

Technical Specifications and Action Statements

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Acronyms

- Technical Specifications (TS)
- Limiting Conditions for Operation (LCO)
- Code of Federal Regulations (CFR)
- Safety Analysis Report (SAR)
- Surveillance Requirements (SR)
- Reactor Operator (RO)
- Senior Reactor Operator (SRO)
- Structure, System, or Component (SSC)

Objectives

- Identify the purpose of TS
- Define the terms: Operable, Mode, LCO
- Describe the criteria used to determine whether an SSC will be included in the LCOs
- Define what an Action Statement is

Objectives

- Describe considerations used to develop remedial actions, establish timeframes, and create clear Action Statements
- Define Immediate
- Activity - Respond in accordance with simulated TS LCO
 - Critique whether it is well written or could be improved
 - Describe how Modes and LCOs/Action statements can assist with safe facility operation

TS Purpose

- **Required as part of SAR** (10CFR50.34)
- Derived from the SAR analyses and evaluation (10CFR50.36)
- **Establish controls** (10CFR50.36(c))
- **Provide** Operating Limits, conditions, and other **requirements to** acceptably (reasonable assurance) **ensure protection of the health and safety of the public.** (NUREG-1537 Introduction)

TS purpose

- TS are a condition of your License (10CFR50.34, 50.36)
- A license constitutes the legal agreement between the licensee and the NRC, and both parties must adhere to it rigorously. (NUREG-1537 Introduction)
- TS state the operating limits and conditions and other requirements for the facility to acceptably ensure protection of the health and safety of the public. (NUREG-1537 Introduction)
- (Because) every facility is unique, no general standard can be applied without thoughtful interpretation, and not all requirements are applicable to every facility (ANSI-15.1)

Define Operable (refresher)

- A system, subsystem, train, component, or device is operable or has operability when it is **capable of performing its specified functions** and when **all necessary attendant** instrumentation, controls, electrical power, cooling or seal water, lubrication, or other auxiliary **equipment** that are required for the system, subsystem, train, component, or device to perform its functions are **also capable of performing their related support functions.** (NRC.gov -> NRC Library)
- A component or system is capable of performing its intended function (ANSI-15.1)

Define Mode

- Corresponds to **any one inclusive combination of core reactivity condition, power level, and average reactor coolant temperature**. (NRC.gov -> NRC Library)
- **May** clarify the applicability of LCOs, defined as needed to **fit a particular reactor facility**, number should be **held to a minimum** (ANSI-15.1, 3.9)

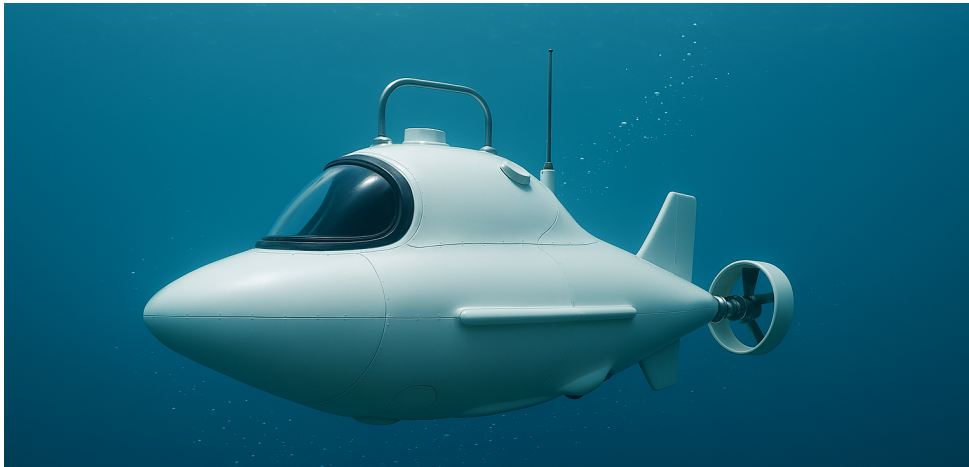
Define Mode

**** This is not the definition ****

- It may help to think of it as a set of unique conditions that define the operational status of the facility

Activity: Identify Modes

- Set of unique conditions that define the operational status of the facility (Submarine)



