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Washington, D.C.

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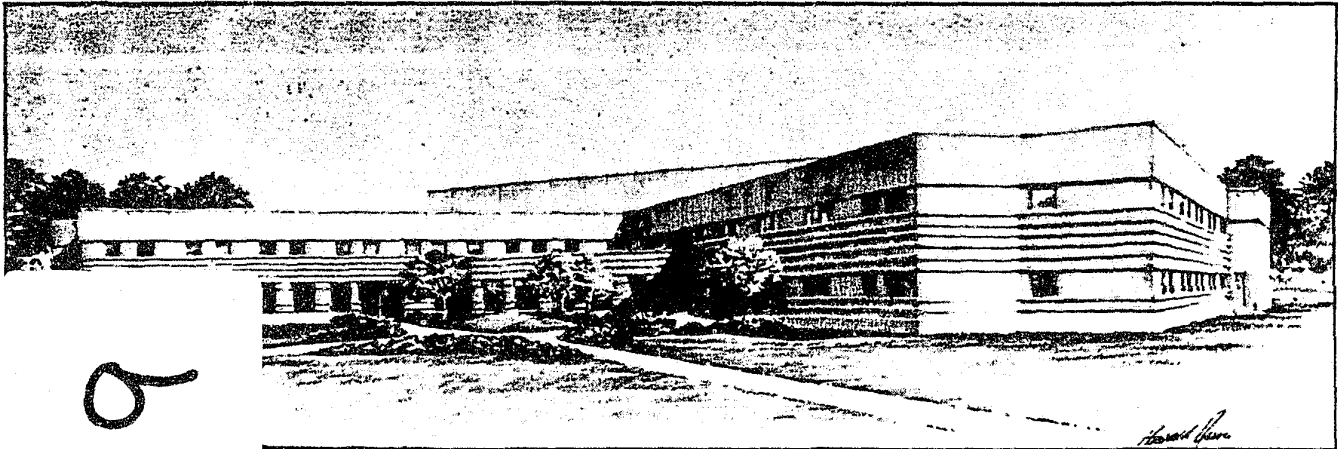


**National Institute
of Justice**

**National Institute
of Corrections**

Building on Experience

**A Case Study of Advanced Construction and
Financing Methods for Corrections**



103869

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Washington, D.C.

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Financing Methods for Corrections**

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January 1987

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and the National Institute of Justice
U.S. Department of Justice

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This project was supported by Grant FP-4, from the National Institute of Corrections, U.S. Department of Justice, and Grant 84-IJ-0019, National Institute of Justice, U.S. Department of Justice. Points of view or opinions stated in this document are those of the author and do not necessarily represent the official position or policies of the U.S. Department of Justice.

From the Director National Institute of Justice

Growing prison and jail populations outstrip capacity in many jurisdictions. Given today's fiscal pressures, policymakers face difficult choices. Building and operating prisons to cope with current crowded conditions represent a major cost burden. But the price of not expanding capacity also has expensive consequences: increased victims of crime and its attendant fear.

Resolving the dilemma ranks high on the criminal justice agenda. When the National Institute of Justice asked criminal justice officials to name the most serious problem facing the entire system, police, courts, and corrections officials were virtually unanimous in naming prison and jail crowding as the number one concern.

To help state and local jurisdictions expand jail and prison capacity, the National Institute of Justice has launched the Construction Information Exchange. The aim is to share—through publications and a computerized data base—creative methods states and localities are using to increase corrections capacity.

This publication is one of a series of informative reports on new methods of construction and finance for correctional institutions. It describes how Ohio has exploited the potential of new approaches in construction, design and financing in building a new prison facility. This case study provides the facts and figures that tell the story of a successful construction project. We believe that state and local officials can build on the Ohio experience to meet the challenges they face in expanding corrections capacity.

James K. Stewart, Director
National Institute of Justice

From the Director National Institute of Corrections

In 1984, the Advisory Board of the National Institute of Corrections adopted a formal position endorsing the podular/direct supervision "new generation" concept of jail design and inmate management. The Advisory Board further encouraged all jurisdictions planning new institutions to examine the feasibility of adopting this design/management concept for their new facilities. In the year that followed, the American Correctional Association (ACA), the American Jail Association (AJA), and the Architecture for Justice Committee of the American Institute of Architects all adopted similar position statements endorsing the concept. In the brief span of one year, the podular/direct supervision concept became state of the art for facility design and inmate management.

At the same time, jail and prison populations were still growing at record rates. In response to the need for beds, many jurisdictions were experimenting with a variety of prefabricated modular units. Several of these "systems" approaches offered promise, but all the examples were "linear" in design.

The questions the National Institute of Corrections sought to answer regarding this new systems construction technology concerned its adaptability to podular design concepts. If the technology was flexible and not limited to the traditional linear concept, jurisdictions adopting the podular/direct supervision concept could also take advantage of the time and cost savings associated with these advanced techniques.

NIC support for this project was for the purpose of answering these questions. Although the institution selected as the case study is a prison, it is clear that larger jails and jail systems might also benefit from this technology.

Raymond C. Brown, Director
National Institute of Corrections

Acknowledgments

The author is most grateful for the support of the following persons, each of whom offered valuable comments and guidance.

Aaron Brown
National Institute of Corrections
Washington, D.C.

John Gillespie
Morgan Stanley
New York, New York

Tony R. Lang, AIA
Greiner Engineering
Dallas, Texas

Bob Prosser
Ohio Department of Rehabilitation and Correction
Columbus, Ohio

Wantland J. Smith, AIA, CE
Dworsky Associates
Los Angeles, California

Special thanks also to Michael O'Toole, who was the National Institute of Corrections Grant Monitor for this project.

Special thanks to all who contributed time and effort to this study.

Charles B. DeWitt
Project Director

Note:

Photographs on pages 9 and 10 were provided by Burke Concrete Accessories, Columbus, Ohio

Cover:

Illustration courtesy of The Voinovich Companies

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Message from the Ohio Department of Rehabilitation and Correction

The Ross Correctional Institution is the first of a "new generation" of institutions and represents a significant step forward for the Ohio Department of Rehabilitation and Correction. It and 15 other construction projects will give us the necessary tools to operate a prison system that is already bulging at the seams and projected to grow by 10,000 inmates in the next ten years.

The relaxed, open atmosphere of Ross combined with its tough perimeter make it and similarly designed prisons safe and secure for staff and surrounding communities while providing inmates a humane living environment. Importantly, our institutions are being designed and built cost effectively, on schedule and on budget.

We're proud to share Ohio's story with the rest of the country. Our thanks to the U.S. Department of Justice for the opportunity to tell it.

Richard P. Seiter, Director
Ohio Department of Rehabilitation and Correction

Highlights of the Study

NIJ research is focused on methods for building and financing jails and prisons, as a complement to NIC studies on facility design and inmate management. This report examines issues of policy that may provide guidance for corrections officials now planning to expand jail or prison capacity.

Ohio's Ross Correctional Institution was selected for this case study because its design embodies the management concepts recommended by NIC, and it also demonstrates the advanced construction techniques now being investigated by NIJ. In addition, Ohio is building prisons with innovative financing methods which may be of assistance to state and local governments across the Nation.

What is the Ohio approach?

The Ross Correctional Institution is a new generation prison that incorporates a campus-style plan and direct supervision management. It is being built with a system of plant-produced precast concrete components and panels. Ohio's financing plan includes variable rate demand securities, backed by lease-purchase agreements for new prisons.

Construction

- The new design saved \$13 million in construction costs when compared to a previous, traditional design.
 - Inmate housing units cost less than \$2 million each, representing approximately \$15,000 per cell.
 - Total construction costs, including the entire institution, translate to approximately \$42,000 per inmate.
- Except for interior walls and foundations, the entire prison is being built from factory-produced components.
 - The new prison is being built with approximately 6,200 pieces of precast concrete.
 - The building frame and shell for eight inmate housing units were completed in only 4 months.
- Towers were eliminated in favor of a security perimeter with electronic detection and perimeter patrol vehicles.

Management

- A new management approach will save 21 percent in manpower, \$100 million in savings over 30 years.
- Inmate management is accomplished by officers in constant contact with prisoners, the "direct supervision" concept.
- Each housing unit functions as an independent facility with a manager and support staff, the "unit management" approach.
- Although the capacity is 1,051 inmates, the institution is being built as two semi-autonomous facilities.

Finance

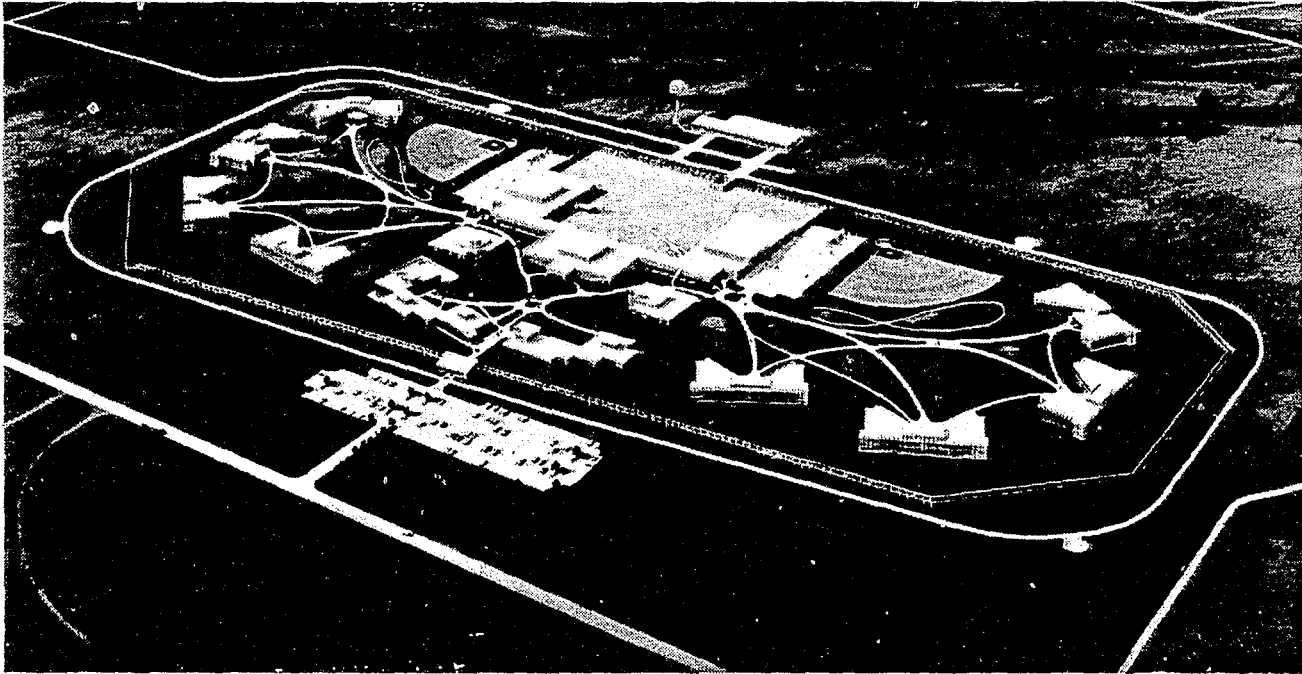
- Advanced finance methods saved Ohio more than \$3 million during the first year alone.
- Ohio prisons are being financed through lease-purchase agreements.
- Interest payments on the construction debt are paid according to a variable rate of interest.

Chapter I
Case Study:
The Ross Correctional Institution

I. Case Study: The Ross Correctional Institution

The Ross Correctional Institution, housing 1,051 inmates in single-occupancy cells, is the largest of twelve new prisons to be built in Ohio. Located on a

59-acre site near Chillicothe, Ohio, the facility consists of two semi-autonomous complexes. The new prison is scheduled to be completed in 1987.



Aerial view of new prison at Chillicothe, Ohio, housing 1051 inmates

✓ Voinovich Companies

Background: Prison Crowding In Ohio

The last prison built in Ohio was opened in 1972, and by the late 1970's the state had already run out of beds. In 1985 the capacity of the Ohio prison system was 13,282 inmates, but the inmate population had climbed to 20,485, creating a shortage of more than 7,000 beds. Despite an aggressive program to expand existing prisons, the state was unable to keep pace with the rapid rate of growth. By 1986, Ohio's prisons had reached 154 percent of their rated inmate capacity.

As shown in Figure B, growth of the Ohio prison population has been consistent with national trends. The years 1981 and 1982 marked the beginning of a significant upswing in the Ohio prison population, starting a period of unprecedented growth.¹

Ohio has avoided a greater shortfall by adding substantial bedspace during recent years. While many states resisted major expansion, Ohio converted four hospitals and a youth facility to adult prisons between 1981 and 1984. However, the Ohio Penitentiary was closed by court order in 1984.

In 1982 the Ohio General Assembly adopted H.B. 530, authorizing \$638 million for prison expansion. The legislature approved construction of a dozen new institutions, to create 9,083 additional

beds. On completion of the planned construction projects, the total capacity of the Ohio prison system will be 21,491.²

Prison Population

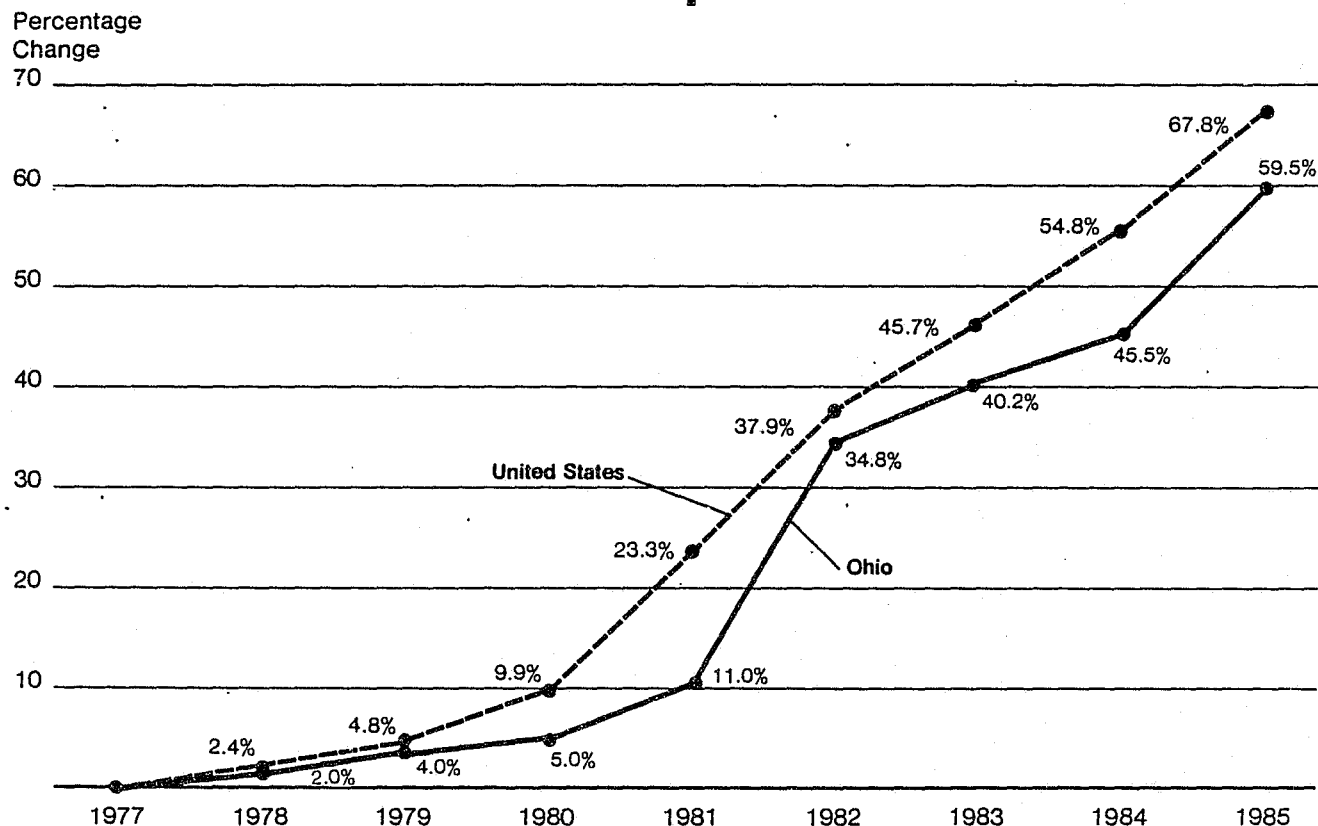


Figure C
Prison Crowding

National Prison Population			Ohio Prison Population				
Year	Number Inmates*	Increase from Prior Year	Increase from 1977	Year	Number of Inmates**	Increase from Prior Year	Increase from 1977
1985	20,485	9.6%	59.5%	1985	503,601	8.4%	67.8%
1984	18,694	3.8%	45.5%	1984	464,567	6.2%	54.8%
1983	18,007	4.0%	40.2%	1983	437,278	5.7%	45.7%
1982	17,317	15.7%	34.8%	1982	413,806	11.9%	37.9%
1981	14,968	11.0%	16.5%	1981	369,930	12.2%	23.3%
1980	13,489	1.0%	5.0%	1980	329,821	4.9%	9.9%
1979	13,360	1.9%	4.0%	1979	314,457	2.3%	4.8%
1978	13,107	2.0%	2.0%	1978	307,276	2.4%	2.4%
1977	12,846	—	—	1977	300,024	—	—

* Total population in state custody on December 31, 1977 through 1985.

** Includes Federal Bureau of Prisons.

A "New Generation" Institution

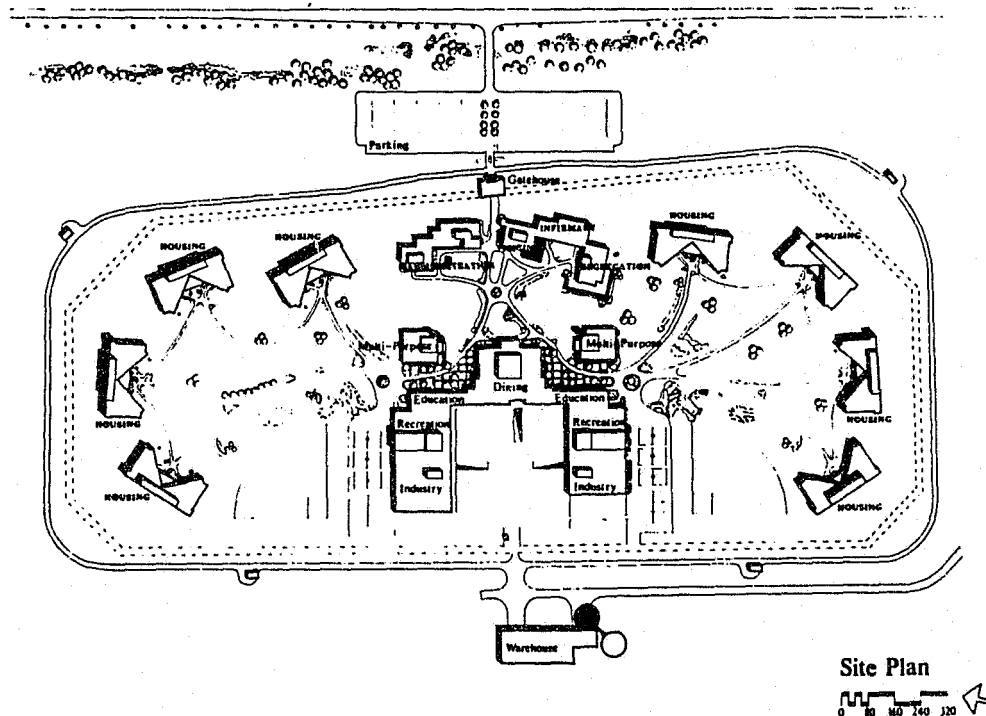
Ohio's new prison was selected for study by the National Institute of Corrections as an example of what may be termed a "new generation" correctional institution. At the heart of a "new generation" institution is a particular style of inmate supervision reflected in both the design and management of the facility. Inmate supervision in a "new generation" jail or prison is the responsibility of staff who are stationed *inside* housing units. Rather than separating staff from inmates by security barriers, as is usual, the new approach places officers in direct contact with prisoners at all times. Staff remain among the inmates to supervise behavior 24 hours a day. The National Institute of Corrections has termed this approach direct supervision, a management model which has long been the policy in Ohio.

Cells in a "new generation" institution are arranged around a central dayroom, permitting a single correctional officer to view all areas in the housing unit. This configuration is sometimes termed "podular" to emphasize its contrast to a linear arrangement of cells along a corridor. Readers may refer to Appendix A for illustrations of design and management models.

Another important feature is the scale and configuration of the institution. Although designed for more than 1,000 inmates, the prison consists of two independent campus complexes, which do not convey the appearance of a massive institution. Buildings are not overwhelming and difficult to manage. They are small units which convey a residential atmosphere, each housing only 126 inmates.

The original design for the Ross Correctional Institution called for a more traditional institution. Buildings were enormous, representing a "telephone pole" or linear arrangement of cells. More than \$2.5 million had already been expended on design services for the traditional, indirect supervision facility when, in the early 1980's, the state requested technical assistance from NIC for the design of its proposed correctional facilities, including the new prison at Chillicothe. The National Institute of Corrections offered technical assistance to develop a "new generation" design that would permit direct supervision and carry out the goals of unit management and objective classification.

