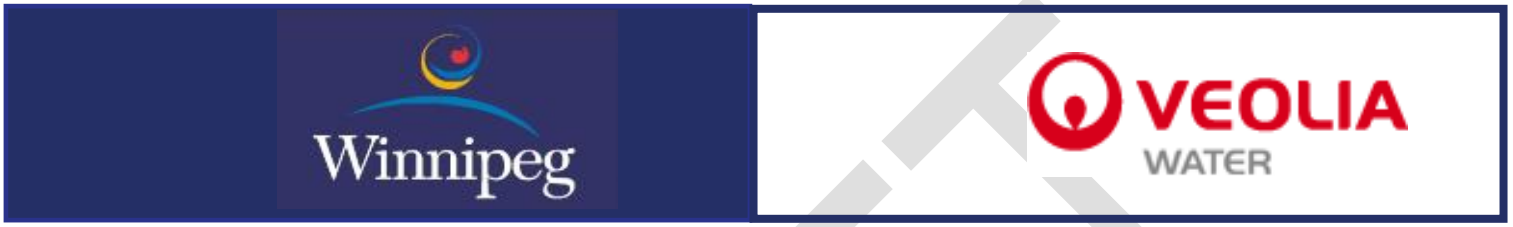
Winnipeg Sewage Treatment Program Integrated Management System

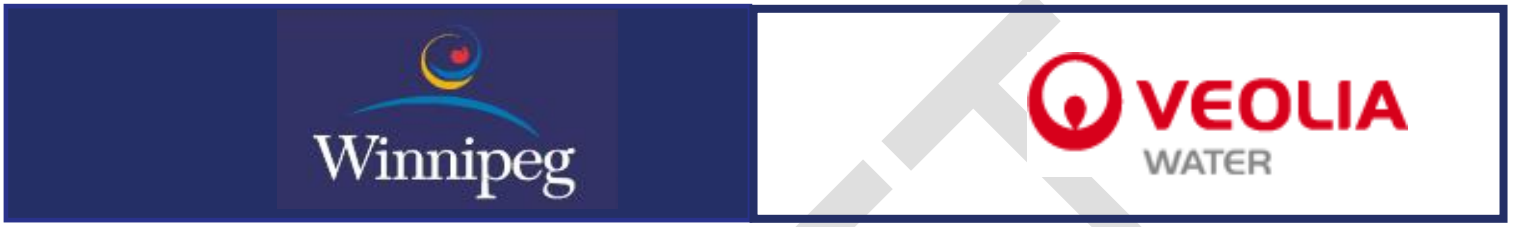


Value Engineering Guidelines and Procedures

DOCUMENT NUMBER: TBD

Rev	Prepared by	Reviewed by	Date	Approved by	Date

Winnipeg Sewage Treatment Program Integrated Management System



Value Engineering Guidelines

DOCUMENT NUMBER: TBD

Rev	Prepared by	Reviewed by	Date	Approved by	Date
March 2015	GLV				

WINNIPEG SEWAGE TREATMENT PROGRAM
VALUE ENGINEERING GUIDELINES

DOCUMENT NUMBER: _____

TABLE OF CONTENTS

1. Goal and Objective
2. Project Definition
3. Value Engineering Team Requirements
4. Project Success Factors

1. Goal and Objective

The Goal of the Winnipeg Sewage Treatment Program (WSTP) is for Value Engineering to be applied to every capital project regardless of size. The objective of the program is to apply the value engineering process so it is cost effective.

To assure a cost effective value engineering effort, the capital cost and project complexity of each project must be understood. A very expensive project may be very simple and a less costly project may be very complex so in the end there is some subjectivity required by the Project Manager as to the level of effort and duration to expend on value engineering of a given project.

2. Project Definition

Projects can easily be defined by cost and for the WSTP value engineering guidelines the project costs are broken into the following dollar ranges:

- $100 Million Dollars or Greater
- Less than $100 Million dollars down to $10 Million Dollars
- Less Than $10 Million Dollars down to $3 Million Dollars
- Less Than $3 Million Dollars

Project complexity plays a role in a value engineering team makeup and duration. A multidiscipline project may require 5 to 7 discipline experts (i.e. civil, geotechnical, architectural, structural, process mechanical, HVAC, electrical, instrumentation & control) to be on the value engineering team whereas a simple but more expensive project such as a large earth moving project may require only 2 or 3 discipline experts.

3. Value Engineering Team Requirements

The attached table provides the requirements to be applied when determining the value engineering procedures and level of effort and duration to use on any given project. The table is based on project size and the variable level of effort and duration within each size category is dependent on the projects complexity. The Proponent proposing on a project should request clarification from the City during the RFP period if the Proponent has questions about the Value Engineering team make-up or duration. If request for clarifications is not submitted during the RFP period, then the Proponents price proposal is assumed to carry the maximum level of personnel involvement and duration for the dollar value of the project. Unless stated in the RFP document, any 3rd party staff requirements will be paid for directly by the City.

