

## **8.5 Unexpected cost classification and management method in implementing DTC for development cost**

### **8.5.1 Unexpected cost classification and management method (draft)**

Unexpected cost classification and management method in implementing DTC for development costs:

The previous sections suggested that the method for managing unexpected costs is important in implementing DTC for development costs.

This sections shows the unexpected cost classification and management method (draft) to promote DTC.

**Unexpected cost classification and management method in implementing DTC  
for development costs**

**(draft)**

## **Unexpected cost classification and management method in implementing DTC for development costs (draft)**

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## 1. Introduction

Because the unexpected cost classification and management method in implementing DTC for development costs depends on the object of the development, this paper describes an assumed example of DTC for the development costs of the Japan Engineering Module of the space station jointly developed by the Japanese Space Development Agency and its counterpart in the United States.

### 1.1 Objectives

This paper indicates the way of thinking and basic criteria of the method on the following topics in order to clarify the management of unexpected costs on a case-by-case basis:

- (1) Definition of unexpected costs
- (2) Classification of unexpected development costs
- (3) The purpose and measure relationship of unexpected cost management
- (4) Principles in managing unexpected costs
- (5) Management of unexpected costs at the site

### 1.2 Character of unexpected cost management

Because the management of unexpected costs is related to its objectives, background, and budgetary management in a complicated manner, it has to be determined on a case-by-case basis. Unexpected costs other than those described in this paper may occur. Cases completely different from those described in this paper have to be managed.

Therefore, the management method here should be treated as the basic criteria for managing them in a reasonable way.

### 1.3 Relation between unexpected costs and DTC activities

#### (1) Recognized facts

When there is a relationship between a customer and a contractor, the phased main DTC activities of development costs on the contractor side are basically performed before the conclusion of a contract for each next phase, where a controlled development cost may occur according the phased contract.

The causes of unexpected costs may appear both before and after the conclusion of the contract.

#### (2) Necessity of the unexpected cost management method for development DTC activities

The unexpected cost management method is necessary because the following adverse effects may occur unless it is adopted:

- i) The contractor has to make a pre-contract estimate that includes large cost allowances for unexpected costs.
- ii) Because the contents of unexpected costs cannot be known in advance, the total estimate for a contract, including such unexpected costs, is meaningless unless a reserve amount for unexpected costs is separately defined and is specified to be returned to the customer if unexpected matters do not happen. (This is the necessary prevention matter for e.g. Some company is expending the money by charging five person for the job which can be done by three person, in the case of unexpected matter trouble was not happened, to spend the budgetary agreed and contracted cost with government )

If a cost estimate of the detailed DTC activities in advance must include vague cost allowances, i.e., unexpected costs, the balance between the accuracy of DTC efforts and the estimate accuracy of the vague unexpected costs cannot be maintained.

In this case, fruitless arguments about whether to proceed with DTC activity may occur, and the development work itself may stall. To prevent this, it is necessary to create the rule that a target cost, excluding unexpected costs, is determined and that any unexpected cost is managed separately. Without it, even a DTC of known development costs cannot be performed.

This is the purpose for making the unexpected cost management method.

## 2. Definition and understanding of unexpected cost

The definition and understanding is as follows:

An unexpected cost is a cost which cannot be estimated in advance because its contents cannot be known in advance even though its existence can be predicted.

## 3. Classification of unexpected development costs

Unexpected costs are classified into the following groups:

### (1) Additional cost from unexpected test troubles

Such a cost is hereafter called test failure cost (TF cost).

### (2) Additional cost from a schedule change

Such a cost is hereafter called a schedule change cost (SC cost).

### (3) Additional cost from a change in requirements.

Such a cost is hereafter called requirement change cost (RC cost).

(4) Additional or reduced cost arising when the previous "To be determined (TBD)" item and its estimated cost has been clearly identified, and when a mistake in estimate is found.

Such a cost is hereafter called estimated vague cost (EV cost).