During this period, Ohio's newly-elected Governor appointed Richard P. Seiter to be the Director of the Department of Rehabilitation and Correction. Mr. Seiter, who had previously served as Director of



Site plan for Ross Correctional Institution, showing two semi-autonomous compounds

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NIC's National Academy of Corrections, wished to implement new management and design concepts in Ohio correctional institutions. The new Director examined cost savings that would result from a "new generation" institution and weighed potential benefits against the \$2.5 million already spent on architectural fees for a traditional design. After detailed study of the relative costs, he recommended to the Governor that Ohio abandon its existing plans and adopt a new approach to the Ross Correctional Institution. When bids were received for the new design, the figures confirmed the director's expectations. The prison will be built for \$13 million less than was estimated for the original design. Staffing costs will be reduced by 21 percent, translating to more than \$100 million in savings over 30 years.³

Development of the Inmate Housing Unit

Housing units at the Ross Correctional Institution are 126-bed buildings, which could serve both jails and prisons. Within each building, inmates are divided into two pods of 63 single cells. Buildings have been planned according to the unit management concept, in which each housing unit is operated as an individual facility within the larger institution. Because each building functions as an independent unit, prison staff and inmates relate to their building much as they would to a 126-bed jail facility.



Prison has open courtyards and attractive support buildings

 Voinovich Companies

The housing unit resulted from an evolutionary process that began with a management philosophy rather than a design concept. In the late 1960's and early 1970's, the Federal Bureau of Prisons began to evaluate the effectiveness of moving inmate counseling services into the housing unit. Through this experiment in decentralization, new staff, including managers, counselors, and clerical personnel, were introduced into the housing unit.

The design response to this management change was to organize spaces in the housing unit for management, administrative, and counseling activities. These spaces differed from the typical cells, guard stations, showers, and dayrooms that characterize inmate housing areas, and they provided the opportunity to create an environment of a less institutional character, one sometimes called a "normalized" environment.

At the same time administrative and counseling services were decentralized, the Bureau of Prisons initiated a new classification system to determine custody level assignments in their institutions. Through an objective classification procedure, inmates with disruptive behavior characteristics were distinguished from those who showed the potential to function effectively with other inmates of similar custody classifications. By spending more time on the classification process, the Bureau of Prisons envisioned that institutions could reflect the anticipated behavior of the inmate population through their design and construction.

As a design response to both unit management and objective classification, the Ross Correctional Institution shows the current direction of correctional architecture. The design team created a secure perimeter through the use of double fences, razor wire, electronic detection devices, and armed mobile patrol units. Buildings within the institution are designed to minimize escape through high security windows, impregnable materials, and closely-monitored exterior doors. However, the interior environment in the housing units and inmate support areas is relaxed, reflecting the new management emphasis.

Profile of Ross Correctional Institution*

Design: Podular/Direct Supervision

Construction: Plant-produced concrete components with masonry interior walls

Finance: Lease Purchase Demand Bonds

Design Capacity:

General Population	1008
Isolation/Segregation	30
Medical/Infirmary	11
Psychiatric	2
Total	1051

Size of Facility:

Gross square feet	540,000 GSF
Net assignable square feet	399,205 NSF
Net/gross efficiency	74%
Gross square feet per inmate	514 GSF

Building Configuration:

Housing Units: 8 x 126 inmate capacity buildings

Support Services: 7 support buildings, gatehouse, warehouse outside and on campus

Site Area: 59 acres

Construction Costs:

Building Construction	\$38,780,263*
Site Improvements	\$ 5,259,349
Total	\$44,039,612

Total Cost per inmate	\$41,903
Building Cost per inmate	\$36,898

Total Cost per G.S.F.	\$82
Building Cost per G.S.F.	\$72

Staffing:

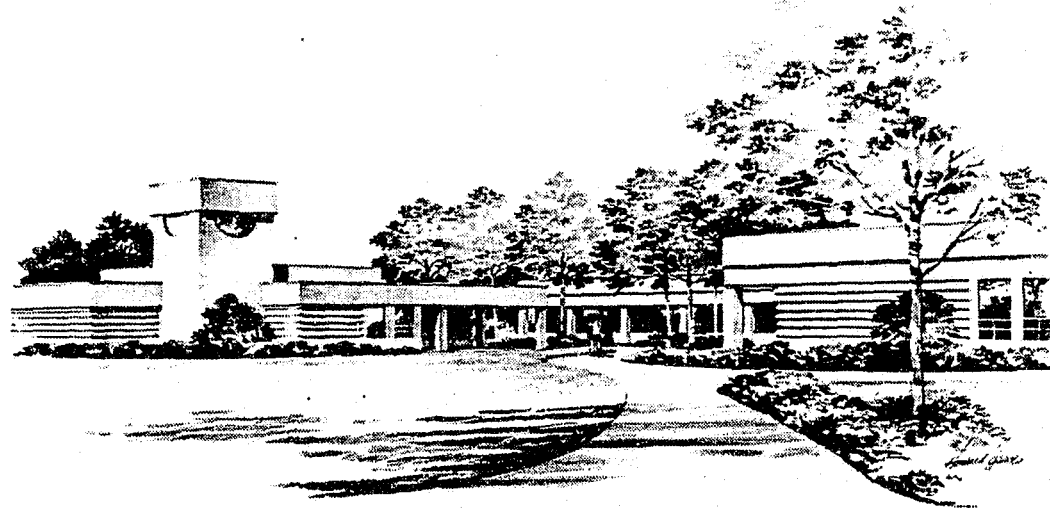
Security	190	Food Service	13
Support	280	Maintenance	19
Administration	32	Medical	14
		Industries	14
		Total	310

Inmate to staff ratio: 3.39 to 1

Perimeter Security:

Fencing 12' and 14'; 20 foot spacing
24" razor wire on and between fences
Electronic perimeter detection system
Armed perimeter patrol vehicles

(* not including sewage treatment plant)



Chapel and central dining facility for prison inmates

✓ Voinovich Companies

The Construction Method

The Chillicothe prison illustrates an advanced method of construction, a technique that employs plant fabrication to accelerate completion of a new jail or prison.

Except for the building foundations and interior walls, the Ohio prison is being assembled with components fabricated at a plant more than 185 miles from the construction site. Approximately 6,200 components consisting of concrete panels, slabs, beams, and columns are being used to build the institution. Each housing unit consists of only 411 pieces of concrete, assembled to comprise the building frame and shell.

The technique is termed "precast and prestressed" concrete construction, because individual building elements are produced in advance at a plant. Pieces of concrete are reinforced for structural strength, and the larger components are prestressed. The structure and shell are thus assembled from completed elements, rather than being built at the site with masonry or poured concrete.

Plant Fabrication

Two types of wall panels are being used for the exterior. One is 14" thick and extends from the foundation to the roof. This type is "non-bearing," meaning that the components do not support floor and roof slabs. The "load-bearing" panels are one

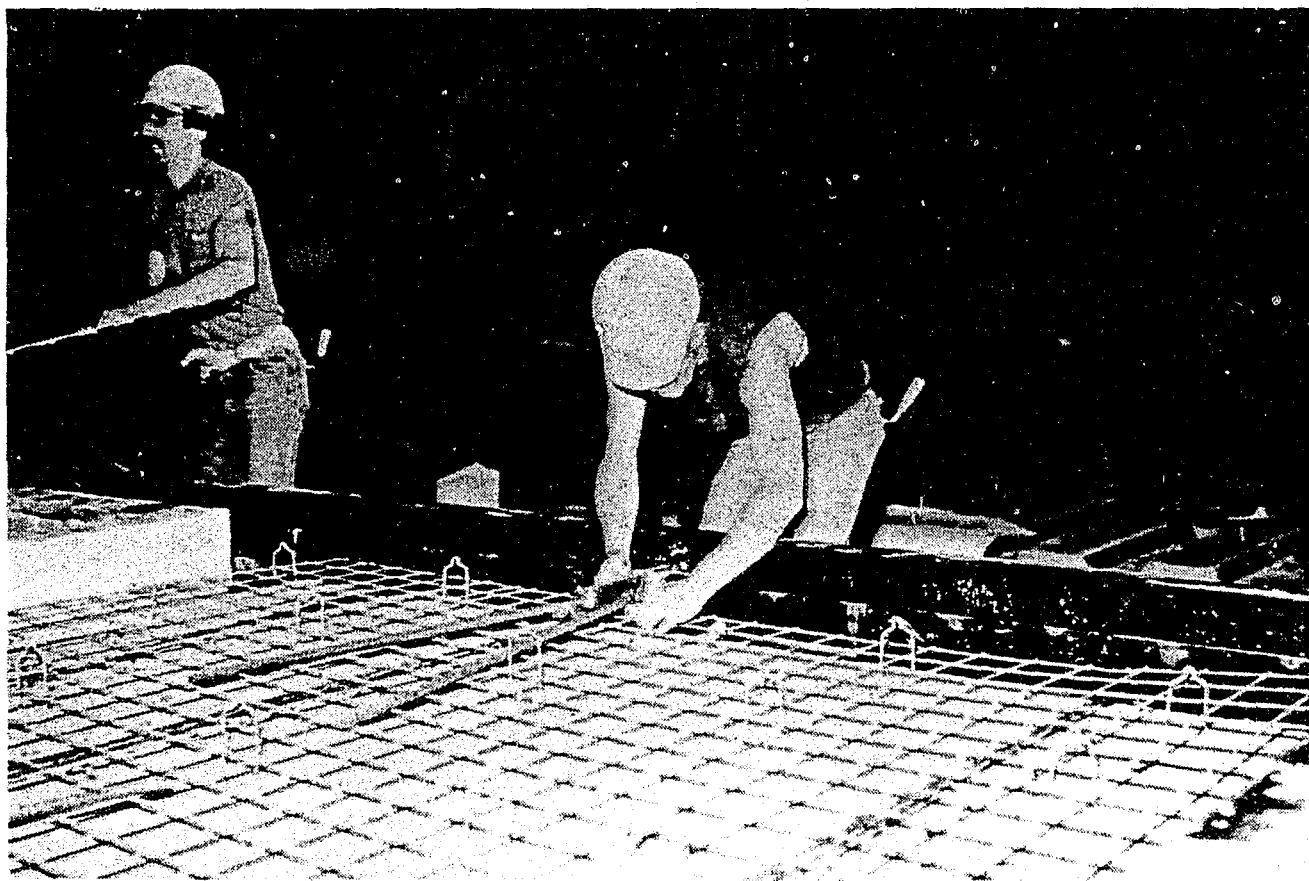
story in height and measure 12" in thickness. These panels include special ledges upon which the floor and roof elements are placed.

The building elements are described as "sandwich" wall panels, because they are poured in several layers. Wall sections are cast in steel forms that provide the fluted shape and exterior details for each panel.

The process of pouring a wall panel involves several stages. The plant production process is shown in Figure G. The outer surface of the wall is completed in the initial step. A special buff-colored concrete is first poured 1-1/2" thick into the steel forms and covered with a reinforcing mesh. A 1" layer of concrete is then applied to cover the mesh at the desired level. This step is followed by placing insulating material, a rigid polystyrene, on the wet layer of concrete. Another layer of structural concrete is then placed, together with steel mesh and a final layer of concrete. The completed "sandwich" panel is thus comprised of an exterior architectural concrete wythe, a middle layer of insulation, and an interior structural concrete wythe intended to be "load-bearing."

Panels are left to cure overnight in their forms, reaching a compression test strength of 3,500 lbs. per square inch. The completed building elements are removed from the forms and sandblasted to achieve the desired exterior texture and uniform color. The finished wall panels are then stockpiled to await transportation from the yard to the construction site.

The aggregate is exposed by sandblasting in order to give the panels and uniform color and texture. These exterior components also have raised horizontal bands and recessed "reveals" to add architectural interest to the appearance of the prison. Other precast building components produced at the casting plant include structural elements, floor slabs, and roof sections.



Workers prepare forms for concrete wall section

Field Construction

When the foundation and utilities were completed, precast concrete components were transported 185 miles south to the site at Chillicothe, Ohio, where two 8-man crews were waiting to erect the concrete elements. As shown in Figure H, wall panels were lifted from the flatbed trucks by a 150-ton capacity crane, with a 100-foot boom. The crawler-type crane maneuvered between different buildings in the complex, and two crews erected 70 pieces each day. Each

of the eight housing units is being built from five typical panels, as shown in Figure H.⁵

The columns and beams are erected first, to form the structural skeleton for the new prison. The structural frame consists of vertical columns and horizontal beams which span between the columns. This system is then connected to the exterior wall panels. When joined together, the three assemblies comprise the load-bearing frame for the buildings.

Individual building elements are connected by welding and bolting together steel plates that have been embedded in the columns, beams, and panels. Each vertical column is fastened to the footing by anchor bolts embedded in the foundation. Horizontal beams are joined to the columns by welded steel plate connections. The beams rest on neoprene rubber bearing pads. Wall panels are bolted to the foundation and welded to adjacent panels. Second floor slabs rest on the lower story wall panels, and the second story wall panels connect to the lower panels with vertical rods. The same rods pass through ends of the second floor slabs, connecting them securely to the top of the first story walls. The second floor and roof are thus supported by the exterior walls, spanning to the interior of the building, where they are supported by the column beam frame.

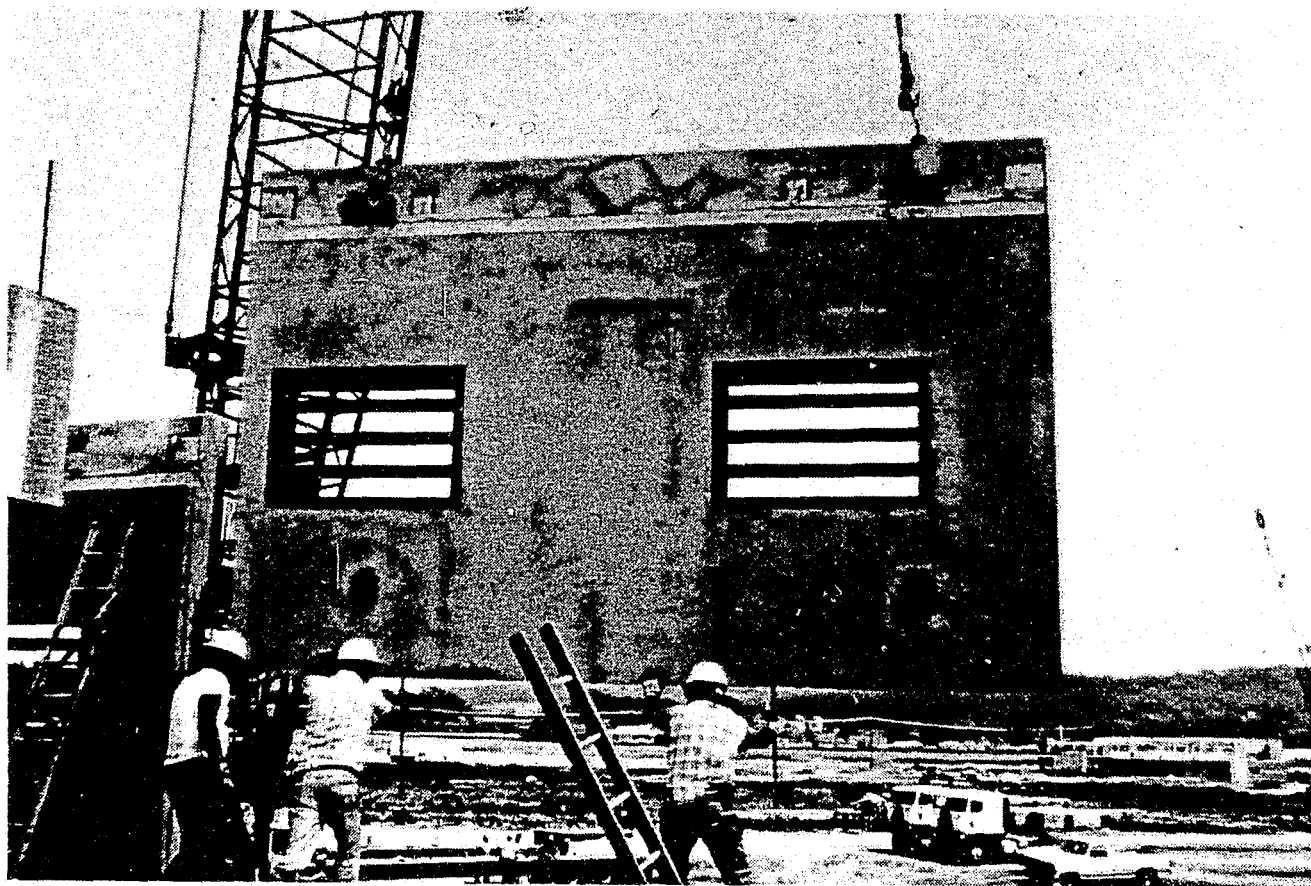
A well-established building method commonly utilized for industrial facilities and parking garages was

used for the roof. It consists of a specialized concrete plank with two underlying structural ribs or fins, forming the shape of T's. These roof components have been termed "Double-T's" by the precast concrete industry and are generally available throughout the country.

Evolution of the Building Technique

The construction methods used in the new Ross Correctional Institution have evolved from lessons learned more than 20 years ago in an urban housing effort called "Operation Breakthrough."

Prefabricated concrete building components are not new to the American building industry. Although only recently introduced to correctional facilities, plant fabrication techniques are well established in housing, commercial, and industrial sectors of the construction market.



Completed wall panels are lowered into position

During the late 1960's, the U.S. Department of Housing and Urban Development (HUD) made a dramatic public commitment to faster, less expensive construction of urban housing in America. After considerable study, it was determined that prototype plans could be developed for residential projects for senior citizens and low income families. The Federal government announced a competition for design of industrialized housing, and proposals were requested from companies across the nation.

The Ross Correctional Institution is being built almost entirely from components fabricated by the F.C. Dillon Company. F.C. Dillon was one of 22 builders selected from more than 600 proposals submitted to HUD in its national competition. The Dillon factories have produced more than 25,000 residential units. Of particular note are Dillon's high rise apartment buildings, designed to comply with the nation's most stringent seismic requirements. A typical Dillon project is Little Tokyo Towers in Los Angeles, California. Sixteen stories in height, the precast building was fully erected in only 33 days and ready for occupancy only seven and one-half months after groundbreaking. The new prison at Chillicothe, Ohio, represents the first application of the Dillon technology to corrections.⁶

As new facilities like the Ross Correctional Institution demonstrate the benefits of a "systems" approach to new jails and prisons, building by assembly line holds promise for corrections officials throughout the United States.

Design Features

The factory-produced wall system used in the Ross Correctional Institution includes all necessary features of security, insulating, and aesthetics. Management is assured of the institution's security, and the "normalized" approach also permits direct supervision within the building perimeter. The design features of the facility are described below:

Profile of Housing Unit: Ross Correctional Institution⁷

Housing Design: unit management/pod design;
63 single cells on two levels,
central dayroom

Cells Per Building: 2 x 63 man housing modules

Size of Unit:

Total Space: 31,181 GSF
Space Per Inmate: 247 sq. ft.
Cell Size: 70 sq. ft.

Costs:

Total Cost: \$1,949,974
Total Cost Per Inmate: \$15,476
Cost per GSF: \$63

Inmate Cells:

Doors: swinging doors
Material: steel, solid type, vertical view part
Locking: remote unlocking, manual close & lock
Floor Surface: sealed concrete
HVAC: forced air, not air-conditioned
Plumbing: china
Furniture: steel
Fire Protection: smoke detectors in ductwork;
smoke evacuation system;
sprinklers in dayroom only

Staffing (for each building of 126 inmates):

Unit Manager:	1/2 (1 for 2 bldgs., day shift)
Secretary:	1/2 (1 for 2 bldgs., day shift)
Unit Correctional Supervisor:	1 (day shift only)
Correctional Officers:	5 (2 day and swing shifts; 1 on nights)
Case Manager:	1 (day shift only)
Total	8

Inmate/staff ratio 15.75 to 1

Exterior Walls

Precast concrete exterior wall systems provide the essential security envelope. The exterior wall system consists of integrated components within which security, structural, insulating, and aesthetic features are combined. In order to achieve the same security level in a conventional masonry exterior wall, each of these aspects must be addressed separately at the site by the general contractor. If the all-important security reinforcing is left out of the exterior masonry construction, management could face dire consequences. A new masonry jail in South Carolina experienced two separate escapes within the first 90 days after opening because exterior walls were not reinforced with steel and grout.

Interior Walls

The National Institute of Corrections has noted that inmates in "new generation" facilities are likely to view the space within which they are incarcerated as though it belongs to them for the duration of their incarceration. This "ownership" concept is a positive attitude, which can be reinforced through architectural design, furnishings and equipment, and materials. The use of a precast exterior wall system permits less secure construction for interior walls, including drywall and other minimum custody materials. Furnishings and hardware may be less secure inside the unit because high-security exterior walls will prevent escapes.

