

Appendix-E

Design-to-Cost Implementation Standard, Program Plan, Implementation Plan, Forms and Samples of Instructions

Abstract

This sample book is a revised version of drafts used to support the compilation of "Design-to-Cost Implementation Standard (NASDA-STD-4)" for the National Space Development Agency of Japan for general applications.

The samples may be too detailed as they were designed to be applied to the development of a large-scale system. With minor corrections, however, the samples can be applied to small-to-medium-sized companies.

Readers, therefore, are advised to use these samples by tailoring them so that they fit their organization.

- 0 Design-to-Cost Implementation Standard
- 1 Procedure to Compile Program Plan on Design-to-Cost at Each Planning Level
(Unit Production Cost and Development Cost)
- 2 Procedure to Compile the Implementation Plan Document for Design-to-Unit- Production-
Cost Activity
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- 4 Procedure to compile the Verification Procedure Document for Unit Production Cost
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- 6 Attached Formats
- 7 Examples of Operation Instruction to Implement DTC in Development Design

Appendix E-0

Document No.	DTCN/DTC-STD-1
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Design-to-Cost Implementation Standard

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AAA Co. Ltd.

On Establishing a Design-to-Cost (DTC) Implementation Standard

The aim of establishing this implementation standard is to present a comprehensive guideline for implementing Design-to-Cost in XX project at the level of program, project, main and sub-contractors and equipment manufacturer.

Therefore, in order to realize the common goal of each project exactly and effectively, it is requested that each operation level should use and tailor this standard as necessary.

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Chairman of Cost Control Committee

On Establishing the Design-to-Cost Implementation Standard

Our company is required to constantly manage funds in an efficient and appropriate way as well as to reduce the costs of value-added products/systems in order to secure sufficient profits and growth in each project and promote development activities. The environment both inside and outside of our company, has become more and more difficult in recent years. As a result, we are strongly urged to develop, at a low cost, specific items such as A-1 Product, A-2 System etc., which are competitive in terms of price.

There is a possibility, however, that the products developed by our company will lose their competitiveness in the international market in terms of value and price if our system remains the same. It will be difficult to meet such demands if the present methods of development and cost control are sustained.

Therefore, there is a need to introduce powerful methods to increase product value and reduce/control costs. In this implementation standard, we adopt the ideas and procedures of “The Thinking and Procedures for Design-to-Cost according to Methods of Design-to-Customers’ Needs (referred to hereafter as “Design-to-Cost” or “DTC”)” as the basic principle for cost control activities before and after costs arise. It is effective in enhancing product value and controlling costs and is applicable from the initial stage of the ideas, value creation and the development phase of products/systems.

Based on the above-mentioned need, this implementation standard not only regulates the procedure of cost control, but also presents guidelines for the control of cost and value-enhancement conducted to develop “ideas, products, and systems” that have value and price-competitiveness. We strongly request those concerned with and in charge of the issue make use of this implementation standard as a means of challenging the difficult targets of enhancing value and reducing costs.

1. Ideas of Design-to-Cost

In short, the idea of Design-to-Cost is to designate cost as a basic parameter on par with performance and schedule. That is, to demand that designers keep in mind that target cost be achieved in the course of designing along with performance and schedule. In this way, Design-to-Cost aims at constantly controlling costs from the initial stage of the development process. The following are the underlying facts which designers and persons in charge of cost control must recognize.

- (1) Most of lifecycle cost (the total cost required for the development and production of a system or an item in the course of research, development, operation and disposal) is decided by the concept and choice of design in the initial stage of research and development. Once the design is set, there very little room left for cost reduction by way of modifying the procedure of unit production or operations.
- (2) Nevertheless, the ratio of design cost to lifecycle cost is small.
- (3) A major cost reduction and an increase in the value of the developed system are attained despite a minor increase in design cost if a thorough DTC is conducted in the initial stage of research and development by creating various plans and comparing them, taking cost as a parameter.

2. Concept of Target Cost

Target Cost in Design-to-Cost is a cost target set for the whole or partial lifecycle cost of a system or an item.

Based on the idea of Design-to-Cost, which regards cost as a basic parameter of design, a target cost must be allocated to each design unit. As a result, the structure of the whole system must be described by Work Breakdown Structure (WBS). Target costs are allocated to each design unit, namely each sub-system, component or part, or material according to the needs. In allocating target costs, enough attention must be paid to their propriety. Even if target costs are not very precise, one must note that it is far superior to designing without target costs in terms of cost control.

