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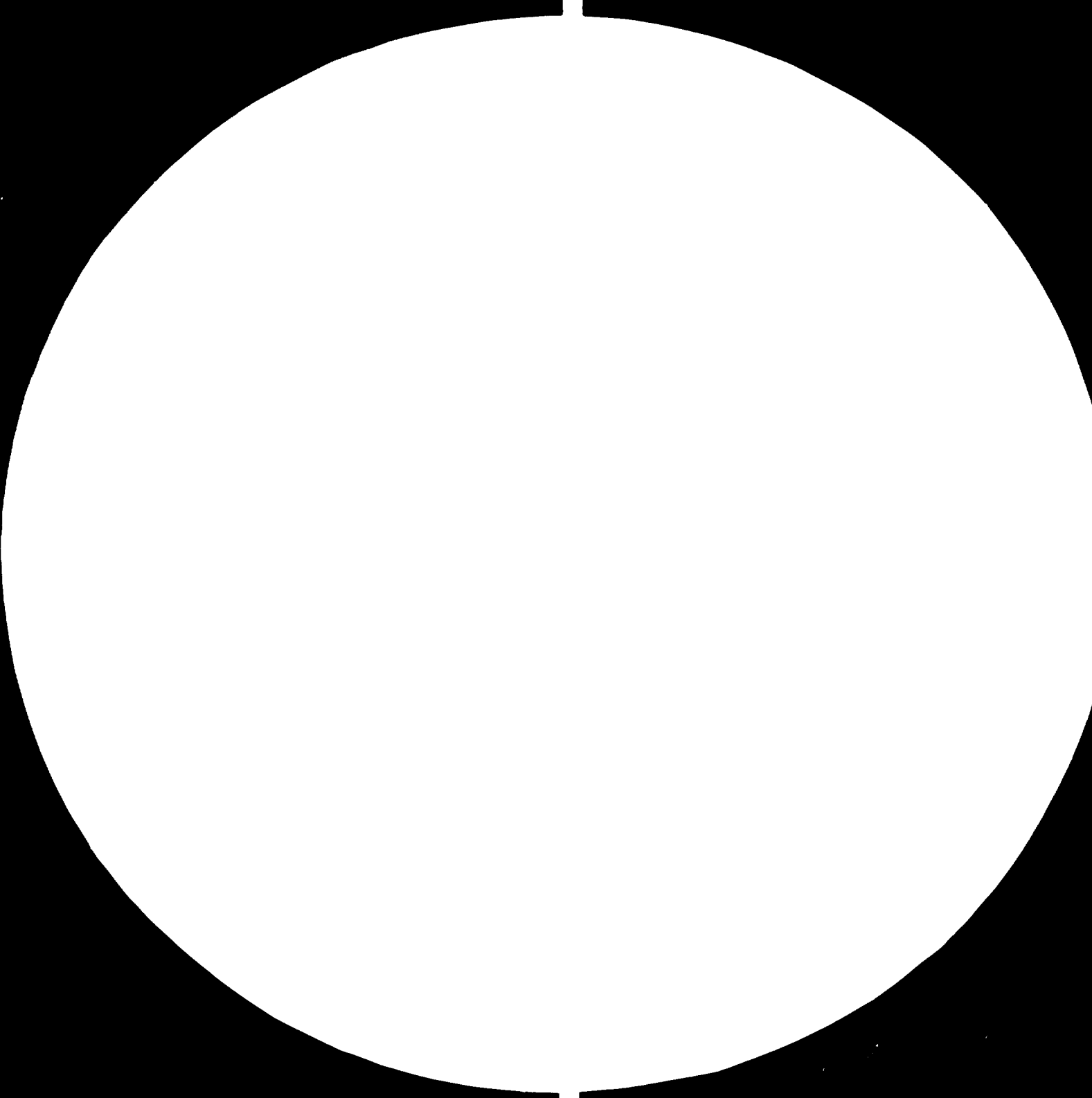

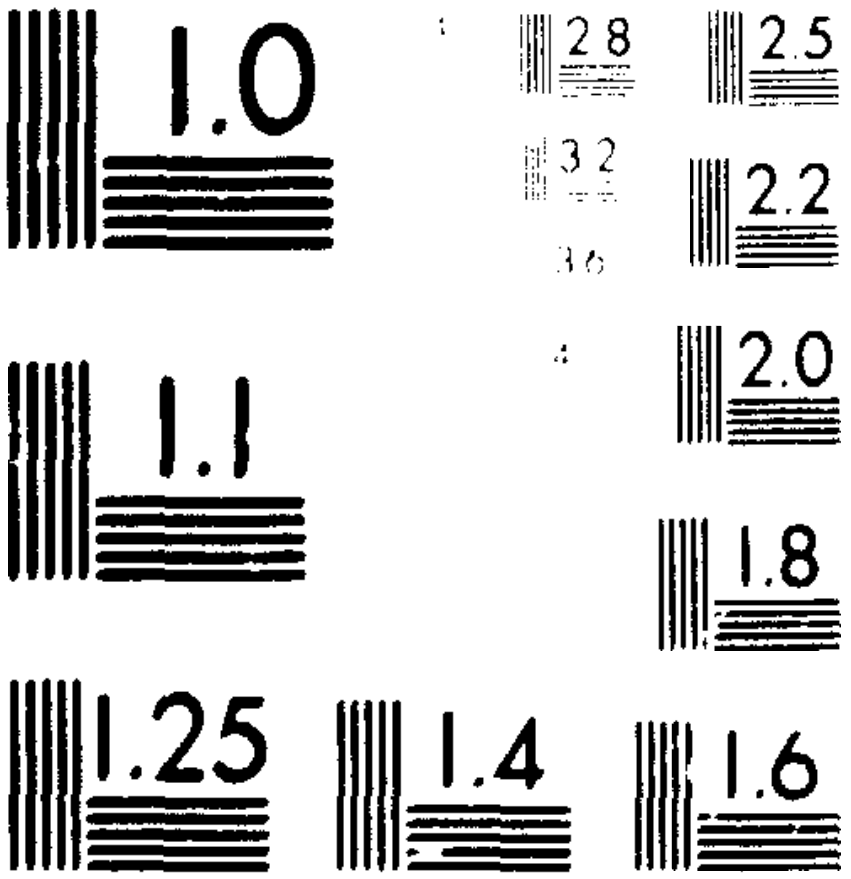
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RESTRICTED

10518

12 September 1980
English

LOW COST PRECAST HOUSING. ACTIVITIES, FUTURE PLANS, AND NEEDS FOR FUTURE UNIDO ASSISTANCE OF THE BUILDING MATERIALS RESEARCH CENTER IN THE ROYAL SCIENTIFIC SOCIETY.

SI/JOR/79/801/11-01/32.1.Z

JORDAN

Terminal Report

Presented to the Government of Jordan
by the United Nations Industrial Development Organization, executing agency for the United Nations Development Programme

Based on the work of Prof. P.W. Reimitz,
Expert in Low Cost Precast Housing

United Nations Industrial Development Organization
Vienna

00188.