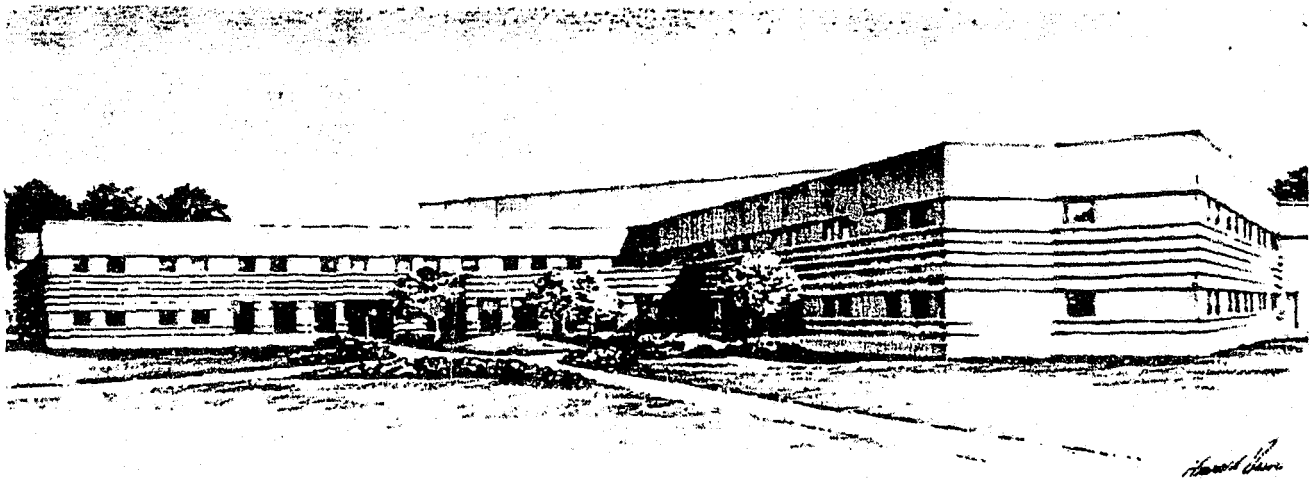
Structural System

In a direct supervision environment, clear sight lines and unobstructed viewing of inmates are major considerations. Appropriately-sized structural columns can help to open the dayroom environment, contributing an important element to direct supervision and unit management. Since plant-produced concrete columns are poured in a factory environment, opportunities exist for "down-sizing" column dimensions while meeting essential structural requirements.

Design Flexibility

The comparatively greater strength of precast components also allows long span capability in the dayroom, resulting in more column-free space. The use of long span precast concrete beams increases sight lines between the officer and inmates in the dayroom. This has a particular advantage in direct supervision facilities, where the officer's view should not be obstructed by columns or other structural components. In this way, precast permits both smaller columns and fewer columns.

The long span structural capability of precast components allows for flexible design of support areas. For example, support services and programs are likely to change over the life of a correctional facility. Where maximum security is not required, long span precast components allow interior drywall construction to be dismantled and reconstructed to accommodate program changes.

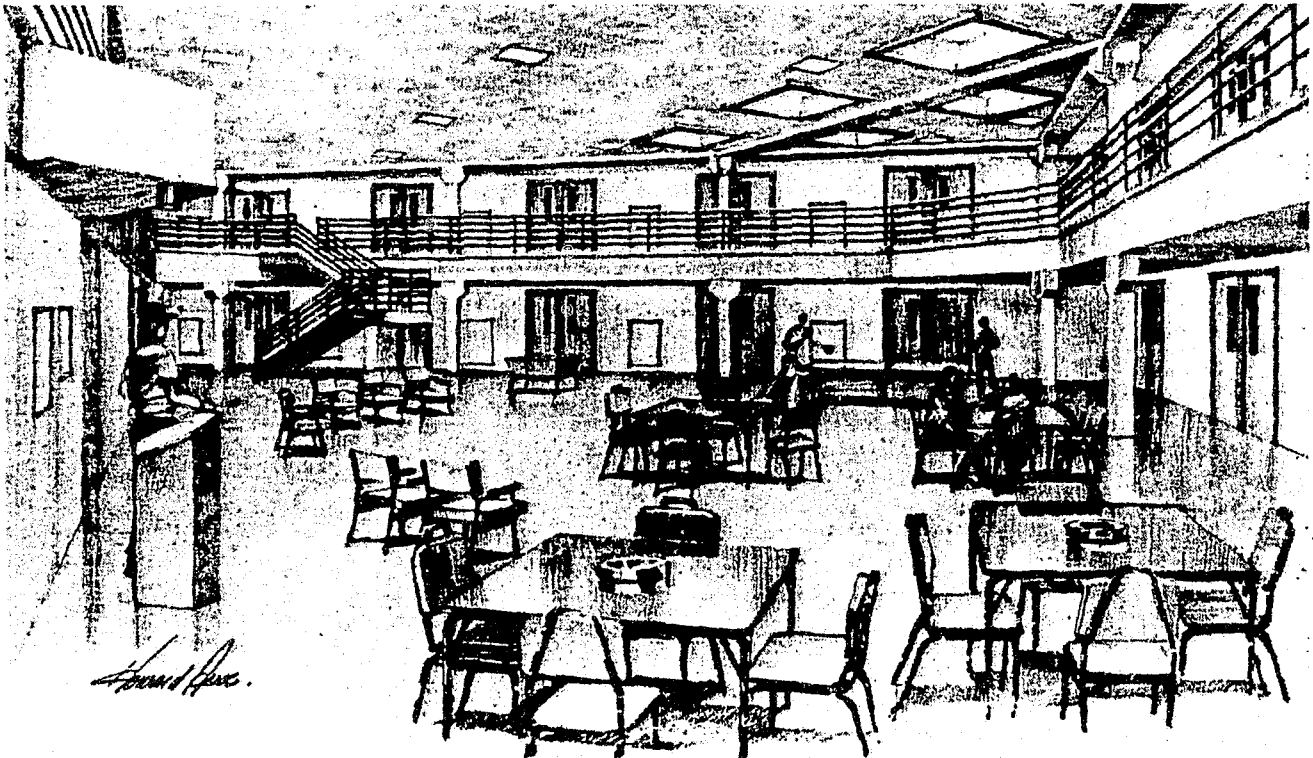


Inmates unit contains two 63 person housing areas and offices for staff

Security

Pre-formed design of cell walls allows for unique features, such as built-in fixtures and mounting brackets. Plant-produced concrete systems permit factory embedment of hardware and fixtures, resulting in security which is superior to that achieved by conventional installation techniques. Shelves, beds, and stools may even be plant cast as integral elements of the cell.

As shown in Figure H, walls for the Ross Correctional Institution arrived at the site with bars and window frames already installed. Bar assemblies had been fabricated by inmates and shipped to the precast plant in Stow, Ohio. Since the bar assemblies were placed in the forms as the concrete was poured, the frames were permanently imbedded in the concrete wall, resulting in a much stronger bond than in conventional field installation. In this instance, the "systems" approach saved time and also produced superior quality.



Living areas have open dayrooms where officers are in direct contact with inmates

Time Savings

When Ohio officials considered the option of conventional construction methods, additional time had to be considered. After careful review, it was determined that the masonry bid alternative would require an amendment to bidding specifications, requiring a substantial extension of the performance period. Together with the cost advantage of precast on this project, the additional time required for masonry led officials to the conclusion that precast was the preferable approach.

Although Ross Correctional Institution is still under construction, the benefits of a "systems" approach are already apparent. Work began on the first housing unit on May 21, 1985. The precast concrete for all eight units was completed by September 13, 1985, a period of less than 4 months. The shell, including frame, exterior walls, roof, and floors of individual cell buildings, took an average of 30 days for completion of each building.

Examples of other precast correctional institutions are shown below. These jails and prisons illustrate typical time savings for both expansion projects and institutions with complete support facilities. Experience suggests that time savings will range from 6 months to 18 months, depending upon the size of the institution and the relative speed of conventional methods.

Accelerated Construction Time For Prefabricated Concrete Correctional Facilities

<u>Location</u>	<u>Months to Complete</u> (type of system)	<u>Type of Building</u>
Pinellas County, Clearwater, FL	10 months (modular)	Medium Security Jail - 192 beds* double cells
Union Correctional Institution, Raiford, FL	8 months (modular)	Maximum Security Prison - 336 beds* single cells
California Medical Facility, Vacaville, CA	8 months (panel)	Medium Security Prison - 600 beds* single cells
Lexington Reception Center, Lexington, OK	9 months (panel)	Minimum Security Prison - 90 beds* single cells
State Penitentiary Parchman, MS	18 months (panel)	Various Security Levels Prison - 1,500 beds comb. single/dorm
Medium Security Institution #3, Dillwyn, VA	18 months (panel)	Medium Security Prison - 512 beds single cells
Jackson County Jail, Pascagoula, MS	12 months (panel)	Medium/Maximum Security Jail - 79 beds single cells

* Facilities for housing only, do not include complete support facilities

resulted in completion of the new prison only 18 months after groundbreaking. Based upon this experience, Virginia has proceeded with two additional precast prisons of an identical design.

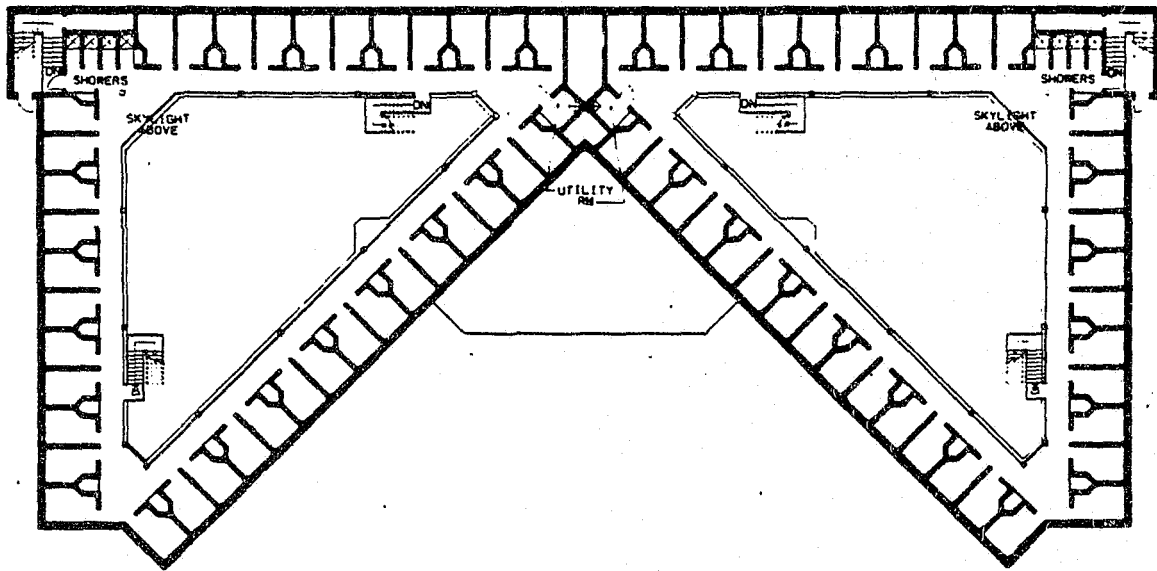
Although the outlook for an early completion of the Ross Correctional Institution is positive, construction will not be finished as quickly as state officials had planned. While prefabrication made possible rapid erection of the building frame and shell, remaining tasks have been delayed. The time from ground-breaking to substantial completion has been estimated at approximately 24 to 30 months, resulting in a 1987 completion date. This estimate represents a significant time savings for a prison of this size, where construction would ordinarily require approximately 36 months. However, other precast prisons have been completed within approximately 18 to 24 months. The factors detracting from an accelerated time schedule for Ross have included: (a) the comparatively large size of the institution; (b) bad weather during field-built portions of the project; (c) labor disputes causing delays; and (d) late delivery of security hardware.

Officials elected to proceed without a contract for construction management (CM), thereby reducing project costs. Although project overhead was reduced, the Chillicothe prison has been built without aggressive scheduling and active onsite supervision, which would have shortened the time frame. Based on this experience, State staff have determined that projects of this size and complexity demand a higher level of administrative and field supervision. All current projects in Ohio over \$15 million now include contracts for construction management services.

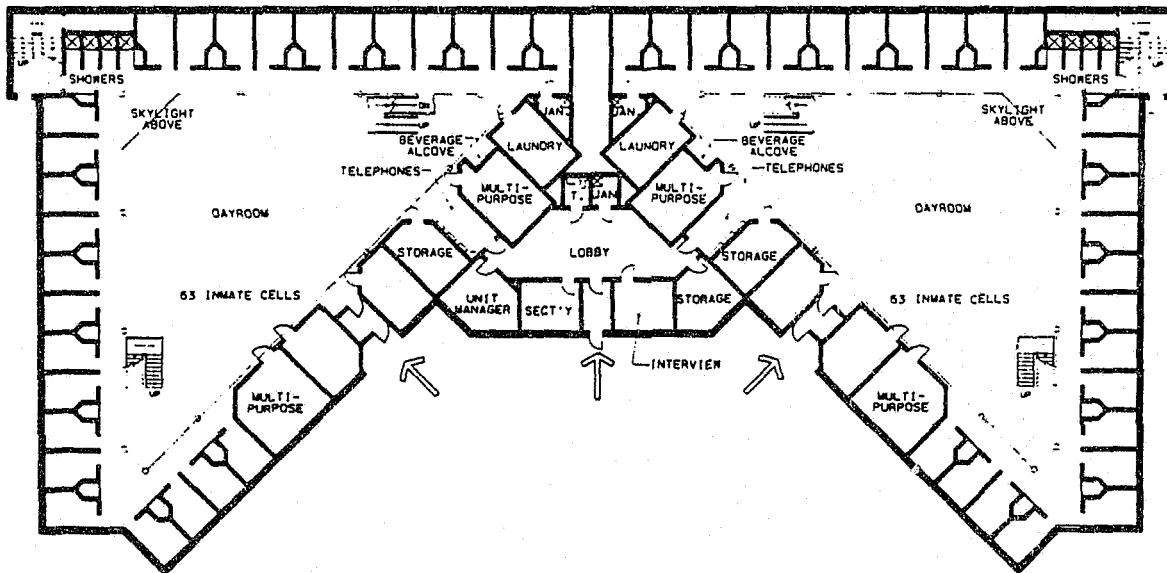
Use of precast concrete partition walls, chases, and cell fronts would also accelerate construction. Although not yet used in prison construction, a preplumbed, prewired precast concrete utility chase would further speed the completion of housing units.

The Commonwealth of Virginia serves as an excellent example, as officials have carefully compared both approaches to construction of a prototype medium security prison. After completion of the first prison with conventional methods, state officials were displeased with the 42-month construction schedule. The same program and design concepts were repeated in an all precast prison, built with construction management (CM). The new approach

Ross Correctional Institution Chillicothe, Ohio



Second Floor Plan



First Floor Plan

Floorplan shows single occupancy cells, dayroom space, and support areas for staff

Cost Savings

Construction Costs

Largely due to design changes relating to the new management approach, the new Director cut \$13 million in construction costs off the original design.

Since Ohio officials were concerned about the cost of precast concrete products, they wished to retain the option to proceed with conventional construction. Throughout planning and design, the project team maintained flexibility to allow for both masonry and precast components.

When construction documents were prepared, alternate bid specifications were included for the masonry approach. Although officials recognized that it would require more time, estimates were then taken for the prison to be built with concrete block and brick veneer, as an alternative to precast concrete panels. Before bidding, contractor estimates were submitted to compare the cost of precast to masonry for the project as a whole. Ohio officials decided to proceed with bidding for an all-precast design, since their detailed estimates showed that masonry would be more costly and require a longer time period.⁷

The precast option was not less expensive for all of the buildings. Estimates revealed that precast was more costly for large, support buildings with unique designs. In fact, masonry would have been less expensive for 10 of the support buildings, but precast produced substantial savings for the 8 most costly buildings, the housing units.

The Ross Correctional Institution demonstrates an axiom of precast design. Economy is realized through repetition. Since the housing unit was a repetitive design, and each building was duplicated eight times, precast was less costly than concrete block.

In the Ross Correctional Institution, an economical approach was developed for the concrete masonry partitions inside the housing unit. Because precast exterior walls were utilized, the interior walls were neither grouted nor reinforced except for light gauge wire trusses placed horizontally in alternate block courses to control cracking due to shrinkage. The chase walls were grouted but not reinforced. The ceiling over the mezzanine walkways is a gypsum drywall system which encases a pipe chase. The joints between precast beams and columns were caulked with elastomeric sealants and are accessible from the mezzanine floor. Gypsum drywall was also used to dress up wall and ceilings areas in the dayroom. Each of these features produced substan-

tial cost savings, when compared to a fully reinforced interior wall and ceiling system.

Although some of these walls and ceilings could be penetrated, the precast concrete perimeter walls are completely secure. Precast concrete systems support the management objectives of both direct and indirect supervision concepts. Jurisdictions concerned about inmates penetrating interior spaces to store contraband or weapons must consider either close supervision of inmates or the use of more costly high-security interior walls.

Figures L and M illustrate the cost savings of the Ohio approach. The housing unit cost less than \$2 million, and may serve as an appropriate example for state and local agencies to consider for institutions holding approximately 126 inmates. With construction of an appropriate perimeter and adequate support facilities, the Ohio unit may be considered for jails and prisons of many sizes and types.

General	\$ 843,412
Cell Door Package	\$ 199,250
Plumbing	\$ 245,520
Fire Protection	\$ 26,820
HVAC	\$ 260,800
Electrical	\$ 374,172
TOTAL ^a	\$ 1,949,974
Cost per inmate =	\$15,476
Cost per square foot =	\$63
*Site work not included. Costs are for housing unit only, cost of support facilities not included.	

Contractors may also realize significant savings through an accelerated schedule, and these cost reductions may be passed on to the corrections agency in the form of a lower bid. If construction time on a prison can be cut from 36 months to less than two years, the contractor saves enormous amounts in labor, insurance, bonding, and other project-related costs.

The average cost of a modern correctional facility of this security level, including complete support services, is approximately \$50,000 per cell. Ohio officials have achieved a total cost that is approximately 20 percent below the national average, while providing more than 500 square feet of space per inmate.⁹

Figure M

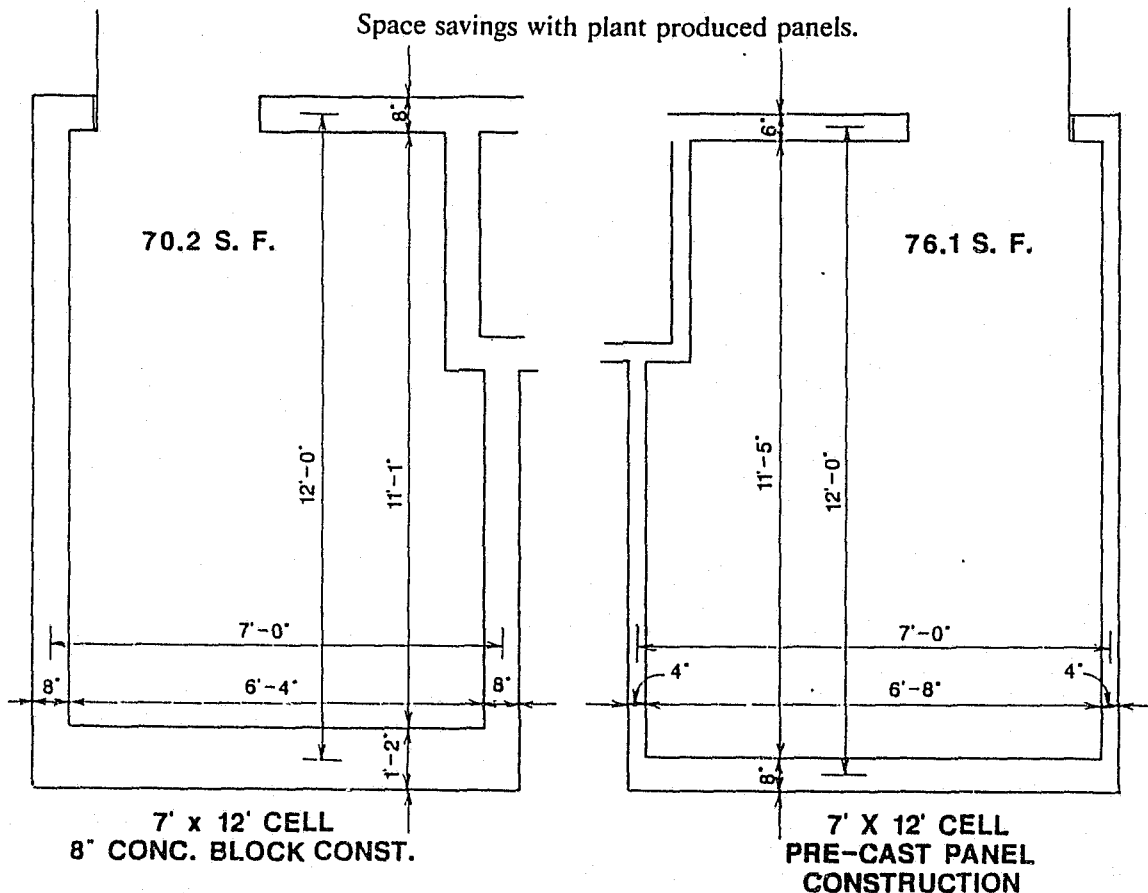
Budget for Ross Correctional Institution

Main Institution Buildings	\$10,437,500
General	\$14,755,000
Plumbing	\$ 3,226,000
Mechanical	\$ 4,979,300
Electrical	\$ 5,380,560
Fire Protection	\$ 532,971
Landscaping	\$ 49,702
Security Hardware	\$ 1,594,000
Major Site Work	\$ 2,730,500
Utility Relocation	\$ 354,079
TOTAL⁸	\$44,039,612 (22 buildings)

Note that generalizations regarding construction costs are subject to market conditions and regional differences. The price of precast concrete will vary across the country, and the proximity of producers can be of critical importance. While the precast approach was most economical in Ohio, there is no guarantee that this will be the case at every location. Each project should be analyzed according to local conditions before arriving at a final conclusion.