However, if a breakdown target cost should be achieved separately, it reduces the flexibility of designing and can adversely affect achievement of the target cost of the whole system. Therefore, a breakdown target cost should have leeway so that it does not affect the target cost of the upper WBS. In other words, the target cost for the lower WBS could facilitate the achievement of the upper WBS target cost in the course of designing, such as by allocating a lower target cost to an item in which a major cost reduction can be expected. The target costs allocated in this manner must be strictly followed. Exceeding these target costs means a failure in the development of the system. We have referred to the main purpose for setting this implementation standard as well as to the ideas of Design-to-Cost. For their applications, appropriate operations are required, following our principles.

Year /Month/Date

Committee to Promote Reduction in Cost of Development and Unit Production

Design-to-Cost Implementation Standard

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Appendix E-2 Procedure to Compile Implementation Plan Document for Design to Unit Production Cost Activities

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Appendix E-4 Procedure to complete Verification Procedure Document for Unit Production Cost

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Appendix E-6 Attached Formats (to be enlarged by copier to A4 or A3 size)

Appendix E-7 Examples of Operation Instructions to Implement DTC in Development Design

1 General

This standard is established to prescribe an implementation standard for development control by Design-to-Cost which our company conducts in developing a development project and related system parts, etc. (hereafter referred to as “system, etc.”) as well as to present guidelines for its implementation.

2 Definition

Definition of terms to be used in this Design-to-Cost Implementation Standard (hereafter referred to as “Implementation Standard”) are as follows:

(1) Design-to-Cost

A development control method which aims at reducing unit production cost and development costs. It sets target costs in the course of the development of systems, etc.; executes development activity regarding target cost on par with target performance and development as required; assesses cost constantly; controls costs involved in the acquisition of systems, etc. (including design, prototype manufacturing, production, operation, logistic support and abolition) through DTC trade-offs between performance, schedule and costs.

Objects of Design-to-Cost control are classified as unit production cost, development cost and lifecycle cost.

(2) Target Cost

A target cost figure set for a prescribed scope of operations under prescribed conditions in the initial stage of the development of systems etc.

(3) Allocated Target Cost

A partial target cost set for the prescribed breakdown unit necessary for management.

(4) Individual Target Cost

The portion of the allocated target cost above that which is tied to operations handled by the contractor.

(5) Present (Current) Cost Status

The cost estimate for the scope of the operations upon which target cost of systems, etc. are set. It is estimated under the same conditions as those for the target cost to verify the level of target cost achievement at some point in the development phase.

(6) Research and Development Phase

The scope of development operations from the start of concept design and detailed design to the completion of development tests (including production, launch, follow-up, etc., of a prototype) in developing new parts and systems, etc. This includes the organization, facilities and equipment required for the development.

(7) Unit Production and Operation Phase

A phase to conduct unit production, maintenance design, operation and logistic support after-sale services.

(8) Contractors

Individuals or corporations which carry out design, production, testing, maintenance, modifications, supply, operation and support, abolition, etc. of systems, etc., upon which development control by Design-to-Cost is applied under contract with our company.

(9) Designated Sub-contractors

Individuals or corporations which conduct design, production, experiment, maintenance, modification, supply, operation and support, abolition, etc. of systems, etc., upon which development control by Design-to-Cost is applied under the designated contract with our company.

(10) Sub-contractors

Individuals or corporations which conduct design, production, experimentation of systems, etc., upon which development control by Design-to-Cost is applied; or which supply components, parts and materials for contractors under a contract with contractors or designated sub-contractors regardless of their formal nominations.

(11) Unit Production Cost

The total of production cost which is required for production of one piece of equipment or one item of a system, etc., in unit production. This includes the cost for direct material, production processing, testing, maintenance and design, maintenance of tools, etc. In some cases, cost for maintenance

operation and storage are also included. It is indicated by the unit price of unit production which sets the normal production period, the production pitch and the total production.

(12) Development Cost

The total cost for development of systems, etc., from start to completion.

(13) Operation and Support Cost

The total cost for operation of parts and systems, etc., and their maintenance. This includes the cost for operation, repair, maintenance and amortizing cost.

(14) Lifecycle cost (LCC)

The total of development cost, unit production cost, operation cost, support cost and abolition cost.

(15) Abolition Cost

The total cost to abolish systems and equipment.

(16) Unexpected Cost

A cost which cannot be anticipated. This cost cannot be estimated beforehand as its contents are unknown until the cost matter arises even if its existence is certain.

