

PI 21.00INTRODUCTION TO THE COURSEAudience and Prerequisites

This course is for Management and Professional staff as part of the initial training program. For the most part, these people will be Junior Engineers in Training who have recently graduated from an Engineering or Honors science program at a university. From time to time, there may also be some people who have joined the Nuclear Generation Division in a more advanced position from another division with Ontario Hydro or from an external location.

The prerequisites for this course are:

1. The course introduction to CANDU which outlines the Corporate Objectives.
2. At least one of senior high school math, first year college or university math, or NTC math courses 421, 321 and 221.

Course Content

As you start this course, you should ask yourself "Why am I learning about Reliability?" If you are not sure why, then it makes it difficult to see the relevancy of this training. So, let's start by looking at WHY this course exists.

All training should be for one purpose and one purpose alone. That is to improve on-the-job performance. Therefore, this course should help you, someone who will be working as an employee in Ontario Hydro in a technical capacity in a production environment, do your job better.

Reliability is important for a number of reasons that we will be discussing in this course - the main ones being Safety and Cost. While this course will not be attempting to make expert reliability statisticians out of you, it is intended to give you the tools to do your jobs more efficiently and effectively.

We will be covering some basic calculations, a few definitions and some of the techniques that are used to analyze systems in the operations environment. The table of contents gives you an outline of the topics in this course.

The general aim of the course is to provide you with sufficient background in rudimentary reliability theory so that you will be able to:

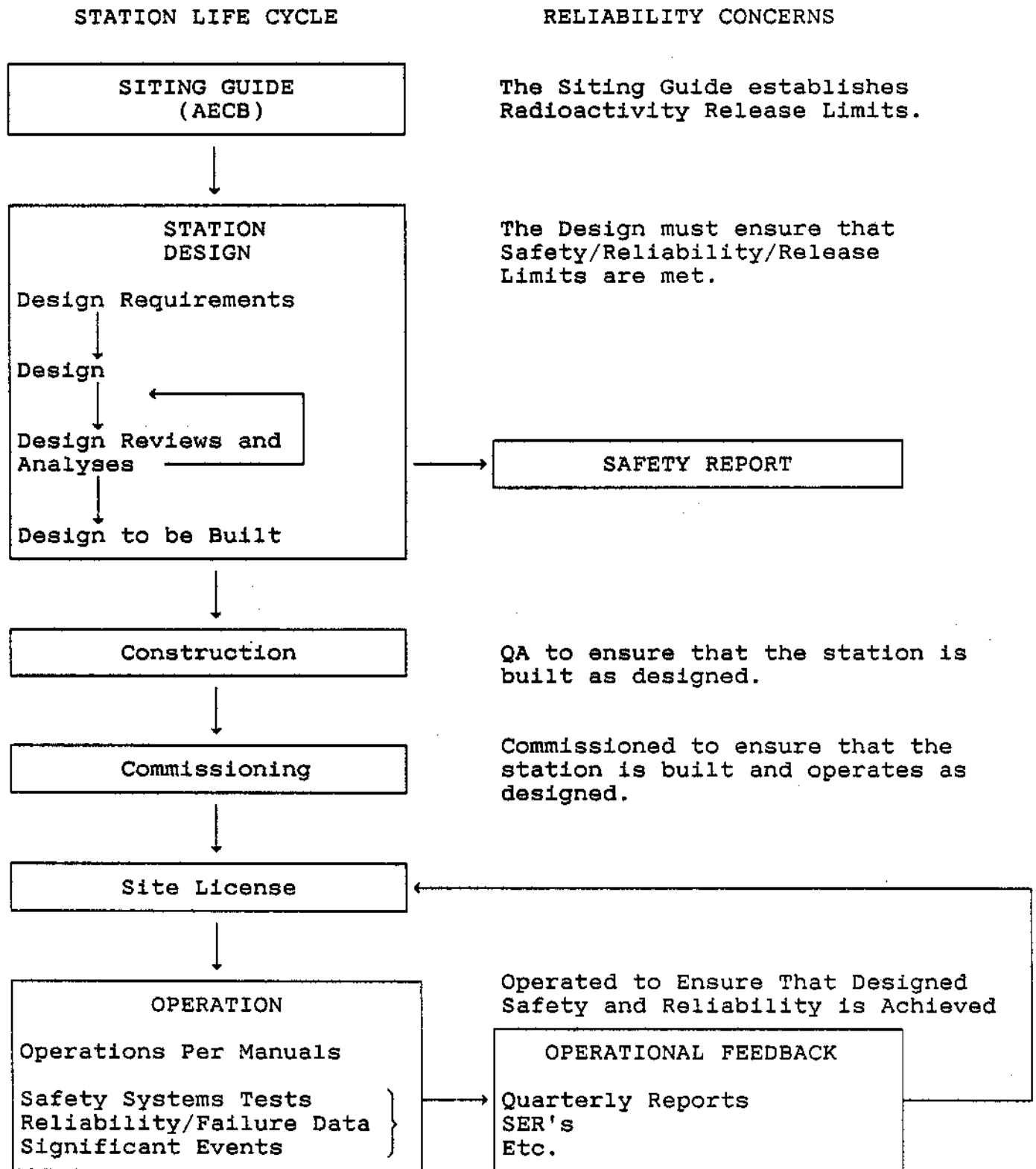
- a) When designing equipment or systems:
 - Recognize that cost and reliability are the two major considerations, the one usually weighing against the other
 - Estimate system reliability from component reliabilities
 - Estimate component redundancy required to meet target reliability
- b) When purchasing equipment:
 - Interpret manufacturer's reliability specifications
 - Ask for appropriate data if it is not supplied voluntarily
- c) When commissioning equipment/systems, devise means of demonstrating equipment/system reliability.
- d) When "operating" plant equipment/systems:
 - Recognize the importance of collecting accurate data on failures, outages and repairs
 - Calculate component and system reliability from failure rate data
 - Rationalize the need for and design maintenance schedules (especially for preventative maintenance and/or replacement of components)
 - Rationalize the need for and design test schedules for passive safety systems
- e) Rationalize the role of station reliability in minimizing cost of electricity and maximizing plant safety.
- f) Rationalize the existence of reliability departments in Ontario Hydro and interpret reports published by such groups.