Space Savings

As shown in Figure N, precast walls are not as thick as concrete block walls. Since interior precast panels require only 4 to 6 inches of thickness, considerable floor space can be saved over conventional 8-inch to 14-inch walls built with concrete masonry units. Given the smaller width dimension for all four walls, a typical precast cell could be almost 6 square feet larger without changing the wall-to-wall center line dimensions. Figure N shows that the minimum thickness of walls also provides opportunities for designing a more efficient utility chase without consuming additional space from the cell.



Precast panels are more narrow than conventional construction, and consume less floor space.

When multiplied by many cells, this feature may represent substantial savings throughout a jail or prison. Moreover, the effect is to increase the building's efficiency by maximizing the net square footage in relation to overall building size. These savings may be translated into construction costs, and space savings are greatly multiplied through a repetitive design.

Engineering Issues

Since precast concrete may produce cost savings through repetition, benefits are maximized when the design is comparatively simple.

While precast framing and cladding were adaptable to the plan layout selected, precast construction is most economical if the outside shape of a building is square or rectangular. When the designers plan their layouts to stay within the discipline of regular repetitive sized and shaped precast components, the result is maximum cost savings. Housing units may be designed for optimal structure economy and still provide the design features shown in more complex shapes such as the triangular housing unit.

Some sacrifices were made to achieve the desired design, as the triangular shape of housing units at the Ross Correctional Institution does not achieve maximum precast economy. However, two triangular housing units may be incorporated into a square or rectangular building frame, and designers may consider ways to incorporate the Ohio housing unit in even more economical structural systems.

More research is needed to examine the true cost differences between precast and conventional masonry construction in correctional facilities. Although architects may sometimes assume that a precast system is more expensive and therefore not worth serious design consideration, the Ohio experience clearly demonstrates that precast concrete offers a viable cost alternative to conventional masonry construction.

Architectural Award

The success of the Ross Correctional Institution design is further demonstrated by receipt of an award from the American Institute of Architects.

Since 1974, the American Institute of Architects has held an annual exhibition of justice facilities that illustrate progressive designs in this highly-specialized field. Sponsored by the Committee on Architecture for Justice, the honor of a Citation is bestowed upon only a few of the approximately 40 projects in the

exhibition. The award represents a high level professional achievement in the field of justice design.

The Ross Correctional Institution at Chillicothe, Ohio, was awarded a Citation by the Committee on Architecture for Justice during the 1984 AIA exhibition. The screening jury described the institution as a model for others to follow:

"This institution and adjacent work camp efficiently incorporate all elements of contemporary correctional design. A unit-management setting provides direct supervision and efficient use of staff."¹⁰

The firm of Voinovich, Sgro Architects, Inc. is responsible for the design of the Ross Correctional Institution. Working with the National Institute of Corrections, architects from Voinovich Sgro devised triangular housing units in a campus layout which responded to the needs of Ohio officials. Staff from Voinovich Sgro had been part of the Ohio team planning this institution for several years. Although engaged by a previous administration to design a traditional institution, the architects adopted the approach advocated by Ohio's new Director of the Department of Rehabilitation and Correction.

The Director worked with the architects in designing a facility which incorporated a new style of inmate supervision and a different management policy. For guidance on design and management issues, Ohio engaged the services of Gary Mote, retired Chief of Facilities Development and Operations for the Federal Bureau of Prisons. Working closely with Gary Mote, architects from Voinovich Sgro responded to the new policies.

Ohio staff give the architects high marks for creativity, as designers translated policy leadership from state officials into an award-winning design:

- A "telephone pole" configuration of linear buildings was rejected in favor of a campus plan.
- Long cell blocks were replaced by triangular housing units with large dayrooms.
- A central core of staff was distributed to a decentralized scheme of unit management.
- Occasional observation of prisoners was changed to direct supervision of the inmate population.

These changes collectively comprise a totally new approach to corrections in Ohio. Director Richard P. Seiter has pledged that the concepts at work in this prison will serve as guidelines for all of Ohio's new institutions.

Ohio Financing Technique

Ohio has developed a creative financing plan for corrections, an approach which can provide as valuable guidance for both prisons and jails. When compared to traditional methods of finance, these new techniques may offer advantages worthy of consideration by officials now planning construction of new correctional institutions. A detailed discussion comparing Ohio's alternative to conventional financing methods is provided in Section IV: Financing Issues.

The Ross Correctional Institution is one of a dozen projects now being financed by the Ohio Building Authority. The statewide plan includes both traditional and the most advanced techniques.

The new Ohio approach is progressive in two noteworthy respects: prisons will be leased by the Department of Rehabilitation and Corrections and the securities carry a variable interest rate.

Officials in Ohio are held to a constitutional debt limit that caps the bonded indebtednesses of the state in much the same manner as in many cities and counties across the nation. Such restrictions led to the creation of the Ohio Building Authority, an agency which finances construction of public facilities with leases to states and local agencies. As the Ohio Building Authority cannot pledge the full faith and credit of the State of Ohio, lease bonds are the only type of security which may be issued.

Ohio's 1985 prison issue of \$79 million is shown in Figure O. Although this plan was employed to finance prison construction, the same approach has been utilized for jails across the nation.

The State of Ohio is a pioneer in developing one of the nation's largest variable rate issues for corrections. The floating rate demand securities are backed by a lease to the Department of Rehabilitation and Correction. In comparing the floating rate to conventional methods, Ohio officials determined that substantial savings could be realized through the demand bond. Officials of the Building Authority continue to monitor the difference between fixed rate issues and their own floating issue, and reported savings of more than \$3 million during the first year.¹¹

Figure O
Profile of Ohio Financing Method¹¹

- Type of Security: Variable Rate, Lease-Purchase Demand Bonds
- Size of Issue: \$79,000,000
- Rate on Date of Issue: 5.15%
- Operator/Tenant: Ohio Department of Rehabilitation and Correction
- Issuing Entity: Ohio Building Authority
- Interest Provision: Variable rate, weekly interest adjustment
- Conversion Features: Convert to fixed rate; also convert rate adjustments to weekly, monthly, or semi-annual periods
- Liquidity: Demand provision permits bond holders to redeem or "put" securities with one week notice
- Security: Letter of Credit issued by bank
- Current Number of Investors: Five institutional buyers
- Unit Size: May be subdivided to \$5,000 units; now set at \$100,000
- Date of Issue: 4/1/85
- Rating: S&P, PA1+; Moody, Aaa/VMIG1
- Current Rate (June 18, 1986): 4.0%
- Due Date: March 1, 2005

Chapter II
Planning Issues

II. Planning Issues

In recent years, the architectural community has become increasingly sensitive to the relationship between facility management objectives and the design of correctional facilities. Although this report focuses on only one facility, it exemplifies "new generation" concepts found in a number of state and local institutions. Appendix A provides descriptions of direct supervision jails that are being completed through advanced construction methods.

Until recently, the relationship between prefabrication and "new generation" designs has been an open question, as it was believed that plant production of components might constrain architectural freedom. The issue of concern has been design flexibility: Will prefabricated components work for both traditional and "new generation" designs?

Concrete prefabrication techniques were initially developed for such applications as hotels, apartments, and hospitals. Since the "new generation" corrections approach requires that cells wrap around a central dayroom, it has not been clear that prefabricated components would accommodate contemporary design requirements.

The positive outcome of this case study should allay such fears, as this report demonstrates that prefabrication does not unreasonably constrain design freedom. The Ross Correctional Institution serves as an example of a flexible building technology. Precast concrete components are highly adaptable and complement a variety of design alternatives, including both linear and "new generation" housing units.

Facility Development Process

The National Institute of Corrections has shown that new institutions realize the most success when their designs are developed out of agency philosophy and practices. An architectural team may ensure that the new building fulfills the needs of its occupants only if the design results from a careful planning process. All too often, new correctional facilities are fraught with problems from the onset, a dilemma which is inevitable where management policies are subordinated to the urgency of construction.

The facility development process should begin with the policy and mission of the corrections agency and ultimately conclude in a completed design. For many years, it has been feared that prefabrication would encourage a departure from this chronology. The concern has been that when the size and shape of large building components are fixed before planning begins, corrections staff might be compelled to adapt their design to match the preconceived layout. This scenario represents a dangerous reversal of the proper planning process, since design should always be based on policy. The steps should never take place the other way around.

This study included a review of Ohio's planning process and an examination of the impact of prefabrication on freedom of design. The Ross Correctional Institution has thus been a test of whether a "systems" approach requires compromises in the facility design process. Critical analysis of the Ohio design process, however, has revealed no evidence of a departure from the appropriate sequence of planning decisions. Officials responsible for developing the architectural program and schematic drawings have reported that precast concrete was not considered until long after policy questions had been resolved. The planning process began with policy decisions, and it proceeded in a deliberate and reasoned manner to a design that responded to those decisions. Precast components were incorporated at the design development stage without requiring sacrifices to accommodate prefabrication.

Architectural Model

The new housing units designed for the state of Ohio have already proven a valuable model, as they have been adapted for use in another jurisdiction. Pennsylvania officials are now planning to incorporate the Ohio design into the Cresson Center Correctional Facility at Harrisburg. Architectural plans for the Ohio prison were provided to Pennsylvania officials for use in design of their institution. Architects responsible for the Pennsylvania project have incorporated two housing units of the Ohio type in a configuration which complements older, existing buildings at the prison site. The Cresson Center Correctional Facility will also employ the unit management concept in much the same manner as Ohio.

Housing units in Pennsylvania were tailored to meet somewhat different needs. They differ from those in Ohio in that one entrance has been designed for both inmate pods, rather than having two separate entrances. The Pennsylvania plan deletes the core or unit management space and rearranges cell strips to place offices in a different location. Moreover, the Cresson housing units were constructed by a different building method. With the Chillicothe buildings as a model, architects in Pennsylvania used concrete block rather than using a precast approach. The Cresson Center Correctional Facility is scheduled for completion in early 1987.¹²

The collaboration between architects in Pennsylvania and the designers of the Ross Correctional Institution is a demonstration of how a successful design may be adapted to another jurisdiction. Corrections officials can avoid many problems by learning from the experiences of each other, as jail and prison construction is more difficult and costly when agencies attempt to "reinvent the wheel."

The Housing Unit

Over the past 15 years, dozens of inmate housing unit configurations have been developed based on the unit management, direct supervision approach. One of the first major experiments was in Pleasanton, California where the Bureau of Prisons introduced the use of open day room spaces with an officer assigned in these spaces. In addition, large expanses of exterior glass were used in both the day room and inmate cells to allow natural light into the housing units.

The Bureau of Prisons also required higher custody facilities for inmates with histories of disruptive

behavior. Again, the interest was in decentralizing administrative and counseling services and providing a secure perimeter system. Therefore, with the development of more secure facilities such as the Chicago Metropolitan Correctional Center (MCC), the San Diego MCC, and the Manhattan MCC, the Bureau of Prisons achieved management philosophy within the housing unit while providing for high security direct supervision environments.

A triangular-shaped housing unit of 48 to 64 inmates joined together with a central inmate sallyport and unit management spaces was constructed in Memphis, Tennessee; Bastrop, Texas; Miami, Florida; and Otisville, New York. A recent version of this housing configuration is the Federal Correctional Institution at Phoenix, Arizona, where the benefits of research and evaluation from other federal facilities are realized in the housing unit design. The housing unit provides for two 62-bed living environments that are grouped around a large day room space. Administrative and counseling services have been decentralized to the housing unit. An objective classification system within the facility assures that those inmates who show more disruptive behavioral characteristics are separated from the general inmate population. The Federal Bureau of Prisons has most recently refined the design with plans for a new facility at Marianna, Florida, which will represent an additional developmental step in the design of housing units.

Working with the project architects, Director Seiter and his staff utilized the design concepts developed by the Federal Bureau of Prisons. While plans for the Ross Correctional Institution are unique, the design represents another step in the evolution of triangular housing units developed to facilitate the direct supervision and unit management approach. The new prison at Chillicothe, Ohio exhibits various refinements and architectural details which make new contributions to the continuing development of this proven model.

Issues for Local Jails

When considering the transferability of the design from prisons to local jails, it is important to examine the basic differences between the two types of institutions. These differences are generally characterized by the type and quantity of support service areas and the intake and release components. In prisons, the support services are much larger than in local jails, but prisons do not generally require extensive intake and release areas.

Although this report focuses on a correctional facility of campus design, precast cell modules or precast components may also be used for combined-use buildings and high rise schemes, which are common for local jails. For some time, precast exterior wall components like those of the Ross Correctional Institution have been used in local correctional facilities. While the Chillicothe facility is an example of a prison, the building concept can be easily transferred to structures where all inmate housing and support services are incorporated in a single building, as shown in Appendix B.

A design advantage of the precast system that may benefit local jails is that use of structural and exterior wall components of high strength concrete permits construction of interior partitions to be inexpensive without jeopardizing security. Prefabricated concrete may be attractive to local officials because standardized components are likely to reduce cost. Less costly interior partitions provide greater flexibility for future interior expansion as well as reducing the initial cost of the facility.

Since the timing of transporting the components and the progress of the site erection crews was carefully controlled, no on-site storage of precast materials was necessary at Chillicothe. Although storage would not have been a problem at the Ohio site, yard space for construction materials is scarce in many urban sites where jails must be built.

The opportunity exists in local single-purpose structures to accomplish multiple objectives with concrete structural components produced by plant techniques. Many local correctional facilities are located in urban environments near courthouses where attention to aesthetics and architectural style is a high priority. Precast exterior components can help a local jurisdiction ensure that an appropriate architectural style is reflected in the exterior design. Precast components can be assembled far in advance of interior construction, allowing the client an opportunity to view the "test" precast panels to determine their architectural appropriateness in the local setting.

Since the quality of the material and the workmanship of precast components are more closely controlled at an assembly plant, on-site craftsmen for finished exterior and interior surfaces need not have the same skill level required for masonry systems.

Facility size does not appear to be a major problem with precast. Economy of scale does not necessarily suggest that smaller jails are an inappropriate application of precast. Jails as small as 50 beds have been

built at costs which are competitive with conventional construction.

Although the use of precast construction in local facilities appears to have many distinct advantages, more research on completed examples of precast local jails will be necessary to fully demonstrate appropriate opportunities for this construction approach. Both the National Institute of Corrections and the National Institute of Justice are monitoring the growth of this technology.¹³

Chapter III
Construction Issues

III. Construction Issues

Precast Concrete and Traditional Methods

The Ross Correctional Institution represents a hybrid approach of precast and conventional methods. More than 6,200 pieces of plant-produced concrete were assembled to comprise 22 different buildings. While this represents only the building frame and shell, the walls, floors, and roof were fully erected and crews were protected from the weather for subsequent tasks required to finish the project. All interior partitions are concrete block, a deliberate policy decision to limit the extent of prefabrication.

More than two dozen jails and prisons have been built with precast components. A comparison of this method to conventional techniques suggests that a number of benefits may be realized from the precast approach.

Analysis of plant-produced concrete components reveals both advantages and disadvantages when compared to traditional methods of field construction, and each issue is exemplified by the Ross Correctional Institution:

Advantages

• Concrete Components

Protection from fire: provide maximum level of fire safety; superior to virtually all other materials.

Prevention of escape: impervious to attack by inmates; 6,000 psi concrete cannot be penetrated without special power tools.

Resistance to vandalism: hard surface will not scratch, dent, or chip; extremely difficult to damage.

Ease of maintenance: surface can be cleaned easily, resists stains and discoloration when sealed; paint is optional.

Energy conservation: panels may be designed to contain rigid foam insulation for maximum energy ratings.

• Factory Conditions

Stockpiled materials: building parts may be stored in large quantities in advance of field erection to avoid production delays.

Quality control: greater consistency and quality can be achieved under controlled plant conditions, and monitoring/inspection can be accommodated more easily than in the field.

Level of productivity: plant production methods increase efficiency and minimize such problems as lengthy travel time, difficult site access, and labor problems.

Security Components: fixtures and hardware may be embedded in concrete at the factory, resulting in greater security.

• Field Conditions

Time savings: less time is required for field construction, since building materials arrive as pre-assembled units.

Simplified process: fewer building parts reduce complexity of field construction, simplifying management and coordination.

Weather problems: rapid erection of precast components minimizes disruption by adverse weather and accelerates completion of a building shell to protect crews from the climate.

Labor skills: precast components may be erected in remote areas where a shortage of skilled masons may preclude brick and concrete block.

Disadvantages

• Design Flexibility

Replication of components: precast is cost effective for projects with repetitive components, as uniquely shaped cells can be problematic.

Simplicity of design: concrete components are most economical when the design is comparatively simple, and complex building shapes should be avoided.

• *Market Conditions*

Availability of precast: while precast plants may be found across the nation, the number of manufacturers may be limited in certain areas.

Cost of precast: although Ohio reports cost savings with precast, costs will vary according to local market conditions and the utility of precast for the facility design.

Potential cost disadvantages of precast are a function of facility design and local market conditions. A design with minimal replication and numerous unique shapes is seldom cost effective when built in precast concrete. Moreover, certain market areas may offer masonry at a lower cost. If field labor costs are also low, conventional methods may be less expensive. As shown in this case study, careful analysis is required to determine which construction method is appropriate.

Likewise, traditional methods sometimes equal prefabrication techniques in speed of construction. Although precast concrete will almost always reduce the time required for construction, this benefit is realized only through effective project management. A well managed conventional project may approach the construction time of a precast facility where management problems have delayed otherwise rapid completion.

Comparison of Prefabrication Methods

The building method illustrated by the Ross Correctional Institution is a system of precast concrete panels and precast structural components. This approach represents one of several methods of prefabrication.

Concrete Systems

- Panels and Components
- Modular Units

Steel Systems

- Panels and Components
- Relocatable Modular Units

Wood Frame Relocatable Units

When comparing the cost of different construction techniques, it is important to look beyond cost per inmate. To begin with, multiple occupancy cells will almost always reduce the cost per inmate and cannot fairly be compared to institutions with single occupancy cells. Likewise, some building projects are additions to existing facilities while others are complete institutions. Construction efforts cannot be accurately compared when they do not include the same assortment of support spaces, utilities, and security features.

The projects shown in Figure P were selected to illustrate contrasting types of prefabrication. A comparison of the institutions reveals that square feet per inmate and cost per square foot are key factors to consider in any analysis, as they accurately measure the differences between one facility and another.¹⁴

Figure P shows that the more popular descriptor, cost per inmate, can be very misleading. This statistic often oversimplifies the comparison and conveys a mistaken impression by leaving out important information.

Philadelphia's maximum security project was built with steel relocatable units. Compared to the Ohio prison, the Philadelphia institution shows twice the cost per square foot and half the square feet per inmate. Although this clearly shows that the projects are not alike, the table indicates approximately the same cost per inmate, an example of how misleading this statistic can be. Despite the misleading appearance of comparable cost per inmate, steel modular units are generally much more expensive and provide substantially less space.

Like the Ross Correctional Institution, the Virginia prison includes a full range of support buildings, and a comparable level of security. Moreover, it is also a permanent facility. These projects illustrate comparable data, and the factor of square feet per inmate is about twice that of facilities which do not have complete support included in the figures. A comparison of space reveals the difference in policy, as Ohio programmed 20 percent more space per inmate than is provided in the Virginia facility.

Figure P also contains adjustments for the Ohio and Virginia prisons to make them more comparable to typical prefabrication projects. Projects like the units in Philadelphia usually provide only housing space. The adjustment shows only housing space, excluding support space and other costs. The table then shows comparable space statistics, a range of approximately 200 to 250 square feet per inmate. With this adjustment, the steel units show more than twice the Ohio cost per inmate, despite an earlier construction date and higher regional construction cost.