This report has not been cleared with the United Nations Industrial Development Organization which does not, therefore necessarily share the views presented.

RESTRICTED

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INTRODUCTION

1. The objectives of the Building Materials Research Centre are as follows:
   - Research on low cost precast housing including utilization of local materials.
   - Preparation of specifications.
   - Testing of raw materials and final products in the building materials industries.
   - Research work with other institutions and research organizations.
   - Surveying, on a continuous basis, the raw materials for building industries.

2. The government of Jordan asked for technical assistance
   - Expert in Low-cost Precast Housing
   to assist in the evaluation of the activities of the Centre of this field,
   assist in the formulation of future plans for the Centre in this field,
   technologically advise local experts working at the Centre on matters related to this field,
   asess the needs for future UNIDO assistance.

3. The mission of the expert began on 16 July 1980, it lasted for two months.
   The cooperating agency was UNDP, Amman.

4. The objectives of the mission - described above (2.)- were not revised. The objectives of the mission were attained.

5. In numerous conversations the expert passed his experience in the field of low-cost precast housing to local experts, handed publications and other documents to them for information and in so far interesting exchange of experience was made at many occasions.

TABLE OF CONTENTS

I. ABSTRACT

The Building Materials Research Centre (BMRC) in the Royal Scientific Society (RSS) is carrying out the activities on research and development in the field of low-cost housing and building materials.
Within the Building Technology Division all research and development in this field in Jordan be concentrated and amplified to research on design, national and regional planning, on existing and new construction methods and testing of housing projects in the field. First of all a Building Research and Test-programme to receive comparable datas should be performed for different construction methods and systems from traditional to semi-industrilized construction.

The Laboratory Division should continue it's testing work for the construction industry and amplify it's research work for the BMRC-programmes. Furthermore it should perform material testing programmes at housing areas and construction sites.

The "REQUEST FOR ASSISTANCE FOR THE DEVELOPMENT
OF THE BMRC AT THE RSS"
submitted to UNDP (science and technology fund)
may 12. 1980
should be supported.(Copies of this paper are enclosed for UNDP-Amman and UNIDO-Vienna)

The existing Building Material Research Centre already works not only on the material field - so that it should in the future consequently become
THE BUILDING RESEARCH CENTRE OF JORDAN
carrying out the activities on research and development on
- low-cost housing,
- material testing,
- industrial construction,
- national and regional planning research,
- rationalization of traditional construction systems,
- testing and judging of new construction systems,
to avoid duplication and parallel investigation.

II FINDINGS

A. The building materials research centre (B.M.R.C.)

The B...M.C. was founded in 1970 and became part of the Royal Scientific Society in July 1977.
It consists up till now of two divisions:
The Building Technology Division and
The Laboratory Division.

B. Activities undertaken at present:

1. Research and development projects

1.1 Housing for low-income groups project aims at the development of a semi-industrialized precast concrete house-building system. The system is oriented towards the solfhely concept according to the core-house principle and is intended for application in rural housing (especially in the Jordan Valley development) and upgrading slum areas in the cities. Design criteria include economy, durability, comfort, climatic and social suitability, and the employment of locally available materials. (see system No. 5, annex 5)

Four different systems have already been designed and a test-house of each erected at the BMC grounds. Experience gained in the development, manufacture and construction of the four systems is being used in the development of a new system,(No.5) which will be introduced to the concerned authorities such as the Jordan Valley Authority, the Housing Corporation and the building industry; after which it is hoped that this system will assist in the efforts to solve the housing problem in Jordan. The BMRC intends to participate at this stage by providing training and technical supervision, continually working on improving the system.
(The four different systems No. 1 till 4, see annex 1 till 4)

1.2 Building regulations

The [illegible] is preparing the Building Regulations for Jordan. These regulations intend to provide minimum requirements to safeguard life, health and public welfare and the protection of property as it relates to these safeguards [illegible] controlling the design, construction, alteration, repair, equipment, use and occupancy, [illegible], removal and demolition of all buildings [illegible].

The Building Regulations shall also include codes of practice for both design and construction dedicated to the development of better building construction and greater safety to the public, and to development of a sound economic basis for the future growth of the nation through unbiased and equitable dealing with building construction.

For the implementation of this project a high Ministerial Commission has been set up and approved by the Prime Minister. It is headed by the Minister of Public Works and it comprises of the Ministers of Transport, Industry and Trade... as well as President of National Planning Council, President of Engineers Association, Director of Housing Corporation, Director of Housing Bank, Director General of RSS., Deans of Faculty of Engineering Scholls at Jordan and Yarmouk Universities, under Secretary of Ministry of Public Works, and the Lord-Mayor of Amman.

1.3 Quality control on materials.

The BRRC [illegible] the Natural Resources Authority [illegible] of quality control on [illegible] the [illegible] product. Each [illegible] to classify [illegible] monitor quality control.

1.4 National building specifications

The BMRC is presently preparing for the Ministry of Public Works and at their request the general technical specifications for building construction in Jordan. The specifications will be drafted to suit local conditions, materials and technology.

1.5 Soil Investigations

This project aims at the identification of different types of soils in Jordan, and studying their properties and load bearing capacities with the object of optimizing the design of foundations in buildings.
This project commenced recently in co-operation with Building Research Establishment in Britain (BRE).

1.6 Development of bituminous mixes

The BMRC is carrying out a comprehensive research programme for the Amman municipality to develop a new rational method of asphalt mix design to take into consideration the local materials and to cater for the prevailing weather and traffic conditions. Work is also in progress to study the problems associated with the road marking in order to select or develop the most suitable paint for roads and climatic conditions of this area.

1.7 Traffic manual

A Traffic manual is at present being drafted at BMRC with emphasis on road accidents and traffic planning. This aims at reducing the number of accidents in both rural and urban areas.

1.8 Creep properties of Jordanien concrete

This project aims at investigation the creep properties of Jordanien concrete which mainly incorporates soft limestone aggregates.

1.9 Cellular concrete

In the search for alternative structural materials, this project aims at establishing the properties of foamed concrete employing local materials. In particular the relationship between strenght and density is sought, in

addition to strenght development with time and shrinkage properties. This research project is undertaken in co-operation with the University of Jordan.

1.10 Quality control on concrete and concrete products

There are about 4[illegible] factories in the country producing concrete and concrete products such as blocks, pipes, tiles, colums, and precast elements. The quality of these products has been degenerating due to improper control on materials and bad workmanship. The BMRC within a contractural agreement with the directorate of specifications of the Ministry of Industry and Trade is carrying out the task of the quality control on all concrete products by surveying all factories including their products, equipments and methods applied. Specimens are brought and tested twice a year.

The following figures show the amount testing for the construction industry in 197[illegible] :

Laboratory:	No. of tests: (197[illegible])
Gravel and Sand	7[illegible]5
Soil and Rocks	[illegible]5[illegible]
Asphalt	7[illegible]0
Cement and Concrete	4241

2. Testing and Consulting Services

In addition to the research projects, testing and consulting services are offered to the private and the public sectors of the building construction industry: consulting firms, contractors, engineers, universities, ministries, and other RSS departments.

