

CHAPTER V

CONCLUSION AND RECOMMENDATION

From the results and discussion in last chapter, we can find the difference between total costs estimation of DOH & DOR and total costs estimation of the contractor that can be concluded as following:

The costs affecting total costs of pavement in-place recycling of DOH & DOR can be identified in main costs as follows: material costs (consists of cement costs), labor and machine costs (consists of investment costs, tire costs, maintenance costs, operator costs, fuel costs, lubricant costs, labor costs, depreciation costs, and traffic factor), operation costs (consists of contracting costs, site office and vehicles costs, staff and headquarter costs, risks costs, interest costs, and addition costs for rainy case), profit, and VAT.

The costs affecting total costs of pavement in-place recycling of the contractor can be identified in main costs as follows: material costs (consists of cement costs), labor and machine costs (consists of labor costs, depreciation costs, investment costs, tax, insurance, and storage costs, fuel costs, lubricant costs, maintenance costs, high-wear items costs, tire costs, operator costs), operation costs (consists of drawings costs, bank guarantee costs, preparation costs and material test costs, temporary construction costs, machine transport costs, other equipments and machines costs, staff costs, facilities costs, vehicles costs, site office costs, headquarter costs, insurance costs, interest costs, and risks costs), profit, and VAT.

Form the comparisons between costs in total costs of pavement in-place recycling of DOH & DOR and costs in total costs of the contractor in example projects, we can find the costs being cause of difference are investment costs, depreciation costs, and maintenance costs. The mainly cause of investment costs and depreciation costs of DOH & DOR are higher than the contractor is the defining prices of machines. The prices of new cold recycler that DOH & DOR use for calculation are 48,384,000 Baht, while the present prices of pavement in-place recycling machines from the sales agency are about 34,000,000. The other cause of difference is the defining type and numbers of machines. DOH & DOR define 5 types

and 5 units that are comprised of cold recycler 1 unit, steel wheel compact 1 unit, rubber tire roller 1 unit, cement truck 1 unit, and water truck 1 unit. While, the contractor define 3 types and 3 units that are comprised of cold recycler with cement spreader 1 unit, steel wheel compact 1 unit, and rubber tire roller 1 unit.

Considering factors being causes of difference between costs in total costs of DOH & DOR and costs in total costs of the contractor, we can find guidelines for improving total costs estimation of DOH & DOR as follows:

1) DOH & DOR should have RAP material testing to design exactly percentage of cement in admixture in each project instead of using constant value from the tables.

2) DOH & DOR should update the new machine prices corresponding to real market prices. Besides, it's possible to exclude some type of machines such as cement truck and water truck from estimation.

3) DOH & DOR projects that can be done out of rainy season should use Factor F in normal rain case.

The analysis of factors affecting costs of pavement in-place recycling in this research can be applied to use with both DOH & DOR and the contractor in any new projects. In perspective of DOH & DOR, this research shows methodology for finding costs in total costs structure of pavement in-place recycling and guidelines for improving total costs estimation. In perspective of the contractor, this research shows methodology for estimating total costs & profit of pavement in-place recycling of DOH & DOR projects.

Limitation of this research

This research has some limitation especially in the collecting data step for total costs estimation of the contractor. The indirect costs of the contractor are defined as 15 costs. It's possible that some costs in indirect costs may be missed in the list. This makes the indirect costs estimation to be mistake. In the lists of indirect costs, many

costs are hard to estimate exactly for example temporary construction costs, other equipments and machines costs, vehicles costs, site office costs, headquarter costs, and risks costs. So, the estimation of these costs has to find by lump sum or defining percentage of contract prices. Furthermore, data collecting for estimation came from studying in the field and interviewing contractors only 2 companies. From the latest data in 2008, the numbers of pavement in-place recycling contractors have more than 77 companies and DOH & DOR have hundreds projects in each year. So, data used in this research can not be represented all system. In addition, some data in hand is not enough, so we have to use from other sources. This make indirect costs estimation of this research may be mistake. The other limitation is machine costs estimation of the contractor. This research used operating costs and operating rate of cold recycler from sales agencies. This data may not correspond with real operation. The correct data should come from operating record and statistics record of costs from operation of the contractor in many projects. It can conclude that the source of data for direct costs estimation is the weakness of this research.

Recommendation

Total costs & profit structure of the contractor in the example projects as presented in this research may have some mistakes in the figure and in the proportion because the weakness of source of data for direct costs estimation. The improvement of this research to be more academic has to use statistics method. The correct study should be started from studying characteristic of indirect costs and factors, which define indirect costs from many contractors in many projects and covering many provinces. In collecting data, it should make questionnaires for interview the contractors. The answer of questionnaires will tell type of costs in indirect costs, factors used for estimation, and figures of costs in each project. These data should be enough for statistics analysis. The factors that relate to costs in indirect costs can be analyzed by correlation analysis to study size and relative direction of costs. Multiple regression analysis can be used to build financial model of indirect costs that can be represented any projects. The financial model of indirect costs can be used to generate figures of costs in indirect costs that reflect to the system. From this statistic method, it will make costs in indirect costs to be more correct and near the real costs.