Figure P
Comparative Examples

Name of Facility	Total Cost	Bid Year	Number Cells/Beds	Cost Per Cell/Bed	Total Sq. Ft.	Cost Per Sq. Ft.	Sq. Ft. Per Cell	Sq. Ft. Per Inmate
<i>Concrete Panels:</i>								
Ross Correctional Institution	\$44,039,612	84	1051	\$41,903	540,000	\$ 82	70	514
Housing units only*	\$15,599,792	84	1008	\$15,476	249,448	\$ 63	70	247
<i>Concrete Panels:</i>								
State of Virginia Medium Security Institution #3	\$20,739,535	81	512	\$39,207	220,000	\$ 94	70	430
Housing units only*	\$ 8,131,000	81	512	\$15,880	105,323	\$ 77	70	206
<i>Concrete Modules:</i>								
Florida State Prison at Raiford*	\$ 5,773,179	85	336	\$17,182	57,520	\$100	68	171
<i>Concrete Modules:</i>								
Pinellas County Jail Facility*	\$ 2,976,221	85	96/192 (2-person)	\$31,002/ \$15,501	29,985	\$ 99	90	156
<i>Steel Modules:</i>								
City of Philadelphia Women's Minimum Security Unit*	\$ 2,077,000	83	50	\$41,540	12,800	\$162	70	256
<i>Wood Frame:</i>								
City of Philadelphia Women's Minimum Security Unit*	\$ 2,200,000	82	112	\$19,643	22,350	\$ 98	70	200

*Data shown for housing areas only, costs do not include support buildings, perimeter, etc.

The minimum security units in Philadelphia are wood frame trailer units. Although this construction method is quite popular, it does not compare favorably to permanent construction. As shown in Figure P, the wood frame trailers actually cost more per square foot than permanent concrete construction. Once again, the cost per inmate is misleading, as it incorrectly suggests that the trailers are less expensive.¹⁵

These simple comparisons illustrate why careful analysis is required for decisions related to prefabrication. Officials should not limit their review to cost per bed, as this statistic does not accurately convey the features, size, and quality of the completed facility.

Concrete Modular Units

The prefabrication method employed in Ohio consists of flat concrete slabs and panels, which are relatively small building components. Larger concrete cell modules have also been tested for major correctional institutions. Prefabricated concrete cells are termed "monolithic" precast, as they are poured as a single concrete unit. This technique differs from the Ohio approach in that it involves casting fewer components in a much larger size. Concrete modules illustrate many of the advantages of precast concrete as well as additional features. Although concrete cell modules weigh up to ten tons each, they require fewer crane lifts than the panel system used in Ohio, thereby permitting faster completion. They also have the advantage of eliminating many joints, which are expensive to construct and are sometimes vulnerable to inmate penetration.

Concrete cell modules have been tested throughout Florida, Wyoming, and in Louisiana, where both state and local agencies have built new correctional institutions using this technology. The modular approach is described in the March 1986 issue of *Construction Bulletin*, published by the National Institute of Justice.¹⁶

Comparison of Concrete Modular Units to Concrete Panel Method

- *"Monolithic" Design*
 - Fewer joints:* as cell is cast as one unit, absence of cracks or joints results in security advantages over panels.
 - Less grouting:* absence of seams and spaces saves time and money for placement of grout as required with panels.
- *Field Construction*
 - Shorter time period:* modules mean fewer pieces than panel system, resulting in fewer crane lifts.
 - Simplified process:* modular units stand alone; no shoring or shims are required for stability, as with panel system.
- *Prefabrication Opportunities*
 - Utilities:* plumbing and electrical may be intergrated at plant, requiring fewer connections in the field.
 - Hardware and fixtures:* units may be fully equipped/furnished before shipment to construction site.
- *Economic Issues*
 - Highway limits:* large size and heavy weight of cell modules is sometimes restrictive.
 - Site:* weight of modules requires heavy crane, speed of field erection slowed by production limits.
- *Design Concerns*
 - Size constraints:* design must accommodate cell units of fixed size, possibly less flexible.
 - Aesthetic issues:* modules generally require exterior facade or coating.
- *Production Questions*
 - Plant limitations:* very limited production volume, redundancy of walls, and costly forms.
 - Administrative concerns:* limited number of producers, need for plant proximity, and possibly proprietary designs.

Relocatable Units

Within the arena of rapid construction techniques, a major competitor to precast concrete is modular construction with steel or wood frame pre-manufactured housing units. The housing sections are pre-assembled in an off-site factory and transported to the site as completed units.

Pre-manufactured housing, comparable to residential trailers, began to get serious consideration during the late 1970's as a fast response to severely overcrowded correctional facilities. Companies began manufacturing wood frame units that could be delivered to a job site within 90 to 120 days from the

date of order. Companies emphasize speed, transportability, and cost as major advantages of pre-manufactured housing.

Steel modular units were developed to provide a higher level of security. Although comparable in size and design to wood frame units, the steel modules offer medium to maximum security construction. Like the residential-type units, steel modules are available faster than permanent construction.

In the study of relocatable inmate housing units completed for the National Institute of Corrections, a national survey concluded that the average cost per bed for pre-manufactured facilities erected since

Comparison of Prefabrication Methods: Precast Concrete Construction versus Relocatable Modular Units (steel and wood frame)

	Relocatable Units	Precast Concrete
Time for Completion:	Typically completed 90 to 120 days	Faster than conventional, saving 6 to 18 months Typically completed in 12 to 18 months
Cost of Construction:	NIC survey shows 20% higher cost than conventional buildings	Cost depends on type of precast, but generally the same cost as conventional construction
Space Per Inmate:	NIC survey shows average space per inmate less than half that of conventional facilities	Space requirements are flexible, design determines size
Design Options:	Rectangular housing units of fixed dimensions are highly restrictive	Cells and dayrooms may be arranged in any configuration required by the architectural program
Durability/Security:	Walls in steel units are strong; wood frame units are subject to vandalism and escape by penetration	Precast concrete is virtually impervious to vandalism and cannot be penetrated without special tools
Fire Safety:	Both wood frame and steel units require extensive fire protection due to combustion potential	Concrete is viewed by fire officials as the most desirable material in terms of fire protection
Relocation:	May be disassembled and moved to another location	Never cost effective to disassemble
Staffing:	Size of relocatable units usually results in small dayrooms and housing units where staffing is not efficient	Housing units range from 48 to 100 inmates for optimum staff efficiency

1980 was approximately \$21,000. At first, this cost appears to compare favorably to the survey's approximately \$40,000 per inmate bed for conventional construction. However, the relocatable facilities provided at this cost included an average of 146 square feet per inmate, while conventional construction contained 362 square feet per inmate. When comparing average costs per square foot, it was again found that the cost for factory modular units was higher. The trailer-type units averaged \$138 per square foot, while conventional construction averaged \$111 per square foot, a difference of approximately 20 percent.¹⁷

In comparing precast concrete to pre-manufactured modular units, the management objectives of the facility must also be considered. In pre-manufactured steel or wood systems developed to date, the design generally includes a double-loaded corridor that serves as a dayroom space between two rows of pre-assembled cells. The design usually allows the grouping of no more than 16 single cells within a dayroom environment. This small number of cells and the long, narrow dayroom space do not support direct supervision or promote staff efficiency.

Both types can be assembled off-site, transported by special permit to project sites, and assembled much faster than conventional methods will permit. Both approaches offer the advantages of factory quality control.

Although a precast concrete facility requires more time to construct than a pre-manufactured one, an open dayroom environment, the improved staff efficiency, and flexible design may justify the additional construction time. In a number of applications, precast components for the dayroom were assembled before delivery of the cell units, and time delays for constructing the dayroom were minimized.

The national survey of pre-manufactured housing sites found that one of the few criticisms of the steel and wood components was a concern about long-term durability and the image of short-term solutions. The design tradition and permanence of concrete construction provides a distinct advantage for the concrete component systems over the pre-manufactured approach.

The rectangular shape and limited size of typical mobile homes have imposed severe constraints on design opportunities for relocatable inmate housing units. In order to meet the size requirements for highway transportation, most factory-produced correctional units are limited to standard trailer dimensions.

When building materials for relocatable units are compared to those of concrete construction, the advantages of precast concrete are apparent. The distinct differences between the pre-manufactured and precast options rest in design opportunities, durability of the materials, economy of construction, and management approaches. Considering these four factors, precast concrete offers more flexible design options; more durable and permanent construction; more economical space and costs; and the opportunity for openness in design to facilitate management by either direct or indirect supervision.

Chapter IV
Financing Issues

IV. Financing Issues

The National Problem

There has never been a greater need for financing construction of correctional facilities. A national survey conducted in 1986 shows that 141 new state correctional institutions are under construction across the nation. When renovations are included, a total of 51,932 beds are now being added to the capacity of America's prisons. The cost of the current effort is estimated at more than \$2.6 billion, and an additional 61,934 bed spaces are planned for the immediate future.¹⁸

State and local agencies are caught between increasing costs of government and limited sources of revenue. Cities and counties must work hard to balance their annual operating budgets, and few units of local government can now afford to finance construction of jails with cash. At the state level, the size and cost of correctional institutions often leave officials confronting financial conditions comparable to those faced by their colleagues in local government.

In all but rare examples, modern jails and prisons are financed through borrowing. Officials recognize that cash or "pay as you go" would avoid costly interest payments, but many state and local governments no longer have sufficient reserves for major capital expenditures. Since most correctional institutions in the future will be built with debt financing, the critical question is: What is the best way to borrow the funds?

Municipal Bonds

State and local governments may raise money for constructing correctional institutions by selling securities in the bond market. Most securities issued by public agencies are called municipal bonds. Compared to the stocks and bonds issued by private companies, municipal securities offer investors an attractive combination of safety and tax exempt income.

These securities offer stability and security that usually cannot be matched by the stocks and bonds issued by private companies. While a private company may lower or eliminate dividend payments at any time, interest payable by state and local governments represents a legal commitment. Similarly, municipal bonds offer a promise to return invested cash on their date of maturity; private sector securities provide no such assurances.

In addition to the safety of the investment, municipal bonds also offer tax-exempt income. As an obligation of state or local government, these securities are exempt from Federal, and generally exempt from state and local income taxes in the state of issuance. For investors who desire tax savings, this feature represents a significant benefit available only from municipal obligations.

Borrowing by state and local government may represent a sound choice for investors who purchase the securities, but what is the best approach for a government agency?

Costs of Borrowing

Like any consumer who buys with credit rather than cash, an agency that finances construction faces significant additional costs. As a general rule, a jail or prison will cost at least twice the actual amount required for construction. For a 20-year fixed rate bond at 8 percent, the cost of a \$10 million jail could actually represent a \$23 million outlay over the duration of the financing period.¹⁹

Issuance Costs

Costs associated with the bonding process represent additional expenses for the state or local agency. Charges relating to the issuance of securities increase the cost by approximately 1.5 to 3 percent, and establishing a reserve fund equivalent to one year's principal and interest adds another 15 percent to the total. The reserve fund may be invested at a rate which offsets the interest cost. Altogether, an agency must plan on borrowing 15 to 20 percent more than the cost of the jail or prison. Costs include the following:

- Legal fees
- Printing and distribution of documents
- Credit ratings
- Bond discounts/Underwriters fees
- Reserve Fund (if desired, may be invested)

Interest Costs

By far the most significant expense is the cost of interest on the debt. Twice each year, interest must be paid by the issuing unit of government to investors who purchased the bonds. The total amount of interest over the duration of financing depends ultimately upon several factors:

- *Interest Rate:* Interest rates in effect at the time securities are issued represent a critical factor. During periods of high interest rates, borrowing is more costly for everyone—from consumers to government agencies. From 1980 to 1985, interest rates as measured by The Bond Buyer Index of 20 Municipal Bonds varied from a high of 13.44 percent to a low of 7.11 percent.²⁰
- *Repayment Schedule:* Although the term or repayment period is generally 20 to 30 years, some agencies have shortened the schedule to reduce interest costs. If the time period is shorter, total interest will be less, since fewer interest payments must be made. Unfortunately, an accelerated schedule requires much larger payments for principal, which most agencies cannot afford.
- *Type of Security:* The specific financial instrument or method of borrowing is the most important determinant of interest cost. Unlike the preceding factors that are determined by the economy, selection of the specific security is a matter of choice.

Traditional Financing Methods

Public resistance to tax increases has made construction financing more difficult than ever before. In the past, general obligation bonds were considered the most desirable type of debt instrument, from the perspectives of both issuer and investor. This approach is depicted by Figure Q. General obligation bonds are distinguished from other securities by their unique pledge of "full faith and credit" from the issuing unit of state or local government. Investors are assured that both interest and principal will be repaid because the debt is a binding obligation, backed by the taxing power of a government agency. The traditional approach for both local and state governments has been to pledge new taxes, subject to approval by the voters, to make interest payments to bond holders.

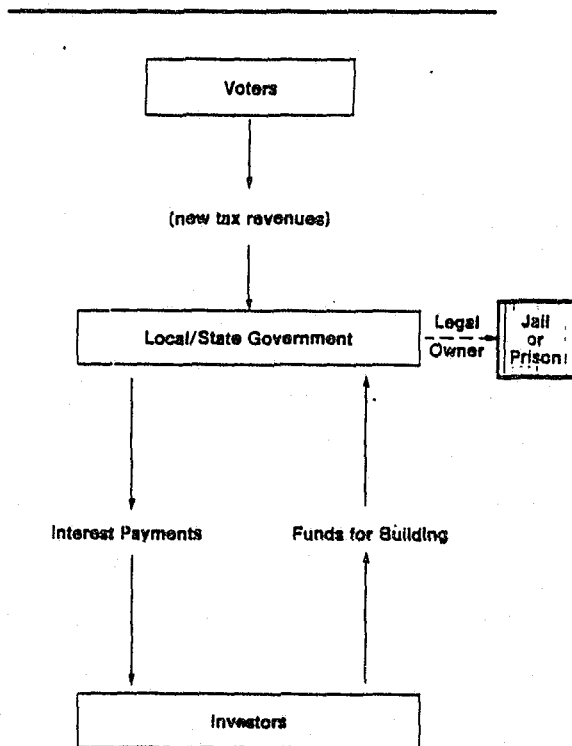
Conventional methods of construction financing are often blocked by one or more of the following obstacles:

- *Debt Capacity:* Like many jurisdictions, the State of Ohio has reached the maximum limit of bonded indebtedness permitted by law. This is a common problem, as most state and local governments have either a statutory or constitutional ceiling imposed on public debt. The debt limit legally restricts or "caps" borrowing by general obligation bonding.
- *Taxing Authority:* In recent years, many units of local government have been stripped of their legal authority to increase ad valorem (property) taxes. Through voter initiatives and state legislation, cities and counties have been prevented from raising taxes without approval by the voters.
- *Tax Base:* Even in jurisdictions permitted to raise ad valorem taxes, practical limits may preclude further taxation. After years of borrowing, many cities and counties have simply exhausted the taxing capacity of real estate. A comparison to other counties may show that increased property taxes would be excessive, as all real property has already been fully appraised and taxed.
- *Budget Allocation:* Annual operating budgets are rarely a source of funding for jail and prison construction. If revenues are frozen by a cap on property taxes, counties may already find it difficult to keep pace with inflation. When a new facility is planned, elected officials are also mindful that it is the annual

budget that must bear the burden of personnel and operating costs. For most agencies, commitment of sufficient funding to retire the construction debt would require substantial cuts in the annual operating budget or depletion of emergency reserves.

- *Special Elections:* When put to the test of an election, voters often refuse to authorize increased taxes for jail and prison construction. Whether presented with a special tax or increased property taxes, the public often looks upon such ballot measures with disfavor. At the local level, required voter approval is sometimes established at a two-thirds affirmative vote. Such is the case in California, where not a single county has secured voter approval for a new jail since the requirement was imposed in 1978.

TRADITIONAL METHOD



Lease-Purchase Financing

The State of Ohio is financing its prison master plan by lease-purchase agreements, illustrated by Figure R. Lease-purchase financing is a method for buying real property and equipment through installment payments. Although technically an installment sale, lease-purchase is based upon a legal arrangement in which the unit of government becomes a tenant in a

facility that is nominally owned by another entity. The relationship is termed a lease because the agency does not actually receive title to the jail or prison until all required payments are made to the entity which financed the construction. Since a lease-purchase issue is a limited obligation issued on behalf of state or local government, income paid to investors is tax exempt just as it is on general obligation bond. Although both are considered to be municipal bonds, lease issues are usually termed "Certificates of Participation."

Similarities:

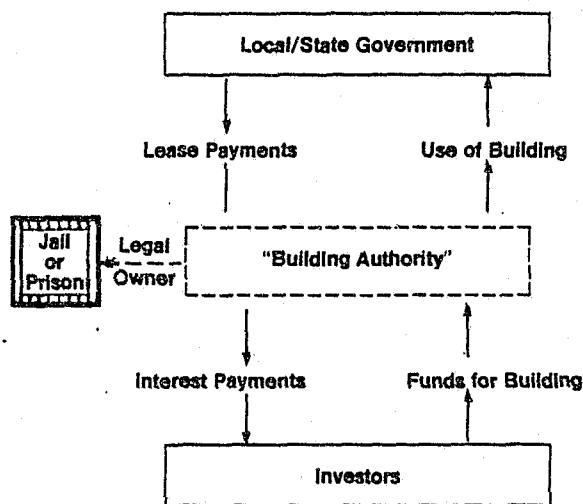
- *Tax Exempt Income:* As an obligation of a unit of state or local government, interest payments to investors are tax exempt. Payments to investors for lease bonds are not subject to federal taxation, and they are also generally exempt from taxes in the jurisdiction of issue.
- *Ownership by Public:* After completion of all payments, the governmental entity ultimately acquires title to the facility. This is usually after 20 to 30 years, but the time period may be accelerated by a shorter debt retirement schedule requiring higher payments.

Differences:

- *Lease Agreement:* The lease-purchase arrangement provides for legal ownership by another entity which leases the correctional facility to the unit of government. Many states permit creation of a public building authority for this purpose. The entity that legally owns the facility and sells the securities on the bond market may be a public agency, non-profit firm, or financial institution. Although the corrections agency controls and operates the facility, the agency is technically a tenant. Since the leasing entity serves only as nominal owner or "middleman," all rights and liabilities are assigned to a trustee bank.
- *Annual Renewal:* A legislative body must appropriate funds for lease payments, and the lease agreement may be terminated by action of the government agency. This provision, termed the "non-appropriation" clause, and legally qualifies the arrangement as a lease.
- *Debt Limit:* Since the obligation is renewable each year, the amount borrowed is not usually categorized as an on-going legal debt and does not count against debt capacity. Like rented

equipment, the facility is leased and not owned, a feature which distinguishes this financing method from general obligation bonds.

- **Taxing Authority:** Lease bonds are not guaranteed with the "full faith and credit" of the city, county, or state. Accordingly, they are not directly backed by the taxing power of the issuing jurisdiction, and general revenues must be used to make payments.



NEW APPROACH

Voter Approval
Not Required

(no new tax revenues)

Issues to be Considered

As shown in Figures Q and R, arrangements for advanced financing are quite similar to the structure used in conventional methods. In both examples, investors purchase a security in the bond market that provides tax exempt income and a promise to repay the principal on the date of maturity. Likewise, proceeds of a lease-purchase issue are used for construction of a new jail or prison in the same manner as general obligation bonds. With both approaches, the unit of government owns the institution "free and clear." But there are issues inherent in

the lease-purchase approach that state and local government must weigh. Following are some of the most important.

Title

Lease-purchase methods require an independent agency to hold title while the unit of government makes installment payments. Depending upon the laws of each state, the entity that receives payments and legally owns the jail or prison may be a public or private non-profit corporation, a joint powers agency, a municipal leasing corporation, or a trustee bank.

This is the first issue to be considered, since the leasing entity must be created if one is not already in place. In Ohio, the state's Building Authority was used for this purpose, and bonds were issued on behalf of the Department of Rehabilitation and Correction.

Higher Cost

Because the lease approach offers less safety than general obligation bonds, a higher rate of return must usually be paid to the investors who purchase lease bonds with a fixed rate of interest. Lease securities lack the commitment of "full faith and credit," because they are not backed by a taxing authority. The arrangement also provides that payments may be terminated by the governmental entity. Together, these factors represent a risk that funds may not be available to make payments.

The higher degree of risk demands a higher rate of interest, thus increasing the cost to governmental entities for lease securities. The interest rate on lease bonds, depending upon the security, usually ranges from one-quarter to one percentage point higher than the rate paid by a unit of government for general obligation bonds. Since interest payments are the major expense for a government agency, fixed rate lease bonds are almost always more expensive than general obligation bonds when compared on the same date of issue. However, this disadvantage for lease financing is somewhat less significant for correctional facilities than for other types of construction, because investors recognize that it is highly unlikely that corrections officials would abandon their new jail or prison. Moreover, a unit of government taking such action would face extreme difficulty in any subsequent rating of its credit.

In the recent past, tax laws have permitted units of government to earn interest on reserve funds. Reserve funds may be created for several purposes, including debt service (to provide funds for one

year's principal and interest payments) and contingencies (to pay for emergencies such as damage by inmates). Federal regulations have limited the total amount to an additional 15 percent, which may then be invested in high yield securities, earning extra income to help offset the interest costs. Depending upon market conditions and prevailing interest rates, this income generally reduces the net cost of lease-purchase bonds to a level comparable to general obligation bonds.