(17) Risk Back-up Cost

A cost required to develop preventive measures against failure of a development with the aim of minimizing risks. It is possible to estimate the contents of this cost. In the case of parallel development, the cost should be included in the development cost target and handled separately from target cost if its implementation is withheld until risks become apparent.

(18) PMD (Purpose-Measure Diagram)

Every possible answer to questions such as "What are we trying to do with it?" and "What are the minimum things that we have to do?" are written for tasks which need to be solved or realized. The answers are arranged in a vertical block diagram in which the purposes, written as "in order to achieve XXX", are placed in the upper area and the measures, written as "It is necessary to do YYY", are placed in the lower area.

Read from the lower side, the diagram roughly shows the order of the main points of the conditions required to realize the purpose.

(19) WBS (Work Breakdown Structure)

WBS has a literal meaning and an interpretation based on MIL-STD-488A. They need to be properly separated as shown in Fig. 2.1.

WBS in this standard adopts each understanding as a definition. The purpose for using it is as follows:

- A. Corrects relations between purpose and measure of WORK. (e.g. PMD WBS)
- B. Prevents omissions in the order (procedure) and items of WORK (e.g. Procedure WBS)
- C. Prevents omissions in parent-child relations and the classification of WORK (e.g. Structure WBS)
- D. Prevents omissions in the work (function) of objective WORK or ITEMS (e.g. FBS/WBS)

WBS has several modes according to its purpose and shape. Seen from the point of purpose, there are 'object item WBS,' 'development WBS,' 'system WBS,' and 'WBS related to purpose.' Seen from the point of shape, there are 'purpose-measure WBS' (=PMD), 'parent-child classification WBS,' etc. The mode should be chosen according to the purpose.

(20) Objective WBS

The parent-child classification WBS which is used to clarify the scope of the objective of development.

(21) Development WBS

A WBS indicated in the parent-child classification in each development phase. It shows how to divide objects of the development.

(22) Grade of Estimate

Even if the totals are the same, deviation in estimate of an object based on a technological document of the initial development phase is larger than one based on a technological document after the development results have been obtained. Grade of estimate is set from 7 to 1 shown in Fig. 2.1 to indicate the grade of the concept of these deviations.

3 Related Documents and References

3.1 Related Documents

- (1) Design-to-Cost Implementation Regulation (AA-001)
- (2) "Procedure to Allocate Target Cost" (AA-002)

3.2 References

- (1) Advanced Project Management Methodology
"The Thinking and Procedure for DTCN and DTC" (ASCII Publishing Co.)

4. Basic Policy

4.1 Development Control by Design-to-Cost

Development control by Design-to-Cost regards cost as a standard required to implement development on par with the required performance and schedule. It then sets the required cost (referred to hereafter as "target cost") for the development and production of systems etc., indicated by a price under certain preconditions. Cost results of systems etc. under the same conditions must come below the target cost.

4.2 Cost Control Organization

The organization is shown in Fig. 4.1. (Fig. 4.1 shows an example of a layered system)

4.3 Outline of Design-to-Cost Procedure

Development control of systems, etc., by Design-to-Cost should be conducted according to the following procedure. The details of implementation should be set in Articles 6, 7, 8, 9 and 10.

(1) Allocation of Target Cost

Target cost for the development of the production of systems, etc., should be established in the initial phase of research and development.

(2) Compilation of Program Plan, Design-to-Cost Implementation Plan

The program and implementation plans of Design-to-Cost, which describe the basic policy, the implementation organization, procedure, target cost, etc., of the development control of Design-to-Cost concerning the development and production of systems etc. will be compiled.

(3) Follow-up and Inspection of Cost Status

Gaps between the present cost and the target cost are periodically discovered in each development phase. Predicted prospects for target cost achievement are scrutinized by extracting the possible theme/ideas from concerned people and parties to achieve the target cost and by individual reporting on the result of study up to each reporting and inspection point.

(4) Implementation of Design-to-Cost Activity

The present cost should be analyzed and assessed, and ways to achieve the target cost should be formulated, examined and chosen.

(5) Period to Achieve Target Cost

- Unit production cost: Upon completion of development
- Development cost: In each development phase, or prior to the signing of the development contract allocated to each business year.

(6) Design-to-Cost Activity after Target Cost is Achieved

Even after the prospects for achieving target cost are determined, Design-to-Cost activity should be continued in order to maintain the prospects.

(7) Verification by Cost Results

- Unit Production Cost:
Achievement of target cost is verified based on cost results, excluding costs from peculiar factors concerning the prototype in the development phase.
- Development Cost:
Target cost is verified from a contract estimate signed in each business year or in each development phase.

