Some of the highlights are as follows:

- Before any SCT can become part of the qualification program, he or she must meet the following minimum requirements:
 - green or yellow badge qualified
 - completed level 4 station systems
 - current Work Protection
 - completed OP&P Training
 - minimum of 2 years experience at BNGS"B"

Once the minimum requirements are met, the candidate may be placed in the Qualification Program. This is accomplished via Bruce B Form BBF-50 and requires approval of the Control Maintenance Coordinator.

There are a number of qualifications that a candidate may work towards within the Qualification Program including:

- SDS#1/SDS#2 Tier#1,
- SDS#1/SDS#2 Tier#2
- SDS#1/SDS#2 Tier#3
- NPC
- ECI
- F/H-TC (This is a special qualification to allow SCT's to do maintenance on the Fuel Handling Transfer Chamber Doors, which constitute part of the NPC system.)

MAP 2.001 specifically outlines the process for each qualification including training required, procedures to be completed, field experience required as well as the working rights and limitations for each qualification. The entire process is tracked through TIMS and will be discussed later.

To make the MAP more user friendly, appendices were included to show, in block form, the qualification process and forms required for each specific qualification.

DEVELOPMENT OF TRAINING MANUALS

The single largest task undertaken in our move to a better Qualification Program was the development of new Special Safety System Training Manuals, as the existing material was outdated, poorly laid out and not of any real value to the SCT working in the field.

To ensure the final product would meet Ontario Hydro Nuclear Standards, we made use of the expertise of the Western Nuclear Training Department (WNTD). They provided word processing and drafting services, and a Training Technician to assure the final manual for each Special Safety System would meet TSSD standards that were developed from INPO documents. The actual technical information within the documents was written by experienced SCT's.

After canvassing the Control Maintenance staff, volunteers were selected to provide the technical content of each manual. Questionnaires were sent out to all staff who were presently qualified asking for their input into the final product. This feedback was used to help determine what the final product would look like. For example, a large number of respondents requested that actual logic drawings be included in the manuals. They were looking for training, and training material that would assist them long after the course was completed.

The SCT's writing the material were given wide latitude in developing the final product, based on the feedback from the questionnaires and their personal experience. The intent was to produce a training manual that was easy to follow, relevant to the SCT's job in the field and most importantly, of value to the SCT after he or she left the classroom and returned to the actual work environment.

To accomplish this task, the following generic format was adopted for each of the Special Safety System manuals.

- Section 1 would consist of a general overview of the specific Special Safety System, including the purpose, specific definitions and terminology, failing safe methods, testing requirements, and generic concerns that are common to all Special Safety Systems. (e.g. Mercury Wetted Relays)
- Each Special Safety System would then be broken down into sizable pieces that would be developed under the following headings:
 - Reference material
 - Purpose
 - Failing Safe
 - Circuit Operation
 - Section Specific Information
 - Trip and Testing
 - Common Faults

Simplified process loop and elementary drawings were drafted from the actual station documentation to support the training material. All references to wire numbers were deleted from the simplified drawings as there was a fear that people might substitute training material for approved drawings in the field, and try to troubleshoot from them.

Also, the simplified training drawings did not include test circuit logic, indicators, multiplying relaying etc. as this was not considered relevant to the concepts being discussed.

SPECIFIC DETAILS

Using the SDS#1/SDS#2 manual as an example, Section 1 consists of an overview of both Special Safety Systems, generic test circuits, definitions, etc.

Section 2 is SDS#1 specific and breaks SDS#1 down into 3 specific sections which are:

- Trip Logic,
- Firing System (Shut Off Rods) and
- Individual Trip Parameters

Each section is then broken down to the trip relay level. The material is written to give the candidate a thorough understanding of how the individual sections tie together and is reinforced with the simplified drawings.

To reinforce the lessons learned, questions are included at the end of each section.

Section 3 is SDS#2 specific and follows the same format as SDS#1.

Section 4 is titled Compliance. Specific Operating Policies and Procedures are reviewed, along with MAP 2.001 and details such as data cards, test equipment, work reports, hot standby panel etc.

Upon completion of the course, a final checkout is given to verify the candidate has gained a basic understanding of the concepts presented.

The courses are presented by qualified SCT's. This facilitates the answering of questions that result from the prepared material and gives credibility to the training. Any questions that can not be answered are referred to the responsible System Engineer and resolved before the end of the training course.

Also, to support the training courses, a complete set of overheads were developed to augment the material being presented and assist the instructors with their presentations.

As part of the requalification plan it was decided to run all existing qualified SCT's through the initial training courses, rather than through shorter refresher training courses. This would bring all qualified staff to a standard level, and took into consideration the fact that many of the qualified personnel had not had any refresher training in a number of years.

REFRESHER / REQUALIFICATION TRAINING

After all personnel have been brought up to a standard level of training, a three year requalification program will maintain competency in Special Safety Systems. Qualified Special Safety System Technicians will be required to periodically requalify to:

- Reinforce system knowledge and skills
- Emphasize lessons learned from plant and operating experience to prevent the occurrence/recurrence of errors
- Review appropriate plant modifications and procedural changes.
- Review appropriate OP&P's and Regulatory Commitments.

To meet the requirements of the requalification program, a revised training package will be developed every three years. The package will include sections of the training manual, SER's that have occurred over the last three years, changes to procedures as well as cover modifications in the field. The requalification training will be continually changing with time to help keep the field troops current.

TRAINING INFORMATION MANAGEMENT SYSTEM (TIMS)

The final step in producing the training program was to develop a method of tracking qualification, requalification, and progress within the qualification program that was accurate, simple and auditable. To do this we used the TIMS system that is currently used at the Western Nuclear Training Centre.

Each step in the process was assigned a number, including courses, field experience, procedures completed, qualification, and requalification. Using the TIMS system, all the numbers were linked together to create a report that would list the candidates by qualifications held, expiration date as well as a means of checking any candidate's progress within any of the qualification programs.

New forms were created to allow supervisors a means of getting access to the system as well as listing the signing authorities required for each step. Note that the forms are generic to all Special Safety Systems.

BBF-50 - Individual credits for courses, field experience, and procedures completed.

BBF-51 - Application for actual qualification on the Qualification Register.

BBF-52 - Removal from Qualification Register.

Once a candidate's name is recorded on the Qualification Register, they are allowed to work on any system they are qualified for as TIMS is our Official Record of qualification. A copy of the Qualification Register is kept in the Control Room for quick reference and is updated on a regular basis.

As a means of tying everything together, reference to TIMS credit numbering was included in MAP 2.001 text to assist the users, as well as simplified flow charts included in the appendices which show credits required, and forms used to obtain a desired qualification.

CONCLUSION

The program is now up and running. In the 1996 WANO Peer review, this program was identified as Strength MA.10 -1. This doesn't come without effort and expense. A number of people had to be released on a full or part time basis to develop the training material and deliver the courses. People had to be released from regular duties to take the training and several supervisors complained bitterly when their people's qualification lapsed because the individuals missed their scheduled training.

Having said that, the real benefit from the program comes to light in an analysis of the Performance Objectives and Criteria, MA.9. A few of the criteria are paraphrased below;

- Maintenance is performed by personnel who have completed formal qualification for the tasks performed.
- Maintenance personnel understand fundamental concepts and applications and the effect of maintenance on plant systems.
- Continuing training effectively addresses plant hardware and procedure changes and lessons learned from operating experience.