4. Project Success Factors

Value engineering's success is dependent on the value engineering effort following a strict implementation procedure by a highly qualified team which is under the direction of a trained facilitator. The WSTP has developed a Value Engineering Procedure (Document Number: CD-CP-PC-02) to be followed, which is available to the Proponents of any RFP.

The actual qualification of success of a value engineering effort is the ratio of the savings realized due to the actual value engineering recommendations implemented.

WSTP VALUE ENGINEERING REQUIREMENTS FOR PROJECTS BASED ON DOLLAR VALUE OF PROJECT - DRAFT March 19, 2015

Project Value:			<$100 to $10 Million	<$10 to $3 Million	<$3 Million
When VE should be Performed					VE Continuous Throughout the Design by the Project Team & City Using VE Record Form Only, which Goes to City PM for Initial Evaluation
Length of VE Session			1 to 3 Days	1 Day	
VE Team Makeup					
Designer's Staff			At Opening Session & Closing Session	All day Attendance	
City Staff[1]			At Opening Session & Closing Session	All day Attendance	
3rd Party Staff			In Attendance Every Day	All day Attendance if 3rd Party is on Team	
Number of Personnel at VE Team Session					
Designer's Staff			1 to 3	1 to 3	
City Staff			1 to 3	1 to 3	
3rd Party Staff			5 to 7 (includes facilitator & scribe)	3 to 5 (5 includes facilitator & scribe)	
VE Session Staffing					
Designer's Staff[2]	City Staff	3rd Party Staff[2]			
PM			*	*	
Cost Estimator			*	*	
	VE Sponsor		*	*	
	City PM		*	*	
		Facilitator	*	*	
		Scribe	*	*	
		Process Engineer			
		Process Mechanical			
		Electrical Engineer			
		HVAC Engineer			
		I&C Engineer			
		Structural Engineer			
		Architect			
		Geotechnical			
		Civil/Site Engineer			
	Operations Staff	Operations Specialist(s)			
	Maintenance Staff	Maintenance Specialist(s)			
Responsible Party for VE Reports					
Designer	City Project Manager	3rd Party Staff			
		VE Report (due no later than 2 weeks after VE workshop ends)	*	*	
	VE Ideas for followup by Designer ((due no later than 3 weeks after VE workshop ends (i.e. 1 week after VE Report received))		*	*	
VE Recommendation Report (due no later than 3 weeks after receipt from City of ideas for followup by Designer)			*	*	
	Final VE Acceptance (1 to 5 weeks after receipt of VE recemmendations from Designer depending on cost impacts and complexity to obtain City authorization of recommendations)		*	*	
Information to Be Provided by City					
VE Constraints			*	*	
Room and Supplies for VE Session			*	*	
Information to Be Provided by Design Engineer					
Basis of Design			*	*	
Preliminary Design Report			*	*	
Cost Model by Disciplines & Major Structures or Systems			*	*	
Calculations			*	*	
Major Equipment List & Specs			*	*	
Information to Be Provided by 3rd Party					
VE Session Templates			*	*	

NOTES: 1.The City Staff may be accessed throughout the VE process and may attend the VE as observers. 2. 3rd party staff may include designer staff not involved in the project and/or Veolia staff not inlvolved in the project.

Winnipeg Sewage Treatment Program
Integrated Management System

Value Engineering Procedure

DOCUMENT NUMBER: CD-CP-PC-02

Rev	Prepared by	Reviewed by	Date	Approved by	Date
2013-10-25	PBI	JVG			
Nov 2014	GLV				

Table of Contents

1. GENERAL 3
1.1 Definitions 3
1.2 Background 3
1.3 Execution Outlines 3
1.3.1 The “Value Engineering Record” 4
1.3.2 The “Value Engineering Study” 4
2. RESPONSIBILITY OF PROJECT VALUE ENGINEERING INITIATIVE 4
3. VALUE ENGINEERING STUDY 4
3.1 Objectives 5
3.2 Value Engineering Team and roles 5
3.3 Value Engineering Execution Process 7
3.4 Value Engineering Pre Workshop Preparation 8
3.5 Value Engineering Workshop Phases 8
3.5.1 Information Phase: 9
3.5.2 Function Analysis Phase: 9
3.5.3 Creative Phase: 10
3.5.4 Evaluation Phase: 10
3.5.5 Development Phase: 10
3.5.6 Presentation Phase: 11
3.6 Value Engineering Post Workshop Documentation and Implementation 11
3.7 Value Engineering Study Flow Diagram 13
4. VALUE ENGINEERING STUDY FOLLOW-UP 13
4.1 Reporting 13
4.2 Benefits 14
5. VALUE ENGINEERING PROCESS FLOW DIAGRAM 15
6. ATTACHMENTS 16

This document defines the procedure for the application of Value Engineering techniques within the WST Program.