(8) Control of Expenses for Unexpected Development Costs

The contents of unanticipated costs cannot be estimated. Therefore, a reserve fund is set aside in the XX control section, separately from the target cost allocated in the development cost. Each time

unanticipated costs arise, expenses are controlled upon examination of the necessary measures and cost estimate.

5. Application

Development control by Design-to-Cost is conducted on the development of systems, etc., designated by the president. In principle, it is applied to the whole procedure, starting from the research and development phase and continuing through unit production and operations.

6. Allocation of Target Cost

6.1 Allocation of Target Cost

Target cost should be set by the president. Considerations are trade-off of cost, performance, schedule, design and planning, and alternatives, as well as international competitiveness estimated from cost models based on the performance data of similar items both domestic and foreign.

The target cost is set at a level which is attainable through maximum effort. When changes are made to the required performance or schedule of systems, etc., target cost or the conditions in which it is set can be also changed.

If unanticipated risks arise in implementing the development cost by Design-to-Cost, risk recovering operations, except emergency countermeasures at the site, should be made after setting a separate target cost to recover the risk and making an expenditure plan from the reserve set aside for such risks.

6.2 Scope of Target Cost Allocation

Allocation of the target cost of a system, etc., is to follow the standard set below and is to adopt one cost or a combination of costs.

(1) Unit Production Cost

Unit production cost is applied specifically to unit production and items which are repeatedly generated.

In reality, production unit price changes from one machine to another depending on its learning curve rate and rate of design change in unit production. Therefore, an average unit price for all the machines for unit production (average unit production cost or price) is adopted.

(2) Development Cost

Development cost should be adopted if the developed item is not repeatedly produced or when special cost control is necessary, as when the total development test cost is very large.

(3) Operation and Support Cost

This should be adopted when special cost control is necessary such as when the total is very large. It applies to items whose individual division is possible and whose cost target can be set.

(4) Other Cost

If required due to the nature of development, costs other than the items shown in (1) and (2), such as operation and support costs, can be defined and regarded as target costs.

(Note) Lifecycle cost

To reduce lifecycle cost, several feasible design plans should be formulated for each development item and a comparative examination should be made, although the target cost is not set.

6.3 Clarification of Target Cost Conditions

In establishing target cost, conditions for the establishment must be clarified. The conditions should, in principle, include the following:

(1) Unit Production Cost as Target Cost

- A. Required specifications
- B. Scope of objective items, and scope of establishment of target cost indicated by WBS
- C. Year of price setting, ratio of applied expenses, foreign exchange rate, and rate of change in presumed commodity price
- D. Average target unit production price based on an assumption of the number of machines for unit production, and unit production pitch for production period
- E. Allotment of development, and production
- F. Other necessary conditions

(Note) If real unit production is carried out under different conditions from those mentioned above, the price and cost for that business year should be decided by adjusting the costs which are subject to change under such conditions.

(2) Development Cost as Target Cost

A. Required specifications, and development test plan

B. The scope of establishing target cost indicated by development object WBS and development activity WBS

C. The year of price setting, ratio of applied expenses, foreign exchange rate, and change in presumed commodity prices (to be adjusted later according to the real ratio of change)

D. Allotment of development, and production

E. Other necessary conditions

(Note 1) Target cost and present cost should be indicated as the price for a certain year, and the unit price for that year should be used for the price of materials and standard parts. When the unit price is not available for that year, a price escalation and conversion formula should be established for each category of material and standard part for that year.

(Note 2) If the total cost generated over a period of several years is the target cost, the rate of change in the anticipated commodity price for that period should be indicated (to be adjusted afterward based on the real rate of change)

6.4 Approval of Target Cost

The target cost of systems, etc., should be studied by the departments and groups etc. which coordinate the projects (referred to hereafter as "design department"), as well as by the departments and groups in charge of development. When the person in charge of cost control (director or project manager of the design department, groups etc.) makes a proposal, it should be examined in a meeting of the Board of Directors based on the procedure in related document (2) "Procedure to Compile Target Cost" and approved by the president before its establishment. A change in the target cost should follow a similar procedure.

7. Compilation of Program Plan, etc., of Design-to-Cost

Implementation Plan Document for Planned Fund Control of Design-to-Cost

7.1 The person in charge of fund planning for a program or project must compile an implementation plan document of fund control which includes the items described below in order to implement Design-to-Cost that suits each control level.

- (1) Basic policy
- (2) Fund control organization
- (3) Fund control objects and target cost etc.
- (4) Implementation of fund control
- (5) Procedure to implement fund control, measures etc.