The figure on the next page is the Reliability Life Cycle. It shows for each phase in the station's life, the corresponding reliability concerns. For the most part, we will be concentrating on those areas, as shown highlighted, that deal with the operation of the station and we will be referring back to this diagram from time to time throughout the notes. However, reliability is a part of every phase of the station's life.

Course Structure

The course is made up of the seven self-contained units of instruction called "modules" as listed in the Table of Contents. Except for this module, all the remaining six modules are divided into two parts:

RELIABILITY LIFE CYCLE



The Objectives

These both specify the content of the module and define the scope of the test you will write at the end of the course. The objectives are based on discussions with staff who are working in the environment that you will be in and have been reviewed by Training and Technical Superintendents to ensure that they are relevant to your job duties.

The Course Notes

To help you meet the objectives and pass the final test, this material contains all the information that you will need. New terms and key concepts are highlighted in the text and are reinforced in a summary at the end of the module. Exercises along the way give you an opportunity to look at the subject material in a little more detail or from a different angle. The summaries are followed by assignment questions based on the objectives to give you an opportunity to practice what you've learned. You can then check your answers by referring back to the relevant parts of the text. If you still aren't sure about the answer, discuss it with the Instructor or your classmates. During reviews in class, you may be called upon to give your answer to some of the questions.

Learning Format

The layout of the course notes makes self-studying a viable option. If you choose to do this, make arrangements to write the final test when you are ready for it. However, the course can also be taught by an Instructor using a balanced mixture of lecturing, self-studying, group discussions and review sessions. Along with audio-visual aids, this approach can enhance the learning process.

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