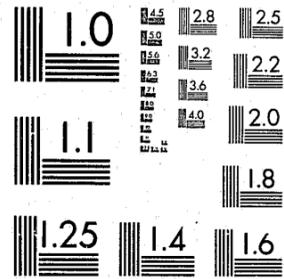


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ACQUISITIONS

INSTITUTIONAL ECONOMIES OF SCALE  
(MAXIMUM/MEDIUM SECURITY)

CANADIAN CORRECTIONAL SERVICE  
MINISTRY OF THE SOLICITOR GENERAL

EXECUTIVE SUMMARY

The purpose of this study was to investigate economies of scale in penal institutions of the Canadian Correctional Service, (CCS). It was one of a number of studies undertaken to develop the Five Year Accommodation Plan for the 1978/79 to 1983/84 period.

The scope of the analysis is limited to comparing the costs of providing medium and maximum security male inmate accommodation at various institutional capacities. Therefore, the conclusions drawn must be considered along with those of other current research which analyses the success of realizing correctional objectives in relation to institutional scales of operation.

The study approach involved: adopting functional performance specifications as in institutional designs already approved by the CCS; developing conceptual models for the two security classifications at three inmate capacity levels; computing the costs associated with each model; and comparing the costs of the different scales of operation.

The models developed were as follows:

Security Classification	Inmate Capacity		
	Small	Medium	Large
Maximum	162	216	428
Medium	168	252	420

Every effort was made to maintain, among the models, constant availability of institutional programs and service levels in order to analyse only the effects of the one variable - size.

The cost analysis was based on a life cycle of 30 years and all costs, including initial capital costs of construction and equipment, were annualized and computed on a per inmate basis.

For maximum security inmates the total annual cost increase between the large and small scale models was found to be about 60 percent; between the large and medium scale models it was 40 percent. For medium security the cost increases were approximately 40 percent and 20 percent respectively. Additionally, it was found that at a given scale of operation, it is from 10 to 20 percent cheaper to maintain an inmate in a medium security institution than in one of maximum security.

The above results are all based upon the models operating at full capacity; economies of scale appear to level off in the 400 to 500 capacity range.

It was thus concluded that, from the viewpoint of minimizing costs:

1. future CCS institutions for male maximum and medium security inmates should be designed to accommodate four to five hundred inmates.
2. where the forecast population does not require the above capacity, an institution should be designed for eventual expansion to that capacity and built initially at a smaller scale.
3. policies and procedures should be pursued to allow the incarceration of an inmate in a medium rather than a maximum security institution whenever possible.

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## I. INTRODUCTION

### A. Background

In early 1978 the Canadian Correctional Service (CCS) prepared and presented its Five Year Capital Construction Program to the Treasury Board (TB) Secretariat for approval in principle. It was this document upon which would be based:

- (1) the provision of new correctional institutions;
- (2) major renovations and additions to existing institutions; and
- (3) other acquisitions and renovations of a capital nature.

The program was intended to provide the long range framework within which individual capital projects would be presented to the senior management of the CCS and to TB for specific project approval.

A major portion of this TB submission dealt with the future requirements to accommodate medium and maximum security inmates. It reflected the then current CCS policy that such institutions, unlike their predecessors, should be designed and built to operate on a small scale of inmate capacity.

This policy was based on the hypothesis that, other things being equal, small institutions:

1. deliver better rehabilitation results than do large institutions, and
2. reduce tension and violence, hence deliver better security than large institutions.

These premises were advanced and supported by both the Working Group on Federal Maximum Security Institutions' Design, (The Mohr Committee), in 1971,<sup>1</sup> and in the Report

- 
1. Mohr, Hans W. et al, Report of The Working Group on Federal Maximum Security Institution's Design, Department of the Solicitor General, 1971.

of the Parliamentary Sub-Committee on the Penitentiary System in Canada in 1977.<sup>1</sup> Accordingly, in the T.B. submission, new medium security institutions accommodated no more than 252 inmates, and new maximum security institutions had a capacity of only 216 inmates.

In June 1978 this submission was withdrawn. Both the CCS and the TB were concerned over the high capital costs inherent in the proposed program, and over the large increases in annual operating expenses forecast. CCS officials requested comments by TB on specific issues which should be addressed before re-submitting a revised Five Year Capital Program. The TB suggested a re-examination of CCS policies pertaining to institutional size, to verify that the increase in tangible benefits of operating at a small scale was commensurate with the corresponding increase in costs.

The Bureau of Management Consulting, (BMC), Supply and Services Canada, was engaged to assist the CCS in redeveloping their accommodation plans for maximum and medium security inmates. The project started in July 1978 and was to be complete by late October. It was early recognized that a decision on the size of future institutions was key; this was the fundamental building block upon which to base the national program to cope with increasing inmate population and the phasing out of sub-standard facilities.

### B. Terms of Reference

This study was undertaken as one of a group of accommodation related studies for the CCS. Its object is to estimate the relationship between costs and the scale of operation of penal institutions of the CCS. The scope of the study is limited to institutions for male, medium and maximum security inmates.

- 
1. Report of the Parliamentary Sub-Committee on the Penitentiary System in Canada, Supply and Services Canada, 1977.

C. Approach

To achieve the study objective, it was judged mandatory that all variables except institutional size should be held constant and that the data derived be calculated and presented in a manner which was internally consistent within the study. A variety of approaches was considered among which were:

- (1) using historical data for existing CCS institutions; the actual costs of construction, operation and maintenance would be derived for the size spectrum of the current institution inventory;
- (2) brainstorming with a group of institution managers, CCS staff, and outside designers known to be outstanding. This approach would involve developing one optimal set of performance specifications for each security classification, and then developing conceptual models of institutions to meet these specifications. Small, medium, and large scale models for each security classification would be developed and subjected to cost analysis and comparison.
- (3) brainstorming as in (2) above but with a view to developing a set of optimal performance specifications for each size and security classification, followed by the development of a conceptual model to meet each set of specifications. Cost analyses of each model and their comparison would then be undertaken;
- (4) adopting a set of performance specifications as represented in institutional designs already developed by the CCS; developing conceptual models for the two security classifications in small, medium, and large scales of operations; and cost analysis and comparison as above.

The first approach was rejected primarily because of the near impossibility of normalizing operating conditions and practices to an internally consistent standard to allow cost comparison with respect to the size variable only.

The limits of time precluded approaches (2) and (3). It was impossible in the time allowed to gather a suitable panel of experts who could systematically produce, analyse and compare a grid of idealized model institutions.

Approach (4) was selected. It could be done quickly; performance specifications were available in architectural programs which represented current CCS philosophies; and the personnel required for modelling, analysis and comparison were immediately available.

## II. ANALYSIS

### A. Overview

Having chosen the general approach, the analytical procedure, in overview, involved the following principal steps:

- (1) selecting which specific architectural programs (institutional designs) for both planned maximum and medium security institutions would act as representative designs;
- (2) selecting the specific scales of operation to be modelled in each security classification;
- (3) identifying key cost variables;
- (4) determining the functional cost centres for each model and estimating the requirements of space, staff and other resources for each;
- (5) estimating unit costs for various types of space, staff and other resource variables;
- (6) calculating the costs for each functional cost centre and subsequently for each model;
- (7) testing the validity of our results and their sensitivity to various key assumptions.

Each of these steps is explained in more detail below.

### B. Selection of Representative Designs

An architectural program is a detailed set of instructions intended to: (1) guide architectural design processes, and (2) guide future operators on how the institution is to be operated. While not really a complete institutional design, it is an adequate document for estimating the capital, operating, and maintenance costs of a new institution.

When this study was conducted, such programs were available for only two scales of operation: 252 medium security and 216 maximum security inmates. Hence, our principal concern

was to select programs approved by the CCS and incorporating current policies on prison operation. From these representative designs we could develop smaller and larger models through an extrapolation procedure.

After consultation with members of the CCS Headquarters staff, the two architectural programs selected were:

- (1) Medium Security - The Kamloops Institution, Kamloops British Columbia, Capacity 252; and
- (2) Maximum Security - The Dungarvon Institution, Renous, New Brunswick, Capacity 216.

Both Institutions had been planned for construction in the near future; design work had commenced based upon each architectural program; and the architectural programs had been approved by the Central Users Committee, (CUC), of the CCS. (The CUC is the inter-functional committee made up of CCS Headquarters and Regional representatives which monitors and approves accommodation standards and implementation).

### C. Selection of Scales of Operation for Modelling

In its simplest terms, the next problem we faced was, "How large is large; how small is small?" The scales of operation of institutions now operating in Canada range from about 150 to over 600 capacity, and world-wide range upward into the thousands. Again, through consultation with the CCS staffs, it was determined that, in the Canadian context, an upper limit of 400-500 would be appropriate. This would allow detailed consultation during the study with CCS managers who were experienced in the operation of institutions, and would allow us to validate our assumptions and estimates at each stage of our procedure.

The selection of the lower limit was based upon the expressed desire of our client and our own wish to quantify the cost of the model postulated by the Mohr Committee in 1971. Mohr<sup>1</sup> recommended institutions in the range of 150

<sup>1</sup> We understand that the Mohr Committee intended to deal only with (high) maximum security inmates. Its recommendations were generalized within the CCS to apply to all classes of maximum and medium security institutions.

inmate capacity organized in small living units of 12. It was primarily this recommendation, modified upwards, upon which the CCS had based the previous Five Year Plan.

We now had three appropriate scales of operation for each of the two security classifications. Our benchmark models were in the middle scale of each, and we determined that valid upward and downward extrapolation of architectural program specifications could be made. Intermediate increments of scale, (say at the 175 and 325 capacity), were considered but rejected due primarily to the limits of time. The resulting model grid is shown in Table 1.

Security Level	Size (inmate capacity)		
	Small	Medium	Large
Maximum	162 3 x Living Unit of 48 = 144 10 Orientation 8 Dissociation	216 4 x Living of 48 = 192 12 Orientation 12 Dissociation	428 8 x Living Unit of 48 = 384 20 Orientation 24 Dissociation
Medium	4 x Living Unit of 42 = 168	6 x Living Unit of 42 = 252	10 Living Unit of 42 = 420

Table 1

The Institutional Study Grid

D. Identification of Key Costing Variables

From a detailed examination of previous CCS budgets and from the 1978/79 Main Estimates it was determined that the four key variables for costing an institution were:

- (1) location
- (2) organization;
- (3) space allocation; and
- (4) staff levels;

Note that we made no attempt to idealize the variables. Our concern was to achieve consistency for comparison. Furthermore, although consistency within each security classification is achieved, only limited comparisons between institutions of different security classifications should be attempted. Part 1 of Appendix A shows the principal characteristics of the six model institutions.

(1) Location

The location of an institution would determine, to some extent, site costs, construction costs, annual maintenance and other operating costs. However, for this study we assumed all six models would be located in the same area of the country. Therefore, unit costs of site work, construction, and annual operating costs would be held constant. Rather than set a notional value on the land required, land costs were excluded. Although this produces an understatement of total cost, the difference is small as land acquisition is a very small portion of total capital cost. (Further, land values tend to increase in line with general inflation, hence are more correctly an investment than a cost).

(2) Organization

Two principal organizing concepts are used: (a) the Living Unit concept, and (b) the Team concept. Our representative architectural programs employ the Living Unit (LU) concept. Table 1, above indicates the LU sizes used in our models. The special purpose cells provided are based on the proportions in the reference models.

Whether or not an institution is organized through the Living Unit or Team Concept, the size of the living units, the availability and management of inmate programs, and the provisions of institutional services all impact on costs. All our institution models are multi-program; that is, there are opportunities available to the inmates for academic and vocational training, and industrial activity. (This would be unlikely in the small institutions but was required to maintain internal consistency for cost comparison). Further, some variance from the benchmarks was required to achieve comparative consistency. For example, the models are all costed with internal, non-contract, food preparation despite the fact that the program for Dungarvon Institution specified contract feeding.

(3) Space Allocation

The allocation of space to a function within our models affects not only the initial capital costs but also affects such costs as those of energy, maintenance and security. The benchmark models provided various relationships of space to inmates, staff, or function, and these relationships were used in the space allocation procedure for the large and small models.