1. GENERAL

1.1 Definitions

Value Engineering (VE):

Value Engineering (VE) is an organized effort to analyze project concepts, critical features, function (s) of systems, equipment, facilities and services for the purpose of achieving the essential functions at the lowest life cycle cost, consistent with required performance, reliability, quality and safety.

The overarching objective of VE study is to improve the value of the subject under study.

Related definitions:

Value is the relationship between the utility of an item to the user and the actual monetary cost of resources required over its life cycle.

Life cycle cost is the sum of all costs over the useful life of an item, building, system or service. It includes the cost of design, construction, acquisition, operation, maintenance, disposal and salvage value, if any.

Function is the purpose or use of a product, service or process. The VE approach first concerns itself with what the item or process is supposed to do. The consideration of function is the fundamental structure of the VE method.

1.2 Background

Value Engineering is a problem solving technique based on encouraging free thinking and creative ideas to provide innovative alternatives. The alternative solutions are evaluated first on a technical merit basis and then the solution that optimizes life cycle costs is pursued.

Value Engineering methods and techniques are recommended throughout project development. They are especially recommended for large complex projects; however they can be also used for smaller projects, whether the project is new or not.

The philosophy of value engineering techniques is based on the premise that a certain amount of "unnecessary costs" is inevitable in executing design work due to the inherent complexity of the process.

Unnecessary costs in any given design are the additional costs of that design compared to a more economical design which provides the same function, such as: over specification, unnecessary material costs, excessive requirements, inclusion of "nice to have" features, inclusion of non-essential redundancy, overdesign for expediency and the desire for technical excellence before cost considerations.

Unnecessary costs can also be caused by a failure to consider the construction or operation implications of a plant design. This can lead to an inefficient use of labor and plant resources during the construction or operation phase.

1.3 Execution Outlines

VE is recommended to be undertaken after completion of the Preliminary design phase as an initial step of the detailed design of all Program major Capital Projects.

The results of the Value Engineering process are incorporated into the project's Detailed Design.

If alternate VE sessions are being considered, then the City Project Manager should refer to the Project Director for guidance prior to implementation.

If the value engineering exercise results in significant change to the preliminary design, the changes will be managed as per Program policies.

VE techniques require an effort in terms of resources that has to be assessed against the prospective benefits on the project before they are implemented. Other considerations are the project size, characteristic and budgetary constraints.

Two value engineering techniques are used within WSTP

(a) The “Value Engineering Record”;

(b) The “Value Engineering Study”.

1.3.1 The “Value Engineering Record”

is a simplified technique for small or specific projects, or to capital project specific phases.

In this process, all members of the project team look for innovations and improvements and bring those to the attention of the City Project Manager on the special “Value Engineering Record” form (CD-PD-TO-09 Value Engineering Record Form).

The form should be completed in sufficient detail and submitted to the City Project Manager for review, record and decision.

Improvement ideas will be considered by the City Project Manager for inclusion in the detail design.

This simplified technique also contributes in promoting Value awareness within the project teams.

1.3.2 The “Value Engineering Study”

The Value Engineering Study remains the leading VE technique to be applied on Capital projects and is discussed in more detail in this document.

2. RESPONSIBILITY OF PROJECT VALUE ENGINEERING INITIATIVE

The City Project Manager (PM) shall initiate the execution of value engineering techniques on their project. The PM will set the program, the schedule, the occurrence of the formal sessions and the budget, and will promote the use of value engineering forms.

When Value Engineering activities are contracted to a Consultant, special care is to be taken in the determination of the scope and responsibilities of the Consultant.

In any case, VE should be considered and defined in the Consulting RFP prior to assignment of the engineering services.

Responsibilities of the members of the Value Engineering team in a study are detailed in section 3.2 Value Engineering Team and roles.

3. VALUE ENGINEERING STUDY

Note: the following sections describe more specifically WSTP capital projects. Similar

sequences apply to the other Program deliverables.

3.1 Objectives

The value engineering process covers almost every aspect of plant design including concepts, project specification, detailed design, selection of materials, constructability (including decommissioning), operations and maintenance. The key focus areas shall be:

(a) Process

(b) Engineering specifications

(c) Utilities and logistics

(d) Site plan

(e) Project execution plan

A multidiscipline team must be established to formalize and document the Value Engineering Study.

The Value Engineering Study allows the team to evaluate the information in a structured format.

The objectives and scope of the subject evaluated are analyzed using the value engineering functional approach. The current design is evaluated against the functions identified by the team, to check for technical, cost optimization and other considerations to ensure the optimum design has been presented. Any alternatives are also evaluated identifying the benefits and risks of any changes to the alternative design.