I need you all to give me at least two potential Modes for a submarine



Potential Modes we came up with

- Dry Storage
- Dry dock ¹
- Wet dock – Depressurized ²
- Wet dock – Pressurized ³
- Startup
- Safety Overrides Engaged ⁴
- Surfaced – Depressurized ²
- Surfaced – Pressurized ³
- Surfaced – Mobile
- Surfaced - Stationary
- Submerged – Stealth
- Submerged – Offensive Posture
- Submerged – Defensive Posture
- Submerged – Emergency Ballast
- Submerged – Emergency Depth (> Crush Depth) ⁴
- Submerged – Cold Water

We might try to bundle Modes as applicable to reduce the number

We might consider things like depth of water, pressurization, support systems available (ex. safety interlocks)

Note - Numbers are for those that find the colors hard to differentiate only

Potential Modes we came up with

- Dry Storage

- Dry dock

1

- Wet dock – Depressurized

- Wet dock – Pressurized

2

- Startup

- Safety Overrides Engaged

- Surfaced – Depressurized

- Surfaced – Pressurized

- Surfaced – Mobile

- Surfaced - Stationary

3

- Submerged – Stealth

- Submerged – Offensive Posture

- Submerged – Defensive Posture

- Submerged – Emergency Ballast

- Submerged – Emergency Depth (> Crush Depth)

- Submerged – Cold Water

4

We might try to bundle
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We might consider things like depth of water,
pressurization, support systems available (ex.
safety interlocks)

Note - Numbers are for those that find the
colors hard to differentiate only

Define Limiting Condition for Operation (refresher)

- **Lowest functional** capability or performance level of **equipment required for safe operation of the facility**. (NRC.gov -> NRC Library, ANSI-15.1 Section 3)
- Administratively established constraints on equipment and operational characteristics that shall be adhered to during operation of the facility. (ANSI-15.1 Section 3)
- 10CFR50.36(c)(2)(ii) establishes **four criterion for identifying LCOs**

LCO Criterion abbreviated

(10CFR50.36 for definition)

1. **Instrumentation used by the control room** during a significant degradation of the **reactor coolant pressure boundary**
2. **Initial conditions of** a design basis **accident** or transient analysis that **challenges fission product barrier integrity**
3. **Equipment** that is part of the primary success path **to mitigate a** design basis **accident** or transient that **challenges fission product barrier integrity**
4. **Equipment** which **operating experience** or probabilistic risk assessment has shown to be **significant to public health and safety**

LCO Criterion abbreviated

(10CFR50.36 for definition)

RTR's are considered low pressure,
low energy

2. Initial conditions of a design basis accident or transient analysis that challenges fission product barrier integrity

3. Equipment that is part of the primary success path to mitigate a design basis accident or transient that challenges fission product barrier integrity

4. Equipment which operating experience or probabilistic risk assessment has shown to be significant to public health and safety

Define (LCO) Action Statement (refresher)

- Prescribes remedial measures required under designated conditions, identify time (to take actions) (NRC Enforcement Manual)

**** Reordered ****

- Defines the condition(s), remedial action(s), and timeframe to perform those actions when an LCO is not met

Considerations for Remedial Action(s) (10CFR50.36)

- Corrective (Remedial) Actions specified should:
 - Not further reduce the margin of safety
 - Be implemented prior to a loss of function or fission product barrier
(i.e. loss of redundancy)
 - Generally, not be required once the Mode of Applicability for the LCO has been exited.

Considerations for Action(s) Timeframe

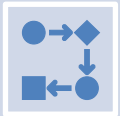
- Action Timeframe:
 - Related to the safety significance of the LCO
 - Technical justification will be needed for extending beyond “Immediate”
 - May consider:
 - Availability of redundant features
 - Established Compensatory Actions
 - *Risk Significance – if risk is determinable

What makes a good action statement



Specificity

Degraded Condition
Required Action(s)
Timeframe



Coherent

Sequentially Ordered

- Most Likely to least likely (single/multiple failure)
- Earliest actions first



Completeness

Document all actions to safely

- Restore the function or capability
- Exit the mode of applicability



Written for Audience

ROs and SROs
Guidance clear (knowledge and supporting documentation)

What makes a good action statement

Technical Specifications are submitted by the licensee and the format can vary between facilities, but the intent is consistent

A poorly written Action Statement that ensures reasonable safety is maintained may still be acceptable

Ex. Shutdown the Reactor immediately whenever clouds are present within 100 miles of the facility may be acceptable to address severe weather conditions.