(4) Staff Levels

By far the greatest source of expenditure within an institution is that of staff. This expenditure is not limited to salaries, overtime and benefits, but relates as well to both induction and refresher training, travel costs, provision of space, management overheads and so-on. For this study, the staffing levels of the benchmarks were normalized as required (e.g. food preparation), and, in consultation with the functional staffs of CCS Headquarters, were extrapolated to provide staff levels for each function of the large and small models. Availability of staff, and a common level of staff training and suitability were assumed; and the costs associated with staff recruiting and training were excluded from all models.

E. Determination of Functional Cost Centres

The two representative architectural programs organized the operations of the institutions into twenty functional areas for maximum security and ten functional areas for medium security; these centres were used for all of our models.

Further, the programs subdivided these functional areas and translated each into requirements for staff and space. These standards were accepted without change, (except to normalize operations). Part 2 of Appendix A details the functions and provides the results of extrapolation from the two standard models to the large and small models in each security classification.

Each extrapolation step was verified with the applicable CCS Headquarters staff. The completed models were then validated through further consultation to ensure both space and staff were properly allocated.

F. Cost Estimation Procedures

(1) Overview

With the six institutional models in place we were in a position to cost the construction and operation of each model. In order to fairly represent the total life cycle costs of each institution we decided to present initial capital costs on the same basis as annual recurring costs. That is, an arbitrary institutional life-span was chosen, (30 years), and initial capital costs were distributed over that life span using constant annual payments (i.e. using the concept of mortgage amortization). This procedure allowed stating annual total costs with capital and operating cost components in the same relation to each other as would have been the case in a net present value analysis.

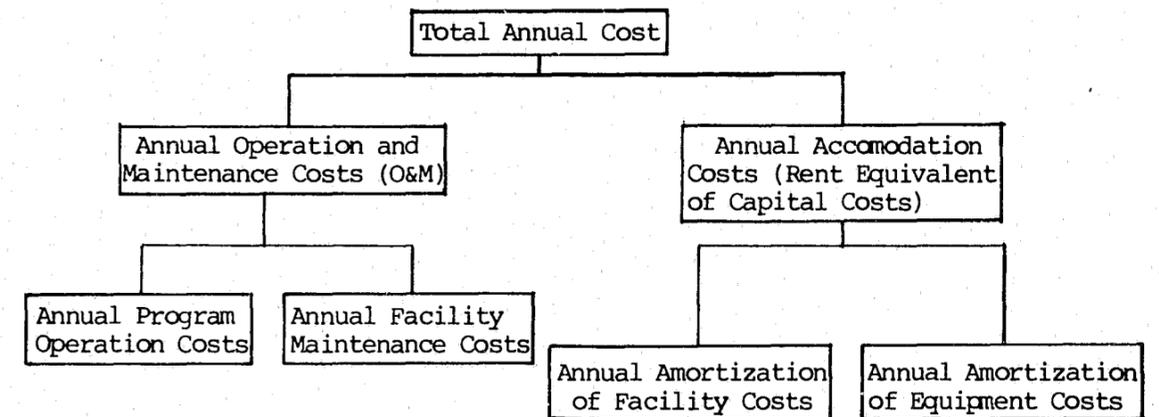


Figure 1

Concept of Annualized Life Cycle Costs For an Institution

Figure 1, above, illustrates our concept for calculating an annual cost that accounts for long term changes in the value of money. All costs are expressed in 1978 dollars. O&M costs are assumed to be inflation free; to compensate for this the interest rate on capital was reduced to an inflation free 4 percent. This provides consistency with the net present value concept by providing a realistic spread, (opportunity cost), between inflation rates and discount rates in any given year over the long term.

## (2) Derivation of Unit Costs and Cost Calculations

In order to calculate total capital costs, (e.g. construction) and annual recurring costs, (e.g. staff, maintenance, supplies), the following unit costs were required:

- (a) construction costs per gross square foot;
- (b) fees of architects and engineers etc;
- (c) initial cost of institutional equipment;
- (d) contingency and site work costs;
- (e) staff, operation and maintenance costs on a per square foot, per inmate or per staff member basis.

### Capital Costs

The architectural programs provided construction costs for each functional element of the two standard institutions on the basis of expenditure per gross square foot. These unit costs were then applied to the areas resulting from the extrapolation procedure to give the estimated construction costs for each of the models.

Historically, the CCS expenditure on site work and contingency has been an average of 13 per cent of construction costs. This proportion is not at variance with our experience in the construction industry and was used for each model.

Likewise, construction related fees (architectural, consulting, engineering etc.) have averaged 16.25 per cent of construction costs and this figure was applied to all six models.

The initial equipping of an institution including, for example, industrial process equipment for the industrial program, and office and living unit furniture, costs an average of approximately 10 per cent of the initial construction expenditure. This percentage was used for each model.

The unit cost of capital involves the cost of capital during construction and, as explained above, the amortization of the cost of the completed institution. Interest during construction was calculated at 8.875% of construction costs

based on a straight line cash flow during 2 1/2 years of actual construction. The total capital cost of each model exclusive of land and equipment costs was amortized over 30 years at 4%, equipment costs were amortized over 7 years at the same interest rate. (Note interest rate during construction is based on Department of Finance data for 2.5 year line of credit financing). The resulting annualized capital costs are detailed in Appendix B and in Chapter III.

### Operation and Maintenance Costs

Staff salaries are based upon the average annual cost of a CCS staff-year exclusive of statutory benefits. The figure used of \$17,600 per staff member was based on data from the 1978/79 CCS Main Estimates and consultation with the staff of the Director General Finance of the CCS. To this figure was added a further 11 percent for Canada Pension Plan, Health Insurance, Unemployment Insurance premiums, and Public Service Superannuation contributions payable by the employer and 4 percent for salary adjustment in respect of contract renewals during the current fiscal year, (Salary Adjustment Reserve Account, SARA).

Other Operation and Maintenance (Other O&M) expenses were based on averages derived from the 1978/79 main Estimates in consultation with the applicable functional staffs in the CCS Headquarters. By this method for example were derived the annual personnel management overheads of \$180 per staff member, the annual costs of contract teachers and chaplains, and those of engineering and architectural services.

A complete break-down of the annual operating costs and the total annual operating and the capital costs for each model is provided in Appendix B. These costs are also calculated on a per-inmate basis and presented in Chapter III.

### G. Validation Procedures

We thought it appropriate to confirm the accuracy of our cost estimating procedures. We therefore subjected our results to a three way test:

- (1) continuous validation of our costing assumptions and parameters with the functional branches of the CCS Headquarters;

- (2) comparison with the actual costs of currently operating institutions; and
- (3) testing of the sensitivity of our results to possible errors in our estimating parameters.

Further details of this procedure are provided both in the following chapter and in Appendix C.

### III - RESULTS

#### A. Summary

It has always been accepted in an intuitive way that there are economies of scale. The preceding analysis has confirmed this and we can now identify the order of magnitude of this potential economy. For example, our results now indicate that, for maximum security accommodation, institutional costs can increase by some 60-65 percent if the design population is reduced from the 400 inmate range to the 160 range. (40 percent if reduced to the 200 capacity range). Similar, if not so dramatic results apply to medium security accommodation - a 40 percent, (and 20 percent), increase respectively.

Moreover, there are significant savings to be derived from optimizing the maximum/medium security accommodation mix to allow the placement of all potential medium security inmates in medium security institutions. Depending on the size of the institution it is anywhere from 10-20 percent more expensive to maintain an inmate in a maximum rather than medium security institution of the same size. Interestingly, the larger the institution the less significant is the saving. It could thus be argued that optimizing the accommodation security mix is less critical if based upon institutions of the large, (400 capacity), scale. Therefore the economic consequence of population forecasting error is less significant at the higher scales of operation.

The results appear to beg the question, "If the 400 capacity range is so economical, why not 500 or 1000?". When cost is plotted in relation to capacity, the resulting curves flatten somewhere in the 400-450 capacity range indicating an absence of further economies of scale. Furthermore, there is some evidence to suggest that above the 400-500 capacity range, incremental costs due to institutional/inmate/staff operational dysfunction may cause total costs to rise slightly.<sup>1</sup> Since we could not attempt to quantify these dysfunctional costs, (e.g. inmate violence, staff absenteeism, staff turnover), we do not argue with the premise. Therefore, we do not hypothesize the economies in institutions larger than those described in the model grid.

<sup>1</sup> California Department of Corrections, Program Planning Report, April 1, 1978, Volume III.

B. Detailed Results

This section, presented in tabular and graphical format provides the detailed results of the institutional costs in relation to scale of operation. The initial capital costs and their annualized equivalent are in Tables 2, 3 and 4. Tables 5, 6 and 7 provide the annual operating costs, and Table 8 gives the total institutional cost for each scale of operation. All costs are expressed in 1978 dollars and are normally expressed as annual expenditure per inmate assuming the institution is at capacity.

Security Classification	Inmate Capacity		
	Small	Medium	Large
Maximum	1021	890	713
Medium	946	776	683

Table 2

Operating Ratio Space per Inmate at Capacity in Gross Square Feet

Security Classification	Inmate Capacity		
	Small	Medium	Large
Maximum	97,859	92,004	72,711
Medium	94,011	77,588	68,260

Table 3

Facility Capital Cost (construction, sitework, fees) per Inmate at Capacity in 1978 Dollars (excludes interest on money during construction)

Security Classification	Category of Expenditures	Inmate Capacity		
		Small	Medium	Large
Maximum	Facilities	6,412	6,028	4,764
	Equipment	1,241	1,167	922
	Total	7,653	7,195	5,686
Medium	Facilities	6,160	5,084	4,472
	Equipment	1,192	984	865
	Total	7,352	6,068	5,337

Table 4

Annualized Capital Costs per Inmate at Capacity in 1978 Dollars

Security Classification	Inmate Capacity		
	Small	Medium	Large
Maximum	1.59	1.29	0.89
Medium	1.21	1.02	0.83

Table 5

Operating Ratio Staff per Inmate at Capacity

Security Classification	Category of Expenditures	Inmate Capacity		
		Small	Medium	Large
Maximum	Salaries	27,921	22,733	15,708
	Other O&M	6,281	5,780	4,963
	Total O&M	34,202	28,513	20,671
Medium	Salaries	21,371	17,950	14,541
	Other O&M	5,234	4,891	4,313
	Total O&M	26,605	22,841	18,854

Table 6

Annual Operating and Maintenance Cost per Inmate at Capacity in 1978 Dollars

Security Classification	Inmate Capacity		
	Small	Medium	Large
Maximum	4,188	3,410	2,356
Medium	3,206	2,693	2,181

Table 7

Annual Staff Salary Related Costs (UIC, CPP, PSSA, SARA), per Inmate at Capacity in 1978 Dollars

Security Classification	Inmate Capacity		
	Small	Medium	Large
Maximum	46,654	39,649	28,965
Medium	37,936	32,205	26,884

Table 8

Total Annual Institutional Costs per Inmate at Capacity in 1978 Dollars

On the following pages Figures 2 to 6 inclusive portray the above data in chart and graph form.