It is necessary to outline project constraints prior to the Value Engineering Study. In this way the value engineering team does not make recommendations that are contrary to the project charter or fundamental design requirements.

3.2 Value Engineering Team and roles

The Value Engineering Study team is a multidisciplinary group of experienced professionals and project stakeholders.

The City PM in consultation with the Consultant and the VE Facilitator will select Team members based on their expertise and experience with the disciplines and technics involved as well as on their knowledge or their objectivity in regard to the project evaluated.

In order to maintain flexibility and speed it is recommended that a core team size of 7 to 10 members per Workshop is not exceeded. The following functions should be established:

(a) VE Sponsor

(b) VE Facilitator

(c) Scribe

(d) Team members

Supporting discipline resources, like estimating and planning may be involved on as required basis.

The VE Facilitator and scribe are generally to be provided by the Consultant as part of its services, and the City may also require external VE consultants to participate in the

Workshops. The City PM shall identify such requirement in the Request for Proposal.

The role of VE Sponsor is typically filled by the City Project Manager.

However, these arrangements are to be reviewed for each project, and CD-PD-TO-11 Value Engineering Resources Form can be used by the City PM to review resources requirements and to define consultants and other stakeholder's scope in terms of specific VE study resources.

The roles are further detailed:

Value Engineering Sponsor

The VE Sponsor will ensure the availability of task force resources to the team, liaise with the stakeholders. The VE Sponsor will also ensure that the proper amount of Pre Workshop documentation is made available to the participants prior to any VE Workshop, and that a proper balance between the different disciplines and organizations is maintained to guarantee a thorough and unbiased analysis.

VE Facilitator

The VE facilitator should have specific experience in all aspects of VE and in leading workshops for similar size projects in order to structure the approach, streamline the process and to improve the effectiveness of the program.

The VE Facilitator should not have been previously involved in the project, and should be capable of objectivity in regard to the Project design

The VE Facilitator will plan, lead and facilitate the Value Engineering Study and key responsibilities include:

(a) Ensure proper application of a value methodology and follow the VE study phases

(b) Guide the team thorough the various phases of the Value Engineering Study.

(c) Delegate responsibilities as appropriate

(d) Scheduling of the Value Engineering Study including preparation of agendas

(e) Keep team focused

(f) Keep team members engaged

(g) Insure that the input of members of different parties is positive and contributes to better communication.

(h) Make sure that the Scribe records correctly the proceedings of the study.

(i) Be a catalyst to keep team moving and motivated, be diplomatic; not dictatorial.

Scribe

The Scribe, shall record the details of the Value Engineering Study. The Scribe needs to be familiar enough with the technical aspects being discussed and competent to interpret the discussion.

Team members

Team members are selected based on the identified expertise needed to address the major functional areas and critical high-cost issues of the study.

In order to ensure proper knowledge of the project characteristics to the team and free thinking and unbiased opinions, the selection will consist in a mixture of people from inside and outside the project design team. The Facilitator will control this mixture and

specify the attendance and role during the different phases of the study, in particular to avoid conflicting objectives for the project design representatives and to promote provision of different points of view.

Members are typically Process, E&IC, mechanical or civil specialists, cost estimating, plant operators, functional managers from the Consultant, Program Team, City, contractors, consultants or other outside organizations.

It is desirable that some team members have previous Value Engineering experience.

Regardless of the role they have in their respective organization, all team members are expected to participate in a Value Engineering Study in the following ways:

(a) Participate in all sessions

(b) Gather information as requested

(c) Analyze information

(d) Identify functions

(e) Contribute ideas

(f) Evaluate ideas using their experience and expertise

(g) Develop alternatives

(h) Present results

Team members' responsibilities are mainly related to "playing" the team game and contributing plainly as instructed by the VE Facilitator.

3.3 Value Engineering Execution Process

No two projects are the same; therefore VE activities will be adapted to fit a project's unique needs. The VE facilitator shall prepare a specific detailed strategy and plan in consultation with the City PM and Consultant.

The VE process must follow an organized plan made of phases, in which activities are designed to stimulate the team to identify and develop ideas into alternatives to the original concept or design. Phases must be performed in sequence because each phase provides information and understanding necessary for the successful execution of the next phase. As the team gains additional knowledge about the project, a previous phase may be revisited.

The phases are grouped in three stages, with a core stage being organized in 6 distinct phases run in workshops. The term Value Engineering Workshop refers to this stage:

1. The Pre Workshop preparation

2. The Workshop itself which applies six plan phases:
   1. Information phase: gather information what is being done now?
   2. Function Analysis phase: Analyze functions. What must be done? What does it cost?
   3. Creative phase: generate ideas (creative brain storming. What else will do the job?
   4. Evaluation phase: Evaluate ideas. Which ideas are best?
   5. Development phase: Develop Ideas. What are the impacts? What are the risks? What is the cost?

