

TEMPORARY CHANGE REQUEST

TCR NO. **TCR-ENG-063, R0-001**

(e.g., TCR-ENG-021,R0-001)

The Temporary Change Request (TCR) Form is to be used to process urgent or minor changes for PPPL Policies, Organization/Mission Statements and Procedures. The TCR should be used when changes are:

- 1) urgent, and cannot wait the 2-4 week period for Department Head review/comment, or
- 2) minor, and do not warrant Department Head review.

Person Requesting Change: V Riccardo_____

Phone Ext: 2866_____

Department Name: Engineering_____

Document Number: ENG-063_____

Revision No.: 0_____

Document Title: System Breakdown Structure and Categorization_____

Reason for change:

To streamline SBS&C process.

Change description: (Summarize and attach changed pages, with changes clearly indicated)

Replace "Chief Engineer" with "Head of Engineering" in part A point 5

Remove "Chief Engineer" in Training point 1 (as already part of Engineers) and replace "Chief Engineer" with "Head of Engineering" in Attachment 1

Add "Optional - " before "Add schematic (here is... " in Attachment 1

1. Does this TCR significantly alter the intent or scope of the document? YES:____NO:X_____

2. Does this TCR significantly impact ES&H? YES:____NO:X_____

If 1 or 2 is YES, Explain why the changes should not be routed for Department Head review:

Department/Division Head Approval

Date

Head of PPRM Office/designee

Date

Release/Effective date of this TCR: 10/18/18

Incorporate this TCR into next revision of this document?

YES:X____NO:_____

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Subject: System Breakdown Structure and Categorization	Effective Date: 8/1/18	Initiated by: Head, Engineering Department	
	Supersedes: NEW	Approved: Director	

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Management System (Primary): 03.00 ENGINEERING (ENG)
Management System Owner: Engineering Department Head
Management Process: 03.06 Technical Project Management
Process Owner: Engineering Department Head
Sub-Process: 03.06.12 Scope Management, Planning, Definition, Verification, and Scope Change Control
Sub-Process Owner: Engineering Department Head
Subject Matter Expert: Engineering Department Head; Chief Engineer

Applicability

This procedure defines the process to establish the categorization of items in accordance with the graded approach defined in the PPPL Quality Assurance Program Description (QAPD). This procedure applies to systems, subsystems, and elements, as part of experiments and in support of experimental operation. Categories defined according to this procedure apply to all activities and documentation of the categorized item.

The categorization method considers the characteristics of individual items along with their function when integrated with other items to form a complete system. This procedure defines a system breakdown structure that describes the decomposition of a system into its constituent parts to guide in the categorization process.

Introduction

Complex systems may be decomposed into a hierarchical, interacting set of subsystems and elements as shown in figure 1, referred to as a system breakdown structure.

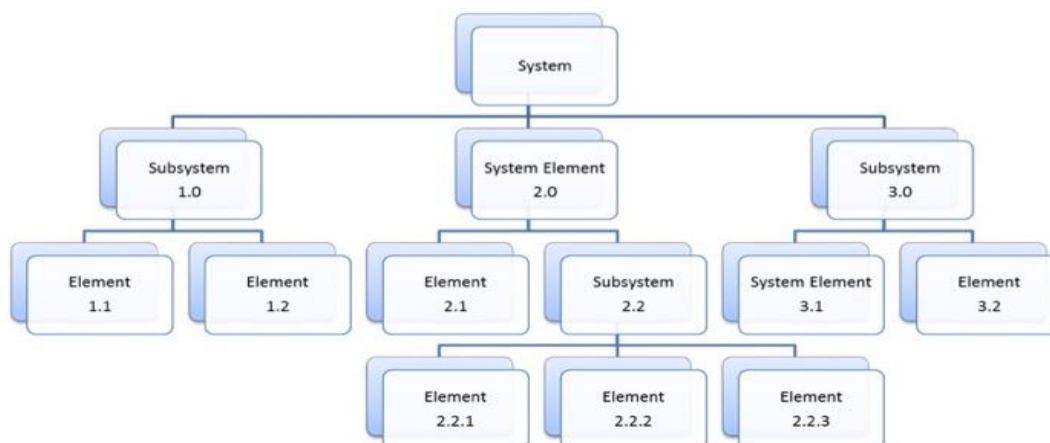


Figure 1 – Sample system breakdown structure

When a branch of the structure is assessed the level of risk is determined by the item, or combination of items, that poses the highest risk. However, individual items within the system may pose a lesser risk based on their individual functions/characteristics and the role that they play when integrated into the system.