Define Immediate (Dictionary)

- Occurring or accomplished without delay; instant
- Following or proceeding without a lapse of time
- Having no object or space intervening; nearest or next

Define Immediate (Dictionary)

- Occurring or accomplished without delay;
instant

Delays associated with performing a procedure, performing an action(s), and transiting to a location (to perform an activity) generally comply with immediate if performed without delay.

Define Immediate (Dictionary)

- Following or proceeding **without a lapse of time**
- Having **no object or space intervening**; nearest or next

Activities that introduce unnecessary time delays and performance of activities that distract from, unnecessarily delay, or result in a failure to implement remedial actions **do not comply** with immediate.

Activity: Consider enhancements

- This activity is intended to provide a chance to think through the concept of what makes a good Action Statement and not representative of what level of detail may be needed at your facility.

Activity

- You are a Senior Submarine Operator (SSO) at a local Submarine Tourism Company
- You have two major safety accidents to avoid:
 - Loss of Human Life
 - Significant Environmental Damage (for this activity any loss of submarine qualifies)

Activity – Initial Information

- Modes (2)
 - Surfaced
 - Submerged
- LCOs (3)
 - Life Support
 - Propulsion
 - Hull Integrity

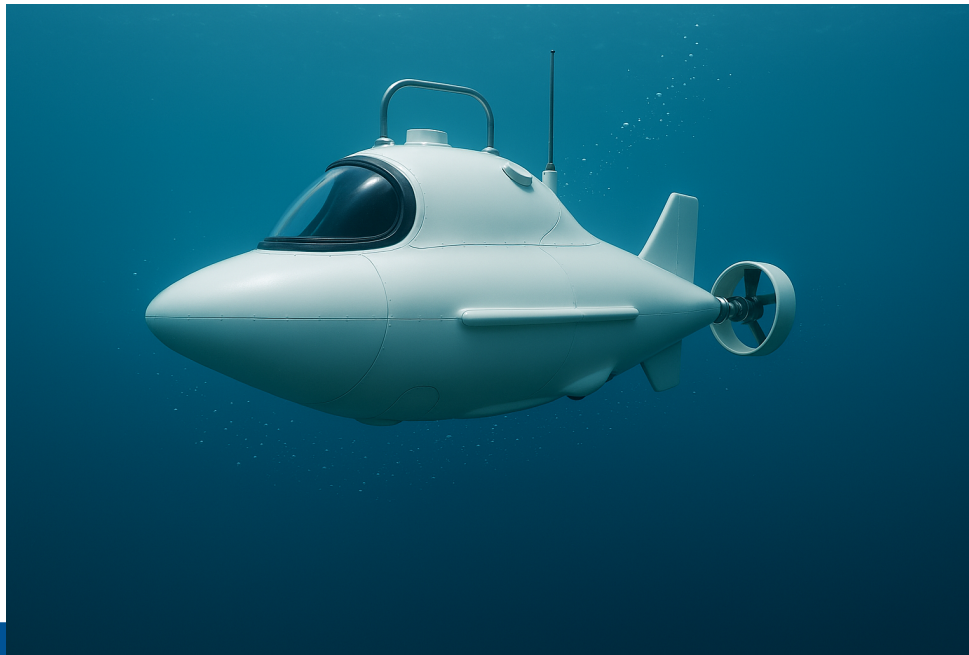
Activity Mode: Surfaced

- Wet hull, access port is above water (ex. floating)
- Interior - Atmospheric pressure or pressurized



Activity Mode: Submerged

- Access port below water not to exceed 300 meters
- Interior – Pressurized



Activity LCO Applicable Systems

	Surfaced	Submerged
Life support	Partially required	Required
Propulsion	Not Required	Required
Hull Integrity	Partially Required	Required

Activity Initial Conditions

- You are the SSO in the middle of a tour.
- Mode: Submerged
- Depth: 200 **ft**
- Conditions: A hull penetration is leaking at 10 drops per minute, attempts to isolate were unsuccessful
- What are your required actions? (Next Slide)



3.3.1 Hull Integrity

Applicability:

At all times.