6. Presentation phase: present ideas Sell alternatives.

3. The Post Workshop documentation and implementation

The plan is a powerful tool that assists the VE team in a number of ways:

(a) It is an organized approach which allows the VE team to analyze a project by quickly identifying high cost to worth areas and selecting alternatives which minimize costs while maximizing quality.

(b) It encourages the VE team to think in a creative manner, i.e., to look beyond the use of common or standard approaches.

(c) It emphasizes total ownership costs (life cycle costs) for a facility, rather than just initial capital costs.

(d) It leads the VE team to develop a concise understanding of the purposes and functions of the facility.

3.4 Value Engineering Pre Workshop Preparation

The purpose of pre Workshop preparation is to plan and organize the Value Engineering workshop.

The following activities should be accomplished in the general sequence listed below:

(a) A coordination meeting between the City PM, Design Manager (Consultant) and VE Facilitator
   (i) Develop the scope and objectives for the Value Study
   (ii) Identify and prioritize strategic issues of concern

(b) Develop the study schedule

(c) Collection of the project's technical and cost data (scope of work definition, drawings, specifications, reports, detailed project cost information, costing models, quality data, marketing information, process flow charts, etc) This includes any costing document prepared for or coming from a cost estimate in view of establishing target cost for Program Capital Projects.

(d) Confirmation of the composition of the VE team and logistical arrangements for the VE workshop

(e) Preparation of initial cost, energy, and life cycle models to assess alternatives.

(f) Distribution of the project's technical and cost data to VE team members.

It is during this phase that a decision is made as to whether subsequent phases are likely to yield sufficient value to justify the cost of the study. It may be appropriate to increase or decrease study parameters at this time.

Typically this phase is covered within 2 weeks, and the documents should be submitted to the team members at least one week ahead of the workshops.

3.5 Value Engineering Workshop Phases

Based on the size of the project and the amount of efforts dedicated to the VE Study, each workshop phase lasts typically between half a day and 2 days, for a total duration of one week.

Team composition for each workshop is adjusted by the VE Facilitator according to

plans and progress.

3.5.1 Information Phase:

This phase is the first of the workshop and generally takes place the morning of the first day of sessions. It is the opportunity for the VE Sponsor to open the session and to have the goals of the study identified. A presentation by the Design Manager where he can explain the difficulties encountered during the design of the project as well as discarded alternative solutions and risks analysis, and a site visit may be arranged.

The purpose of this phase is to understand the current conditions of the project and constraints that influenced project decisions. This refers to the question “what is being done now and what are the requirements for the project?”

The VE Team will collect, organize, and analyze information to understand project functions and requirements and estimated life cycle costs as completely as possible. Most of the data provided should have been reviewed by the team members prior to the workshop.

3.5.2 Function Analysis Phase:

Function analysis is the cornerstone of value engineering since it separates VE from direct cost reduction techniques.

It helps the team understand the project from a functional perspective rather than on how it is currently conceived. Project designers are generally not involved in this phase as it should not be a platform for them to defend their design choices.

The team should identify the primary and secondary functions that must be maintained to satisfy the intended project goals. These functions are analyzed and evaluated with regard to their contributions to the project objectives, and their costs. This process aids the VE team in determining the least costs to perform primary functions and secondary functions, and in identifying these costs, determine which can be reduced or eliminated without affecting the performance, reliability, quality and safety of the facility.

In determining what functions are important, one should ask questions like: What does the object do? What must it do? What should it do? What could it do? What must it not do?

For this exercise, function is usually expressed in a two word active verb/measurable noun structure as support/load or produce/heat.

During this phase, the workshop team identifies functional areas sequentially since the functions vary according to the selected area. The function of the total project is established before the functions for the project elements are established.

A session would be completed as follows:

1. Identify the study area.
2. Identify the function of the study area.
3. List the component parts of the study area.
4. List the function of each component and subcomponent.
5. Identify whether each function is primary or secondary and required, or not required.
6. Identify the estimated cost of each function.

7. Speculate on the contribution of the function and/or the least cost to accomplish it.

8. Estimate value of functions to select value mismatched functions on which to focus the following creativity phase.

3.5.3 Creative Phase:

Creativity is second only to function analysis in its importance to Value Engineering.

The VE Team uses creativity techniques to identify alternative means of satisfying primary and selected secondary functions of the project, its components and subcomponents. It answers the question: How else can the function be performed?

This phase involves an open discussion without any restrictions on the imagination or inventive thinking of individual team members, any critical judgments or comments which might inhibit any of the team members should be deferred.

The VE Facilitator is responsible for maintaining a climate for the free exchange of ideas by directing the team members away from discussion or arguments about relative merits of individual ideas.

The ideas should be listed by system, subsystem, and component to facilitate effective organization of the study and later evaluation.

3.5.4 Evaluation Phase:

In this phase, the team follows a structured evaluation process to compare to one another and to the original design, short listed ideas, and select those that offer the potential for cost saving while delivering the project's function(s) and performance requirements.