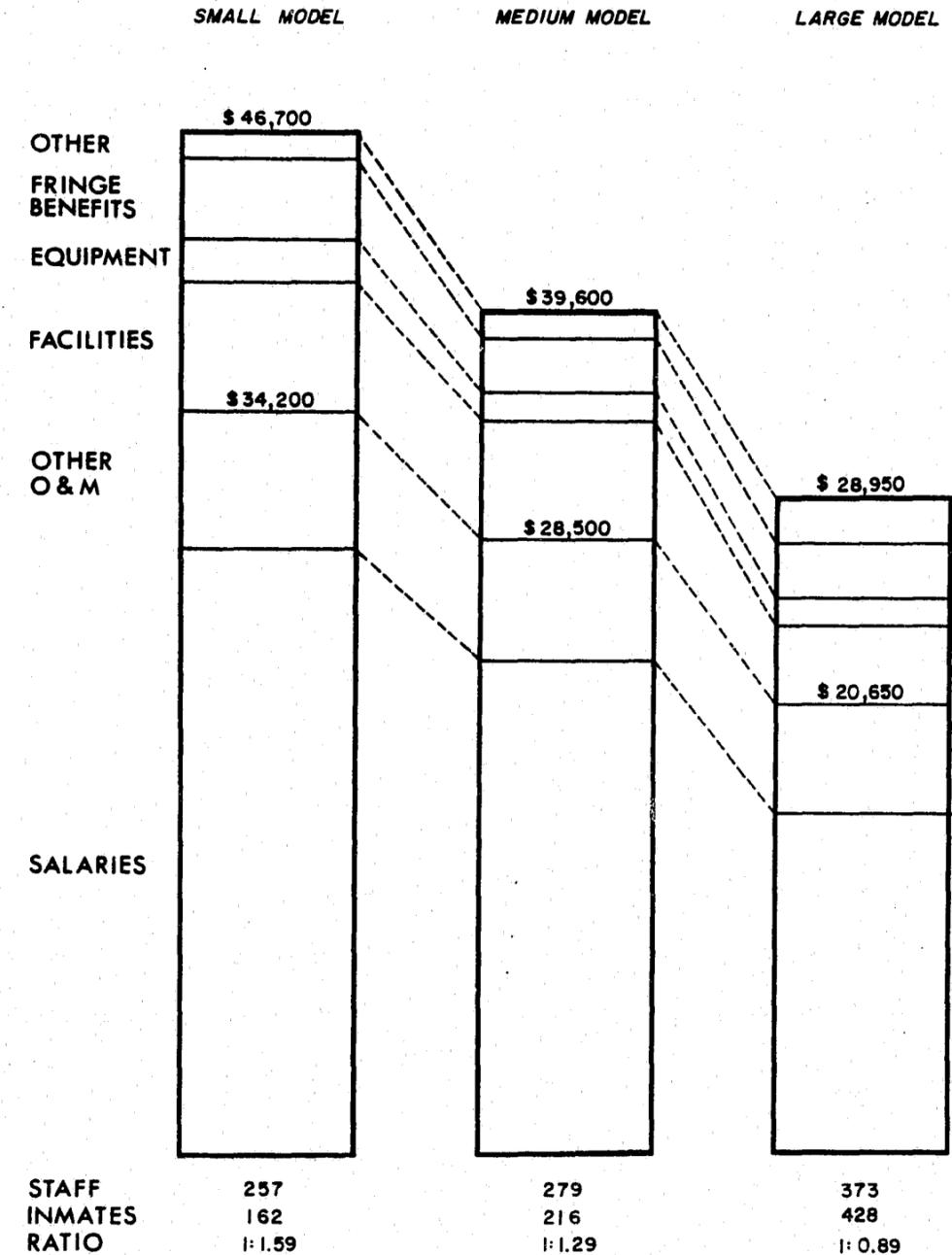
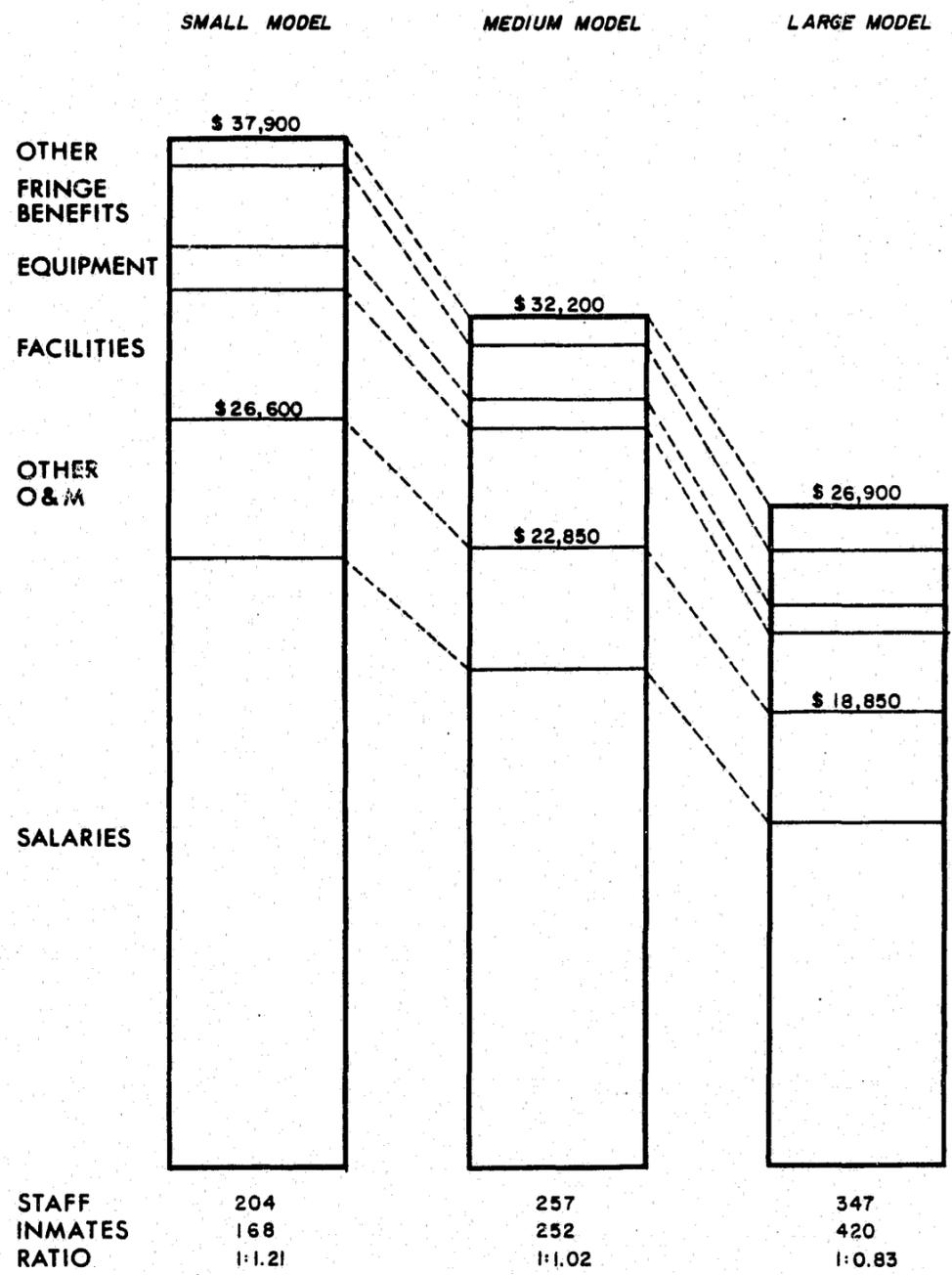
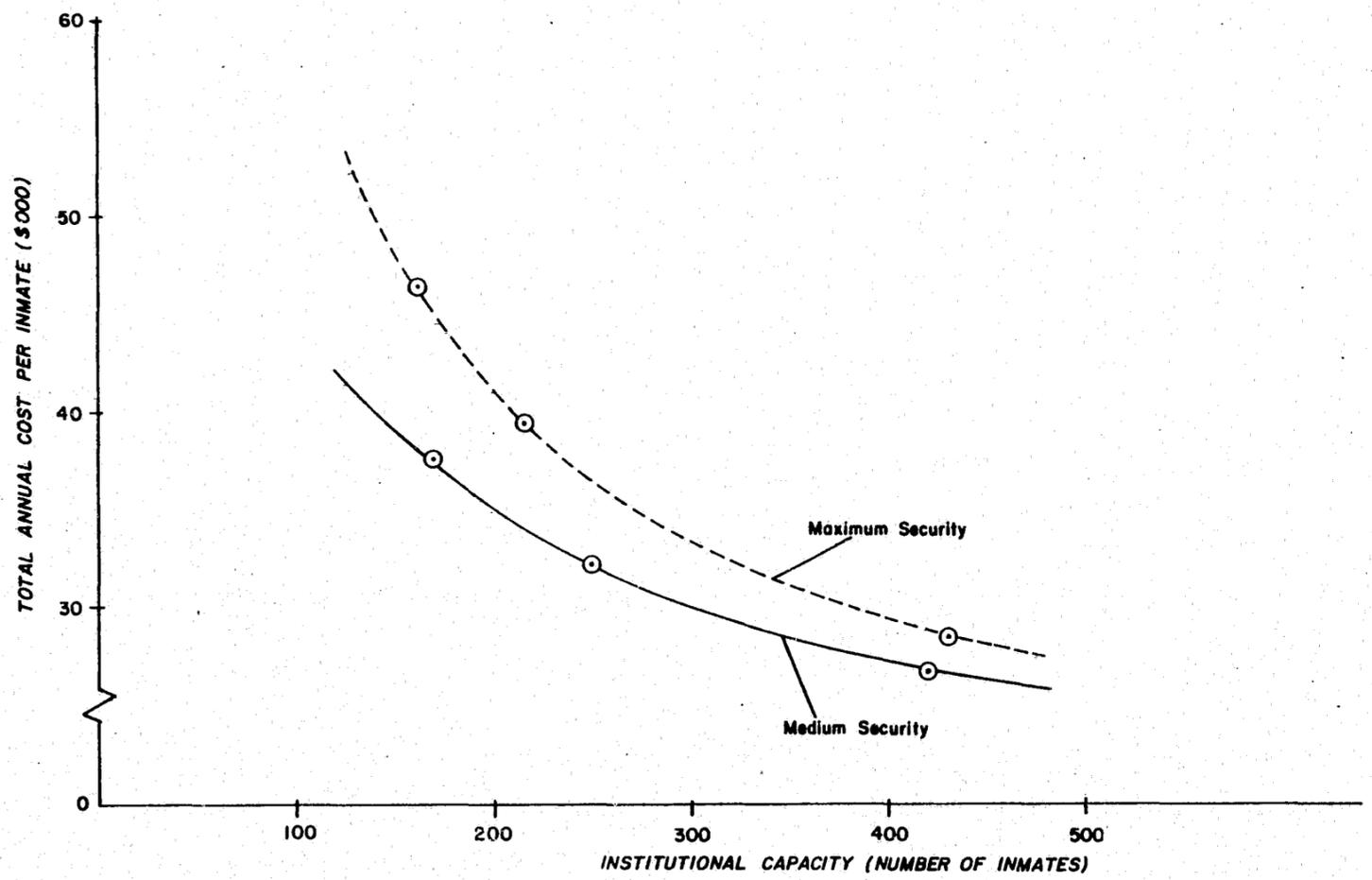