3. Membership of the Centre

The BMRC is a member in the Union of European Laboratories (RILEM), European Council for Concrete (CEB), the Construction and Industrial Research and Information Association (CIRIA), the Arab Union of cement and building materials.

4. BMRC Participation in conferences

The centre has participated in many national and international conferences:

These are:

- Quality control on concrete.(Stockholm, june 1979)
- Structural design of concrete.(Rome 1979)
- New building materials.(Iraq 1979)
- Quality control on concrete.(Madrid 1979)
- Management Workshop.(Denver 1979)
- Human Basic Needs.(Habitat, Nairoubi 1980) BMRC prepared a paper.
- UN Expert meeting on the appropriate building technology, held at BMRC in Amman, 1978.
- Symposium on construction.(Amman 1978)
- Symposium on housing.(Amman, April 1978) BMRC submitted two papers.

5. Training

Some members of staff at the centre have been trained in different parts of Europe, namely Germany and England. The centre,on the other hand, has offered training facilities to university students studying in Jordan and abroad.

C. Regional and international Co-operation with BMRC

The RSS has established means of co-operation with regional and international research institutes. These are:

- Scientific Research Foundation, Iraq.
- Kuwait Institute for Scientific Research, Kuwait.
- Arab Development Institute, Lybia.
- Industrial Development Centre for Arab States, Tunis.
- Arab Union of Cement and Building Materials, Damaskus, Syria.
- Denver Research Institute, USA.
- Building Research Establishment, United Kingdom.
- Georgia Institute of Technology, Atlanta, USA.

Thus BMRC acquires know-how from its associates with institutes in developed countries and applies this know-how in Jordan and in the region.

D. **Achievements** made untill now in respect of the -Realization of low-cost housing systems:

x = yes
- = not jet

Evaluation Chart: Systems for low-cost housing.

Action:	System No.: 1	2	3	4	5
Planning:					
Design of system concluded:	x	x	x	x	x
Specifications made:	-	-	-	-	-
Moulds designed:	x	x	x	x	in progress.
Test house designed:	x	x	x	x	in progress.
Fabrication:					
Moulds fabricated:	x	x	x	x	in progress.
Costs estimated:	x	x	x	x	-
Costs determineted:	-	-	-	-	-
Quantity estimated:	x	x	x	x	-
Quality determinated:	x	x	x	x	x
Transport & Handling:					
Manner determinated:	x	x	x	x	x
Equipment determinated:	-	-	-	-	-
Cost estimated:	-	-	-	-	-
Erection:					
Method determinated:	x	x	x	x	x
Costs estimated:	-	-	-	-	-
Costs determinated:	-	-	-	-	-
Time estimated:	-	-	-	-	-
Time determinated:	-	-	-	-	-
Test house erected:	x	x	x	x	in progress.
No. of houses to be erected in the nearest future:	-	-	-	-	20

E. **Publications** made by the BRRC untill now, see ANNEX 6

III. RECOMMENDATIONS

A. For future plans of the Laboratory Division:

1. Continue the preparation of specifications for
   - the quality of building construction materials,
   - the quality control of building construction materials.

2. Research and Development on construction materials:

Example 1

We are a[illegible] construction material atlas, showing where, and what kind of material is available in what quantities and qualities throughout the country for what kind of building components:

such as: - concrete aggregates for concrete blocks,
- light concrete aggregates for light concrete blocks, wall- or roof panels, infill in hollow walls ...etc.,
- clay for bricks and hollow bricks,
- clay for expanded clay,

etc.

Example 2

Investigation for light aggregates to be added to concrete in order to improve thermal insulation of blocks.

Example 3

Investigation of suitable infill material for hollow blocks and roofs to improve thermal insulation.

Example 4

Assist the Building Technology Division on a permanent basis on testing houses being erected, such as test-houses at the BMHC site or houses erected by the executing Institutions like the Housing Corporation or the Jordan Valley Authority, and others.

This shoud be performed in order to receive data of material, components and methods used in practice in thermal insulation, sound insulation and other fields.

This served for:- material research,
- component research,
- quality control,
- control of social acceptibility... etc.

3. Installation of a pilot plant.

A Pilot Plant for components should be installed at the BMRC , equipped with a block making machine, mixer, moulds, material testing equipment, lifting devices... etc.
This pilot plant should be designed to fabricate and install all necessary materials and components for the erection of test houses and small test house programmes, for the fabrication of new and economical components for walls and roofs.
The pilot plant should be designed to be mobile in order to be installed easily at any construction site as well.

4. Reference to the FIVE YEARS PLAN 1981 - 1985

The Laboratory Division shoud amplify it's research activities according to the fifs years plan shown in the

REQUEST FOR ASSISTANCE FOR THE DEVELOPMENT
of the BMRC at the RSS

submitted to UNDP (science and technology interim fund) in May 12 1980 .

Copies of the above mentioned request for assistance are enclosed to this report for

UNDP - Amman, and UNIDO - Vienna.

B. For future plans of the Building Technology Division

1. Test Programme

After having received further experience by erecting a test-house for the precast system No. 5 a Building Research and Test Programme should be run in order to receive comparable datas for traditional and precast low-cost housing construction.
(See ANNEX No. 7 "Project Document")
A vast number of interesting datas will be received by this Test-Programme for future decisions in the low-cost housing field, and great experience will be gained for future rationalization efforts on traditional building methods.
Annex 7 indicates every detail of this test-programme.

This test-programme has been discussed and agreed upon with the BMRC and UNDP-Amman so that it should be followed up and realizised consequently.

2. Permanent research on low-cost housing

2.1 Design research from the single house to the townsite:

- floor plans (rural and urban), room sizes, roomvolumes, doors and windows for industrial mass-production, rational installation, finishing.
- grouping of houses (rural and urban), twinnhouses, rows, staggering.
- townplanning (rural and urban) with infrastructure, roads, schools, comunity buildings, recreation-buildings, playgrounds...etc.

all this should be performed in close co-operation with the executing institutions in the low-cost housing field.

2.2 Regional and nationwide planning:

- construction physics: specifications of climate areas to specify minimum standarts and requirements for thermal insulation, sound insulation, ventilation, shadow provision..etc.
- specifications of minimum requirements for low-cost housing in the different areas of the country and rural and urban.

2.3 Existing construction methods:

- research and development work on traditional low-cost housing with the aim of rationalization of the construction by using prefab components.

2.4 New construction methods:

- research and development, judgment and testing of new construction methods from traditional to industrializised methods.

2.5 Testing of low-cost housing projects.

- permanent co-operation with the existing executing institutions in the field of low-cost housing to improve technology of the erection.

3. Reference to the FIFE Years Plan 1981 - 1985

The building Technology Division should amplify it's research work according to the the fife years plan shown in the

REQUEST FOR ASSISTANCE FOR THE DEVELOPMENT
of the BMRC at the RSS

submitted to UNDP (science and technology interim fund) in May 12 1980 .