In ranking ideas, the VE team should consider the following:

(a) Are the performance, quality, reliability and safety requirements met or exceeded?

(b) Will excessive redesign or project delay be created?

(c) Is there improvement in operation and maintenance?

(d) Will life cycle cost savings be achieved?

(e) Are there excessive Project or Operations risks involved?

(f) Does the idea have a reasonable chance of acceptance and implementation?

Only the ideas that present the greatest potential for cost savings and value improvement will be retained for further investigation and possible development in the Development Phase.

If no valid solution is identified, it might be necessary to go back to creative phase.

3.5.5 Development Phase:

The ideas selected in the evaluation phase are developed as completely as possible into alternative proposals, including descriptions, capital and life cycle cost estimates, sketches, advantages, disadvantages, and risks scenarios to allow detailed comparison to the original design by the decision makers before they determine if the alternative should be implemented.

When more time is required to complete collection of information, an action plan is developed for each alternative. The action plan should, at a minimum, include what needs to be done, who will do it, and when it will get done.

During this development phase, the technical expertise of the team is very important. It may also be necessary to consult outside experts, vendors, and reference sources to obtain additional evaluation information before developing the alternative proposals.

Ideas should generally not be grouped together into a proposal; each alternative idea should be presented as a single independent VE recommendation so that it can be reviewed on its own merit.

3.5.6 Presentation Phase:

The Presentation Phase consists of both an oral and a written presentation of the results from the VE study on the last day of the VE Workshop.

The presentation is addressed to the VE team members with a focus on City PM, Design Manager and VE Sponsor (if role not filled by the City PM).

If required, the audience is extended to other stakeholders, an advisory committee and/or higher levels of management.

The purpose of this phase is for the team to present and "sell" alternatives for implementation.

The oral presentation should be a one to three hours relaxed and informal meeting. The presentation provides an opportunity for the PM and the Design Manager to discuss the VE proposals with the VE team. The VE facilitator should start the presentation with an overview of the VE study and a summary of the VE proposals including the potential cost savings, highlighting the major factors which influenced the study and a brief description of each proposal. The PM and Design Manager should seek only to understand the concept and background of each proposal and should delay detailed discussions on the merits of the proposals.

A written summary of the VE proposals should be provided to the PM and Design Manager during the presentation so they can commence their review and analysis prior to the receipt of the VE report.

During this phase, some questions may be raised that will require some clarifications and re-evaluation.

3.6 Value Engineering Post Workshop Documentation and Implementation

(a) Value Engineering Report;

Within one to two weeks following the oral presentation of the workshop and submission of a written summary of the VE proposals, the VE Facilitator prepares a Value Engineering Report which summarizes the results of the entire VE study which closes the responsibilities of the VE team. The report should stand alone as an independent document and contain at least the following:

1. Executive summary;
2. Project name and general description;
3. Scope of the VE study;
4. Names of the City Project Manager, the Design Consultant, and VE team; members and their related responsibilities

5. Location and date of the workshop;
6. List of the data provided by the Consultant;
7. Project objectives and constraints;
8. All cost, energy, and life cycle models, and worksheets from the plan phases;
9. Summary of VE proposals with anticipated cost savings and other improvements;
10. Specific VE proposals with supporting documentation; and
11. Appendix with additional information which the VE Facilitator may find appropriate.

This report as well as any required clarification, is used by the City PM and Design Manager in their review and evaluation of the VE proposals, and for the preparation of the VE implementation summary acceptance by the Design Manager.

(b) Value Engineering implementation summary acceptance.

The VE implementation summary acceptance summarizes the Design Manager's proposed recommendation for each of the VE proposals, stating acceptance, value improvement and an implementation plan, including associated engineering costs and project schedule implication, for acceptable proposals, and detailing and justifying reasons for rejection of unaccepted proposals.