However, the practice of investing reserves for higher earnings has been eliminated by a change in Federal tax laws. In 1986 the U.S. Congress enacted legislation to prohibit the arbitrage arrangement. The rate earned on reserves may no longer exceed the interest costs. As a result, fixed-rate lease-purchase bonds will almost always cost government agencies somewhat more than general obligation bonds issued on the same date.

Repayment of Debt

As shown in Figure R, a key distinction between general obligation bonds and lease-purchase techniques is the difference between sources of money used to pay interest and return principal to investors. A leasing entity or building authority simply passes payments from the government agency through to investors. Lease-purchase methods impose a budget strain on the governmental entity comparable to conventional methods but this procedure does not result in a requirement for new property taxes. Rather, general revenues are pledged, and another source of repayment must be found.

The lease-purchase method does not answer the question of how the government agency will find the funds to make the payments. Without property taxes, officials must either identify an alternative source of revenue or make an allocation from the annual budget of their jurisdiction. Thus, lease-purchase offers opportunities for construction that may be otherwise impossible, but lease methods are viable *only* when officials have identified a source of repayment for the debt.

Jurisdictions now issuing lease securities have developed a number of creative new sources of revenue to take the place of property taxes. Both California and Kentucky have passed laws which dedicate criminal fines and forfeitures to financing of justice facilities. Many jurisdictions have also used new sales taxes for this purpose. Ohio has committed revenues from inmate industries to help secure a portion of the principal and interest due on lease securities.

Timing

A late start on jail or prison construction can be very costly. Both rising interest rates and increased building costs may take a toll on the project budget. Moreover, litigation on crowding may require a swift response, since construction may be ordered by a court.

A vital advantage of lease-purchase is the speed of the process—funds can be raised much faster than with conventional methods. How much faster depends upon factors like state laws on leasing and whether an election would be required for general obligation bonds.

Time savings generally range from 4 to 8 months; 6 months is quite common. This savings impacts the project cost in two ways:

- *Bid Price:* If construction costs are increasing, an early bid can save a substantial amount. Assuming a modest 5 percent rate of inflation, a \$10 million project would increase at \$42,000 per month. Because voter approval and legal requirements can delay a general obligation bond by up to 8 months, the bid for a \$10 million jail or prison could increase by more than \$333,000.²¹ For this reason, the 90-day timetable typical for lease-purchase may represent substantial savings.
- *Interest Rates:* During periods of rising interest rates, a delay can result in greater interest costs. A \$10 million facility would require an issue of approximately \$11.3 million in securities, costing a state, county, or city about \$1,151,000 per year for interest payments (assuming interest at 8 percent). If securities were issued on a later date when rates were just 1 percent higher, the jurisdiction would pay an additional \$87,000 per year for the 20 year duration, or a total of \$1.7 million.²²

In this way, time savings can have the effect of erasing the extra cost for fixed rate lease bonds. Although lease-purchase securities generally bear a higher rate of interest than general obligation bonds issued on the same date, costs may be equalized if general obligation bonds are delayed long enough for interest rates to rise to the same level. Unfortunately, the opposite would be true during a period of declining interest rates, as the gap between more costly lease bonds and traditional methods would grow wider.

Variable Rate Financing

Ohio has sold one of the nation's largest variable rate issues, and the first floating rate securities for state correctional facilities. In 1985, the Ohio Building Authority issued \$79 million in floating rate demand securities, backed by a lease to the Department of Rehabilitation and Correction. A floating rate was evaluated in comparison to conventional methods, and Ohio officials determined that substantial savings could be realized through variable rate demand bonds.

In contrast to traditional fixed rate financing, Ohio's bonds bear an interest rate which changes every seven days, to follow current rates. Like a homeowner's adjustable rate mortgage, Ohio securities pay interest which rises or falls according to changes in the economy. During the year following issuance in April of 1985, the rate paid to investors moved down to 4.5 percent, up to 9.0 percent, and back down to 4.8 percent.²⁴

Lower Costs

Since variable rate securities pay a lower rate of interest than fixed rate bonds at the time of issue, the amount paid to investors by a governmental entity issuing variable rate bonds will generally be less than required by long-term fixed rate bonds. Officials of

the Ohio Building Authority continue to monitor the difference between fixed rate issues and their own floating issue. Figure S compares the Ohio variable rate approach to fixed rate securities. During the first year, Ohio saved more than \$3 million by issuing variable rate securities. Ohio's lower interest costs result from two important distinctions which characterize floating rate securities.

- *Short-term Rate:* The Ohio bonds bear a lower rate because the interest rate is fixed for a very short period of time. Since the rate changes weekly, the bonds do not offer the protection that their interest rate will remain at the level set on the date of issue. For fixed rate bonds, the interest rate remains unchanged for up to 20 to 30 years, even if rates increase dramatically during this period. This protection warrants a premium, and government agencies must pay more to lock-in a fixed rate. Homeowners who compare fixed rate mortgages to variable rate borrowing will note that a 20 to 30-year, fixed rate mortgage always begins with much higher monthly payments. With variable rate mortgages, the savings in house payments can be substantial, and the same rule applies to jail and prison financing. If a governmental agency is willing to give up some safety, interest payments can be much lower.

Figure S
Interest Cost Savings with Ohio Approach
\$79,000,000 Variable Rate Bonds - Comparison to Fixed Rate Securities

Month	Fixed Rate		Variable Rate		Savings*	
	Rate	Interest	Rate Range	Interest Paid	Per Month	Since Issue
April 1985	9.63%	\$633,975	5.15 - 5.20%	\$302,473	\$331,502	\$ 331,502
May 1985	9.63	\$633,975	5.30 - 5.40	\$359,395	\$274,579	\$ 606,082
June 1985	9.63	\$633,975	4.60 - 5.30	\$324,441	\$309,534	\$ 915,615
July 1985	9.63	\$633,975	4.50 - 4.80	\$305,286	\$328,689	\$1,244,304
Aug. 1985	9.63	\$633,975	4.80 - 5.50	\$351,604	\$282,371	\$1,526,675
Sept. 1985	9.63	\$633,975	5.45 - 5.50	\$354,959	\$279,016	\$1,805,691
Oct. 1985	9.63	\$633,975	4.90 - 5.45	\$347,384	\$286,591	\$2,092,583
Nov. 1985	9.63	\$633,975	4.90 - 5.50	\$324,874	\$309,101	\$2,401,384
Dec. 1985	9.63	\$633,975	5.50 - 8.40	\$477,355	\$156,620	\$2,558,004
Jan. 1986	9.63	\$633,975	6.25 - 9.00	\$483,740	\$150,235	\$2,708,239
Feb. 1986	9.63	\$633,975	5.25 - 6.25	\$351,821	\$282,154	\$2,990,393
Mar. 1986	9.63	\$633,975	4.60 - 5.25	\$314,501	\$319,474	\$3,309,867

NOTE: Savings shown here are gross differences, not reflecting costs associated with variable rate lease bonds. Charges to Ohio for a Letter of Credit and remarketing of securities reduce the net savings somewhat. Costs are now estimated at approximately \$400,000 annually.²⁵

* all figures rounded to nearest dollar

- *Liquidity:* The Ohio bonds offer a high degree of liquidity, because investors may quickly obtain the full cash value of their securities. Somewhat like a bank's passbook savings account, the Ohio securities may be cashed in almost immediately.²⁶ In a bank, highly liquid accounts bear a lower interest rate than long term accounts like Certificates of Deposit. The same holds true for Ohio's variable rate bonds, since they may be redeemed or "put" back to the Building Authority with only one week's notice. This permits Ohio to pay a much lower interest rate than would be required for conventional bonds. Moreover, the lower rate was not an obstacle to raising capital. In fact, the entire \$79 million Ohio issue was sold during its first day on the market.

Risks

The short-term variable rate features that result in reduced interest rates for Ohio also create a degree of risk that does not accompany conventional methods.

- *Market Conditions:* Interest rates may not remain at the level in effect at the time of issuance. There is a significant risk that the variable rate may move up to a level higher than the fixed rate available at the time of issue. Looking back, governmental officials might deeply regret their decision to follow a floating rate when it would have been easy to "lock-in" a fixed rate for 20 to 30 years. If rates continued to increase, it would not be long before savings initially realized by variable rate securities would be offset by higher interest payments.
- *Demand Feature:* Although low interest rates are possible because investors maintain the prerogative to "demand" their money, this feature represents a significant risk to a unit of government issuing variable rate securities. Someone must guarantee the cash to investors, since the government agency has already spent the money on building the new correctional institution. Should investors exercise the demand feature, the funds to return their principal must be borrowed from a financial institution until the securities can be re-sold. An underwriter is retained to re-market securities which are "put back" by investors, and the risk of this procedure is that market conditions might make it difficult or impossible to sell the securities.

Security

In order to receive a favorable rating for demand bonds, an issuing unit of government must guarantee a source of funds to pay investors in the unlikely event that bonds cannot be immediately resold. This procedure is known as a "Letter of Credit" and represents the guarantee by a financial institution that funds will be provided to cover the "put" by purchasers who have cashed in their bonds. This liquidity support is an essential feature of demand securities.

This guarantee can also provide credit support for an unforeseen disruption in lease payments. Should the governmental entity face difficulty, investors are assured that a financial institution will cover payments.

When these events transpire, every effort is made to remarket the securities as quickly as possible. Since the government agency must pay higher interest on the funds drawn against the Letter of Credit, the securities must be sold to new investors right away.

Both the Letter of Credit and remarketing fees represent additional costs associated with the demand feature of variable rate securities. These costs have the effect of somewhat reducing the savings available from variable rate securities.

Banks and insurance companies provide this service to government agencies, a feature which costs anywhere from 1/8 of a percentage point up to 1 full percent per year. Ohio pays 0.45 percent to maintain this credit guarantee.

Precautions

The Ohio Building Authority has taken steps to reduce risks associated with rising interest rates. Officials are confident that they have retained sufficient flexibility to allow an appropriate response to adverse economic conditions.

For example, officials may change the schedule for adjusting interest rates, anywhere from weekly to semi-annually or any other period specified by the Building Authority. This mechanism works as a safeguard during periods of interest rate volatility.

The primary protection against dramatic increases in interest rates is a feature called "conversion," which permits Ohio to change from variable rates to fixed interest rates at any time. Should interest rates suddenly soar upward, the Building Authority could lock-in the most favorable fixed rate available. Because of the conversion feature, some agencies have issued variable rate securities in

anticipation of a drop in rates. When a lower interest rate becomes available, an agency may exercise the conversion feature to lock-in a reduced rate for up to 30 years. As a final measure of safety, Ohio has provided that the entire issue may be redeemed or repurchased by the state in the event that the Building Authority wished to arrange for a new financing package.

Advantages of Lease-Purchase

Jurisdictions planning to build correctional facilities may wish to consider the lease-purchase method for a variety of reasons:

- *Variable Rates:* Governmental entities may take advantage of lower interest payments for variable rate lease issues, provided they are willing to assume the risks associated with a floating rate.
- *Avoids Debt Limit:* Leases do not create an ongoing legal obligation for the governmental entity. Leases are not a public debt because they always include a "non-appropriation" clause permitting the lease to be terminated at the end of any year.
- *No Voter Approval:* Unlike general obligation bonds, leases do not pledge taxes, and the taxing authority of a governmental entity may not be used to pay the debt. Since the issue is only a lease, voter approval is almost never required.
- *Flexibility:* Conditions imposed upon the issuer of general obligation bonds may not apply to certain leases. Several states permit agencies to negotiate terms of lease-financing when issued as certificates of participation, while general obligation bonds must be publicly bid. Another example is that date of issue and pricing may be shifted during volatile market periods.
- *Set-Up Time:* Lease financing may be arranged in as little as 45 days, provided that legal and/or organization changes are not required. Conventional methods consume more time to satisfy legal and procedural requirements. This benefit represents a significant advantage since an earlier bidding process may save the costs of inflation and secure a lower interest rate.

- *Set-Up Costs:* The technical requirements for a lease are less onerous than general obligation bonding where an election may be required, and fewer expenses are incurred by a unit of state or local government when establishing lease-financing.
- *Pooled Financing:* Lease packages make it possible for a number of jurisdictions to form an agreement with a single financing entity, thus simplifying the process and reducing costs. The states of Ohio and Kentucky have used pooled financing to sell lease securities for a number of county jail projects.

Disadvantages of Lease-Purchase:

Despite several positive features, lease-purchase financing techniques also have significant disadvantages, which raise important policy questions for a governmental agency.

- *No New Tax Revenues:* Since lease-purchase financing does not require new ad valorem taxes, the unit of state or local government must find another way to make payments. This may require a direct outlay from the annual operating budget, allocation of a new tax, or development of a new revenue source.
- *Higher Interest For Fixed Rate Issues:* Since the investment community does not consider a lease obligation to be as secure as general obligation bonds, fixed-rate lease issues require a higher rate of interest.
- *Risks for Variable Rate Issues:* Although less expensive than conventional financing, floating rate issues are also somewhat risky. Like any homeowner with an adjustable rate mortgage, a state or county assumes the risk of rising interest rates. If interest rates increase rapidly, a unit of government may ultimately have to pay a higher rate than would be required if a fixed rate issue had been selected.
- *Adverse Public Opinion:* Since lease-purchase issues may bypass a ballot measure, taxpayers may view leases as an effort to evade the will of the electorate. The decision to proceed with lease-purchase could therefore become a political issue, particularly if a previous referendum has failed.

Chapter V
Summary and Conclusions

V. Summary and Conclusions

Construction Issues

Questions:

The application of prefabrication techniques to new generation correctional institutions raises several important planning issues. At the onset of the facility planning process, prefabrication may impose constraints on the design. For this reason, the following questions of policy are often asked:

Does a commitment to prefabricated construction impose limitations on the planning process?

No. This is not a problem with concrete components. The Ohio experience shows that a full range of planning options may be considered long before prefabrication is considered. Corrections staff worked with the architects to devise a pre-architectural program responsive to the needs of their department and supportive of new generation concepts.

Can prefabrication be utilized with all design options?

No. Experience with several precast concrete prisons shows that certain limitations must be considered at later stages in the design process. As planners complete schematic drawings, a discipline must be imposed upon the process to ensure that engineering requirements are considered during the design development phase. These parameters include maximizing the repetition of basic elements in the building; reducing curves and unusual angles; and avoiding unique features wherever possible. In order to achieve the greatest time and cost savings, designers should attempt to incorporate the smallest number of different shapes in the largest possible quantities of replication.

Do the design features of a "systems" building enhance direct supervision management?

Yes. A number of benefits may be observed in the Ohio approach. For example, the column and beam structural frame coupled with "Double-T" roof slabs results in wide, expansive dayrooms. As the inmate area is virtually free of columns, correctional officers have an unobstructed view of the entire housing

unit. Elimination of sight obstructions is possible only when long spans are incorporated into the design. The Ross Correctional Institution clearly illustrates how direct supervision may be enhanced through plant-produced building components.

Can all jurisdictions utilize prefabrication and a "systems" approach?

No. Depending upon the location, production of precast concrete and prevailing market conditions are potentially problematic. It is important for corrections officials to confer with their architects and carefully examine the feasibility of materials like precast concrete in their own market area. Although precast manufacturers are located throughout the United States, there may be certain sites where the jail or prison may be an unreasonable distance from a precast plant.

Is the construction method used in Ohio always faster and less expensive than conventional techniques?

Usually, but not always. While prefabrication should always reduce the time required for completion of a correctional facility, costs may be influenced by factors like project management and market conditions. For example, cost savings produced by prefabrication may be outweighed by excessive costs elsewhere in the construction project. The cost of precast concrete will depend upon such market conditions as competition, the number of manufacturers, and the quantity of projects in the region. The particular design will have its own cost implications, and project management will also make a significant difference.

The positive cost impact of the "systems" approach results directly from the time savings. If the cost of materials is comparable, the prefabricated project will generally cost less because it is faster. Contractors must finance their expenditures to maintain cash flow, and faster projects reduce financing costs. If a project can be completed in 12 months rather than 24 months, the contractor may save a year of costs for bonding and insurance, as well as the

expense of borrowed funds. Even more significant cost savings may be realized if the contractor can reduce payroll because crews are on the site for a shorter period of time.

Do prefabrication techniques have a negative impact on the staffing and operating costs of a facility?

No. Although wood frame and steel relocatable units are reported to require comparatively higher staffing levels, this does not appear to be a problem with precast concrete components. Since the architect may use the building components in a wide variety of designs, a correctional facility built with an Ohio-type panel system will require the same level of staffing as one built with conventional construction.

Experience at the Ross Correctional Institution illustrates the full potential for the precast building method to be applied to jail and prison construction. Even though housing units were not completed entirely with plant-produced components, the opportunity for developing a complete precast housing facility can easily be visualized through the Chillicothe experience.

The *Consolidation* of successive stages of the construction process into periods of intensive, simultaneous activities is the key to time savings in a "systems" approach. For example, the normal building process calls for excavation and completion of foundations *before* any work can be done on prison walls. When walls are fabricated at a plant, both activities can take place at the same time. Builders need not wait for completion of foundations to work on all-important tasks like walls and windows.

This approach is described as "fast track" because of overlapping or simultaneous "tracks" in the design and construction process. With an accelerated schedule, it is possible to begin early steps like casting the concrete elements and excavating the foundation even before all design documents have been completed. Efforts to consolidate chronological steps into overlapping or simultaneous activities have been successful in saving time on many jail and prison construction projects.

The *Integration* of diverse trades into completed components represents another principle of "systems" construction. At the typical corrections building site, scheduling of different trades usually becomes a major problem. A common example is that plumbers and electricians cannot both work inside a utility chase at the same time. Prefabrication solves many of these problems through the integration of

several different tasks into a completed "package." When components are delivered to the site, several trades have already completed their work, meaning that much less work needs to be done in the field.

An example of the advantages of the "packaging" concept achieved by prefabrication by the Ross Correctional Institution is the placement of wall insulation. Conventional methods rely on field labor to build a concrete block wall, followed by installation of insulating material. A facade of brick may then be applied, resulting in a "sandwich" effect. In contrast, the new prison at Chillicothe is being built with panels that already contain insulation inside the walls on delivery to the site. Completed walls are erected in a single action, where the conventional alternative would have required three separate and time consuming field construction steps. Effective coordination of project activities is essential. To this end, Ohio and many other jurisdictions have decided to engage the services of professional construction management firms to supervise the construction effort.

To fully capitalize on the potential for early occupancy with prefabricated construction, it is important for the mechanical, electrical, and finishing trades to follow closely on the heels of structural component erection. At Chillicothe, this close coordination was not achieved by the contractors, and the facility is not being completed as quickly as possible.

Critical items that have long lead times must be procured at an early date. It is very important, for example, to place orders as early as possible for items like locking hardware, which may require many months in fabrication before they can be shipped to the site. Officials should provide the necessary incentives for mechanical, electrical, and finishing subcontractors to complete their work in a timely fashion.

Relatively few designs cannot be built with prefabricated components. The new Ohio prison at Chillicothe represents a design which was fully responsive to program requirements and not constrained by the use of precast concrete components. Designs that might preclude a "systems" approach are those with many angles and curves, resulting in a complex design where prefabrication is not cost-effective.

This review of planning, design and construction in the Ohio experience suggests several lessons for state and local officials who are planning to employ advanced construction methods.

- **Planning Process:** Design options and prefabrication alternatives were not considered until *after* operating policies were formulated and planning was completed. Only by proceeding in this order can officials ensure that a design is responsive to all their critical needs.
- **Corrections Policy:** A traditional linear design was rejected and totally new plans were developed along the lines of "new generation" policies. This comprehensive change reflected policies of the new Director and the design is an implementation of his new approach to inmate management.
- **Operating Costs:** Ohio staff recognized that the operating costs over the life of the institution would outnumber initial construction costs by approximately ten to one. For this reason, staffing was streamlined and the new prison design is estimated to save \$100 million over 30 years.
- **Construction Technique:** A detailed review of alternative building methods revealed that precast concrete would be both faster and less expensive than conventional construction. This determination was reached only after a comparative analysis and estimates were completed, based upon prevailing local conditions.
- **Design Parameters:** Optimal use of precast components may be realized through comparatively simple designs and maximum repetition. Although precast need not impose limitations on planning and design, a decision to utilize precast should be made no later than the schematic phase of the process.
- **Project Management:** Coordination of a large precast construction project requires a high degree of organization and intensive field supervision. Institutions of this scale clearly benefit from oversight by a professional construction management team, responsible for duties such as scheduling, estimating, inspection, and value engineering.

Financing Issues:

Questions:

A few of the most commonly asked financing questions are given below as informal guidance for officials now planning jail and prison expansion.

If a jurisdiction cannot raise funds to build a correctional institution because of obstacles to conventional financing, can lease-purchase help?

Yes. Lease-purchase financing may serve as an appropriate alternative to traditional financing when conventional alternatives have been exhausted. Legal distinctions make lease financing possible where conventional methods may be precluded. However, the lease-purchase approach may not be as safe or economical. Variable rate issues are somewhat risky, and fixed rate leases are more expensive than general obligation bonds.

If a jurisdiction does not have funds to make payments on general obligation bonds, will lease-purchase methods solve the problem?