Figure 2

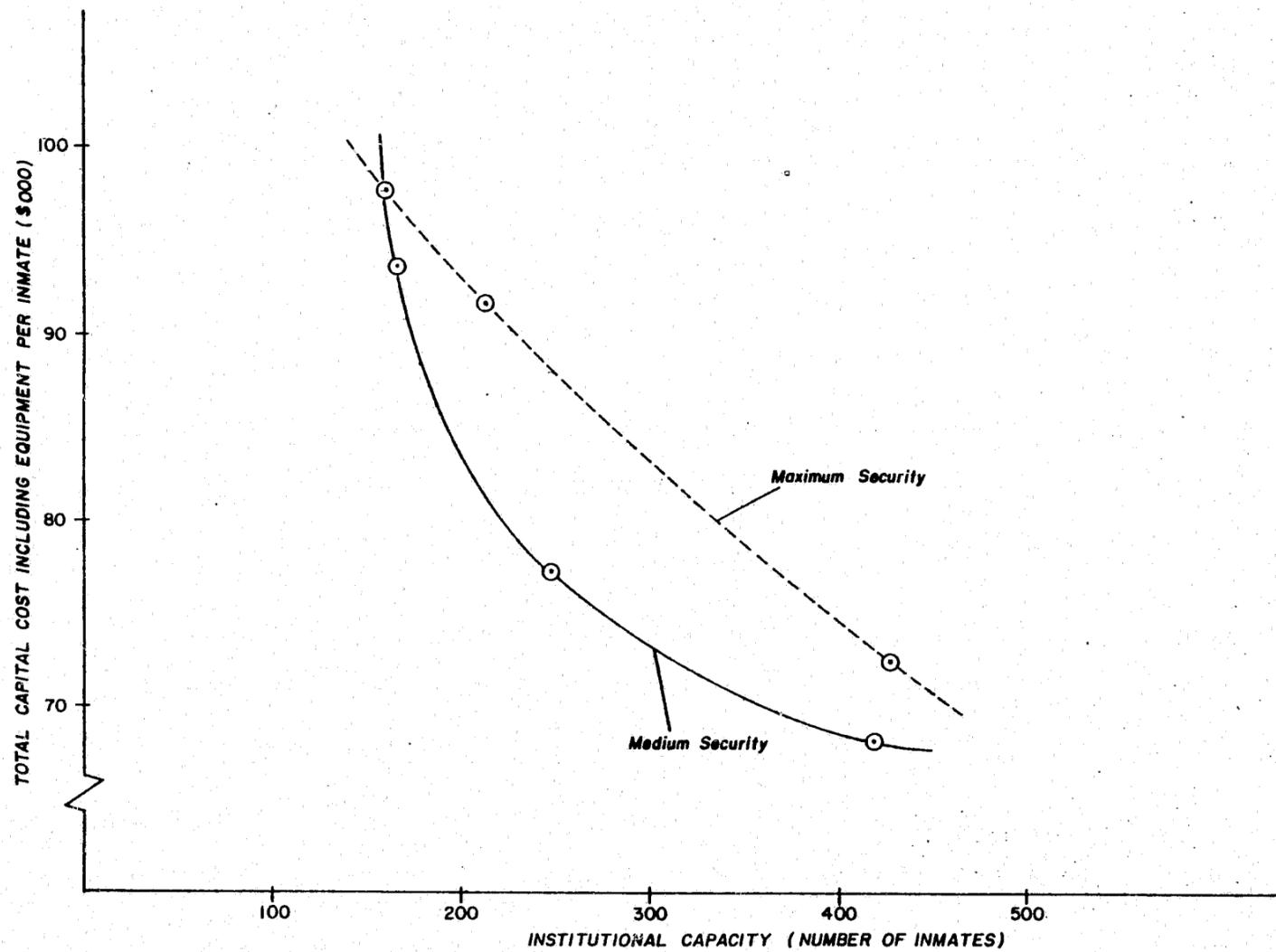
**TOTAL ANNUAL INSTITUTIONAL COST PER INMATE AT CAPACITY  
MAXIMUM SECURITY INSTITUTIONS IN 1978 DOLLARS**



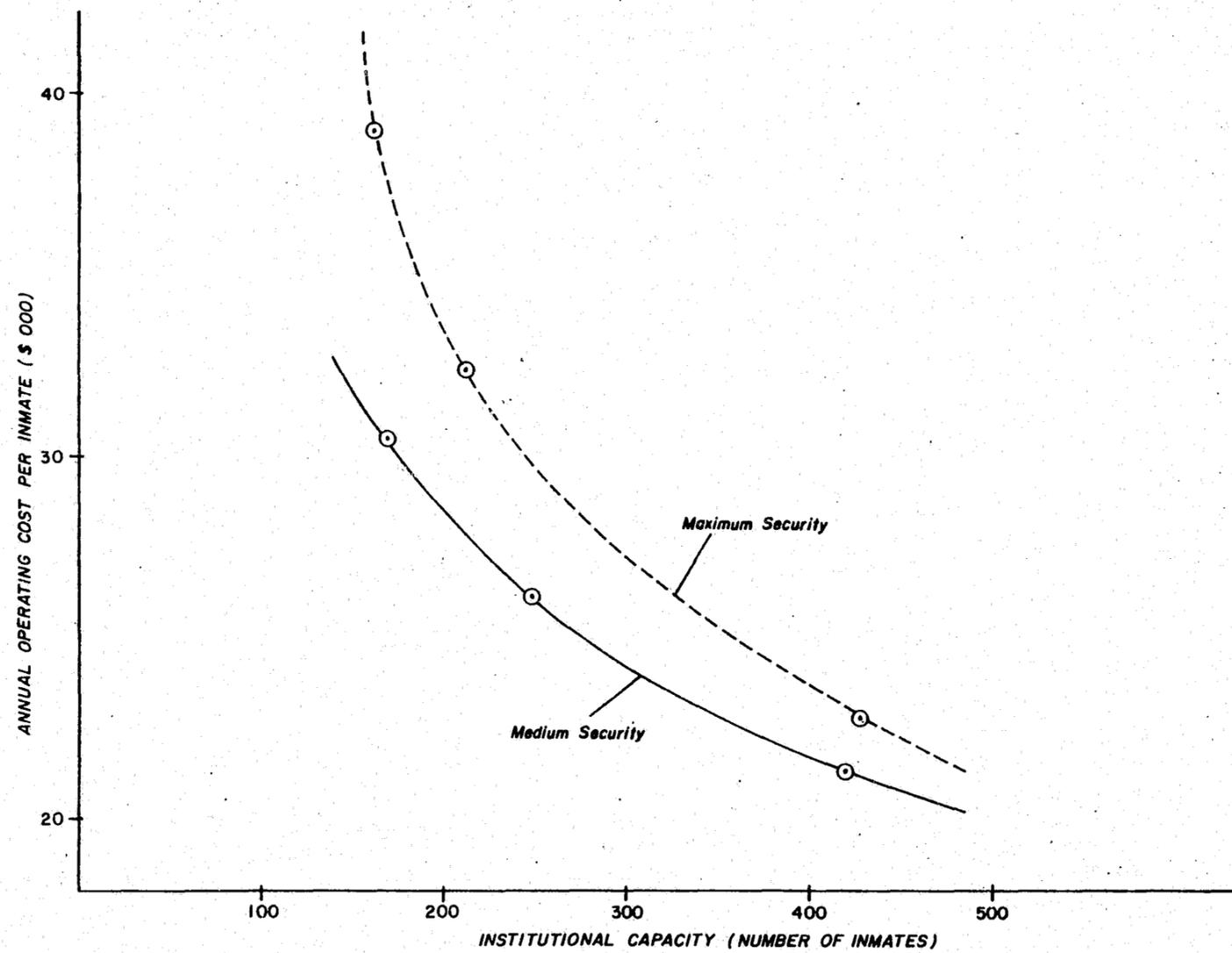
**Figure 3**  
**TOTAL ANNUAL INSTITUTIONAL COST PER INMATE AT CAPACITY**  
**MEDIUM SECURITY INSTITUTIONS IN 1978 DOLLARS**



**Figure 4**  
**ANNUAL TOTAL INSTITUTIONAL COST PER INMATE AT CAPACITY IN 1978 DOLLARS**  
**AS A FUNCTION OF INSTITUTIONAL CAPACITY**



**Figure 5**  
**TOTAL INITIAL INSTITUTIONAL CAPITAL COSTS PER INMATE IN 1978 DOLLARS**  
**AS A FUNCTION OF INSTITUTIONAL CAPACITY**



**Figure 6**  
**ANNUAL INSTITUTIONAL O&M COST PER INMATE AT CAPACITY IN 1978 DOLLARS**  
**AS A FUNCTION OF INSTITUTIONAL CAPACITY (INCLUDING SALARY RELATED BENEFITS)**

C. Validity of Results

The limits of available time and specific, precise information necessitated some compromises in our approach to this study. Nevertheless we have complete confidence in the validity of the results as an indicator of relative economies within the CCS. These results must be interpreted in the context of four major caveats as follows:

- (1) the availability of programs and services and operational standards provided for in the architectural building programs for Dungarvon Maximum and Kamloops Medium Security Institutions are assumed to be representative of the levels of service to be provided in future CCS institutions;
- (2) the extrapolation procedure ensures only that the availability of programs and services is maintained in the equivalent proportion to their availability in the two benchmarks. The level of quality of program output, which may be adversely affected by changes in scale, is not guaranteed as constant;
- (3) since the purpose of this study was to analyse the relationship of institutional size and costs, no specific effort was made to design more or less cost-effective institutions. Only the natural effects of the alteration of capacity are analysed; and
- (4) the results relate to institutions operating at full capacity. Significant vacancy rates will increase annual per inmate costs.

Furthermore, the resulting data may be unfamiliar both in absolute magnitude and in relative terms. This is because we have included in the total annual per inmate costs those costs associated with the annualized cost of capital; and we have excluded CCS overheads outside the institution (e.g. Regional and National Headquarters and associated costs).

In order to ensure that the results we obtained were not unrealistic, we have compared the annual O&M expenditures of

our models with those of a selection of institutions now operating in a roughly equivalent manner to these models. In Figures 7 and 8 we have plotted annual O&M costs derived from the CCS 1978/79 Main Estimates against capacity for selected maximum and medium security institutions. When necessary the operations of these institutions were adjusted to provide equivalent services (e.g. Archambault was adjusted to include institutional food preparation and architectural and engineering services). When the model O&M expenditures of Table 6 are super-imposed on these graphs, the resulting curves show reasonable correspondence between our models and the currently operating institutions.

We have also tested the sensitivity of results to the variation of key variables in case we had over or underestimated specifications or unit costs. For each of the following variables we both reduced and increased the estimated requirements 10 per cent each side of the model and calculated the per cent change in the total cost, (Table 8), in respect of each variation. The variables thus tested were:

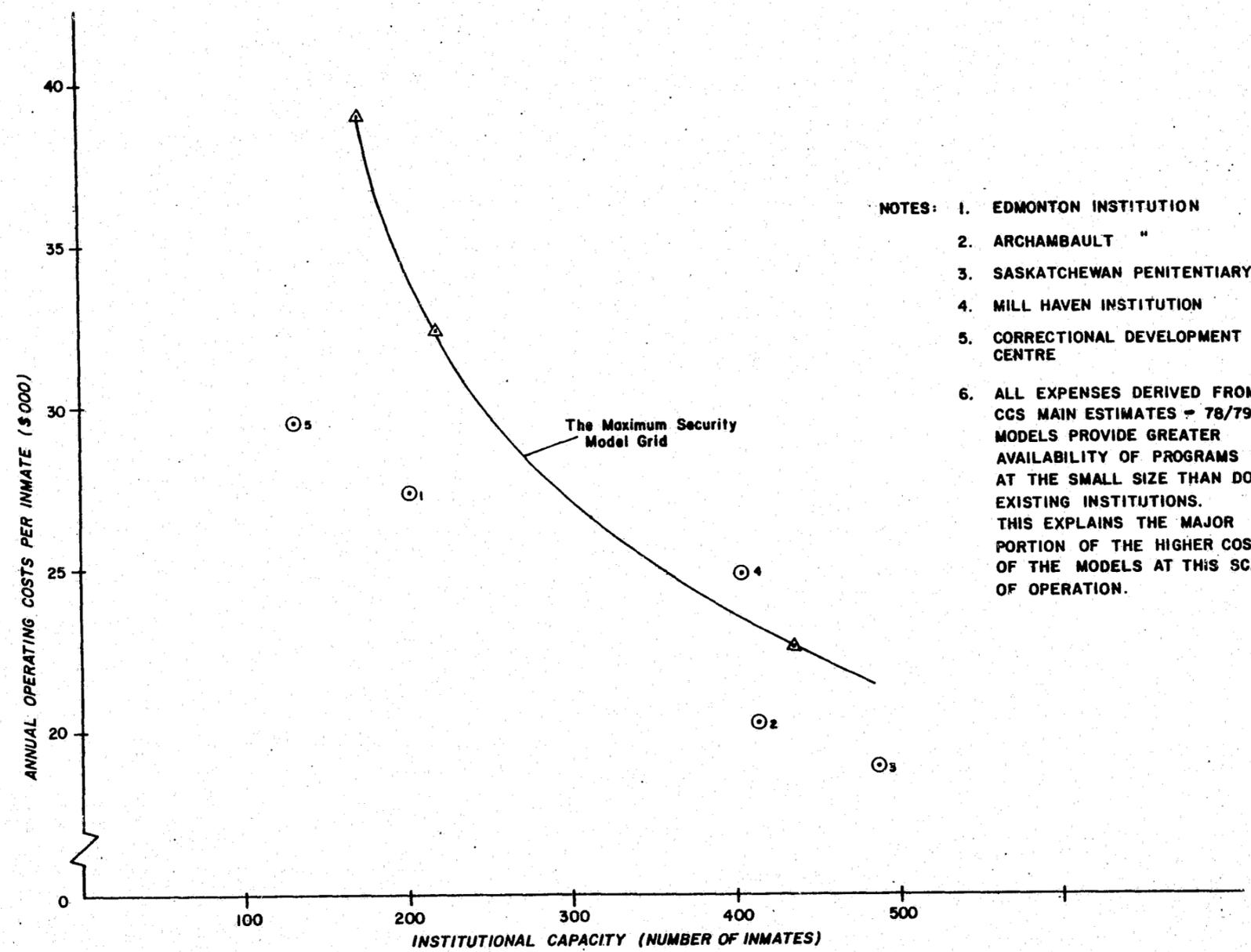
- (1) estimated gross area requirements;
- (2) estimated facility and equipment costs;
- (3) estimated staff levels;
- (4) estimated staff salaries; and
- (5) estimated expenditure on "other O&M".