Furthermore

- all research and development work should be concentrated for low-cost housing in Jordan in the BMRC to aviod duplication and parallel investigation.
- close co-operation should be performed with the existing executing institutions in the low-cost housing field.
- research activities should be extended to design research, national and regional research as shown under B.2, and research should be extended to the construction site.

- - - - - - - - -

The existing Building Materials Research Center already does not work on the material field alone. It consequently should become now and should be trasferred to

THE BUILDING RESEARCH CENTER OF JORDAN

carrying out the activities on research and development on

- low-cost housing (better:"Housing for low income groups"),
- building materials,
- industrial construction,
- national and regional planning,
- rationalization of traditional construction,
- testing and judging of existing and new construction methods.

- - - - - - - - -

C. Recommendations for further UNIDO - assistance:

Further UNIDO-assistance is needed as follows:

1. According to the "Project Document" (ANNEX 7), two UNIDO-experts are needed to assist in the Building Research and Test-Programme:

1.1 Expert in Work Preparation for traditional and precast low-cost housing projects: 14 months (ANNEX 8)

1.2 Expert in Public Relations and Marketing for low-cost housing projects: 4 months (ANNEX 9)

(The annexes 8 and 9 show a draft for the two "job descriptions" for those two experts.)

2. UNIDO-contract for a leaving expert.

Explanation:

From the erection of the BMRC-building (1976) untill now the Laboratory Division was technically supervised by DIPL.-ING. ERNST-DETLEF GRUEBEL, a highly qualified german expert in material testing and civil engineering, who has been sent to Jordan by the "Deutsche Gesellschaft für technische Zusammenarbeit" (german society for technical co-operation).

Mr. Grübel left the BMRC now on 1 Sept.1980 for his german contract could not be prolonged anymore.

Mr. Grübel knows every work and equipment detail within the Laboratory Division. He speaks english and arabic.

A man of this high qualifications in science, research, development and practice should not be lost to BMRC(or UNIDO)!

To take advantadge of his experience and to ensure the further assistance of this expert, I highly recommend that UNIDO may now take Mr. Grübel under contract on a consulting basis. (Proposed and agreed upon by BMRC and Mr.Grübel: for instance, monthly two days visit to BMRC, but details should be worked out.)

Mr.Grübel is on vacation for two months till nov.1980. He then can be reached under: Mr. E.D.Grübel, c/o Obermeyer Project Management, Riyadh/Saudi Arabia.

3. Expert in Building Acoustics

The BMRC already has started work on building acoustics and is presently in possession of equipment for the measurement of Reverberation time and Sound Pressure Level. It needs expert assistance in planning expansion of these activities as well as application.
An Expert for a period of 3 months conversant with equipment and acoustic measurments is required.

4. Expert in computer aided reinforced concrete structural design.

The BMRC has commenced work in providing computer design services for the country and requires expert assistance in this field - namely building structures.