7.2 Program Plan Document for Design-to-Cost

The person in charge of costs at the project level must compile a Design-to-Cost program plan which includes the following items related to the implementation of development control prior to or at the same as the establishment of the target cost.

- (1) Basic policy
- (2) Implementation organization
- (3) Target cost and conditions for its establishment
- (4) Regulations and basic contract for companies, which are the basis of implementation, law etc.
- (5) Methods to be used, references etc.

In compiling the program plan for Design-to-Cost, "Procedure to Compile Program Plan for Design-to-Cost (Unit Production Cost and Development Cost) (Appendix E-1)" should be referred to.

7.3 Implementation Plan Document for Design-to-Cost Activity

(1) If our company wishes to implement Design-to-Cost, contractors must submit a Design-to-Cost activity implementation plan document (pre-draft) which concretely describes basic policy, individual target costs, the organization of activities and procedures etc. so that their participation in the activities becomes possible before signing a contract. Upon signing the contract, the contractors should immediately provide an implementation plan document, and acquire the approval of our company.

(2) Contractors must also sign a basic contract concerning material transactions which explains the basic relation between the companies for implementing Design-to-Cost under the designated format. Designated sub-contractors should also follow this procedure.

In drawing up the implementation plan document, "Procedure to Compile Implementation Plan Document for Design to Unit Production Cost Activity (Appendix E-2)" should be used as a reference

for Design-to-Cost of unit production, and "Procedure to Compile Implementation Plan Document for Design to Development Cost Activities (Appendix E-3)" should be used for the Design-to-Cost for development cost.

7.4 Implementation Plan Document for Design-to-Cost Activity for Sub-Contractors (equipment maker level)

(1) DTC should be implemented based on a contract with sub-contractors (equipment manufactures, etc.) which requires joint DTC activity in order to achieve target cost for individual plans.

(2) In drawing up the Design-to-Cost activity implementation plan document, "Procedure to Compile Implementation Plan Document for Design to Unit Production Cost Activity (Appendix E-2)" should be used as a reference for Design-to-Cost of unit production, and "Procedure to Compile Implementation Plan Document for Design to Development Cost Activity (Appendix E-3)" should be used for the Design-to-Cost of development cost.

8 Follow-up and Inspection of Cost Status

8.1 Cost Verification Procedure

Contractors must compile and submit a cost verification procedure document which describes the verification method of the present cost with a Design-to-Cost implementation plan document (draft) if they sign a contract with our company concerning the application of Design-to-Cost.

In drawing up the cost verification procedure document, "Verification Procedure Document for Unit Production Cost (Appendix E-4)" for unit production and "Procedure to Compile Verification Procedure Document for Development Cost (Appendix E-5)" for development cost should be referred to.

8.2 Follow-up of Cost Status

8.2.1 Follow-up of Cost Status by our Cost Control Manager

Our cost control manager should grasp and understand the cost status, and the predicted prospects for target cost achievement by analyzing and assessing the achievement status of target cost and applying the necessary control and measures to make the achievement.

(1) To Allocate Target Cost:

A. When unit production cost is set as target cost, draw up a WBS of "unit production items and related objective items" and allocate costs by making individual target cost divisions to the level required for control.

B. When development cost is set as target cost, draw up a development object WBS as well as a development activity WBS which allows activities to be divided according to item and development phases and allocate target cost divisions to the level required for management.

C. Reserve funds can be included in target cost to the extent appropriate for adjustment.

(2) Make estimates of present costs that correspond to each WBS item upon which target cost is allocated following procedure (1).

(3) Make present cost total at each WBS level obtained by procedure (2).

(4) Confirm the difference between the present and target costs at each WBS level and analyze the contents of the difference, referring to the method and conditions of initial allocation of target cost at each WBS level.

(5) Based on an analysis of the difference between the target cost and present cost, clarify the items, such as the DTC trade study to be examined, which are required to achieve the target cost, assess the possible effects and conditions necessary for their achievement, and evaluate the prospects for achievement. (To assess means to positively evaluate).

(6) The results of procedures (2), (3), (4) and (5) are verified by each contractor in the design verification of each phase. A Design-to-Cost results report should be submitted at the completion of development in order to accumulate know-how.

8.2.2 Follow-up of Cost Status by Contractors

Contractors must grasp and understand the present costs as follows and make an effort to achieve each target cost after analyzing and assessing the achievement status of each target cost. Sub-contractors should follow a similar procedure.