All processes and documentation applicable to each item or subset of items shall be in accordance with the category determined by the methodology given herein and as defined in the ENG procedures as a function of the category.

REFERENCES

QAPD Quality Assurance Program Description

A. Development of Breakdown Structure and Categorization

Procedure

This procedure defines the methodology for creating a system breakdown structure and establishing the category of a system and its constituent subsystems, elements.

Until categorized system elements default to A-1.

Attachment 1 replaces the previous Categorization form.

- | | |
|--|---|
| Person responsible for the highest level of the system (e.g. Responsible Engineer, etc.) | 1. Develops the System Breakdown Structure with appropriate number of levels, the objective is to have each element correctly represented by a single category. |
| | 2. Proposes the category for each system, subsystem, or element of the System Breakdown Structure using the template in Attachment 1. |
| Project Director (if not applicable, or Cost Center Owner)
Head of ES&H | 3. Reviews the System Breakdown Structure and Categorization, and signs to confirm agreement. |
| | 4. Reviews the Categorization, and signs to confirm agreement. |
| Head of Engineering
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Responsible Engineer | 5. Reviews the System Breakdown Structure and Categorization, discusses with the stakeholders, reaches a consensus and approves by signing the form. |
| | 6. Maintains the System Breakdown Structure and Categorization as a controlled document. |

7. Revises the Breakdown Structure and Categorization when necessary to reflect changes in characteristics of entities and/or expansion to include additional entities and/or levels and or compression, and has it approved by the same roles who approved the original

B. Categorization of output and work

Procedure

This procedure provides PPPL's methodology for categorizing engineering output (documents and records, such as technical specifications, drawings...) and work (such as performing design reviews, tests, installation...).

This procedure provides the category to be noted on the documentation, e.g. on a technical procedure, affecting a subset of system elements.

- | | |
|-----------|---|
| Initiator | <ol style="list-style-type: none"> 1. Identifies all elements affected by the process being initiated (e.g. all drawings affected by an ECN, all elements being reviewed in a design verification package, all elements affected by a technical procedure...). 2. Sets the process category as the most demanding category among those of all the identified elements. 3. If any category is missing, assumes A1 and asks the Responsible Engineer to revise the System Breakdown Structure and categorize the missing element. |
|-----------|---|

TRAINING

- | | |
|------------------------------|---|
| Head, Engineering Department | <ol style="list-style-type: none"> 1. Ensures the appropriate training methods and means (below) are provided and obtains concurrence of the Management System Owner and the Management Process Owner. |
|------------------------------|---|

Target Audience: Engineers, owners of cost centers used for engineering work, ES&H Head

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Instructor: Head, Engineering Department

Training Method:

- X Briefings (major re-issue, new positions)
- X Required Reading (major re-issue and minor revisions)
- X Email distribution (minor revisions)

- | | |
|------------------------------|--|
| Head, Engineering Department | <ol style="list-style-type: none"> 2. Notifies the Human Resources Training Office of the training so that they will be aware of the training requirements and be able to provide assistance and guidance in the course development, implementation, tracking, and maintenance if needed. |
|------------------------------|--|

Records Requirements specific to this procedure

Records Custodians must assure records are maintained as follows:

Record Title	Record Custodian	Location	Retention Time
System Breakdown Structure and Categorization Form	Responsible Engineer	Responsible Engineer	See record Schedule for specific Project Type <i>Reference Admin 17, Cartographic, Aerial Photography, Architectural & Engineering Records (30.c)</i>

Attachment

1. Breakdown Structure and Categorization Worked Example
2. Explanation of Categorization

Breakdown Structure and Categorization Worked Example

Attachment 1

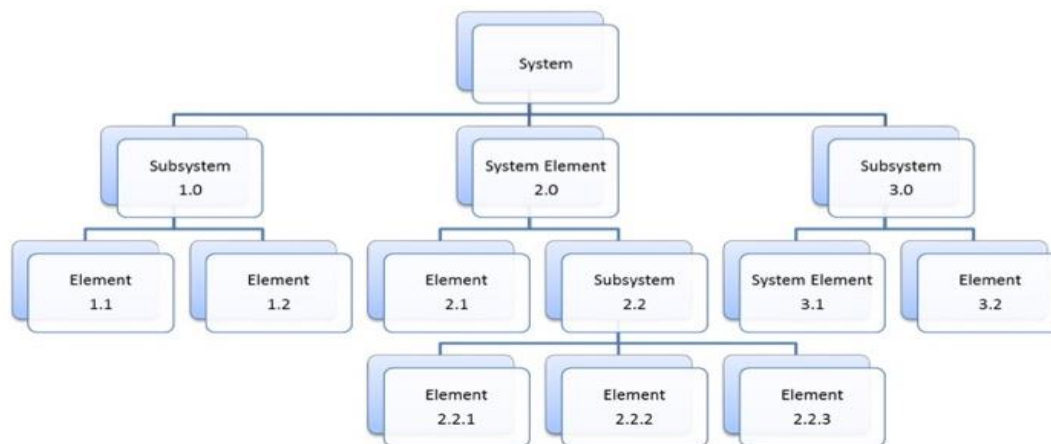
TCR-ENG-063.R0-001**Breakdown Structure and Categorization of System name**