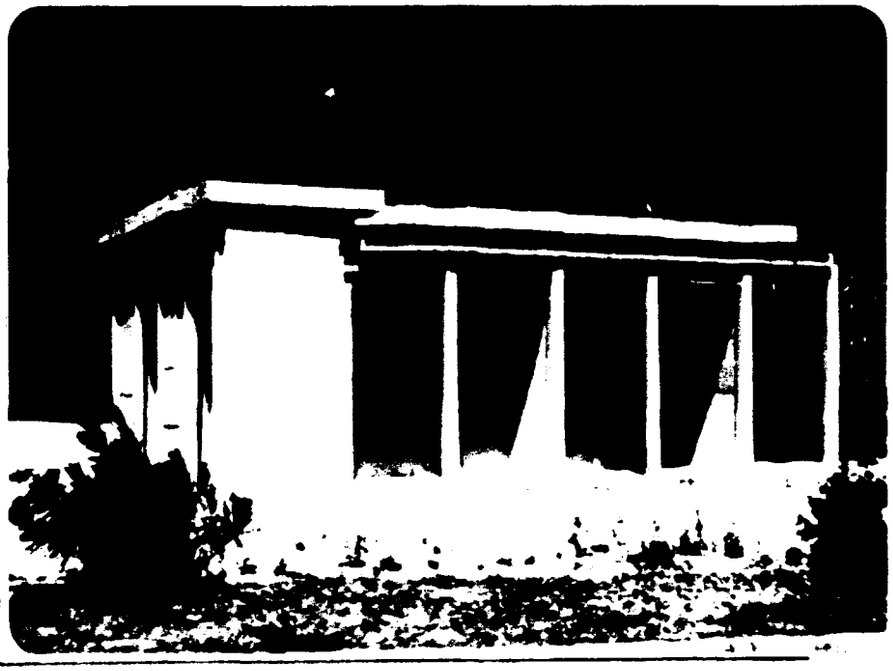
- - -

Amman, 12 September 1980

Reimitz

System No.: 1

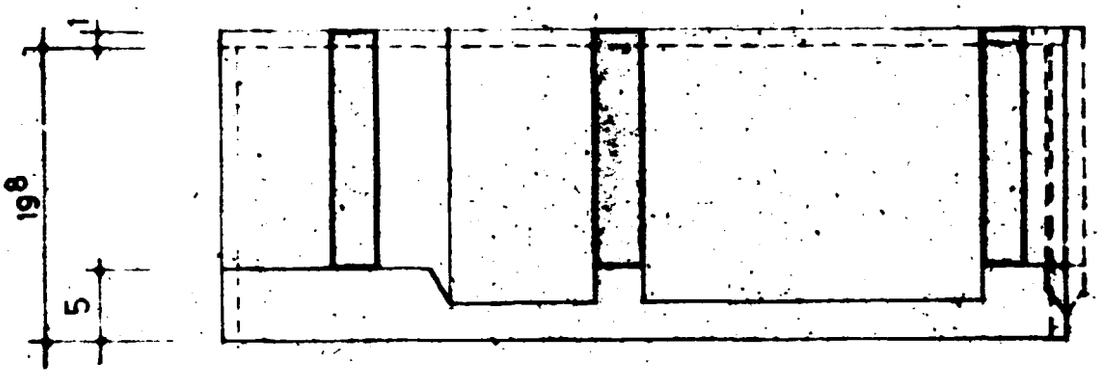
The Test-House

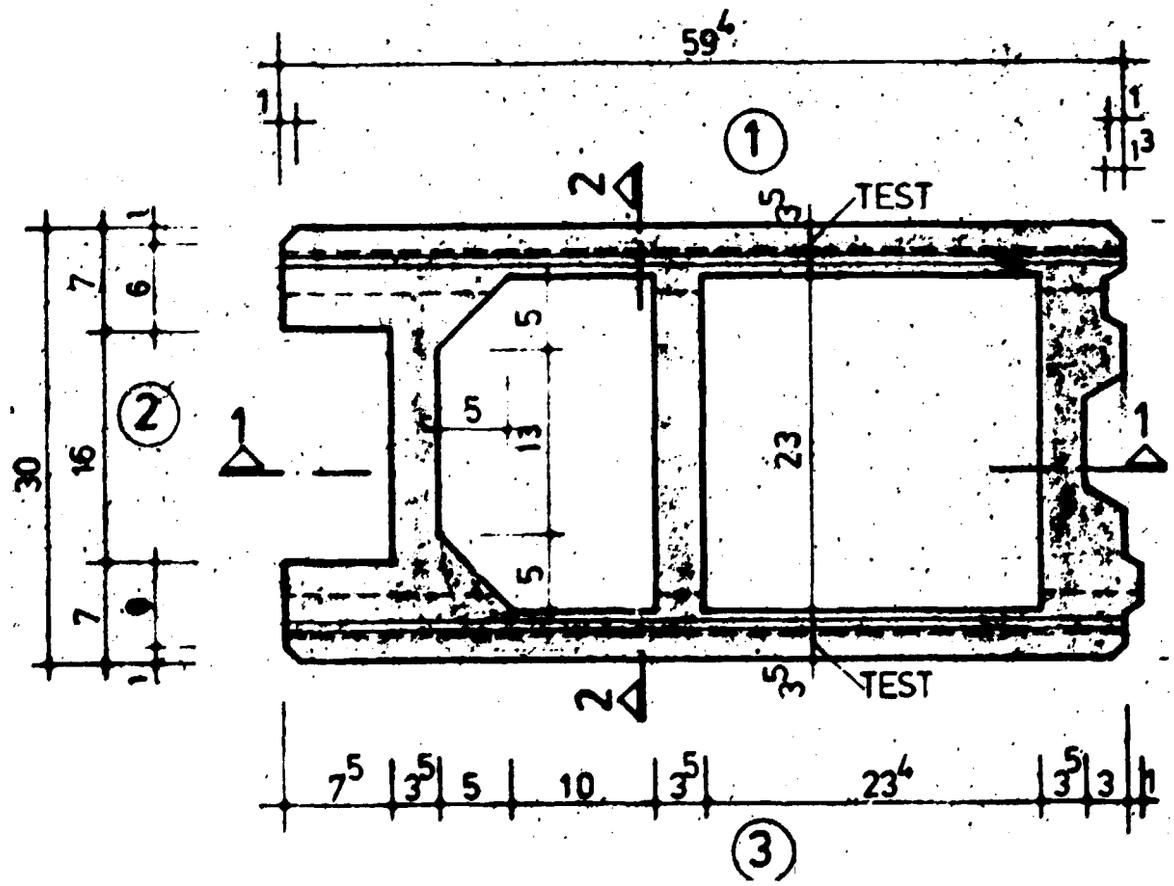


Construction System:		Semi-industrialized (Conde)
No. of components	:	15
Exterior walls	:	Hollow concrete blocks, dry-wall, precast columns at corners and connections, ext. and int. plaster.
Interior walls	:	Same as system from ext.walls using some prefab columns. Plaster.
Columns	:	Prefab concrete columns.
Floor	:	Concrete
Roof	:	Beams, upper and lower horizontal panels, hollow space with infill and cross-ventilation.
Stair	:	No stair in system.
Doors	:	Wood.
Windows	:	Steel