Table 9 gives the results of these tests. Example calculations are in Appendix 3.

INSTITUTION COST COMPONENT	VARIATION IN TOTAL ANNUAL COST/INMATE % ±					
	MAXIMUM			MEDIUM		
	SMALL	MEDIUM	LARGE	SMALL	MEDIUM	LARGE
Gross Area ± 10% sq. ft.	2	N/A	2	2	N/A	2
Construction Costs ± 10% \$	2	2	2	2	2	2
Staff ± 10% Staff-Years	7	N/A	7	8	N/A	7
Salaries ± 10% \$	7	6	6	7	7	7
Other O&M ± 10% \$	1	2	2	1	1	2

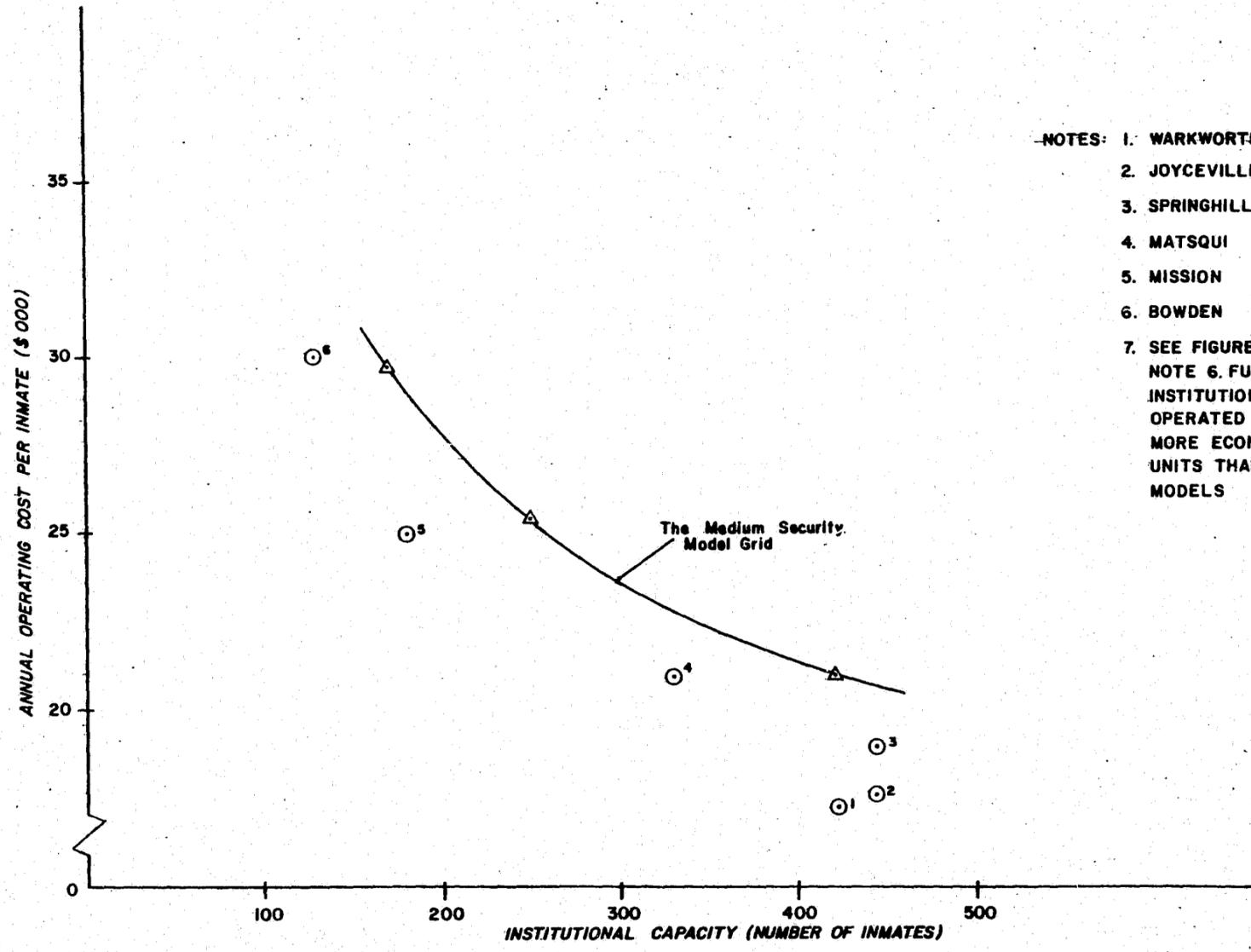
Table 9

Summary Of Sensitivity Of Total Annual Cost Per Inmate To  
Variations In Institutional Cost Components  
(Expressed In \$ Per Cent)



- NOTES:
1. EDMONTON INSTITUTION
  2. ARCHAMBAULT "
  3. SASKATCHEWAN PENITENTIARY
  4. MILL HAVEN INSTITUTION
  5. CORRECTIONAL DEVELOPMENT CENTRE
  6. ALL EXPENSES DERIVED FROM CCS MAIN ESTIMATES - 78/79. MODELS PROVIDE GREATER AVAILABILITY OF PROGRAMS AT THE SMALL SIZE THAN DO EXISTING INSTITUTIONS. THIS EXPLAINS THE MAJOR PORTION OF THE HIGHER COST OF THE MODELS AT THIS SCALE OF OPERATION.

**Figure 7**  
**COMPARISON OF ANNUAL OPERATING COSTS-**  
**MODEL GRID WITH CURRENTLY OPERATING INSTITUTIONS-MAXIMUM SECURITY**



- NOTES: 1. WARKWORTH INSTITUTION  
 2. JOYCEVILLE "  
 3. SPRINGHILL "  
 4. MATSQUI "  
 5. MISSION "  
 6. BOWDEN "  
 7. SEE FIGURE 7  
 NOTE 6. FURTHER,  
 INSTITUTIONS 1, 2, 3 ARE  
 OPERATED WITH LARGER  
 MORE ECONOMICAL LIVING  
 UNITS THAN ARE THE  
 MODELS

Figure 8  
**COMPARISON OF ANNUAL OPERATING COSTS  
 MODEL GRID WITH CURRENTLY OPERATING INSTITUTIONS - MEDIUM SECURITY**

In view of the results of the above validity testing, we are confident of the accuracy of the data, its presentation, and the procedures used in its derivation. However, estimating methods are always subject to error. We have attempted to minimize the effects of such error by the application of consistent procedures so that any over or understatement of costs is common to all models; conservative approaches to estimation were used in all nebulous situations; and expert counsel was sought and received from the staff of the CCS at all stages of the study. Therefore, notwithstanding the possible variation of the absolute levels of cost, we believe that their relationship within the model grid is fairly represented.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

In the context of cost-effectiveness the conclusions are self evident: future new institutions and modifications to existing institutions should be designed for a capacity of between 400 and 500 inmates; and efforts should be maintained to ensure inmates are incarcerated at the medium rather than the maximum security level whenever possible.

However, the inmate population in a given region may not justify this scale of operations for some considerable period of time; and the long term total costs of operating a large institution at less than capacity may outweigh the eventual economies of scale. Moreover, we have confined this study to the relationship of institutional costs to the single variable - capacity. We have assumed and held constant such variables as staff availability and competency, inmate and staff attitudes and behaviour, and organizational effectiveness; all of these could have a quantifiable and significant effect on system costs.

Further, the results of this report should not be considered in isolation. Reference should also be made to research which evaluates the effects of institutional size on the achievement of correctional objectives and system outputs.

From the viewpoint of minimizing costs, we recommend that:

- A. future CCS institutions for maximum and medium security inmates accommodate four hundred to five hundred inmates;
- B. where the forecast population does not require the above capacity, an institution should be designed for eventual expansion to the four to five hundred capacity range, but built initially at a smaller scale; and
- C. policies and procedures should be pursued to allow the incarceration of an inmate in a medium rather than a maximum security institution whenever possible.

APPENDIX A

Development of the Institutional  
Study Grid

DEVELOPMENT OF THE INSTITUTIONAL  
STUDY GRID

Part 1 - Description of the Model Institutions

A. The Standard Maximum Security Institution

Housing Groups: 4 Living Units with capacity for 48 inmates each.

Induction Unit: Capacity: 12 inmates.

Segregation Unit: Capacity: 12 inmates

Inmate capacity in housing units, induction unit, and segregation unit: 216

Relationship to existing and planned institutions:

This standard design was closely modelled on the Dungarvon, Maximum Security Institution planned for Renous, N.B. However, facilities and staff for internally provided food services were added, as was internal staff for vocational training. The national average mix of industries was applied to the standard model.

As modified, the standard Maximum security design is quite similar to the maximum security institutions recently built in Edmonton and Aggasiz.

B. The Small Maximum Security Institution

Housing Groups: 3 Living Units with capacity for 48 inmates each.

Induction Unit: Capacity: 10 inmates

Segregation Unit: Capacity: 8 inmates

Inmate capacity in housing units, induction unit, and segregation: 162

Relationship to existing and planned institutions:

There is only one small maximum security institution operating in Canada today. It is the Correctional Development Center in Quebec. This institution houses super-maximum inmates, and has relatively few programs. Thus, it is not very similar to our model.

C. The Large Maximum Security Institution

Housing Groups: 8 Living Units with capacity for 48 inmates each.

Induction Unit: Capacity: 20 inmates

Segregation Unit: Capacity: 24 inmates

Inmate capacity in housing units, induction unit, and segregation: 428

Relationship to existing and planned institutions:

There are several large maximum security institutions currently in operation, including Archambault which has a capacity of approximately 450 inmates. The design and programs of these institutions differ significantly from those of our model.

D. The Standard Medium Security Institution

Housing Groups: 6 Living Units with capacity for 42 inmates each.

Induction Unit: None

Dissociation Unit: None

Total Inmate Capacity: 252

Relationship to existing and planned institutions:

The standard Medium Security institution was modelled on the planned 252 inmate Medium at Kamloops. The major alterations include standardizing the industrial programs and the medical programs.

E. The Small Medium Security Institution

Housing Groups: 4 Living Units with capacity for 42 inmates each.

Induction Unit: None

Dissociation Unit: None

Total Inmate Capacity: 168

Relationship to existing and planned institutions:

The Small Medium Security Institution will operate in a similar fashion to the Mission Institution, which has 5 "Housing Units" with 2 wings of 18 cells; and thus has an inmate capacity of 180. However, Mission lacks a vocational program, which has been included in the small Medium Security model.

F. The Large Medium Security Institution

Housing Groups: 10 Living Units with capacity for 42 inmates each.

Induction Unit: None

Dissociation Unit: None

Total Inmate Capacity: 420

Relationship to existing and planned institutions:

The Large Medium Security Institution is similar in capacity to the Warkworth, Springhill, Drumheller, and Cowansville Medium Security Institutions. The accommodation facilities are smaller-scaled (the existing institutions have only 4 Housing Groups).

The model and the existing institutions have similar availability of programs, except that there is no induction or dissociation unit in the model institution (Springhill, for example, has a 22 cell induction unit).