(1) Unit Production Cost

A. A target cost is allocated to an item of the WBS of a system which corresponds to each target cost and is about two or three levels below the target cost according to the size of each target cost. The corresponding present cost is calculated based on the cost verification procedure document and totaled at each level.

B. The difference between the present cost and the target cost at each WBS level is checked.

C. Based on the difference between the target cost and the present cost, items that need to be examined for the achievement of the target cost are clarified. By assessing the conditions required to meet the desired effects and their achievement, the predicted prospects for achievement are evaluated.

D. Procedures A, B and C above are conducted at every reporting regulated by the implementation plan document of the Design-to-Cost activity. The results of reporting are compiled in a Design-to-Cost results report and submitted to our company.

(2) Development Cost

The measures necessary to achieve the development target cost are carried out separately between contracts yet to be concluded and those already concluded.

A. Unsigned contracts

(a) The target cost is allocated to an item of development WBS activity which is about two to three levels below the development activity level. The corresponding present cost is added according to the cost verification procedure document and totaled at each level.

(b) The difference between the present cost and the target cost at each WBS level is checked.

(c) Based on the difference between the target cost and the present cost, items that need to be examined for the achievement of the target cost are clarified. By assessing the conditions necessary to meet the desired effects and their achievement, the predicted prospects for achievement are evaluated.

(d) Procedures A, B and C mentioned above are verified through reporting at design verification stages. In order to accumulate know-how at the completion of the development, a Design-to-Cost results report is compiled and submitted.

(e) In addition to the above procedures, if unanticipated costs increase or become apparent, an estimate of the costs required to take measures should be submitted each time to our company for assessment and selection as an appendix to the above Design-to-Cost report.

B. Concluded contracts

(a) The achievement of the target cost for contracts already concluded is a matter of concern to contractors. Measures considered necessary for the target achievement are realized by steadily fulfilling the necessary conditions for their achievement. Also, if there are any items among the necessary conditions that may require the support of our company, contractors are obliged to make an effort in obtaining such support. Our company will provide the support.

(b) If an unexpected condition or incident occurs while under the conditions of the contract, or an increase in unexpected costs is foreseen, it should be reported immediately to our headquarters. An estimate for countermeasures should be submitted, negotiations with headquarters should be held and, if necessary, an additional or separate contract should be signed. The procedure for reporting the unexpected incident and estimating the cost should follow the cost verification procedure which had previously been submitted and approved by our company.

8.3 Verification of Cost Status

Contractors must go through cost status verification under the design inspection of our company. Verification materials should be compiled by contractors and inspection should be conducted based on the implementation plan document of Design-to-Cost activity and approved by our company.

9. Control

9.1 General

Design-to-Cost activity is a wide-ranging comprehensive activity. Our company, as well as the contractors and sub-contractors as a whole, must act organically at each development phase and create a system to promote smooth operations.

9.2 Control of Allocated Target Cost

9.2.1 The cost control manager at the project level can make changes to the allocation of the target cost under 8.2.1 within the limits of the maximum target cost of the systems etc.

9.2.2 Contractors should receive the approval of the cost control manager of our company in allocating individual target costs or changing the allocation under 8.2.1.

9.3 Control Organization

9.3.1 The cost control manager at the project level must gather all the cost elements involved in the development and production of the concerned systems etc. As for control, the following items need to be included.

(1) Allocated target costs and corresponding present (current) costs must be controlled to allow comparison.

(2) Individual unit production target costs (as for development cost, the target cost at each development phase) that cover each responsible area must be given to the department in charge of the development of the sub-elements of the systems, etc., or to the contractors. Their cost status (present cost) must be understood and the necessary instructions given to achieve the target cost.

9.3.2 Contractors draw up a Design-to-Cost activity implementation plan document following article 7.3 and implement Design-to-Cost activity following the plan after obtaining the approval of our company. As to the application of Design-to-Cost, contractors must, in some cases, make minor revisions to the established control organization. They must avoid establishing a large-scale organization for this purpose. The minimum conditions for contractors are those listed below. (Sub-contractors are also subject to these rule).

(1) Divide target cost, assign designers and the designer support team members at each WBS level; promote the attitude to handle the necessary operations to achieve the above, and the measures to generate concrete ideas (PMD, FBS, WBS phasing theme technique and cost reduction at each site, etc.); and educate the participants according to their needs. This organization and method should be enforced to improve the disposition of contractors to the necessary and sufficient level, by referring to Reference (1), etc.

(2) The cost estimate of the designers' preliminary design plan and or the experiment plan made by the support team members must be quickly returned to the designers.

