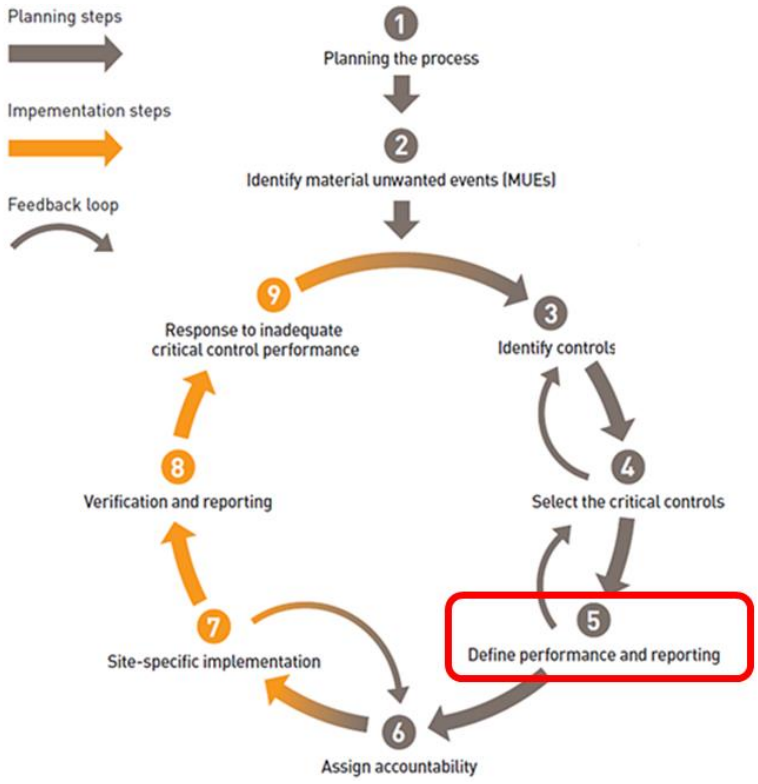
Article 10 – Challenging critical control performance requirements

Welcome to article 10. This article continues to discuss the Critical Control Management (CCM) process using the structure outlined in the ICMM CCM guide (2015) with additions based on experience related to CCM initiatives in major mining companies.



Article 9 dealt with critical control (CC) selection (step 4) and measurability issues with control acts. This article will discuss part of step 5 in the CCM process; the development of CC performance requirements. Verification, reporting and accountability will be covered in future articles.

When the ICMM guide was written, this step in the CCM process was seen as important by senior risk expertise in leading ICMM companies. The guide suggests that the selected critical control should be challenged with a series of questions to ensure its performance is appropriate for its purpose. Note that some information generated in this step may be like previous discussions about erosion factors and supporting activities for a control.

Discussing and documenting the performance requirements of a CC may be seen as extraneous work in an already significantly complex health and safety project. However, especially with objects and technological systems, discussing performance requirements may lead to important insights. Let's look at this step differently based on the type of control.

Let's firstly examine **CC objects** (controls that function without human intervention) and the **object/equipment component of the technological systems** (that require acts to apply). A pressure release valve (PRV) in a minerals processing or mining situation will be used as a simple example. The PRV must release over-pressure without human action. Therefore, it is an object control.

The potential CC object should be examined by answering a set of questions about its objective, performance requirements and current performance-affecting activities in the management system.

1. What is a clear description of the CC object and its specific objectives related to the relevant priority unwanted event (PUE)? The specific CC objectives describe the intent of the control related to preventing the threat or mitigating the consequence. Note that there may be several objectives for complex threats or where the same CC applies to multiple threats. *EXAMPLE: The control is a PRV located in the ____ process at _____ location. Its objective is to safely release excessive pressure from*

the process. This is its only objective in the process when all threats to process pressure explosion are considered.