Part 2 - Details of Extrapolation

A. Maximum Security - Functional Cost Centres

- .01 Perimeter
- .02 Visiting
- .03 Admission
- .04 Health
- .05 Administration
- .06 Staff
- .07 Counselling
- .08 Orientation
- .09 Segregation
- .10 Recreation
- .11 Social
- .12 Housing
- .13 Food Services
- .14 Academic
- .15 Industries
- .16 Supplies
- .17 Maintenance
- .18 Stores
- .19 Garage
- .20 Security

Note: The 20 Functional Cost Centres were identified in the Architectural Program for the Dungarvon Institution, prepared for the CCS by A Programmed Environment Ltd., Moncton, New Brunswick.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.01 PERIMETER</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	-	2,300	Staff: included in .20 Security
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	-	2,300	Staff: included in .20 Security Area: unchanged - standard area in towers and gate.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	-	2,300	Staff: included in .20 Security Area: unchanged - standard area in towers and gate.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.02 VISITING</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	3	3,700	
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	3	3,240	Staff: unchanged Area: reduction in population/visitor related area.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	5	5,240	Staff: increased by 2 visit and correspondence officers re population Area: increase in population/visitor related area.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY		
FUNCTION		<u>.03 ADMISSIONS</u>		
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION	
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	2	2,300		
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	2	2,150	Staff:	no reduction - function related
			Area:	reduction in population related areas.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	3	2,970	Staff:	added 1 clerk
			Area:	increase in population related areas and 1 staff space.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY		
FUNCTION		<u>.04 HEALTH</u>		
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION	
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	9	5,900		
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	9	5,700	Staff:	unchanged - function related
			Area:	reduced by 1 in-patient room
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	9	6,300	Staff:	unchanged - function related: doctors, dentists on contract
			Area:	increased by 2 in-patient rooms

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.05 ADMINISTRATION</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	17	8,600	
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	15	8,200	Staff: reduced by 1 secretary, 1 acct. clerk Area: reduced staff-related areas. Records area unchanged.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	21	9,700	Staff: increased by 1 steno, 1 record clerk, 2 acct. clerks. Area: increased staff-related areas and records area.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.06 STAFF</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	3	6,200	
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	3	5,960	Staff: unchanged - function related Area: reduced in total instit. staff-related spaces
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	3	6,750	Staff: unchanged - function related Area: increased in total instit. staff - related spaces.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.07 COUNSELLING</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	16	3,800	
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	13	3,160	Staff: reduced by 1 clerk, 2 classification officers. Area: reduced in staff-related spaces.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	25	5,800	Staff: increased by 2 clerks, 7 classification officers. Area: increased in staff-related spaces.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.08 ORIENTATION</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	-	4,100	Staff: included in .20 Security
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	-	3,750	Staff: included in .20 Security Area: reduced re occupant related spaces: i.e. inmate rooms, classrooms.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	-	5,600	Staff: included in .20 Security Area: increased re occupant related spaces i.e. inmate rooms, classrooms.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:	MAXIMUM SECURITY		
FUNCTION	<u>09 SEGREGATION</u>		
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	-	7,500	Staff: included in .20 Security Number of inmates in segregation 12, Dissociation 8.
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	-	6,400	Staff: included in .20 Security Number of inmates in segregation 8, Dissociation 6.  Area: reduced - occupant related i.e. units, dining, workshop, storage.
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	-	11,100	Staff: included in .20 Security Number of inmate in segregation 24, Dissociation 16.  Area: increased - occupant related i.e. units, dining, workshop, storage.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:	MAXIMUM SECURITY		
FUNCTION	<u>.10 RECREATION</u>		
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model)  (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	3	20,000	
SMALL  (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	3	18,400	Staff: unchanged Area: reduced exercise area, gymnasium, misc. areas re population
LARGE  (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	5	29,000	Staff: increased by 2 instructors Area: increased exercise area, gymnasium, misc. area re: population.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.11 SOCIAL</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	7	10,900	
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	7	10,250	Staff: unchanged - function related Area: reduced population related area i.e. studio, arts and crafts room.
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	7	14,300	Staff: unchanged - function related Area: increased population related areas i.e. studio, practice room, canteen, arts and crafts rooms, etc.

Notes: 1. Base model from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.12 HOUSING</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	-	51,000	Staff: included in .20 Security Area: 12,750 SF per housing group. Total 4 groups.
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	-	38,250	Staff: included in .20 Security Area: 12,750 SF per housing group. Total 3 groups.
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	-	102,000	Staff: included in .20 Security Area: 12,750 SF per housing group. Total 8 groups.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:	MAXIMUM SECURITY		
FUNCTION	<u>.13 FOOD SERVICE</u>		
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	8	10,700	
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	7	9,600	Staff: reduced by 1 food officer Area: dining and food preparation areas reduced re population.
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	8	14,300	Staff: unchanged - majority of work done by inmates. Area: dining and food preparation are increased re population

Notes: 1. Base model data from Atlantic Maximum 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:	MAXIMUM SECURITY		
FUNCTION	<u>.14 ACADEMIC</u>		
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	(2) Contract	2,500	Staff: for program enrolment of 28.
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	(2) Contract	2,500	Staff: unchanged for program enrolment of 21. Area: unchanged
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	(3) Contract	4,100	Staff: increased by 1 contract teacher for program enrolment of 56. Area: increased by 1 calssroom and additional teacher accommodation.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.15 INDUSTRY</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	11	30,000	Staff: based on worker population of 109 <sup>2</sup> .
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	9	24,300	Staff: reduced - pro rated to worker population. Area: Calculated at 78 Worker-related areas <sup>2</sup> reduced on basis of 275 gross square feet per worker <sup>3</sup> .
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	23	57,200	Staff: increased - pro rated to worker population. Area: Calculated at 258 Worker related areas <sup>2</sup> increased on basis of 275 gross square feet per feet per worker <sup>3</sup> .

- Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.
2. Derived by total available population less number necessary for maintenance and institutional work, less members in academic program.
3. Assumed 10,000 square feet fixed and balance pro-rated to workers.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.16 SUPPLIES</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	-	4,500	Staff: included in .18 Stores
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	-	4,100	Staff: included in .18 Stores Area: decreased population related areas i.e. exchange lobby, issue, laundry, storage.
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	-	5,600	Staff: included in .18 Stores Area: increased population related areas i.e. exchange lobby, issue, laundry, storage.

- Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.17 MAINTENANCE</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	16	6,700	
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	16	6,700	Staff: unchanged Area: unchanged - function related
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	19	7,900	Staff: increased by 1 plumber 1 electrician, 1 carpenter. Area: increased workshops and storage.

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.18 STORES</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	7	7,600	
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	7	6,500	Staff: unchanged Area: reduced warehouse space re population
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	9	11,100	Staff: increased by 2 storemen Area: increased warehouse space re population

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.19 GARAGE</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	3	4,000	
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	2	4,000	Staff: reduced by 1 driver Area: unchanged - related to function.
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	4	4,000	Staff: increased by 1 driver Area: unchanged - 2 bays are adequate

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

INSTITUTION TYPE:		MAXIMUM SECURITY	
FUNCTION		<u>.20 SECURITY</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Base Model) (Pop. 216 4 L.U. at 48 + 12 Orient + 12 Seg.)	174	-	Staff: as per Base Model plus 9 additional staff years for industries security. Area: N/A
SMALL (Pop. 162 3 L.U. at 48 + 10 Orient + 8 Seg.)	161	-	Staff: reduced by the following: 9 sec. off - Housing groups 1 " " - Segregation 3 " " - Industries. Area: N/A
LARGE (Pop. 428 8 L.U. at 48 + 20 Orient + 24 Seg.)	241	-	Staff: increased by the following: 2 Sen. Sec. off - Escorts etc. 33 Sec. off. - Housing groups 3 " " - Orientation 3 " " - Visiting 3 " " - Segregation 22 " " - Industries 1 " " - Recreation Area: N/A

Notes: 1. Base model data from Atlantic Maximum Number 1, Renous, N.B. architectural program December 1977.

B. Medium Security - Functional Cost Centres

- .01 Administration
- .02 Accommodation
- .03 Religious Services
- .04 Health
- .05 Recreation
- .06 Institutional Services
- .07 Security
- .08 Social Development
- .09 Education & Training
- .10 Industries

Note: The 10 Functional Cost Centres were identified in the Architectural Program for the Kamloops Institution, prepared for the CCS by Built Environment Co-ordinators Ltd., Vancouver B.C. Although only 10 major divisions are made, (as compared to 20 for the Maximum Security Institutions), all relevant functions are included in the 10.

INSTITUTION  
TYPE:

MEDIUM SECURITY

FUNCTION

.01 ADMINISTRATION

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	6 20 1 -	1,696 7,369 1,714 866	1. <u>Admissions and Discharge</u> 2. <u>Administrative Offices</u> 3. <u>Staff Training</u> 4. <u>Staff Services</u>
	6	1,696	1. Staff: unchanged - not significantly population related.
SMALL (Pop. 168 4 L.U. at 42)	15	6,180	2. Staff: reduced by 5 personnel <sup>2</sup>
	1	1,714	3. Staff: unchanged Area: unchanged (staff/function related)
	-	790	4. Staff: N/A Area: reduced (total staff related)
	7	1,850	1. Staff: increased by 1 A and D officer Area: increased by 1 office
LARGE (Pop. 420 10 L.U. at 42)	23	8,000	2. Staff: increased by 3 support pers. Area: increased area by 3 offices
	1	1,714	3. Staff: unchanged Area: unchanged (staff/function related)
	-	1,000	4. Staff: N/A Area: Increased (total staff related)

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

2. Reduced 1 sentence Admin. Officer. 1 Record Manager, 2 Admin. Support, 1 Finance Admin. Officer.

INSTITUTION TYPE: MEDIUM SECURITY  
 FUNCTION: .02 ACCOMMODATION

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	86 2 -	0,617 434 -	1. Living Units: 6 at 42 inmates 2. Psychological Services 3. Protective Custody - in Function .01 Administration
SMALL (Pop. 168 4 L.U. at 42)	58  1	40,410  300	1. Staff: same as model for each Living Unit Area: varies with population in increments of 42. 2. Staff: deleted psychometrician Area: reduced by 1 office.
LARGE (Pop. 420 10 L.U. at 42)	42  3	1,028  600	1. Staff: same as model for each Living Unit. Area: as above 2. Staff: added 1 psychologist Area: increased by 1 office.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE: MEDIUM SECURITY  
 FUNCTION: .03 RELIGIOUS SERVICES

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	1	1,438	1. Religious Services. (Chaplain's office, multi-purpose chapel, reception/waiting area).
SMALL (Pop. 168 4 L.U. at 42)	1	1,200	1. Staff: no reduction Area: chapel reduced pro-rated to population.
LARGE (Pop. 420 10 L.U. at 42)	2	2,200	1. Staff: increased by 1 chaplain Area: increased by 1 office chapel increased prorated to population.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE:		MEDIUM SECURITY	
FUNCTION		<u>.04 HEALTH</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	8	5,080	1. Medical Health: level one out-patient and in-patient services
SMALL (Pop. 168 4 L.U. at 42)	8	4,500	1. Staff: unchanged Area: Population sensitive areas reduced accordingly; reduced by 1 in-patient room.
LARGE (Pop. 420 10 L.U. at 42)	8	5,300	1. Staff: unchanged Area: increased by 1 in-patient room, increased waiting area.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE:		MEDIUM SECURITY	
FUNCTION		<u>.05 RECREATION</u>	
SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	4	18,343	1. <u>Indoor recreation:</u> includes gymnasium, change and shower areas, storage, film rooms. 2. <u>Outdoor recreation:</u> N/A
SMALL (Pop. 168 4 L.U. at 42)	3	17,500	1. Staff: reduced by 1 instructor re population Area: miscellaneous areas reduced re population.
LARGE (Pop. 420 10 L.U. a 42)	5	30,500	1. Staff: increased by 1 instructor re population. Area: added 1 gymnasium, 1 hand-ball court, increased seating area, miscellaneous population sensitive rooms

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE: MEDIUM SECURITY  
 FUNCTION: .06 INSTITUTIONAL SERVICES

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	2 8 3 4 12	- 9,788 4,802 6,649 7,147	1. <u>Technical Services</u> 2. <u>Food Services</u> 3. <u>Institutional Services</u> 4. <u>Material Management</u> 5. <u>Engineering and Architecture</u>
SMALL (Pop. 168 4 L.U. at 42)	2 7	- 3,840	1. Staff: remain unchanged (Area in .01 Administration) 2. Staff: Reduced by 1 Area: Population/food service demand areas reduced i.e. reduced seating capacity based on 55% occupancy in 2 sittings, kitchen total, working spaces and other areas.
LARGE (Pop. 420 10 L.U. at 42)	2 8	- 11,500	1. Staff: remain unchanged (Area in .01 Administration). 2. Staff: remain unchanged. Area: Population related areas increased i.e. seating capacity based on 55% occupancy in 2 sittings, kitchen total, working spaces and other areas.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE: MEDIUM SECURITY  
 FUNCTION: .06 INSTITUTIONAL SERVICES (CONT.)