Objective:

Ensure water does not enter the submarine in an uncontrolled manner

Specification:

Water shall not be permitted to enter the submarine.

Basis:

This specification is designed to ensure that the submarine does not flood with water. Visible indications of leakage or a valid alarm of the sump pit alarm sensor provide indication that water is entering the submarine in an uncontrolled manner.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Sump pit alarm sensor inoperable	A.1 Be in Mode Surfaced	1 hour
B. Water entering uncontrolled	B.1 Isolate the source of water	Immediately Unsuccessful
	OR	
	B.2 Evacuate the submarine	Immediately Evacuate

4.0 SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 4.3.1	Perform a CHANNEL TEST	Prior to operation
SR 4.3.2	Perform a General Inspection of all penetrations.	Monthly
SR 4.3.3	Perform a pressure drop test	Quarterly



Activity Critique

- How comfortable are you that the action you are taking is appropriate? (raise hands)
- If you do not feel confident, what are some areas that could be improved?
- What are some methods we could use to provide better structure?



Could we better define SRs?

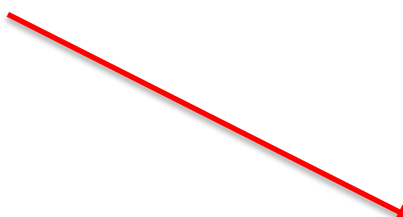
4.0 SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 4.3.1	Verify total volume of sump water in-leakage will not exceed 200 gallons when the submarine is occupied and capable of being submerged	Prior to operation
SR 4.3.2	Ensure both Ballast Tank pressure is ≥ 350 psig and ≤ 750 psig	Daily
SR 4.3.3	Perform a General Inspection of all penetrations.	Monthly
SR 4.3.4	Perform a pressure drop test	Quarterly

Activity better define Action Statements?

ACTIONS		
CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Water entering the submarine in Mode Surfaced	...	...
B. Water entering the submarine in Mode Submerged	B.1 Isolate the source of leakage	Immediately
	<u>OR</u>	
	B.2.1 Initiate SR 4.3.1	Immediately
	<u>AND</u>	
	B.2.2 Suspend any further descent in depth	Immediately
	<u>AND</u>	
	B.2.3.1 Be in Mode Docked	4 hours
	<u>OR</u>	
	B.2.3.2 Evacuate all non-essential personnel from the submarine	4 hours
C. Leakage exceeding 2 gallons per minute	C.1 Be in Mode Surfaced	1 hour
	<u>AND</u>	
	Evacuate the Submarine	Immediately

Created New Mode (Docked) – More work required



Created New Action for actions taken prior to Max Hypothetical Leak



$2 \text{ gpm} * 60 \text{ mins} = 120 \text{ gallons}$

$120 \text{ gallons} < 200 \text{ gallons (SR 4.3.1)}$

Activity better define introduction?

No longer at all times (Mode Docked was created)

3.3 Hull Integrity

3.3.1 Hull Leakage

Applicability: Modes Surfaced and Submerged

Objective: Ensure submarine buoyancy is available and protect submarine support systems from excessive water accumulation.

Specification: Water shall not be permitted to enter the submarine in excess of buoyancy or flood mitigation design limits.

Basis: This specification is designed to ensure that adequate margin exists to compensate for water accumulation inside the submarine. Design limits are contained in the submarine Safety Analysis Report:

Chapter 4 (Submarine Description) – Design Criteria

Chapter 9 (Auxiliary Systems) – Ballast System

Provide a better objective and specification – instead of preventing water from entering submarine

Use the basis section to provide the bases for the LCO, Action Statements, and limits specified

Key Takeaways

- TS are a condition of your License and constitute a legal agreement between the licensee and the NRC
- Modifications to the Technical Specifications require sufficient rigor to demonstrate a reasonable assurance of safety is maintained

Key Takeaways

- Well written TS benefit SRO/ROs during facility operation by providing clear guidance
 - Establishes objective limits for operation of the reactor in different modes/conditions
 - Take actions prior to complete loss of lowest functional capability or performance level
 - Starting point for identifying risk significant components
 - Provide some clarity when modifications are required (50.59)



Questions?