2. What are the CC object performance requirements to meet the objectives? Consider aspects such as:
    a. What is the object required to do to achieve the objectives? *EXAMPLE: The PRV must open and safely direct the released _____ energy under pressure.*
    b. When is it required to function? What is the input or signal to the object that initiates application? *EXAMPLE: The PRV should automatically open when internal process pressure exceeds _____.*
    c. Where is the CC object to be located to function as required? Consider both input and output locations if relevant. *EXAMPLE: The PRV must be located where the energy release is directed _____, away from the following possible work areas based on the nature of the energy; _____.*
    d. Does it have any dependency on other controls or systems to effectively function? If so, this may compromise the CC which may require a design change. *EXAMPLE: No. The PRV is an independent control. Pressure sensing and release control are part of the PRV design.*
    e. What aspect ensures its survival during the PUE and ability to function if required? *EXAMPLE: An external fire and/or rapid over pressurisation event should not compromise the PRV function.*

3. What is the target CC performance? Try to define a metric that might be used to measure the CC status and is suitable for defining a target level (e.g. % applied, % function, etc.). *EXAMPLE: The PRV is a CC so its target performance is 99.95% of demand.* Note that design reliability of a CC object should be a purchasing criterion.

4. What level of CC performance would initiate immediate reactive action such as shutdown, CC review or investigation? *EXAMPLE: Any PRV failure on demand or observation that the PRV cannot function will initiate process shutdown and*

investigation.

By considering the above set of questions for a specific potential CC, weaknesses or issues with a potential CC may be identified. This will require improvement of the CC or replacement of the CC. In the latter case, the CC selection, step 4 in the process, will need to be repeated.

Now let's examine CC acts and the performance requirement step. The *3 points of contact when climbing* act will be used as the example.

Again, each potential CC act should be examined by answering a set of questions about its objective, performance requirements and current performance-affecting activities in the management system. Some of the questions are different from the CC object.

1. What is the clear description of the CC act and its specific objectives related to the relevant priority unwanted event (PUE)? The specific CC objectives describe the intent of the control act related to preventing the threat or mitigating the consequence. Note that there may be several objectives, for example, for complex threats or where the same CC applies to multiple threats. *EXAMPLE: the control is the act of using 3 points of contact when climbing. The act is intended to provide the climber with safe holds on surfaces being climbed whether it be equipment or structures.*

2. What are the CC act performance requirements to meet the objectives? Consider aspects such as:
    a. What is the act required to accomplish to achieve the objectives? *EXAMPLE: The act must involve gripping the equipment or structure with 3 of the 4 available hands and feet at any point in the climb*
    b. When is it required to occur? What is the input or signal to the person(s) that initiates the act? *EXAMPLE: The act is initiated by recognition that equipment or structure must be climbed to heights greater than ___ metres.*
    c. What is needed to support the act? E.g. procedures/instructions, equipment, knowledge/skill, signals, etc. *EXAMPLE: The equipment or structure to be*

climbed must be designed with clearly indicated, slip resistant hand and foot holds that are ergonomically located to optimise reach, or access should involve the use of suitable equipment such as scaffolding. Also, there must be no requirement for the climber to manually carry load when climbing.

d. Does the act have any dependency on other controls or systems to effectively occur? If so, this may compromise the CC which may require a design change. *EXAMPLE: 3 points of contact climbing is dependent on equipment and structure design for safe hand and foot holds, the availability of alternative access equipment such as scaffolds and the availability of equipment to lift loads to height so manual carrying is not required.*

Logically, the target CC act performance is 100%, or the act occurring whenever required. However, note that the measure of effectiveness will be further discussed as part of the verification 'algorithm' definition in the next article.

The level of CC act performance should be defined that would initiate immediate reactive action such as a work stoppage, CC review or investigation. For example, the site may decide that 20% deviation (or only 80% control effectiveness) from an expected act like *climbing with 3 points of contact* would warrant immediate addressing. As discussed earlier, the effectiveness 'score' may be an 'algorithm' of contributing factors that yields a percentage.

The performance requirements for the CCs should be documented for future review that should be required if a related potential or actual incident occurs, or simply for a timely CC review process as operations change.

The next article will discuss the derivation of CC verification activities, based on the definition of a CC specific 'algorithm' of factors that contribute to CC effectiveness. According to recent ICMM member feedback, this step has been challenging.