No. Like conventional methods, the lease-purchase approach also requires annual payments. A stream of revenue must be identified to cover lease payments. Many jurisdictions have created new sources of revenue. Examples may be found where sales taxes, filing fees, and fines are used to satisfy the required payments. Ohio has pledged sales revenues from penal industries.

Variable rate lease issues are less expensive than conventional methods, and may be of assistance to jurisdictions with a limited ability to make payments. However, the extent of savings depends upon many factors, including changes in interest rates, and whether funds must be drawn against the Letter of Credit.

Since the variable rate securities have a "put" feature, does this mean the government agency must return the money to investors if they exercise the demand feature?

Yes. However, a government agency would prepare for this possibility by securing a Letter of Credit (LOC) and immediately remarketing the securities to a new purchaser. The LOC represents a loan, so that funds may be borrowed to pay investors if the bonds are not resold.

When state or local government officials issue a variable rate lease bond, are they protected from increases in the interest rate?

No, not completely. Underwriters have developed a number of features to afford a high level of protection, but the risks are not entirely eliminated. Safeguards come in the form of conversion features, allowing an agency to switch from a variable rate to a fixed rate; to change the schedule for adjustments in interest rates; and to buy back the entire issue for refinancing.

If the prime rate were to increase at a pace which concerned officials, the conversion feature could be exercised to provide the protection of a fixed rate. However, the fixed rate available at that time would be higher than the fixed rate available at the time securities were issued. How much higher these rates might be at conversion depends on how quickly the prime rate advances and when the decision for conversion is made.

Do lease-purchase methods represent "privatization" of corrections?

No. These finance methods do not involve the private sector in any position of management or control over corrections agencies. The role of the sheriff or corrections director remains unchanged when the finance techniques described in this publication are used to build a correctional facility.

An entity like the Ohio Building Authority is not a private firm, and ownership of correctional institutions never passes to a profit-making company. Independent, non-profit governmental/corporate agencies such as the Ohio Building Authority were in widespread use all across the nation long before the current debate over private sector management of correctional institutions.

A true example of "privatization" is one where a private company assumes responsibilities formerly discharged by a government agency, and such arrangements do not necessarily have anything to do with how to finance construction of a new jail or prison. A few examples may be found where units of government have built correctional institutions with advanced finance methods and also decided to contract with private companies to operate the facilities. Although very limited in number, these true examples of "privatization" have contributed to a mistaken understanding that all applications of new finance methods result in private sector ownership and/or management of correctional facilities.

As demonstrated by Ohio, lease-purchase bonds come in several forms, and variable rate issues can be quite complicated. While a fixed-interest lease requires the issuer to pay investors up to one percentage point *more* than general obligation bonds, a floating rate lease costs *less* than the traditional method. As shown in Figure T, the differences may be significant. Ohio pays almost 4.5% less than would be the case if general obligation bonds had been selected. If officials are willing to assume risks associated with rate increases and remarketing, variable rate securities may result in substantial savings.

Figure T
Comparison of Interest Costs²⁷

Conventional Finance Rate	New Method Fixed Rate	New Method Variable Rate
General Obligation Bond	Lease-Purchase Bond	Lease-Purchase Demand Bonds
9.63%	10.09%	5.15%

Like Ohio, other jurisdictions have tested variable rate financing of correctional facilities. The City of Philadelphia recently financed a jail with floating rate securities. In California, both Los Angeles and Sacramento counties issued similar securities for criminal justice facilities.

The Ohio plan has been expanded to include local jails. On February 15, 1986, another issue of \$25 million was sold to finance construction of county jails throughout the state. Like the lease issue for prison construction, these securities were also variable rate demand bonds. Another \$180 million prison issue was sold during the summer of 1986.

Evaluation of financing options has become a complex undertaking, and mistakes can be costly. Officials should exercise caution when considering alternative finance methods. A variety of strategies for borrowing may be considered by officials planning to build correctional institutions, and positive or negative consequences of their financing decisions may endure for as many decades as the institution itself.

To help make these decisions, many jurisdictions have engaged the services of a professional financial advisor. Independent consultants and accounting firms may be retained to analyze the alternatives and prepare recommendations for review by the government agency. Investment bankers also provide these services as part of their underwriters contract to arrange for financing.

Although Ohio's variable rate approach is responsive to needs and priorities in that state, this method may not be the answer for everyone. Because financing alternatives now available to state and local officials are numerous and diverse, general conclusions are inappropriate. Each city, county, and state should consider the unique factors which bear upon its ability to raise capital and repay debt. Fixed rate lease financing is being employed in many states, including California, Colorado, New York, Rhode Island, Florida, Kentucky, New Jersey, Alaska, Georgia, Alabama, Michigan, Missouri, Texas, Indiana, Louisiana, and Oregon.

Lease-purchase financing is a viable alternative for agencies that are blocked from use of conventional

methods. However, lease bonds are likely to cost a governmental entity more money, in the form of higher interest payments. Variable rate securities can cost less than both fixed rate lease bonds and general obligation bonds, but this approach presents certain risks which must be carefully considered.

Only rigorous quantitative analysis can determine which approach works best for each agency. Like Ohio, many state and local agencies are weighing the risks of variable rate lease securities against the substantial savings that may be realized from this approach, and this creative new technique is growing in popularity across the nation.

Further Information About Lease-Purchase Financing. . .

Do you want to evaluate how the information presented here may be applicable in your jurisdiction? Another National Institute of Justice publication, available soon, provides details on lease-purchase financing in clear, understandable terms. The publication leads you through simplified examples of financing facility construction, complete with cost calculations, and compares lease-purchase financing costs to those of traditional general obligation bond financing.

To order your copy, call (800) 851-3420 or write to the National Criminal Justice Reference Service, P.O. Box 6000, Rockville, MD 20850, and request *Lease-Purchase Financing for Prison and Jail Construction*.

VI. For More Information . . .

Ohio State

Officials:

Richard P. Seiter (614) 431-2762
Director

Robert Prosser (614) 431-2771
Public Information Officer

David Blodgett (614) 431-3213
Activation Manager

Roger Overberg (614) 431-2806
Design Contact

Ohio Department of Rehabilitation & Correction
1050 Freeway Drive, North
Suite 403
Columbus, OH 43229

Architect:

Louis F. "Zeke" Boros
Director of Criminal Justice Services
The Voinovich Companies
2450 Prospect Avenue
Cleveland, Ohio 44115
(216) 621-9200

Building System:

Glen Moenich
Forest City Dillon, Inc.
10800 Brookpark Road
Cleveland, OH 44130
(216) 267-1200 ext. 2555

Finance:

Michael J. Dorrian
Executive Director
Ohio Building Authority
30 East Broad Street
Columbus, OH 43215
(614) 466-5959

John C. Conner
First Vice President
McDonald and Company Securities Inc.
2100 Society Building
Cleveland, Ohio 44114
(216) 443-2800

General

Contractor:

Bill Edwards
Vesta Construction Company
1133 West Columbus
Box 250
Bellefontaine, Ohio 43311
(513) 592-8010

VII. The National Institute of Corrections— Facility Planning and Design Services Available to State and Local Governments

The National Institute of Corrections is a national center of assistance to the field of corrections. The goal of the agency is to aid in the development of a more effective, humane, constitutional, safe, and just correctional system.

The National Institute of Corrections is both a direct-service and a funding agency serving the field of corrections. Its five legislatively mandated activities are: (1) training, (2) technical assistance, (3) research and evaluation, (4) policy and standards formulation and implementation, and (5) clearinghouse. The basic objective of the Institute's program is to strengthen corrections at all levels of government, but primarily at the state and local levels.

As established by the enabling legislation, the Institute's policy is determined by a 16-member non-partisan Advisory Board appointed by the Attorney General of the United States. The Board is composed of six federal officials serving *ex officio*, five correctional practitioners, and five individuals from the private sector who have demonstrated an active interest in corrections. Through public hearings the Advisory Board regularly solicits the opinions of correctional practitioners and others involved in the criminal justice process prior to targeting the Institute's fiscal year funds.

• *Jails Division*—The Jails Division was established in June 1977 in Boulder, Colorado, to serve as an identifiable source of assistance to the nation's jails. Creation of the "NIC Jail Center" marked the first time federal funding was specifically targeted to solving the vast number of problems in the nearly 3,400 jails throughout the country.

The Jails Division's targeted technical assistance program, "Planning of New Institutions" (PONI), is in its eighth year. Through this well-received program, the Institute has provided assistance to more than 250 local jurisdictions in the planning, design, construction, and transition to new jail facilities.

The Institute's multiyear research effort entitled "Model Architectural Plans for Small Jails" has produced two documents to assist local jurisdictions: *The Nature of New Small Jails: Report and Analysis* and *Small Jail Special Issues*. The final product of this effort, a design guide for small jail construction, is scheduled for release in the summer of 1987.

NIC Jail Center
1790 30th Street, Suite 440
Boulder, Colorado 80301
(303) 497-6700

• *Prisons Division*—Training and technical assistance services related to new prison planning and construction are provided to state agencies through the Institute's Prisons Division.

NIC Prisons Division
320 First Street, N.W.
Washington, D.C. 20534
(202) 724-8300

• *NIC Information Center*—The Institute operates a national Information Center in Boulder, Colorado. Services are available to the field free of charge.

NIC Information Center
1790 30th Street, Suite 130
Boulder, Colorado 80301
(303) 444-1101

VIII. National Institute of Justice— Construction Information Exchange

At the direction of Attorney General Edwin Meese III, the National Institute of Justice has developed a new program of research and publications to assist officials who are planning to build correctional facilities. The goal of this initiative is to promote an ongoing exchange of information about new construction, remodeling and expansion of the nation's jails and prisons.

Through the Construction Information Exchange, agencies now planning to build are put in contact with jurisdictions that have faced comparable issues. Officials then share information about the critical issues they have in common. In this way, successful experience can be transferred and past errors can be avoided.

Construction Data Base

The heart of the National Institute of Justice program is a computerized library that permits State, local, and Federal officials to share lessons learned from recent jail and prison construction projects.

As new projects are completed, the critical facts and figures are entered into an automated information system at NIJ's National Criminal Justice Reference Service. Detailed reports can be easily obtained by calling or writing to the Construction Information Exchange, where a reference specialist will search the computer for information to match the needs of the requesting agency.

The data base serves criminal justice practitioners in several ways. A sheriff, for example, who is planning to build a combined jail and court facility may contact the Construction Information Exchange to obtain a special search of the data base describing facilities of this type. The sheriff will receive a computer printout providing a wealth of detail on projects like the planned facility, and persons to contact for further information on the projects will also be listed. In addition, many of the architects responsible for designing facilities included in the data base have agreed to provide a package of descriptive materials on their projects.

National Directory of Corrections Construction

The directory is a reference guide to correctional institutions built since 1978. The first edition includes information on 102 prison and jail construction projects totaling \$1,184,412,000 in construction costs. The projects shown in the first edition have design capacities for a total of 31,860 inmates.

The *National Directory of Corrections Construction* is designed so correction officials who are planning construction can benefit from the experiences of their colleagues. In this way, jurisdictions can avoid "reinventing the wheel," a problem that has too often characterized the process of building jails and prisons. Through the directory, officials who are about to begin this difficult process can review data gathered about comparable projects and contact colleagues who have important information to share about completed facilities.

This publication also can serve as a research resource, as it contains quantitative information for comparison of different projects. Never before have so many aspects of correctional facility construction been systematically compiled and reported. Construction costs and building features were carefully examined. This information has been verified by architects and, where possible, the facts have also been verified by the public officials responsible for each facility.

Updates of this directory will be drawn from the expanding data base to ensure availability of the most current information on recently completed jails and prisons.

Construction Bulletins

Another element in the program is a new publication series, NIJ *Construction Bulletins*. These special reports provide indepth case studies of selected projects, giving State and local officials a closer look at noteworthy facilities drawn from the directory. The *Construction Bulletins* explain in more detail selected projects and current issues. They report on

progressive techniques of management, creative designs, and new methods of construction. Each bulletin contains concise details on individual projects that demonstrate particularly helpful approaches.

Those jurisdictions whose projects have been published in the *Construction Bulletins* have agreed to provide information on the design and building of their facilities and to host site visits of their facilities by officials currently involved in new construction projects.

With this new corrections construction initiative, the National Institute of Justice is responding to priorities identified by corrections agencies. By referring to these publications, officials can learn from facilities where new technologies and efficient construction methods have been employed to save time and money. Jurisdictions planning to build will receive a response tailored to their individual interests and needs from the new Construction Information Exchange.

For information concerning services to register a facility with the
Construction Information Exchange

call the
National Institute of Justice
Construction Information Exchange
800-851-3420, or
301-251-5500

or write
Construction Information Exchange
National Institute of Justice/NCJRS
Box 6000
Rockville, MD 20850

IX. Notes

1. Data from Bureau of Justice Statistics, U.S. Department of Justice, "Prisoners in 1977" through "Prisoners in 1984."
2. Ohio building plans include 10,544 beds, 1,451 of which are to replace space in delapidated facilities, resulting in a net increase of 9,083 beds. The planned capacity will be increased to 21,491 as the Ohio Reformatory is to be closed upon completion of new construction.
3. Paul Misfud, "The Changing Role of Correctional Architecture," *Corrections Today*, American Correctional Association, April 1984, pp. 16-17.
4. *1984 Architecture for Justice Exhibition*, American Institute of Architects, Committee on Architecture for Justice, August 1984, pp. 50-53.
5. Data provided by F.C. Dillon. See "Building a Precast Prison," *Concrete Construction*, February 1986, pp. 145-150.
6. Wantland J. Smith, AIA, CE, "Systems Construction for the New Generation Jails and Prisons," *Design Resource File 1985, Volume II*, Architecture for Justice Committee, American Institute of Architects, and *Los Angeles Herald Examiner*, Sunday, April 8, 1979, Section C.
7. Data provided by Voinovich Sgro. Cost of masonry and brick facade \$3,211,760 plus \$527,760, sum of \$3,738,936.
8. Data provided by Voinovich Sgro and verified by Ohio Department of Public Works.
9. NIJ summary data of 50 single-cell institutions, medium security, new construction, support facilities included. Sample controlled for comparability.
10. *1984 Architecture for Justice Exhibition*, American Institute of Architects, Committee on Architecture for Justice, August 1984, pp. 50-53
11. Data provided by Ohio Building Authority. Note: Ohio has utilized both general obligation bonds and variable rate demand bonds. Funds for the Ross Correctional Institution were proceeds of earlier fixed rate lease bonds.
12. Cresson shown in *1985 Architecture for Justice Exhibition*, American Institute of Architects, Committee on Architecture for Justice, August 1985, pp. 96-97.
13. Charles B. DeWitt, "New Construction Methods for Correctional Facilities," U.S. Department of Justice, National Institute of Justice, March, 1986.
14. Survey data collected by Charles B. DeWitt, National Institute of Justice, *National Directory of Corrections Construction*, U.S. Department of Justice, June 1986.
15. Charles B. DeWitt, National Institute of Justice, *National Directory of Corrections Construction*, U.S. Department of Justice, June, 1986. Contains a detailed discussion of cost comparisons and provides information on how to review cost data.
16. Charles B. DeWitt, "Florida Sets Example With Concrete Modules," U.S. Department of Justice, National Institute of Justice, March 1986.
17. Stephen A. Carter, "Evaluation of Pre-Manufactured Housing for Correctional Purposes," U.S. Department of Justice, National Institute of Corrections, February 1984.
18. George and Camille Camp, *Corrections Yearbook 1986*. Criminal Justice Institute, South Salem, New York, 1986.
19. Assumes construction cost of \$10 million is financed as \$12 million issue. Interest payments at 10 percent are \$1.2 million annually for 30 years.
20. The Bond Buyer, 1 State Street Place, New York, NY 10004. Founded in 1891.
21. Assumes construction cost of \$10 million is financed as \$12 million issue. Interest payments at 10 percent are \$1.2 million annually for 30 years. With 5 percent annual inflation project cost increases \$500,000 annually or \$41,667 each month.
22. Interest rate of 9 percent on \$11.3 million issue would be \$1,237,875 versus \$1,150,000, representing an additional cost of \$86,946 annually or \$1,738,920 for 20 years.

23. Legislation pending in July 1986 is H.R. 3838.

24. Rate at issue in April 1985 was 5.15 percent. Ohio Building Authority reports a low of 4.5 percent and a high of 9.0 percent during the first year following issuance.

25. Data provided by Ohio Building Authority.

26. Current procedures require one week notice for exercising the "put," or option/demand feature.

27. Shown is Ohio's actual variable rate compared to the G.O. rate and revenue bond rate, each shown on April 4, 1985, the date of issue. From "The Bond Buyer, op. cit. Each example is 20-year term. Interest rates in effect in Ohio for representative securities shown. Data provided by McDonald and Company.

Note: Readers are cautioned that generalizations may not apply to every jurisdiction across the nation. State and local laws will vary, resulting in somewhat different applications.

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XI. About the Study Team . . .

Charles B. DeWitt is a Research Fellow at the National Institute of Justice and Project Director for a research project relating to construction of correctional facilities. Mr. DeWitt has held several posts in law enforcement and criminal justice. Prior to joining NIJ, he was the Director of Justice Services in Santa Clara County, California, where his duties included planning and construction of correctional facilities. Mr. DeWitt is a member of the faculty at the National Academy of Corrections and is the author of the *National Directory of Corrections Construction*. He also writes the *NIJ Construction Bulletin* series, publications of the U.S. Department of Justice.

Stephen A. Carter, AICP, is the founder and President of Carter/Goble Associates, Inc., a planning and management consulting company based in Columbia, South Carolina. He serves as a consultant to the National Institute of Corrections and authored the NIC study, "Evaluation of Pre-Manufactured Housing for Correctional Purposes." He is responsible for the design of several precast concrete facilities, and has been project manager on planning studies for 6,000 bed spaces nationally. He was the principal author of the South Carolina and Arizona Comprehensive Master Plans as well as correctional plans for more than 50 counties nationwide.

Norman L. Scott is President of Consulting Engineers Group, Inc., of Glenview, Illinois, San Antonio, Texas and Napa, California. He is past president of the American Concrete Institute. His firm has served as structural engineer on a number of precast concrete prisons, including projects in California, Texas, Virginia, Florida, Tennessee, Illinois and Maryland. The firm has prepared two studies on the subject, one for the Prestressed Concrete Institute entitled, "Precast and Prestressed Concrete for Justice Facilities," and another for Santa Clara County, California "Reducing Time and Cost of Jail and Prison Construction with Precast Concrete."