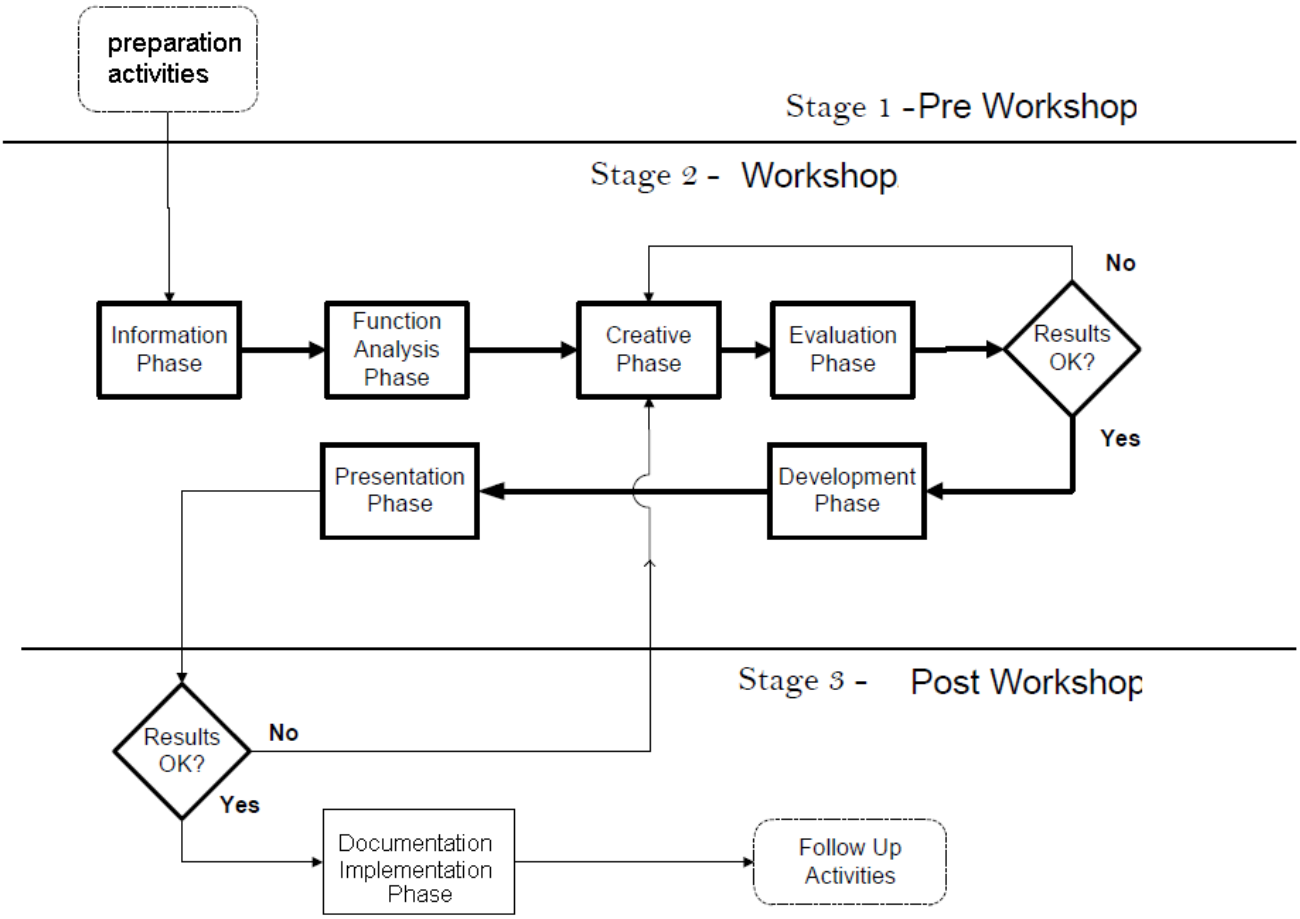
It serves with the VE report as the complete documentation for the VE study. Separate sets of reports must be prepared for each VE study conducted on a project.

(c) Implementation.

At this point, the VE Team can still be involved in helping realize the savings of the VE workshop. However, responsibility for the next phase resides with the City Project Manager.

The City PM records the ideas, manages the list of recommendations, and with the Project Director and other Program Managers, depending on the magnitude of the VE study objectives and results, will decide on the implementation, prepare for change orders and plan on how and by when the implementation will occur. In some instances, additional study and information may be required.

3.7 Value Engineering Study Flow Diagram



4. VALUE ENGINEERING STUDY FOLLOW-UP

4.1 Reporting

The management of the Project Value Engineering Process is the responsibility of the City PM who has to ensure that the Final VE Study recommendations are properly incorporated into the project design and tracked, validated and report the results/savings of the VE study.

The City PM must also ensure the proper recording and follow up of the VE Study results for potential use in other projects or for the Program in general, and also make note of any recommended improvements to VE methodology for future studies.

In addition to the final reports from each formal “VE Study” and the simplified procedure “value engineering records”, the following reporting is required:

(a) Maintenance of a Log register (CD-PD-TO-10 Value Engineering Register Template) listing all identified ideas, Value Engineering items and forms including;

(i) Entry number and identification

(ii) Status (Items considered, Items accepted/rejected)

(iii) Project Record Index (PRI)

(iv) Action owner

(v) Recommendation on timing of implementation of accepted items; and

(vi) Order of Magnitude Estimate (by item and cumulative) of Total Installed Cost reductions arising from the Value Engineering activities.

(b) VE results summary report;

(i) Identify lessons learned, or other items to be recorded and/or tracked through implementation;

(ii) Identify where opportunities were missed;

(iii) Identify roadblocks to innovation and understand why they existed;

(iv) Integrate VE Study results into Program's reporting of lessons learned;

(v) Reflect on the VE Study and consider how the experience has developed new capabilities;

(vi) Suggestions for VE process improvement.