(5) Additional cost to react to sudden risks to life and safety.

Such a cost is hereafter called critical emergency cost (CE cost).

#### 4. The purpose and measure relationship of unexpected cost management

4.1 There are the following two objectives in managing unexpected costs:

- (1) To minimize unexpected costs
- (2) To ensure the reasonableness of unexpected costs

4.2 The purpose and measure relationship of unexpected cost management

See Figure 1.

#### 5. Focus points in managing unexpected costs

(1) Background of the purpose

- The Design-To-Cost method for development costs with the DTCN methodology is a way to effectively manage development costs.
- A target value is set to implement DTC for development costs.
- To implement the DTC for development costs with the target value, unexpected costs whose occurrence is not certain at development, and whose contents cannot be explained at all in advance, are excluded from the target value. This is to avoid controlling costs with entirely different estimate accuracy.
- To implement DTC for development costs, unexpected costs are excluded from the target value of DTC for development costs, and controlled separately as reserve cost.
- As a result, the following articles have been decided in the Financial Control Plan Document:
  - i) "A specific percentage of the target value must be reserved for risk cost at each level."
  - ii) "If an unexpected matter appears, the cost estimate and actions to be taken are examined at each level, together with technical examination." The result of cost examination is phased DTC review and decision making.

(2) Control phase division of unexpected costs

There are the following two phases for unexpected costs:

i) Pre-assurance phase

## ii) Post-assurance phase

### (3) Unexpected cost control in each control phase

#### i) Pre-assurance phase

- Action to prevent delays and matters of unexpected cost should be scheduled as much as possible in advance. Effective back-up measures and their contents for risk should be identified, and the cost for effective back-up risk measures after DTC study should be included in the development target costs as a back-up risk cost.
- When the causes of an unexpected matter become apparent, the combination plan of recovery actions and their rankings are considered and compared so that they can be implemented effectively and efficiently. That is, the recovery actions are taken after the DTC trade of the combination plans. In this case, the period of temporary DTC implementation of the unexpected event is up to the conclusion of the recovery action.
- When a recovery cost for an unexpected matter develops, it would be reasonable to split up the countermeasures for recovery actions before they are taken, using the 3-5 phase improvement method of the DTCN methodology, although there are cases in which all the actions should be done at once.

The countermeasures by 5-phase improvement are as follows:

- a. Phase I: countermeasures that can be done at once and have a immediate effect, and temporary countermeasures until Phase II countermeasures are taken.
- b. Phase II: countermeasures that should be taken as soon as possible, but require some preparation.
- c. Phase III: countermeasures taken as a result of various comparisons (The target of DTC should be set for this action).
- d. Phase IV: countermeasures which cannot enter phase III action without the solution of some task.
- e. Phase V: countermeasures where the task is unclear, and so an investigation to clarify the task is necessary.

## 6. Principles in managing unexpected costs

Although these principles are matters of course, they will be listed to make cost control easier:

- (1) When an unexpected matter appears, a DTC trade study is performed for the recovery action to set an additional target value, and the budget for the target value is drawn up. In this

case, the cost control method is the same as that of the DTC for development costs. See the Draft of DTC instruction for development cost: Document No. 000 for unexpected cost management in end of this section and the rules in each section of this instruction for basic detailed rules to control unexpected costs.

**(2) Management of EV cost**

- In principle, EV costs have to be clarified before the contract is concluded.
- In case any TBD (to-be-determined) items remain and cause fluctuation of the estimated costs, changes in the costs should be managed on a case-by-case basis.

**(3) CE cost**

- Because CE costs develop suddenly and have to be paid without prior approval, a rule that permits the subsequent request of the CE costs has to be made.
- However, any CE cost must be reasonable. To prove that a CE cost is reasonable, an ex post facto report with a price cost breakdown table detailing the cost should be submitted.