(3) Inside a company, a total organization or team organization must be designated to conduct effective negotiations for reaching internal agreement on the implementation of the design and test plans, which are decided by the designers and those concerned, through DTC activity, etc., within reach of the target cost, and to sign the contracts with the contractors.

(4) The cost estimate must be calculated and understood at the present status. In particular, the present cost status for the development cost is required from time to time before a cost negotiation with sub-contractors is completed. In this case, the cost which is considered appropriate is estimated. The necessary conditions for achievement of the target cost are to efficiently combine the attitude for negotiations with contractors, cooperate in formulating ideas and joint operations/ examination through the ideas and methods described in article (1), as well as implementation of negotiation organization written in article (3).

(5) Design-to-Cost data and activity status of sub-contractors must be realized at the designated time.

10. Implementation of Design-to-Cost in Each Development Phase

The development of each system and sub-system should be implemented following the development process shown in Table. 2.1. The following are the standards for the application of Design-to-Cost in each phase by our company and contractors.

10.1 Planning, Concept Drawing and Configuration Drawing Phase

In this phase, our company conducts a study of the target cost for the development and production of a system and research on the competitive price of a system which has the same level of performance. We also set the target cost and allocate a detailed target cost by the end of this phase.

In examining the specifications of the system, the sub-system and the components, multiple plans for each theme or item* should be examined and estimates should be made on each theme or item (this can be substituted by an estimate of the difference from a comparison of the cost of each plan). After that, a balanced design should be made based on performance, the schedule, and the cost.

From this phase on, the application of this procedure or plan is set as a precondition.

*The establishment of modes and their scopes and basic specifications in this phase has a great impact on the cost. At the same time, a study of cost reduction in this phase is quite effective if studied positively and in an orderly manner.

10.2 Basic Design (Making of Plan Drawing) and Detailed Design (Making of Manufacturing Drawing) Phases

Our company promotes the activity necessary for the achievement of the target cost for development and production of systems etc. and makes every possible effort to achieve the target cost. Application of this implementation standard should be described in the contract as necessary.

Contractors must compare and examine multiple plans for the planning and development of systems, etc., and their sub-systems; establish detailed specifications for components; design and develop measures; and develop test measures. They also analyze the differences in cost through estimates and comparisons, and make every possible effort to achieve each target cost while following the required specifications and schedule.

Contractors are obliged to immediately make proposals for change when a major cost reduction, including lifecycle costs, is expected, even if changes in the required specifications, the schedule, or other areas are necessary.

10.3 Production and Review by the Result Phase

(1) In this phase, our company and the contractors examine multiple plans with regards to target cost. This applies when designs and missions are changed by reflecting the results of certification tests or when design changes are made to improve performance, etc. Comparable ideas creation, cost estimates, and analysis of the differences are made on each plan, and the maximum effort is made to minimize increases in cost by adopting the optimum balance between performance and cost.

In this phase, it is possible to make improvements in operations while actually making the products and mastering the procedure. The people concerned should carry out cost reduction campaign activities, etc., such as proposing solutions to problems and drawing up cost improvements.

(2) In addition to the above-mentioned method, at this stage planning documents should be compiled on long-term operation, after-sales service and logistic support. During this process, the location of

DTC activity in the operation phase and a DTC implementation plan document should be compiled. In the implementation plan document, reviews at appropriate intervals (the standard is every two years) should be specified.

Fig.2.1 Comparison of WBS through understanding from the meaning of the word and understanding from the shape