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	3 4	4,802 6,649	3. <u>Institutional Services</u> 4. <u>Material Management</u>
SMALL (Pop. 168 4 L.U. at 42)	2 3	3,840 5,360	3. Staff: reduced by 1 storeman Area: storage and work areas reduced re population/workload. 4. Staff: reduced by 1 clerk Area: storage areas reduced re population.
LARGE (Pop. 420 10 L.U. at 42)	4 5	6,720 9,200	3. Staff: increased by 1 storeman Area: storage and work areas increased re population/workload. 4. Staff: increased by 1 clerk Area: storage areas increased re population.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE: MEDIUM SECURITY  
 FUNCTION: .06 INSTITUTIONAL SERVICES (CONT.)

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	12	7,147	5. <u>Engineering and Architecture</u>
SMALL (Pop. 168 4 L.U. at 42)	11	7,000	5. Staff: deleted 1 mason Area: reduced by mason's office.
LARGE (Pop. 420 10 L.U. at 42)	15	7,600	5. Staff: increased by 1 plumber, electrician, painter. Assumed same mechanical system type as base model with no stationary engineers. Area: increased by trades offices.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE: MEDIUM SECURITY  
 FUNCTION: .07 SECURITY

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	62	2,439 431 914 2,417	1. <u>Dissociation</u> 2. <u>External Security</u> 3. <u>Internal Control</u> 4. <u>I.D. Control</u>
SMALL (Pop. 168 4 L.U. at 42)	55	1,620 431 850 2,417	Staff: determined in consultation with Mr. R. Clark, EA to the Deputy Commissioner Security. 1. Area: reduced by 2 inmate holding, exercise space, misc. areas. 2. Area: unchanged 3. Area: reduced re staff reduction 4. Area: unchanged
LARGE (Pop. 420 10 L.U. at 42)	70	4,000 431 1,000 2,417	Staff: determined in consultation with Mr. R. Clark, EA to the Deputy Commissioner Security. 1. Area: increased by 4 inmate holding, exercise space, misc. areas. 2. Area: unchanged 3. Area: increased re staff increase 4. Area: unchanged

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.  
 2. Took base model and allowed an increase of 8 staff to account for high inmate population with same standard of security.

INSTITUTION TYPE:

MEDIUM SECURITY

FUNCTION

.08 SOCIAL DEVELOPMENT

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	3	389	1. <u>Admin. Social Development</u>
	1	2,490	2. <u>Arts and Crafts</u>
	2	1,055	3. <u>Inmate Services</u>
	4	4,844	4. <u>Family and Social Relations</u>
SMALL (Pop. 168 4 L.U. at 42)	2	260	1. Staff: reduced by 1 S.D. officer Area: reduced by 1 office
	1	2,490	2. Staff: unchanged Area: unchanged
	2	1,055	3. Staff: unchanged Area: unchanged (not significantly population related)
	3	4,200	4. Staff: reduced by 1 officer Area: reduced re population and 1 office
LARGE (Pop. 420 10 L.U. at 42)	3	389	1. Staff: unchanged - function related Area: unchanged
	1	2,490	2. Staff: unchanged Area: unchanged (not significantly population related)
	3	1,200	3. Staff: increased by 1 clerk Area: increased by 1 office
	5	6,100	4. Staff: increased by 1 officer Area: increase population/visitor related.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

INSTITUTION TYPE:

MEDIUM SECURITY

FUNCTION

.09 EDUCATION AND TRAINING

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	2	-	1. <u>Admin. Occupation Ser.</u>
	5	3,742	2. <u>Academic Education</u>
	8	18,495	3. <u>Vocational Training</u>
	1	2,258	4. <u>Learning Resource Centre</u>
SMALL (Pop. 168 4 L.U. at 42)	2	-	1. Staff: unchanged Area: in .01 Administration
	4	3,122	2. Staff: reduced 1 teacher Area: reduced 1 classroom <sup>2</sup>
	8	16,095	3. Staff: unchanged-discipline related Area: reduced in work-bench areas
	1	2,100	4. Staff: unchanged Area: reduced re population
LARGE (Pop. 420 10 L.U. at 42)	2	-	1. Staff: unchanged Area: in .01 Administration
	6	5,000	2. Staff: increased by 1 instructor Area: increased by 2 classrooms <sup>2</sup>
	11	24,200	3. Staff: increased by 3 instructors Area: increased by 3 offices increased work-bench area, misc. areas <sup>2</sup>
	1	2,400	4. Staff: unchanged Area: increased re population.

Notes: 1. Base model data from Kamloops B.C. Medium Security Institution architectural program February 24, 1978.

2. Assumed the same schedule of use as in the base model.

INSTITUTION  
TYPE:

MEDIUM SECURITY

FUNCTION

.10 INDUSTRIES

SIZE CATEGORY	STAFF	AREA	EXPLANATION OF CALCULATION
MEDIUM (Pop. 252 6 L.U. at 42)	12	30,000	1. <u>Industry Shops</u>
SMALL (Pop. 168 4 L.U. at 42)	8	25,000	1. Staffing: see note 1 Area: seen note 2
LARGE (Pop. 420 10 L.U. at 42)	20	50,000	1. Staffing: see note 1 Area: see note 2

- Notes:
1. Staffing based on national average ratio of institutional industries staff to inmates employed. Source: G.M. Richards, A/Manager, Production.
  2. Space requirements based on the standard space allocated to planned institutions. Source: G.M. Richards.

APPENDIX B

Summary of Cost Calculations

SUMMARY OF COST CALCULATIONS

A. Maximum Security Institutions

- 1. Areas
- 2. Cost of Facilities and Equipment
- 3. Staff
- 4. Other O&M
- 5. Cost Summary

A. MAXIMUM SECURITY

1. AREAS (GROSS SQUARE FEET)	<u>INSTITUTIONAL SIZE</u>		
	<u>SMALL</u>	<u>MEDIUM</u>	<u>LARGE</u>
1. Perimeter	2,300	2,300	2,300
2. Visiting	3,240	3,700	5,250
3. Admission	2,150	2,300	2,970
4. Health	5,700	5,900	6,300
5. Administration	8,200	8,600	9,700
6. Staff	5,960	6,200	6,750
7. Counselling	3,160	3,800	5,800
8. Orientation	3,750	4,100	5,600
9. Segregation	6,400	7,500	11,100
10. Recreation	18,400	20,000	29,000
11. Social	10,250	10,900	14,300
12. Housing	38,250	51,000	102,000
13. Food Services	9,600	10,700	14,300
14. Academic	2,500	2,500	4,100
15. Industries & Vocational Training	24,300	30,000	57,200
16. Supplies	4,100	4,500	5,600
17. Maintenance	6,700	6,700	7,900
18. Stores	6,500	7,600	11,100
19. Garage	4,000	4,000	4,000
TOTAL	165,460	192,300	305,270

MAXIMUM SECURITY

2. COST OF FACILITIES & EQUIPMENT	INSTITUTIONAL SIZE		
	SMALL	MEDIUM	LARGE
TOTAL AREAS (GROSS SQUARE FEET)	165,460	192,300	305,270
This consists of:			
@\$83.97	141,160	162,300	248,070
@\$50.00	24,300	30,000	57,200
Thus bldg constr. costs			
@\$83.97	\$ 11,853,205	\$13,628,331	\$20,380,437
@\$50.00	1,215,000	1,500,000	2,860,000
Total bldg constr.	12,068,205	15,128,331	23,690,437
Contingency & siteworks (total 13%)	1,568,867	1,966,683	3,079,757
Total construction	13,637,072	17,095,014	26,770,184
Fees (total 16.25%)	2,216,024	2,777,940	4,350,155
Total construction and fees	\$ 15,853,096	\$19,872,954	\$31,120,339
Interest during constr. (2 yrs constr. + 1/2 yr commissioning) @ 8.875% - based on straight line cash flow during constr. only.	\$ 2,108,462	\$ 2,643,103	\$4,139,005
Total capital cost excl. land and eqpt. (A)	\$ 17,961,558	\$22,516,057	\$35,259,344
Equipment @ 10% of bldg. constr. cost (B)	1,206,821	1,512,833	2,369,044
Total capital cost excl. land (which is disregarded)	19,168,379	24,028,890	37,628,388
Initial Capital cost per inmate	\$ 118,323	\$111,248	\$87,917
Amortisation of			
(A) - 30 yrs @ 4%	\$ 1,038,716	\$1,302,103	\$2,039,047
(B) - 7 yrs @ 4%	201,068	252,053	394,706
Total annual amortisation	\$ 1,239,784	\$1,554,156	\$2,433,753
Annual cost per inmate	7,653	\$7,195	\$5,686

MAXIMUM SECURITY

3. STAFF (Staff Years)	INSTITUTIONAL SIZE		
	SMALL	MEDIUM	LARGE
1. Perimeter	-	-	-
2. Visiting	3	3	5
3. Admission	2	2	3
4. Health	9	9	9
5. Administration	15	17	21
6. Staff	3	3	3
7. Counselling	13	16	25
8. Orientation	-	-	-
9. Segregation	-	-	-
10. Recreation	3	3	5
11. Social	7	7	7
12. Housing	-	-	-
13. Food Services	7	8	8
14. Academic (contract)	-	-	-
15. Industry & Vocational Training	9	11	23
16. Supplies	-	-	-
17. Maintenance	16	16	19
18. Stores	7	7	9
19. Garage	2	3	4
20. Security	161	174	241
TOTAL	257	279	382
Salaries @\$17,600.00 + 15% (benefits & SARA)	\$5,201,680	\$5,646,960	\$7,731,680
i.e. per inmate	\$32,109	\$26,143	\$18,065

MAXIMUM SECURITY

4. OTHER O&M (\$)

INSTITUTIONAL SIZE

	SMALL	MEDIUM	LARGE
1. Management (constant average)	\$6,000	\$6,000	\$6,000
2. Organization & Administration <sup>1</sup>	40,000	55,000	75,000
3. Finance <sup>1</sup>	1,000	1,500	2,000
4. Mgmt. Technical Services <sup>1</sup>	500	750	1,000
5. Food Services <sup>2</sup>	207,070	259,260	468,507
6. Institutional Services (aver. 550.00/inmate)	83,100	118,800	235,400
7. Material Management <sup>1</sup>	3,000	4,000	5,000
8. Eng. & Arch. Services (\$1.60/gross sq. ft.)	264,740	307,680	488,430
9. Mgmt. of Industries <sup>1</sup>	500	1,000	1,500
10. Industrial Shops (305.00/worker)	23,790	33,240	78,790
11. Personnel & Human Resources <sup>3</sup>	46,260	50,220	68,760
12. Mgmt. of Occupational Development <sup>4</sup>	1,500	1,500	1,500
13. Academic Training <sup>5</sup>	46,100	46,800	7,600
14. Incentives (400.00/inmate)	64,800	86,400	171,200

MAXIMUM SECURITY

4. OTHER O&M (\$)

INSTITUTIONAL SIZE

	SMALL	MEDIUM	LARGE
15. Technical Training (incl. in 10)	--	--	--
16. Mgmt. of Socialization	2,000	2,000	2,000
17. Social Development <sup>1</sup>	30,000	40,000	50,000
18. Religious (chaplains on contract + other expenses)	31,000	34,000	44,000
19. Classification <sup>1</sup>	2,000	4,000	6,000
20. Psychological <sup>1</sup>	3,000	4,000	5,000
21. Health Care (600.00/inmate)	97,200	129,600	256,000
22. Security (360.00/sec. personnel)	57,960	62,640	87,760
TOTAL	\$1,017,520	\$1,248,390	\$2,124,347
i.e. per inmate	\$6,281	\$5,780	\$4,963

NOTES:

- 1) based on averages
- 2)  $(\text{no. inmates} + \text{no. staff} \times 0.45 \times \frac{250}{365}) \times 2.10 \times 1.12 \times 365$
- 3) 180.00/member of staff/yr.
- 4) constant average
- 5) teachers on contract @ 22,000.00 + other expenses @ 100.00/pupil

MAXIMUM SECURITY

5. COST SUMMARY: ANNUAL COSTS (&

	<u>INSTITUTIONAL SIZE</u>		
	<u>SMALL</u>	<u>MEDIUM</u>	<u>LARGE</u>
INSTITUTION INMATE CAPACITY	162	216	428
Amortisation of capital costs	\$1,239,784	\$1,554,156	\$ 2,433,753
Salaries	5,201,680	5,646,960	7,731,680
Other O & M	1,017,520	1,248,390	2,124,347
Grants in lieu of taxes (2% of 60% of construction costs)	163,640	205,140	321,240
Total	\$7,622,624	\$8,654,646	\$12,611,020
Less: profit from industry (830.00/worker)	64,740	90,470	214,140
Net total	\$7,557,884	\$8,564,176	\$12,396,880
i.e. per inmate	\$46,654	\$39,649	\$28,965

Note: Does not include provision for self-insurance.