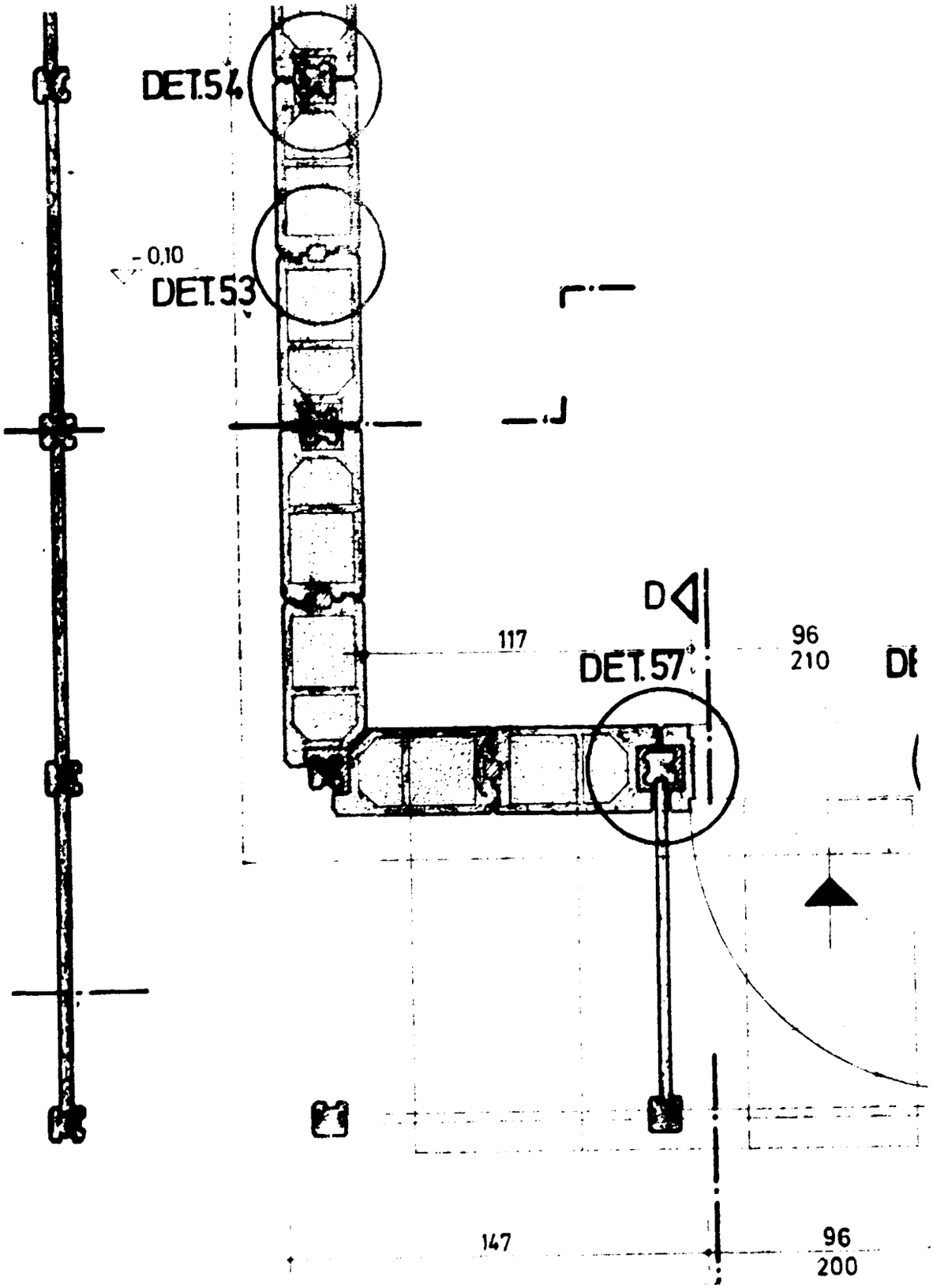
SYSTEM No: 1 BASIC BLOCK

SECTION 1-1

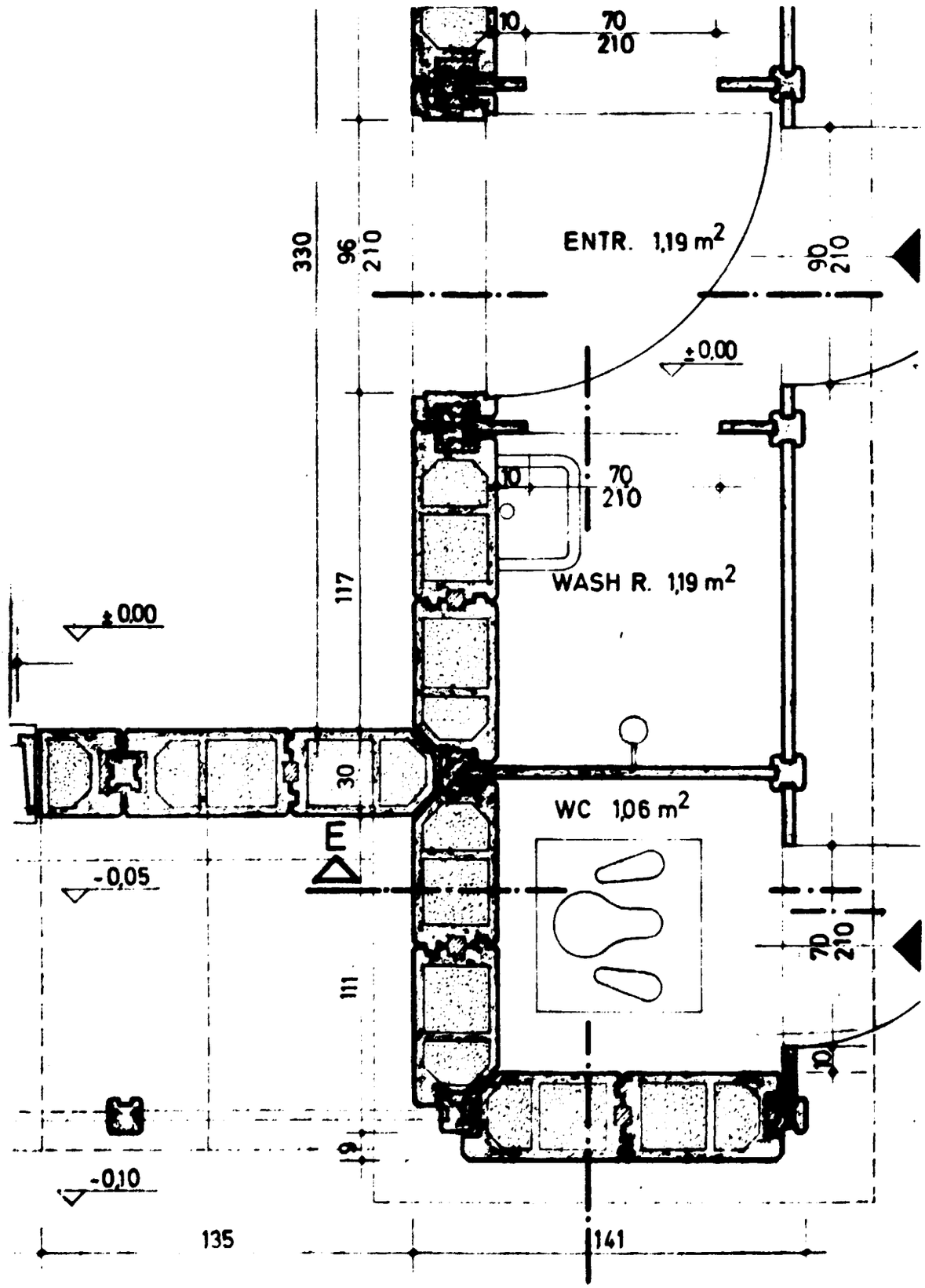




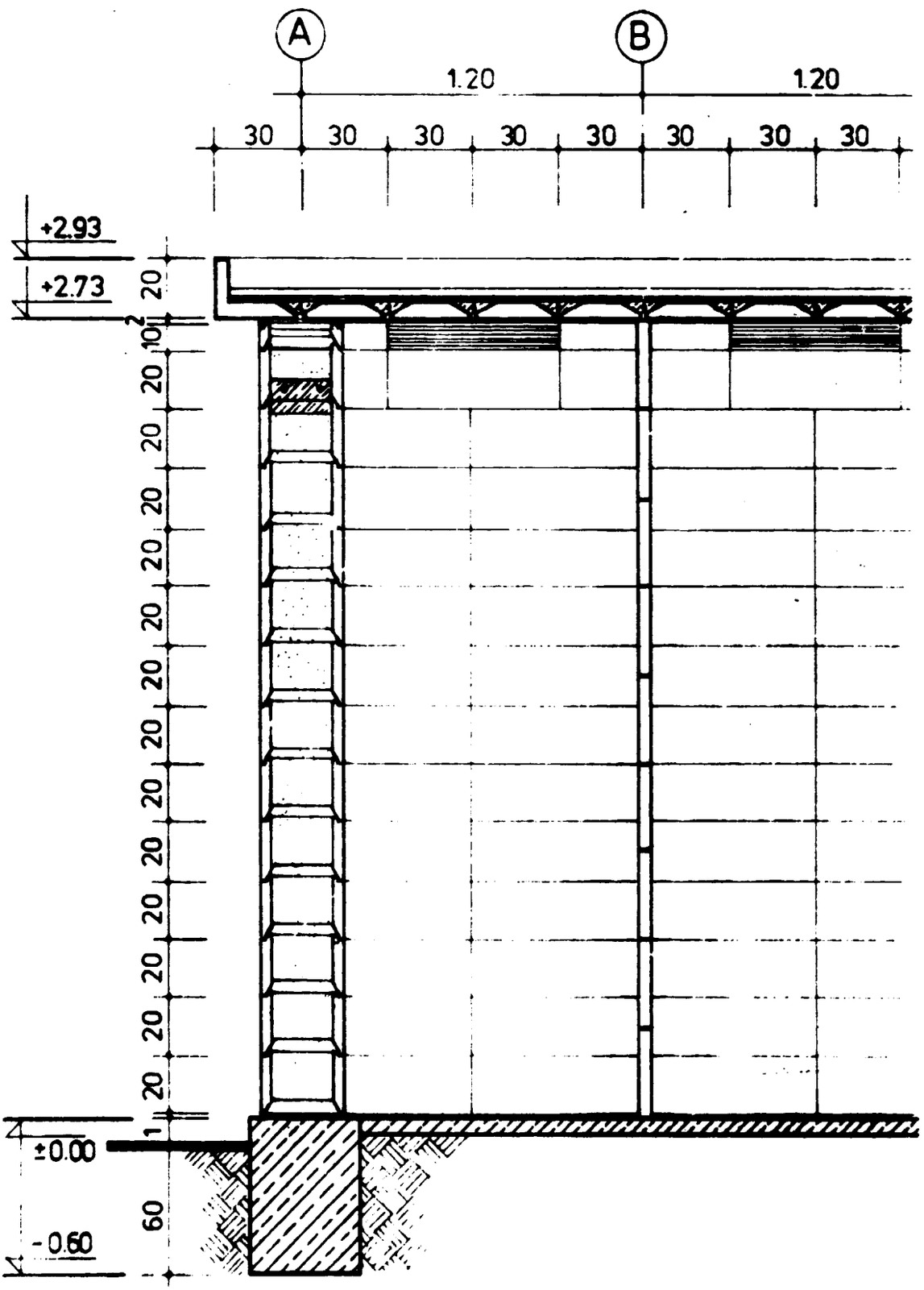
SYSTEM No: 1 CORNER PLAN