Responsible Engineer: _____

Project Director / Cost Center Owner: _____

Head of ES&H: _____

Head of Engineering: _____

TCR-ENG-063.R0-001**Breakdown Structure***Optional - Add schematic (here is a sample, also available on the Engineering Form website)***TCR-ENG-063.R0-001***Add short description if deemed necessary***Categorization***Add table (here is a sample, also available on the Engineering Form website)*

Breakdown Structure and Categorization Worked Example
Attachment 1
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	Potential hazard of item/activity to people/environment	Potential mission impact of item / activity failure	Potential cost impact of item / activity failure	Technical risk of item / activity	Potential radiological impact of item / activity failure	Potential safety Impact of item / activity failure	Potential program impact	Category
0	Serious onsite and/or offsite	> 3 months downtime	> \$500K	First time application	>=100 mrem offsite and/or >=600 mrem onsite	Violation of ASE or USI	Shutdown of experiment or program	A-1
1.0	Considerable onsite and/or minor offsite	> 3 months downtime	> \$500K	First time application	>=100 mrem offsite and/or >=600 mrem onsite	Violation of ASE or USI	Shutdown of experiment or program	A-1
1.1	Considerable onsite and/or minor offsite	> 3 months downtime	> \$500K	First time application	>=100 mrem offsite and/or >=600 mrem onsite	Violation of ASE or USI	Shutdown of experiment or program	A-1
1.2	Minor onsite / negligible offsite	< 1 month downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-3
2.0	Considerable onsite and/or minor offsite	1 - 3 months downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-2
2.1	Considerable onsite and/or minor offsite	< 1 month downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-2
2.2	Minor onsite / negligible offsite	1 - 3 months downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-2
2.2.1	Minor onsite / negligible offsite	< 1 month downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-3
2.2.2	Minor onsite / negligible offsite	1 - 3 months downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-2
2.2.3	Minor onsite / negligible offsite	< 1 month downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-3
3.0	Minor onsite / negligible offsite	< 1 month downtime	\$100K - \$500K	Common practice	None	No impact	Negligible impact	A-2
3.1	Minor onsite / negligible offsite	< 1 month downtime	\$100K - \$500K	Common practice	None	No impact	Negligible impact	A-2
3.2	Minor onsite / negligible offsite	< 1 month downtime	< \$100K	Common practice	None	No impact	Negligible impact	A-3

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Breakdown Structure and Categorization Worked Example			Attachment 1

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NOTES:

- *Insert worked out Categorization spreadsheet from template on Engineering Forms website*
- *In each row, the categorization is determined by the highest impact factor.*
- *1.0 is a parent to 1.1 and 1.2; 1.1 and 1.2 are children of 1.0*
- *1.0 has a category as demanding as the most demanding categories of 1.1 and 1.2*
- *As long as the content (identification and signature block, breakdown structure and categorization) is present different formats can be used.*

Explanation of Categorization
Attachment 2
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QAPD definitions as they apply to Engineering Categorization:

Extract from QAPD

Factor	A-1	A-2	A-3
1. Relative importance to safety, safeguards, and security	An activity or the failure of an item that presents the potential for serious onsite and/or offsite impacts to people or the environment. Activities and items are defined as A-1 due to their intrinsic hazards or due to a collection of lower hazards that increase the probability of a serious accident.	An activity or the failure of an item that presents considerable potential onsite impacts to people or the environment, but at most only minor offsite impacts.	An activity or the failure of an item that presents minor onsite and negligible offsite impacts to people or the environment.
2. Magnitude of any hazard involved			

Drop down menus available in downloaded version of spreadsheet (Categorization form on Engineering website referenced in Attachment 1)

	A-1	A-2	A-3
Potential hazard of item/activity to people/environment	Serious onsite and/or offsite	Considerable onsite and/or minor offsite	Minor onsite / negligible offsite

Explanation of Categorization**Attachment 2****TCR-ENG-063. R0-001**

Extract from QAPD

Factor	A-1	A-2	A-3
3. Programmatic mission of a facility	A failure would cause more than three (3) month downtime or impact to research program.	A failure would cause a one (1) to three (3) month downtime or impact to research program.	A failure would cause less than one (1) month downtime or impact to research program.