B. Medium Security Institutions

1. Area and Cost of Facilities
2. Staff
3. Other O&M
4. Cost Summary

B. MEDIUM SECURITY

1. AREA AND COST OF FACILITIES

Areas (Gross Square Feet)	INSTITUTIONAL SIZE		
	SMALL	MEDIUM	LARGE
1. Administration	10,380	11,665	12,564
2. Accommodation	40,710	61,051	101,628
3. Religion	1,200	1,438	2,200
4. Health	4,500	5,080	5,300
5. Recreation	17,500	18,343	30,500
6. Institutional Services	25,070	28,386	35,020
7. Security	5,318	6,201	7,848
8. Social Development	8,005	8,778	10,179
9. Education & Training	21,317	24,495	31,600
10. Industries	25,000	30,000	50,000
TOTAL	159,000	195,437	286,839

B. MEDIUM SECURITY

1. AREA AND COST OF FACILITIES

COST (\$)	INSTITUTIONAL SIZE		
	SMALL \$75.62	MEDIUM \$76.16	LARGE \$76.05
Average cost per gross square foot			
Bldg. construction costs based on unit costs in Kamloops programme	\$12,023,100	\$14,884,100	\$21,815,540
Contingency & Sitework (total 13%)	1,563,003	1,934,933	2,846,020
Total Construction	13,586,103	16,819,033	24,661,560
Fees (total 16.25%)	2,207,742	2,733,093	4,007,504
Total Construction & Fees	\$15,793,845	\$19,552,126	\$28,669,064
Interest during constr. (2 yrs. constr. 1/2 yr. commissioning) @ 8,875% - based on straight line cash flow during constr. only.	2,100,581	2,600,433	3,812,986
Total capital cost excl. land and eqpt. (A)	17,894,426	22,152,559	32,482,050
Equipment @ 10% of bldg. constr. cost (B)	1,202,310	1,488,410	2,181,554
Total capital cost excl. land (which is disregarded)	19,096,736	23,640,969	34,663,604
i.e. per inmate	113,671	93,813	82,532
Amortisation of			
(A) - 30 yrs @ 4%	1,034,835	1,281,082	1,878,437
(B) - 7 yrs @ 4%	200,317	247,984	363,469
Total annual amortisation	\$1,235,152	\$1,529,066	\$2,241,906
i.e. per inmate	\$7,352	\$6,068	\$5,338

MEDIUM SECURITY

2. STAFF (Staff Years)

	<u>INSTITUTIONAL SIZE</u>		
	<u>SMALL</u>	<u>MEDIUM</u>	<u>LARGE</u>
1. Administration	22	27	31
2. Accommodation	59	88	145
3. Religion	1	1	2
4. Health	8	8	8
5. Recreation	3	4	5
6. Institutional Services	25	29	34
7. Security	55	62	70
8. Social Development	8	10	12
9. Education & Training	15	16	20
10. Industries	8	12	20
<b>TOTAL</b>	<b>204</b>	<b>257</b>	<b>347</b>
Salaries @\$17,600.00 + 15% (benefits & SARA)	\$4,128,960	\$5,201,680	\$7,023,280
i.e per inmate	\$24,577	\$20,642	\$16,722

MEDIUM SECURITY

3. OTHER O & M (\$)

	<u>INSTITUTIONAL SIZE</u>		
	<u>SMALL</u>	<u>MEDIUM</u>	<u>LARGE</u>
1. Management (constant average)	\$6,000	\$6,000	\$6,000
2. Organisation & Admin. <sup>1</sup>	40,000	55,000	69,000
3. Financel	1,000	1,500	2,000
4. Mgmt. Technical Services <sup>1</sup>	500	750	1,000
5. Food Services <sup>2</sup>	198,000	284,000	452,000
6. Institutional Services (400.00/inmate)	67,000	101,000	168,000
7. Material Management <sup>1</sup>	3,000	4,000	5,000
8. Eng. & Arch. Services (1.60/gross s.f.)	254,400	312,700	458,900
9. Mgmt. of Industries <sup>1</sup>	500	1,000	1,000
10. Industrial Shops (305.00/worker)	12,200	18,300	30,500
11. Personnel & Human <sup>3</sup> Resources	36,700	46,300	62,500
12. Mgmt. of Occupational <sup>4</sup> Development	1,500	1,500	1,500
13. Academic Training <sup>5</sup>	48,000	50,000	54,000
14. Incentives (400.00/inmate)	67,000	101,000	168,000
15. Technical Training <sup>6</sup>	15,000	69,000	77,000
16. Mgmt. of Socialisation <sup>4</sup>	2,000	2,000	2,000
17. Social Development <sup>1</sup>	30,000	40,000	50,000
18. Religious (chaplains partly on contract)	9,000	12,000	4,000
19. Classification <sup>1</sup>	2,000	4,000	6,000
20. Psychological <sup>1</sup>	2,000	3,000	4,000
21. Health Care (400.00/inmate)	67,000	101,000	168,000
22. Security (300.00/sec personnel)	16,500	18,600	21,000
	<b>\$879,300</b>	<b>\$1,232,650</b>	<b>\$1,811,400</b>
i.e. per inmate	\$5,234	\$4,891	\$4,313

1) based on averages

2) (NO inmates + NO staff x 0.45 x  $\frac{250}{365}$ ) x 2.10 x 1.12 x 365

3) 180.00/member of staff/yr.

4) constant average

5) 2 teachers on contract @ 22,000 + other expenses @ 100.00/pupil.

6) 2 teachers on contract @ 22,000 in E. & F + supplies.

MEDIUM SECURITY

4. COST SUMMARY: ANNUAL COSTS

INSTITUTIONAL SIZE

	<u>SMALL</u>	<u>MEDIUM</u>	<u>LARGE</u>
INSTITUTION INMATE CAPACITY	168	252	420
Amortisation of capital costs	\$1,235,152	\$1,529,066	\$2,241,906
Salaries	4,128,960	5,201,680	7,023,280
Other O & M	879,300	1,232,650	1,812,900
Grants in lieu of taxes (2% of 60% of construction)	163,000	202,000	296,000
TOTAL	\$6,406,412	\$8,165,396	\$11,374,086
Less: profit from industry (830.00/worker)	33,200	49,800	83,000
Net total	\$6,373,212	\$8,115,596	\$11,291,086
i.e. per inmate	\$37,936	\$32,205	\$26,884

Note: Does not include provision for self-insurance.

APPENDIX C

Sensitivity Testing - Sample Calculations

SENSITIVITY TESTING

SAMPLE CALCULATIONS

A. Sensitivity to Variations in Gross Area of Facilities

The benchmark models are assumed to be correct in terms of gross area. The extrapolation to large and small models could have resulted in interpretation errors. For the purposes of this test assume a  $\pm 10$  per cent error.

1. The Small Medium Security Institution

Gross Area as calculated = 159,000 square feet constructed at \$75.81 per square foot. Stipulated variance @  $\pm 10\%$  = 15,900 square feet.

Cost of construction 15,900 ft <sup>2</sup> x \$75.81 per ft <sup>2</sup>	\$1,205,379	
13% contingency and site work	156,699	
	<u>1,362,078</u>	A
Fees @ 16.25% of A	221,338	
	<u>1,584,416</u>	
Interest during construction 13.3%	210,727	
	<u>1,795,143</u>	B

Cost of Equipment @ 10% of Cost of Construction 120,538 C

Ammortized Facility Cost Amount B @ 4% over 30 years 103,813

Amortized Equipment Cost Amount C @ 4% over 7 years 20,083

Add Annual Engineering and Architectural Services @ \$1.60 per ft<sup>2</sup> x 15,900 25,440

Total Annual Incremental Expenditure \$ 149,336

Per Inmate (168 capacity) \$ 888  
Which is  $\pm 2.3\%$  of total annual cost

2. The Other Medium and Maximum Security Institutions

By calculations similar to the above the following percentage variations were obtained:

- a) Large Medium Security Institution -  $\pm 2.3\%$ ;
- b) Small Maximum Security Institution -  $\pm 2.1\%$ ;
- c) Large Maximum Security Institution -  $\pm 2.3\%$ .

B. Sensitivity to Variations in Construction Costs.

As sensitivity here is also related to gross square footage the resulting variations are equal to those derived for variations in area.

C. Sensitivity to Variations in Total Number of Staff. The benchmark models are assumed correct.

1. The Large Maximum Security Institution

Total Number of Staff of Model - 382  
Stipulated variance @  $\pm 10\%$  - 38 staff

Salary variance @ \$17,600 + 15%	+ \$769,120
Food costs @ \$265	+ 10,070
Personnel Administration @ \$180	+ 6,840

Variation in Staff Relative Space	
200 ft <sup>2</sup> per staff @ \$83.97 per ft <sup>2</sup> ammortized as above	+ 39,905
Engineering and Architectural Services @ \$1.60 per ft <sup>2</sup> of staff space	+ 12,160
Total Variance	+ \$838,095

Per inmate (428 capacity) + 1,958  
Which is - 6.8% of total annual cost

**CONTINUED**

**1 OF 2**

2. The Other Medium and Maximum Security Institutions

By similar calculations, the following percentage variations were obtained:

- (a) Small Medium Security Institution - + 6.8%
- (b) Large Medium Security Institution - + 6.8%
- (c) Small Maximum Security Institution - + 7.6%

D. Sensitivity to Variations in Salary

Average salary for each staff year was modelled at \$17,600 per year. Annual Salary related Benefits were 15% of \$17,600 = \$2,640. Total salary related costs were \$20,240 annually.

In the case of a + 10% variation in salary, the variations in annual total costs for each institution would be:

- 1. Small Medium Security Institution - + 6.5%
- 2. Medium Medium Security Institution - + 6.4%
- 3. Large Medium Security Institution - + 6.2%
- 4. Small Maximum Security Institution - + 6.9%
- 5. Medium Maximum Security Institution - + 6.6%
- 6. Large Maximum Security Institution - + 7.0%

These figures were derived as follows:

% Variation of Total Annual Cost/Inmate =

$$+ \frac{10\% \times 20,240 \times N^{\circ} \text{ of Staff}}{N^{\circ} \text{ of Inmates}} \times \frac{100\%}{\text{Total Annual Cost/Inmate}}$$

E. Sensitivity to Variations in "Other O&M" Costs

In the case of a + 10% Variation in Other O&M costs the variations in annual total costs for each institution would be:

- 1. Small Medium Security Institution - + 1.4%
- 2. Medium Medium Security Institution - + 1.5%
- 3. Large Medium Security Institution - + 1.6%
- 4. Small Maximum Security Institution - + 1.3%
- 5. Medium Maximum Security Institution - + 1.4%
- 6. Large Maximum Security Institution - + 1.7%

These figures were derived as follows:

% Variation in Total Annual Cost/Inmate =

$$+ \frac{10\% \times \$\text{Other O\&M}}{N^{\circ} \text{ of Inmates}} \times \frac{100\%}{\text{Total Annual Cost/Inmate}}$$

Appendix D  
References

REFERENCES

A. Bibliography

1. References Cited

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