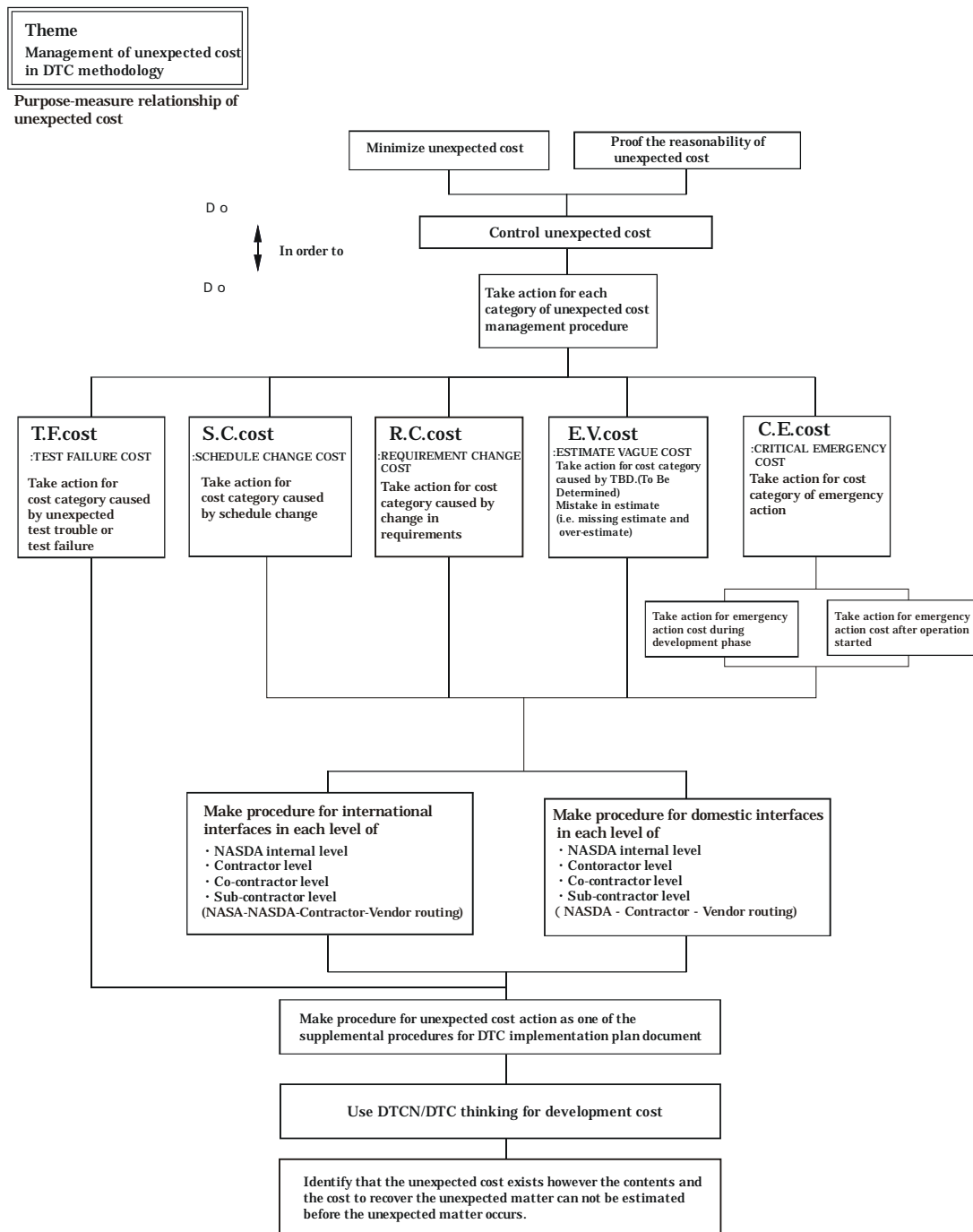
**7. Management of unexpected costs at the site**

**(1) Any unexpected life-threatening event should be handled at the Phase I action level at the site. However, its contents by means of a price/cost breakdown table should be submitted and subsequently approved.**

Emergency events are classified according to Instruction DTC-XX?? "Method to separate items not included in the target cost after DTC examination," and are managed at each level on a case-by-case basis.