SYSTEM NO: 1 WALL JUNCTION DETAIL



SYSTEM No: 1 SECTION



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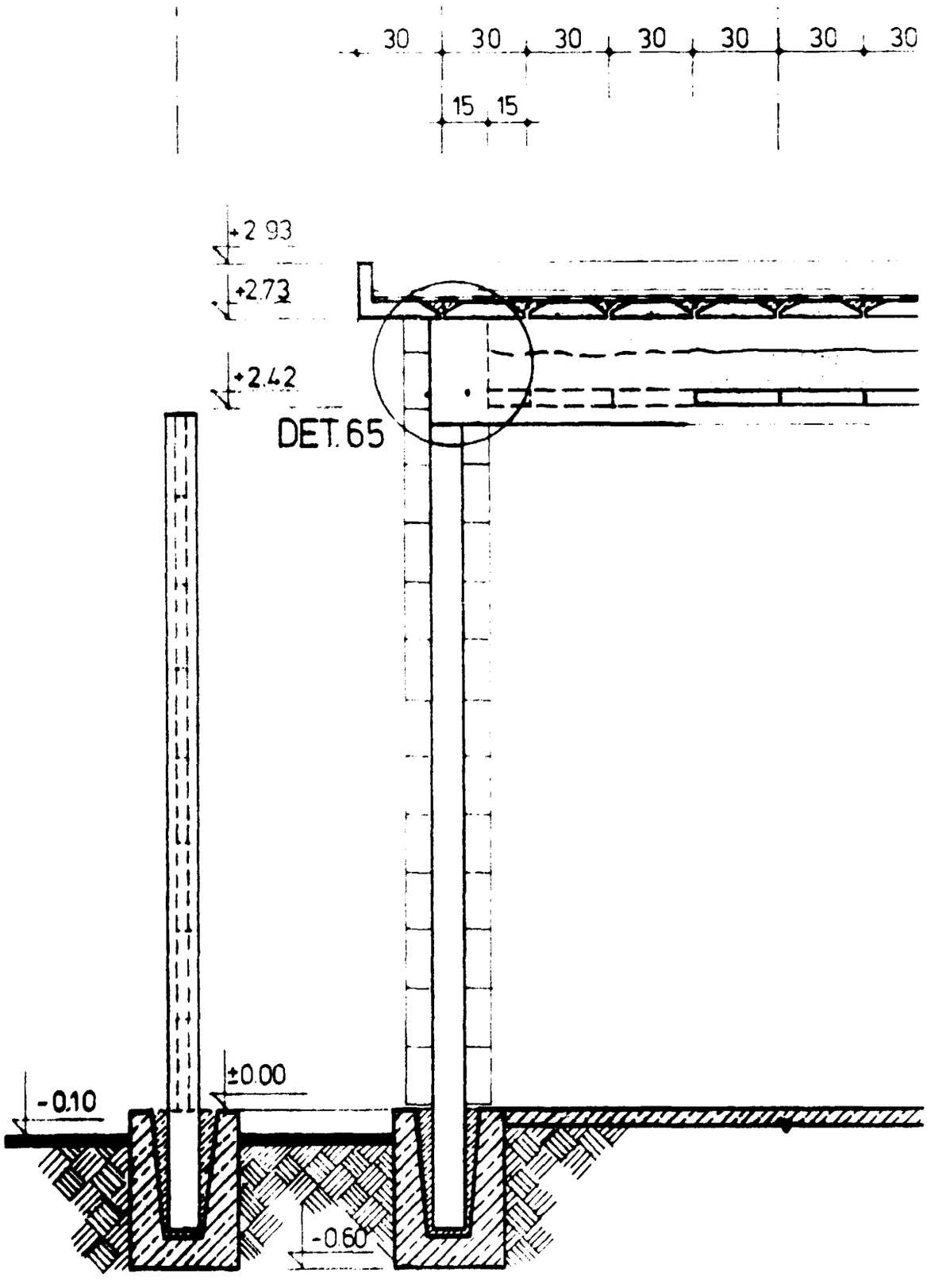
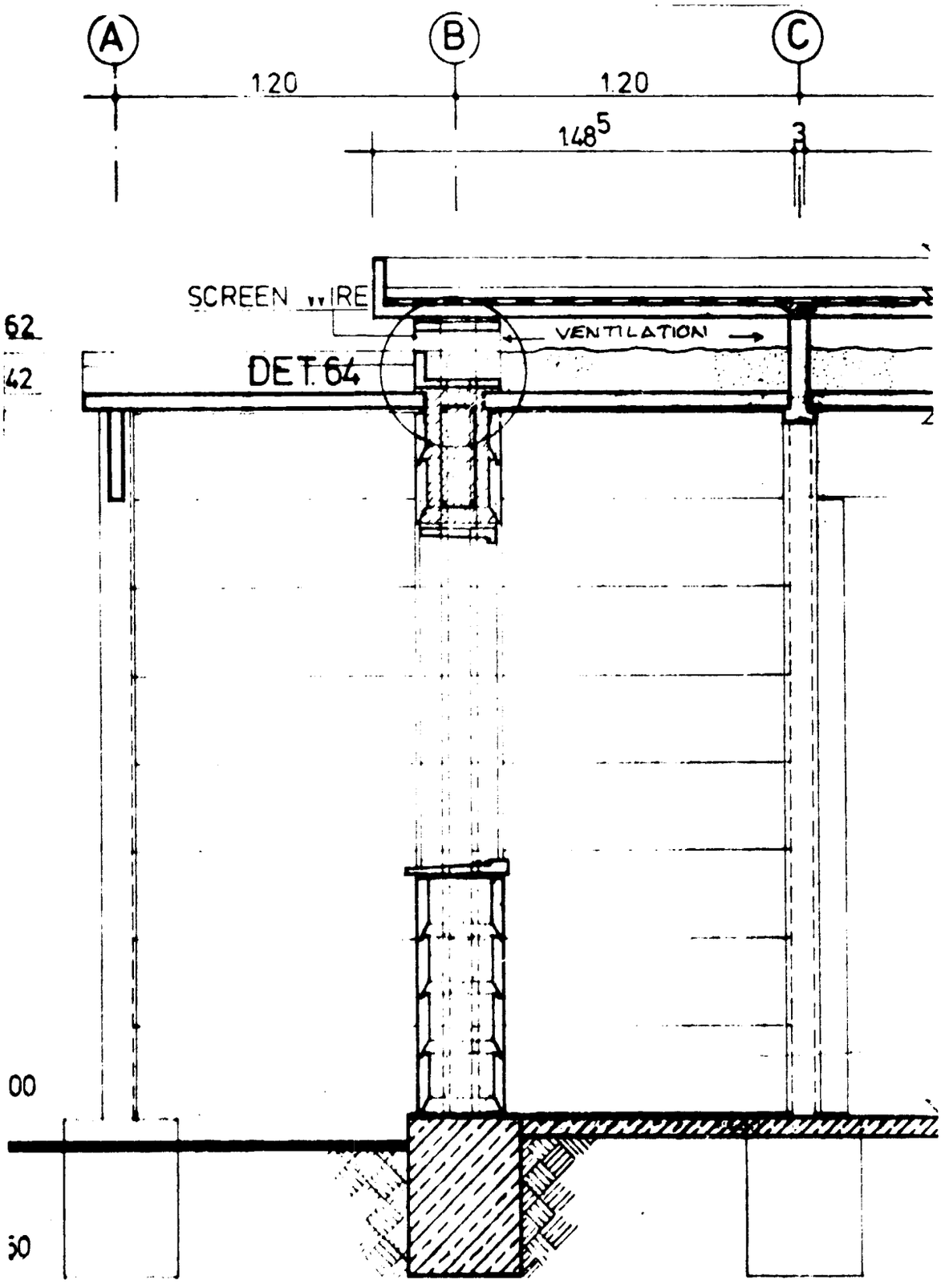