Drop down menus available in downloaded version of spreadsheet (Categorization form on Engineering website referenced in Attachment 1)

	A-1	A-2	A-3
Potential mission impact of item / activity failure	> 3 months downtime	1 - 3 months downtime	< 1 month downtime

Explanation of Categorization
Attachment 2

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Extract from QAPD

Factor	A-1	A-2	A-3
4. Particular characteristics of a facility or item	<i>Item Cost:</i> \$500,000 or more.	<i>Item Cost:</i> \$100,000 or more, but less than \$500,000.	<i>Item Cost:</i> Less than \$100,000.
	<i>Complexity/Uniqueness:</i> Activity or item involving the first time application of technical innovations, principles, analytical techniques, methods, or processes.	<i>Complexity/Uniqueness:</i> Activity or item involving the application of principles, analytical techniques, methods, or processes with limited industry or DOE complex experience.	<i>Complexity/Uniqueness:</i> Activity or item involving the application of principles, analytical techniques, methods, or processes with proven/commonly used industry or DOE complex experience.

Drop down menus available in downloaded version of spreadsheet (Categorization form on Engineering website referenced in Attachment 1)

	A-1	A-2	A-3
Potential cost impact of item / activity failure	> \$500K	\$100K - \$500K	< \$100K
Technical risk of item / activity	First time application	Limited industrial or lab experience	Common practice

Explanation of Categorization
Attachment 2
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Extract from QAPD

Factor	A-1	A-2	A-3
5. Relative importance to radiological and non-radiological hazards	<i>Radiological Potential:</i>		
	<ul style="list-style-type: none"> · ≥ 100 mrem effective dose equivalent to an offsite individual. · ≥ 600 mrem effective dose equivalent to any occupational worker. 	<ul style="list-style-type: none"> · Any measurable dose above background to an offsite individual. · ≥ 100 mrem effective dose equivalent to any occupational worker. 	No radiological impact.
	<i>Non-radiological/Facility Safety:</i>		
	Activity or item has the potential to result in a violation of Accelerator Safety Envelope (ASE) or Safety Certificate, or in the creation of an Unreviewed Safety Issue (USI).	Activity or item has the potential to result in a change to SAD or Project Hazard Analysis that does not affect an ASE or Safety Certificate and does not result in a USI.	Action or item does not have potential impacts to an ASE, Safety Certificate, or SAD.

Drop down menus available in downloaded version of spreadsheet (Categorization form on Engineering website referenced in Attachment 1)

	A-1	A-2	A-3
Potential radiological impact of item / activity failure	≥ 100 mrem offsite and/or ≥ 600 mrem onsite	Measureable offsite and/or ≥ 100 mrem onsite	None
Potential safety Impact of item / activity failure	Violation of ASE or USI	Change to SAD	No impact

Explanation of Categorization
Attachment 2
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Extract from QAPD

Factor	A-1	A-2	A-3
6. Any other relevant factors	<i>Cost Impact:</i>		
	An activity or the failure of an item could cause financial loss or damage to a facility or equipment of \$500,000 or more, including costs of cleaning, decontaminating, renovating, replacing, or rehabilitating property.	An action or the failure of an item could cause financial loss or damage to a facility or equipment of \$100,000 or more but less than \$500,000, including costs of cleaning, decontaminating, renovating, replacing, or rehabilitating property.	An action or the failure of an item could cause financial loss or damage to a facility or equipment of less than \$100,000, including costs of cleaning, decontaminating, renovating, replacing, or rehabilitating property.
	<i>Public or Stakeholder Impact:</i>		
	An activity or the failure of an item has the potential to close down an experiment or program or that has a critical impact on PPPL/DOE mission or program.	An action or the failure of an item has the potential to bring an experiment or program to the attention of the community and activist groups or have a major impact on PPPL/DOE mission or program.	An action or the failure of an item has negligible or no public or stakeholder impact.

Drop down menus available in downloaded version of spreadsheet (Categorization form on Engineering website referenced in Attachment 1)

	A-1	A-2	A-3
Potential reputation impact	Shutdown of experiment or program	Adverse publicity	Negligible impact