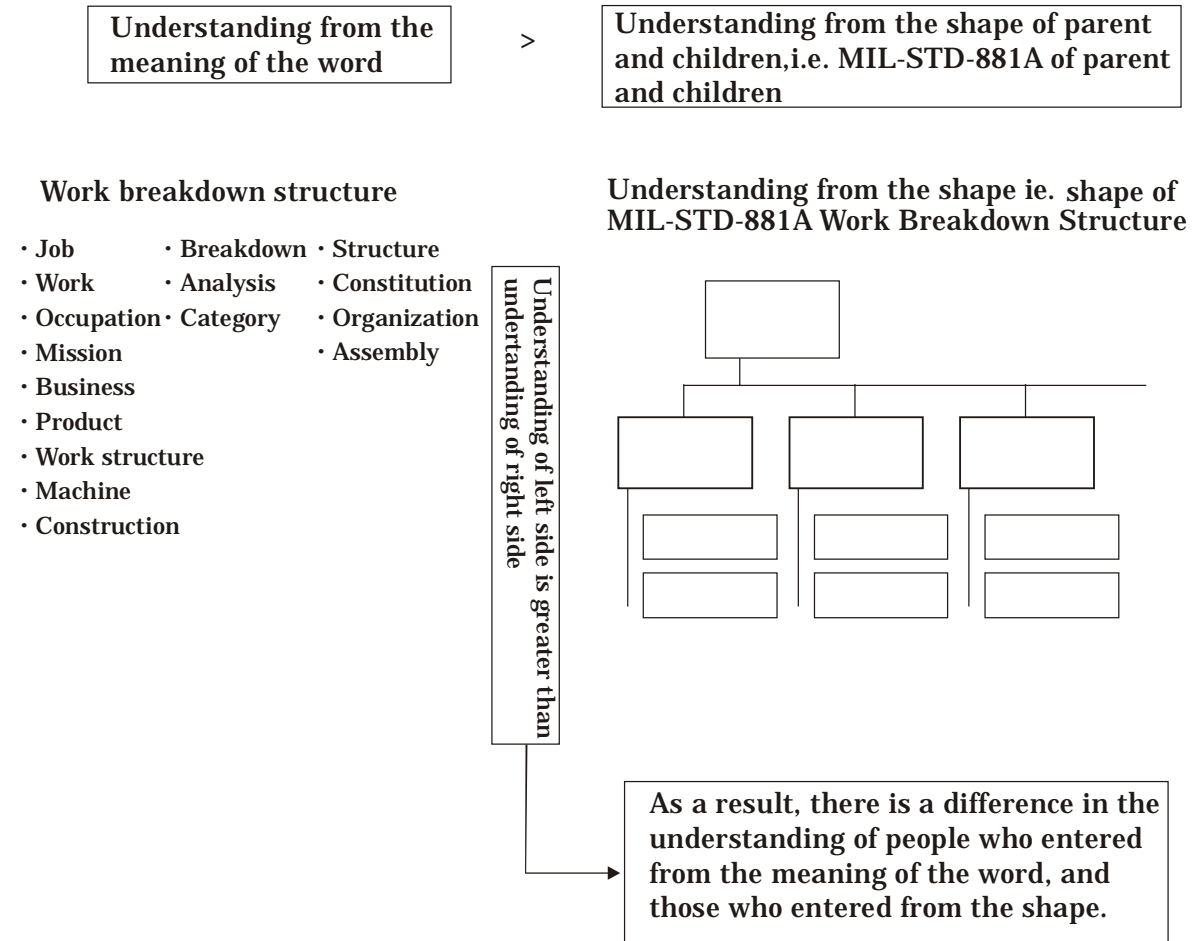


Table 2.1 Grade of estimate

Estimate grade	Phase to estimate	Obtainable materials to estimate (The materials of previous step are added to the materials of the next step accordingly)	Method can be used	Materials for each estimate grade							
				Estimate grade	7	6	5	4	3	2	1
7	Program estimate	<ul style="list-style-type: none"> Function requirement and etc. 	<ul style="list-style-type: none"> Experience Estimate from experience 								
6	Concept dwg. estimate	<ul style="list-style-type: none"> Concept drawing and etc. 	<ul style="list-style-type: none"> Make WBS Parametric estimate DTC worksheet and estimate 								
5	Basic design est.	<ul style="list-style-type: none"> Main structure drawing Specification Requirements for design 	<ul style="list-style-type: none"> Make WBS Parametric estimate for each WBS DTC worksheet and estimate 								
4	Estimate for contract (Estimate by plan drawing)	<ul style="list-style-type: none"> Main body and test body plan drawing Development test plan Detail activity WBS for phased working 	<ul style="list-style-type: none"> Make detailed worksheet Accumulated estimate of each WBS DTC worksheet and estimate 								
3	Estimate by mfg. dwg. Cost allocation for implementation group	<ul style="list-style-type: none"> Main body and test body mfg. dwg. Test procedure Test jig drawing Test facility drawing 	<ul style="list-style-type: none"> Quotation of each material and purchase part Accumulated estimate of each Process Cost allocation for implementation group 								
2	Prototype production result	<ul style="list-style-type: none"> Result of test body and prototype production Test result 	<ul style="list-style-type: none"> Summary of cost by implemented result Exclude the special factor of prototype production 								
1	Review by result	<ul style="list-style-type: none"> Theme to be improved after operation test Corrective action 	<ul style="list-style-type: none"> Summarize the result, learning factor and exclude the special factor and cost Each estimate of scheduled improvement 								

Fig.4.1 Cost control organization