For information on this publication:

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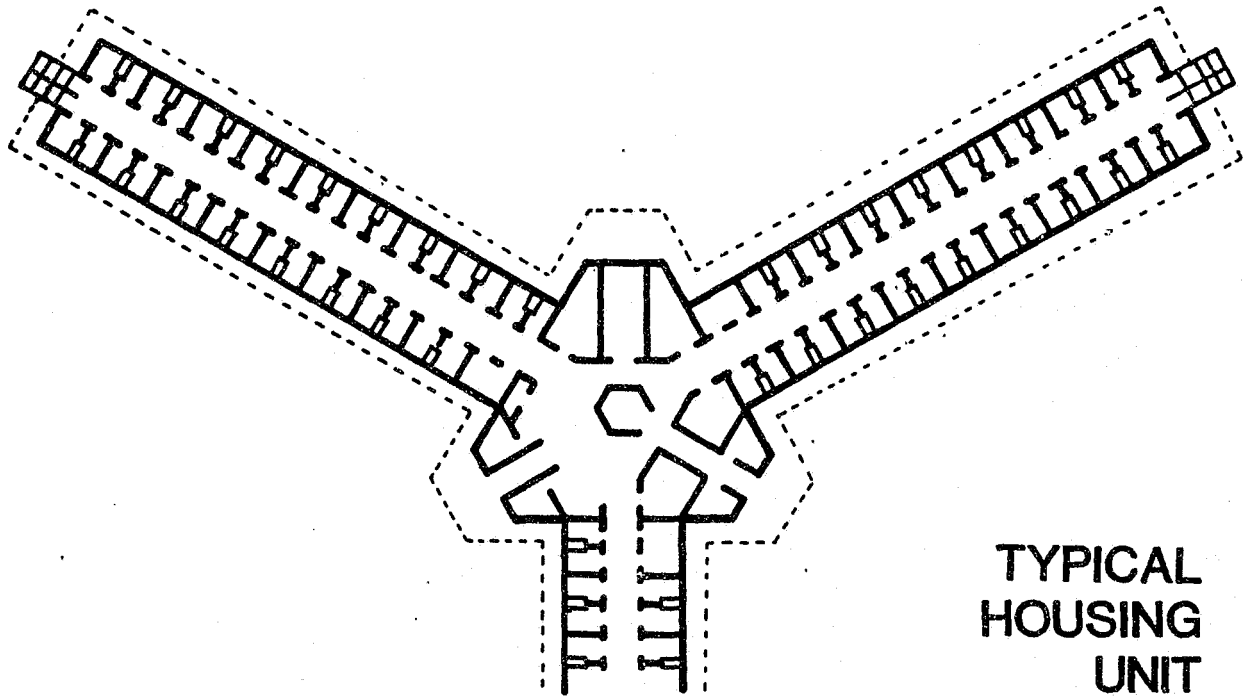
Norman L. Scott, President
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1701 E. Lake Avenue
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(312) 729-0646

Appendix A
**Types of Inmate Management and
Related Designs**

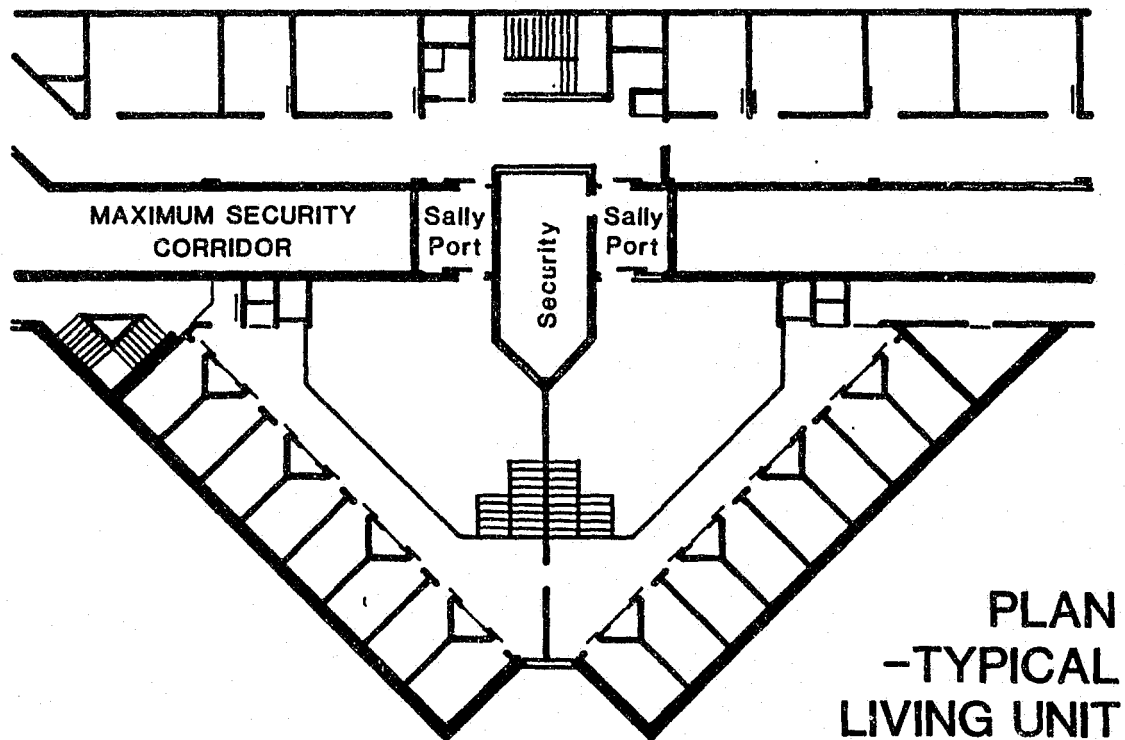
**Jail Architectural/
Management Categories**

- Linear/Intermittent Surveillance
- Podular/Remote Surveillance
- Podular/Direct Supervision

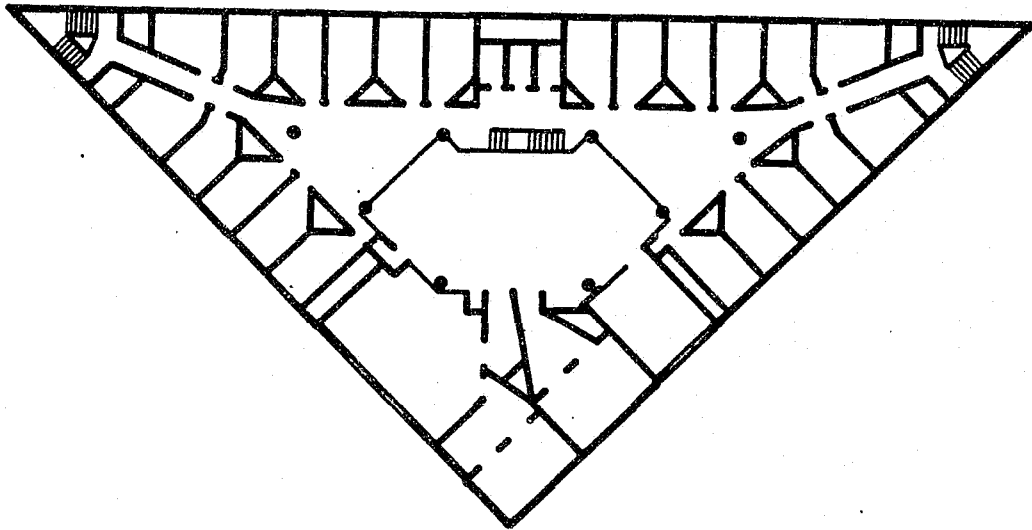
LINEAR/INTERMITTENT SURVEILLANCE



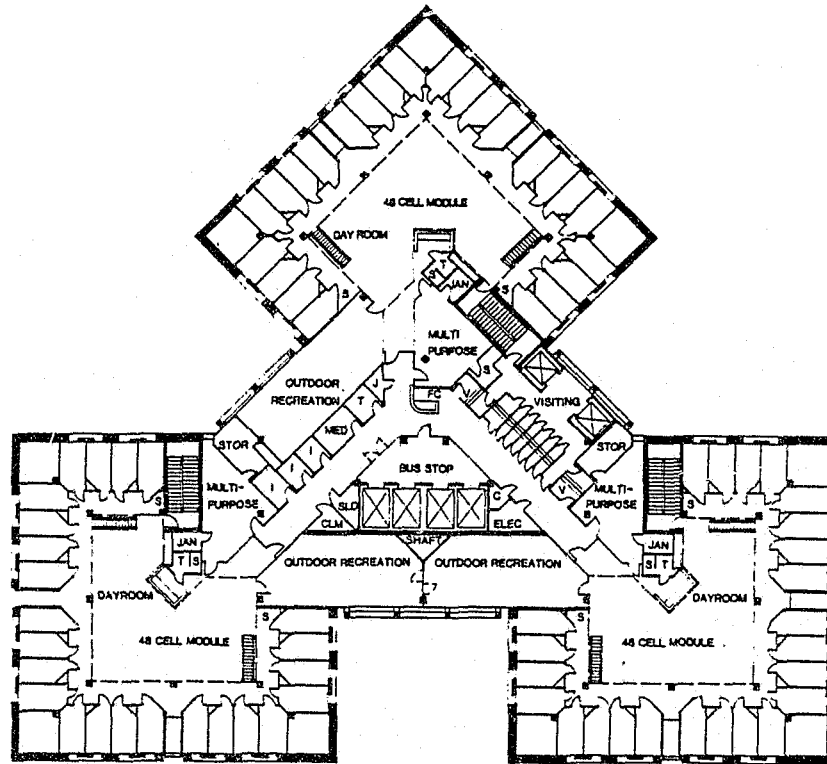
PODULAR/REMOTE SURVEILLANCE



PODULAR/DIRECT SUPERVISION



Appendix B
Examples of Systems Construction
in "New Generation" Jails



Santa Clara County Jail

Facility Mission

The Santa Clara County Hall of Justice will serve as the central intake center for thirteen law enforcement agencies in a jurisdiction of over one million residents. It will be located contiguous to the existing 700-bed jail at the Sheriff's Department in the San Jose civic center. As the first stage in a master plan, the jail will house pretrial inmates and will be connected via tunnel to the planned courts facility.

Design Approach

The building is planned as a maximum security detention center of eight stories, with one sub-level. The jail housing is provided on five levels, each with three two-tiered housing modules, massed as separate, interconnected towers extending upward from the two-story base structure containing jail-support functions. Intake, pre-housing and court transfers are planned for the basement level. Each 48-cell module has a two-story dayroom and an adjacent recreation deck providing exposure to sunlight and fresh air.

Precast concrete will be used for the structural system in housing module towers, floor system, interior walls and exterior walls. Cast in place shear walls and floor toppings and concrete block security wall construction will also be employed.

Jurisdiction: County of Santa Clara, California

Location/Address: Office of the Sheriff
150 W. Hedding Street
San Jose, CA 95110

Completion Date: December 1987 (est.)

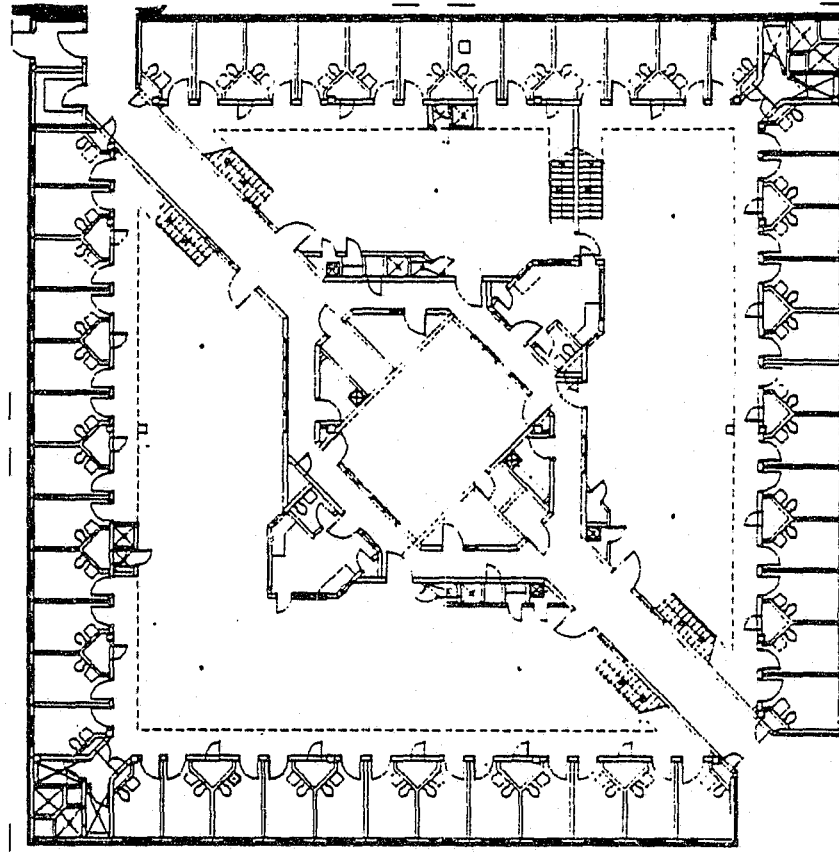
Gross Square Feet: 331,000 GSF

Total Cost: \$52,667,505

Capacity: 785

Architect: Wantland J. Smith, AIA, CE
Dworsky, Hawley & Peterson
2029 Century Park East
Suite 350
Los Angeles, CA 90067
Contact: Wantland J. Smith,
AIA, CE, (213) 552-0822

Sheriff: Robert E. Winter (408) 299-2101



Boulder County Jail

Facility Mission

The Boulder County Jail will provide additional space for the Sheriff's Department at a new location, away from the downtown Justice Center complex. The facility is being designed for both pretrial and sentenced inmates in a direct supervision setting.

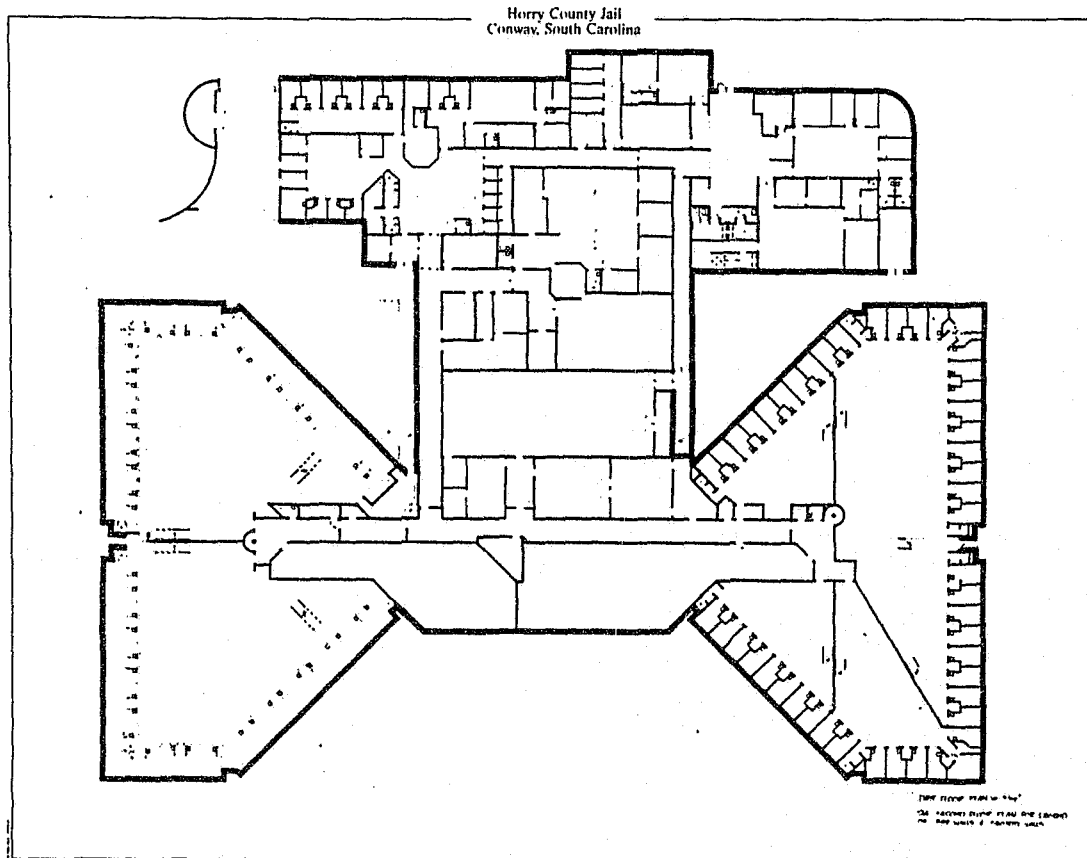
Design Approach

The jail plan features a central courtyard surrounded by inmate housing and program elements. The courtyard is to be utilized for both passive and active recreation and in mild weather for circulation. The facility provides housing for 287 inmates divided into various levels of classification, which are delineated by different construction finishes. These divisions include a 96-person dormitory unit for weekenders and work release detainees. The program areas include court services, contact and noncontact visitation, health services, active and passive indoor recreation, library, classrooms, multi-purpose rooms, and segregated outdoor recreation for the non-general inmate population. Centralized and decentralized dining and commissary services are to be provided. The jail elements are grouped together to

form a consolidated building unit. Fencing and barrier devices will be kept to a minimum at the complex's perimeter.

Precast concrete will be used for exterior walls and the roof system. Interior walls and building frame are conventional.

Jurisdiction:	Boulder County, Colorado
Location/Address:	Sheriff's Department 1777 6th Street Boulder, CO 80302
Completion Date:	September, 1987 (est.)
Gross Square Feet:	103,400 GSF
Total Cost:	\$11,000,000 (est.)
Capacity:	287
Architect:	Lescher and Mahoney, Architecture and Engineering, and Dana Larson Roubal and Associates 400 Essex Court, Regency Park Omaha, NE 68114 Contact: Jack A. Chapin, Jr., AIA. (402) 393-4100
Sheriff:	Brad Leach (303) 441-3630



Horry County Jail

Facility Mission

This 200-bed county facility serves one of the fastest growing coastal communities in South Carolina. The facility combines pretrial and sentenced populations. The sentenced inmates have work assignments in the community during the day. The custody level of inmates ranges from minimum custody-community release to maximum security pretrial inmates. Inmate activities focus on counseling, recreation, and classroom job training.

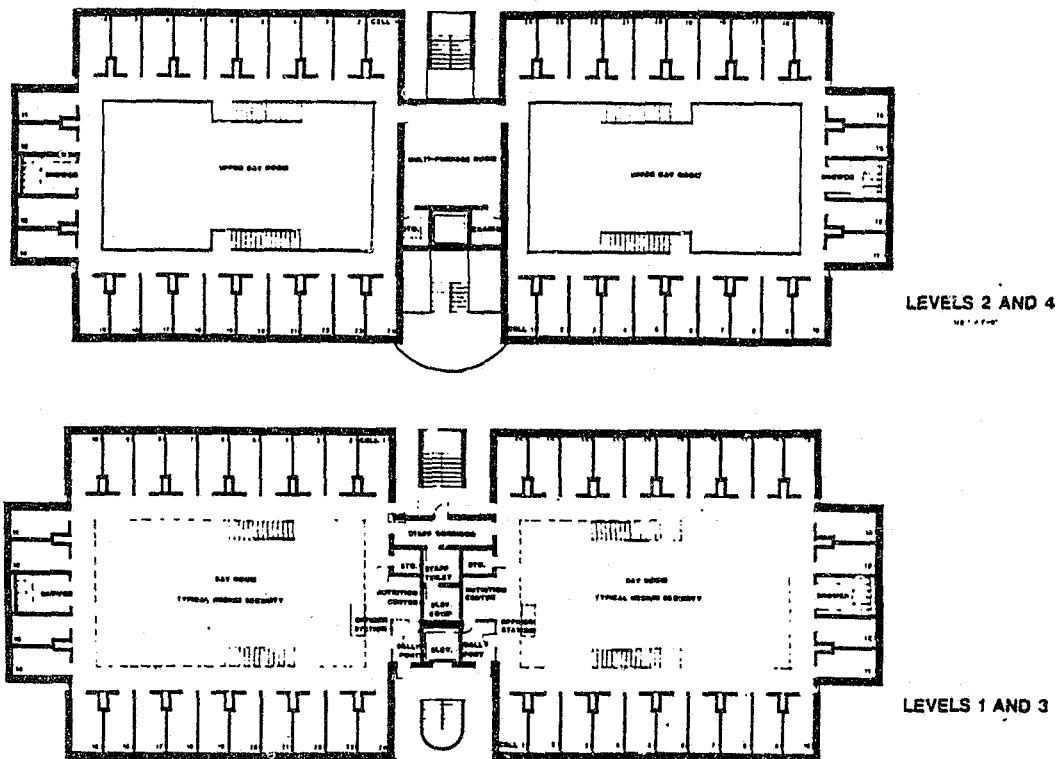
Design Approach

The facility is located at the Government Center in Conway, South Carolina, and, is therefore an urban institution. Perimeter security is provided by the outside walls of the facility. The housing unit is based on the direct supervision approach, with officers assigned to each of the 48-bed housing modules. Visitation takes place at the housing unit through a visitor dedicated corridor at the second level. Sentenced inmates assigned to community work programs enter and leave the facility through a special processing area. All other inmates are processed through the booking and release component. A

special waiting lounge is used by those inmates who will be held for a short period of time before release.

Precast concrete components are proposed for the exterior and interior walls in the housing area. The exterior walls of non-inmate housing areas will be precast concrete panels.

Jurisdiction: Horry County, South Carolina
 Location/Address: P.O. Box 1236, Conway, SC 29526
 Completion Date: February, 1988 (est.)
 Gross Square Feet: 76,000 GSF
 Total Cost: \$6,800,000 (est.)
 Capacity: 200
 Architects: Timbes/Wilund/Usry/Architects
 and Carter Goble Associates,
 Corrections Consultants
 5001 North Kings Highway,
 Suite 203
 Myrtle Beach, SC
 Contact: Steve Carter
 (803) 765-2833
 Chief of Police: Gordon Harris (803) 248-6247



Charleston County Jail

Facility Mission

Approximately 265,000 persons reside in Charleston, South Carolina, which presently supports a jail with an average daily population of 300 inmates. The expansion program includes two new 400-bed housing units for pretrial, sentenced, female, and behavioral problem inmates. The existing 18-year-old facility will be converted to support services for the new inmate housing components.

Major inmate activities will include indoor and outdoor recreation, classroom education programs, substance abuse counseling, and religious programs. The facility will house pretrial and sentenced inmates in single cell, 48-bed housing units.

Design Approach

In response to client specifications, the facility will use existing prototype plans and adapt them to Charleston County's mission statement and site constraints. The two new inmate housing units are comprised of 48-bed housing units constructed vertically to achieve a four-story facility. The perimeter is secured through a double fence, mobile patrol system. The two 200-bed housing units are connected to the existing facility through covered corridors.

Precast concrete components will be used to construct the exterior and interior walls. The day room configuration reflects a direct supervision concept in all but the segregation unit. Multipurpose spaces for counseling and other activities are located at the housing unit.

Jurisdiction:	Charleston County, South Carolina
Location/Address:	2 Courthouse Square, Charleston, SC 29401-2263
Completion Date:	November, 1987 (est.)
Gross Square Feet:	68,000 GSF
Total Cost:	6,500,000 (est.)
Capacity:	400
Architects:	Middleton, McMillan Architects and Carter/Goble Associates, Corrections Consultants 167 East Bay Street, Suite 200 Charleston, SC 29401 Contact: Steve Carter (803) 765-2833
Sheriff:	Charles F. Dawley (803) 723-6769

Note: This proposed plan has not been approved by local officials, as other alternatives are being considered.