Fig. 1 Purpose-measure diagram of unexpected cost control



**"DTC instruction for development costs. Document No. 000 (draft)"**

Number	Title Divisions of the items to be managed as outside of main target cost after DTC trade study examination	Approved by	Examined by	Drafted by
DTC-000				

**1. Objective:**

To demonstrate a special procedure for treating costs which are identified as "not to be included in the given target cost" after the main DTC target cost examination

**2. Related documents**

- (1) DTC-5. "DTC theme/idea and weight reduction proposal sheet registration and management procedure"
- (2) DTC-6. "DTC theme selection procedure"
- (3) DTC-10. "DTC trade study procedure"

**3. Reference**

- (1) Questions and answers about DTC for development costs

**4. Item to be identified and its name**

- (1) After DTC trade study work based on the above objective, the way of thinking and management method in the case of implementing management divisions outside the target cost given by the customer are shown as follows:
  - (2) Those items classified as management divisions outside the main target cost are called "special evaluation items" (\*1).
- (\*1): This name is derived from Japan Defense Agency terms used for management divisions outside the target cost for XT-4 project.

**4.1 Way of thinking (Cost temporarily managed as outside the target cost)**

- (1) Increased costs that developed when the contractor examined and changed the requirements; and the customer agreed to it because it better fit the objective of the product, it prevented risks, or it became evident from the DTC trade study work.
- (2) Increased cost that developed to realize additional requests made by the customer, but that

increased the main target even after examinations including DTC trade study work.

(3) Increased cost that developed when the actions for the development or design information to be collected by the customer was obtained after the deadline (\*2) determined in the agreement between the customer and contractor, but which could not be eliminated even by reasonable DTC trade study work on the actions accompanying the information after the deadline.

(\*2) The deadline has to be agreed on in advance.

To determine the share of responsibility of both parties for additional cost, it is necessary to determine a proper limit and clarify the deadline for providing the information required. It is also necessary to determine what actions will be taken if the information cannot be obtained at this time, and, when temporary actions are taken, the contents and deadline for the actions. After these efforts, both parties can agree on the deadline.

(4) The items for which additional costs are necessary even after DTC trade work on the measures to recover from the unexpected matter is done.

#### 4.2 Contractor management method for the customer

(1) The contractor notifies the customer of the contents and causes of any cost handled outside the target cost using the technical link sheet in Figure 1.

(2) Annual overall evaluation and discussion

The contractor has to prepare and submit a table on the postdated and antedated predictions by the time the customer starts to prepare the following year's budget and operation plans. The customer has to notify the contractor of the deadline for submission of the table using the technical link sheet. Both parties have to discuss the budget for the reserve cost when the table has been submitted.

Fig. 1 Engineering link sheet

<b>Engineering sheet</b>		Reg. Serial No.											
		Date; / /											
(To)	(From) Department: Group: Section:	Project Section Manager	Leader	Assigned. person									
(Title)		-Information -Query -Request	Answer before Year month day	No. of attached documents									
(Memo.)													
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Your distribution x x x x x x x x x Total	<input type="radio"/> Please write answer on this sheet and return with responsible person's signature to (                      ). <input type="radio"/> Please use your distribution column for your purpose.		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="padding: 5px;">Date; / /</th> </tr> <tr> <td style="width: 33%; height: 40px;"></td> <td style="width: 33%;"></td> <td style="width: 33%; padding: 5px;">Assigned person</td> </tr> <tr> <td colspan="3" style="padding: 5px;">Number of attached documents</td> </tr> </table>		Date; / /					Assigned person	Number of attached documents		
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