4.2 Benefits

The typical benefits of a successful VE process that may be listed in VE results summary report are:

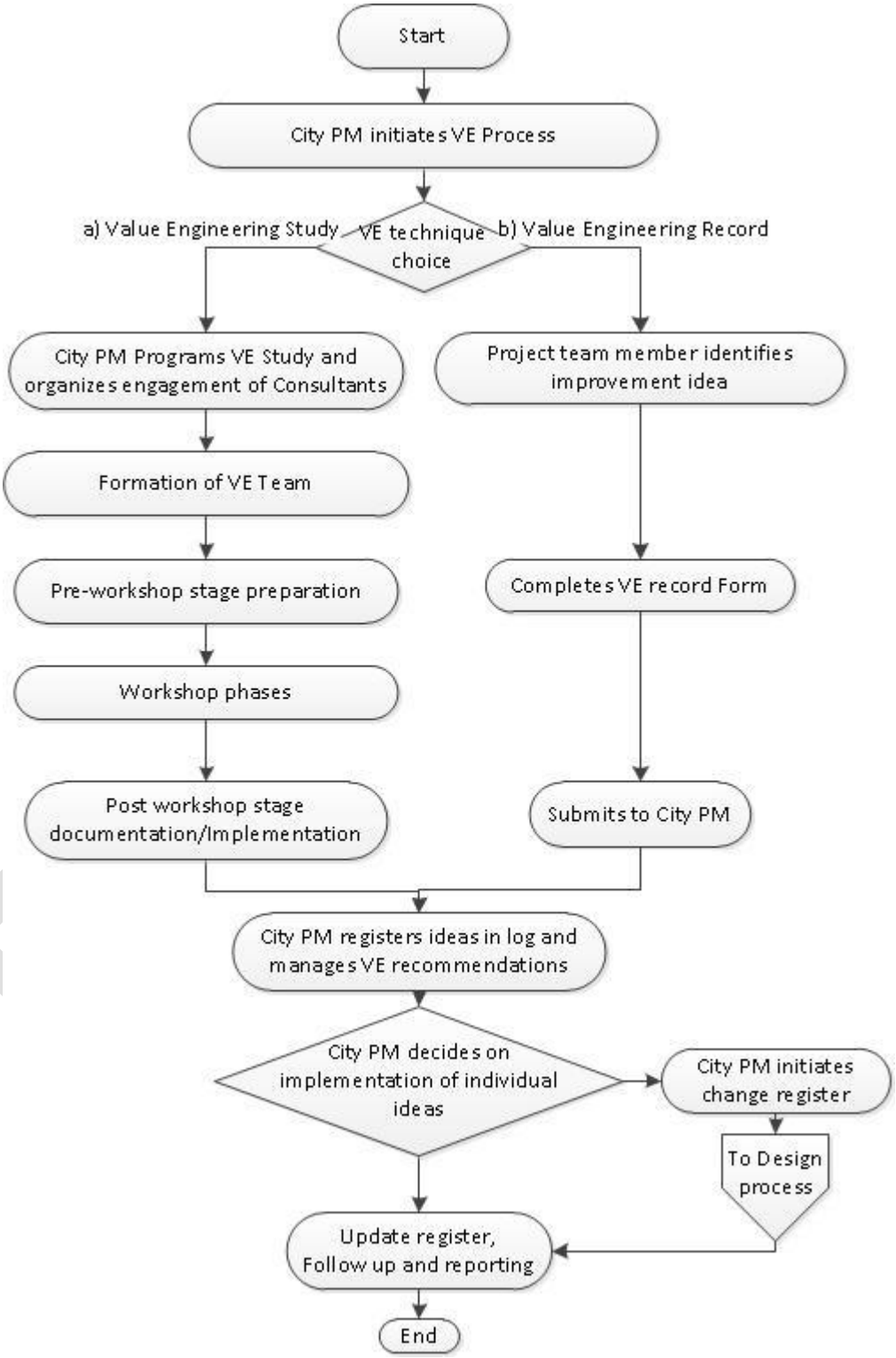
(a) Improved ability to manage projects, solve problems, innovate, and communicate.

(b) Cost savings, risk reduction, schedule improvements and improved job satisfaction

(c) With payback from the investment in VE effort (typical payback exceeds 10:1), VE helps achieve the appropriate quality or value for money in a project.

(d) Provision of a definitive tool to improve value in any product, project or process.

5. VALUE ENGINEERING PROCESS FLOW DIAGRAM



Value Engineering Process Flow Diagram

6. ATTACHMENTS

CD-PD-TO-09 Value Engineering Record Form

CD-PD-TO-10 Value Engineering Register Template

CD-PD-TO-11 Value Engineering Resources Form