SYSTEM No: 1 SECTION



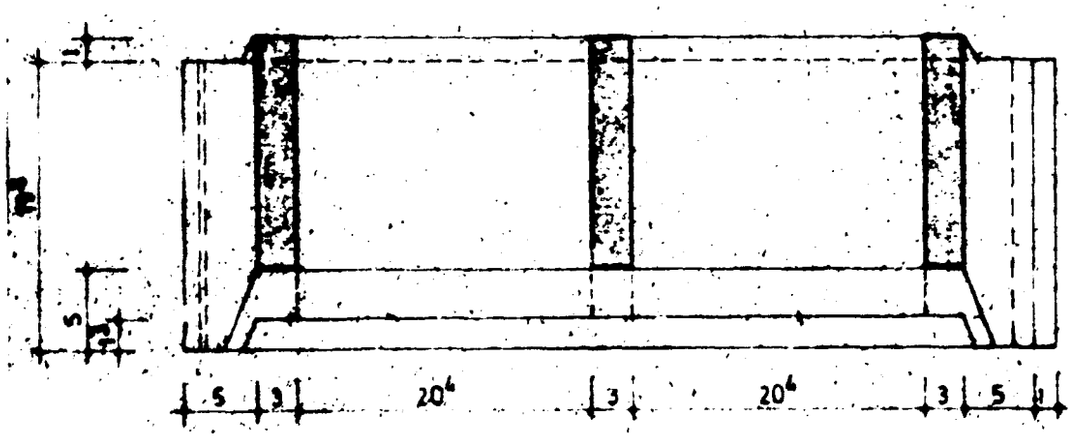
System No.:

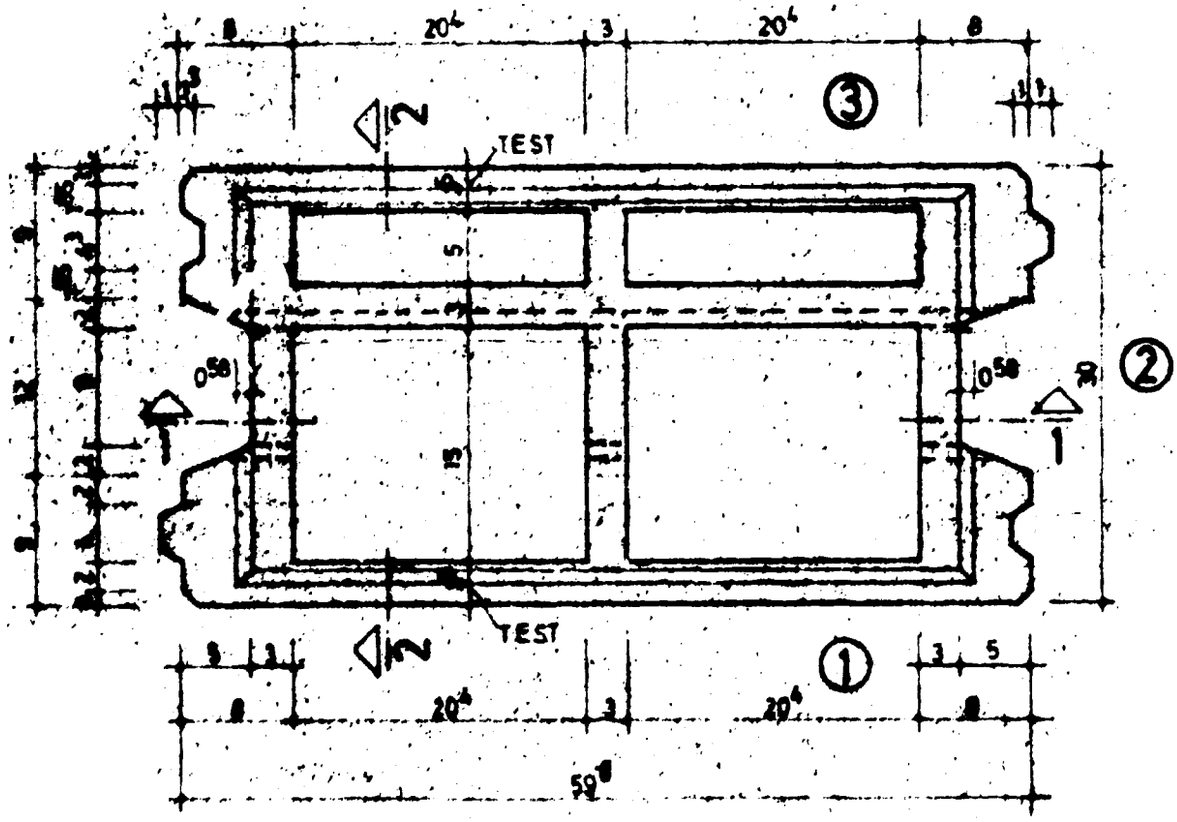
The Test-House

Construction System:		Semi-industrialized (Conde)
No. of components	:	20
Exterior walls	:	Hollow concrete blocks forming small column-spaces at connections. Blocks with vertical outside ventilation.
Interior walls	:	Seperate system from ext.walls. Precast elements. Plaster.
Columns	:	In-situ concrete at etx.wall block connections.
Floor	:	concrete.
Roof	:	Beams and hollow blocks. 5 cm insulation, concrete slab, bitumen, gravel.
Stair	:	No stair system
Doors	:	Steel.
Windows	:	Aluminum.

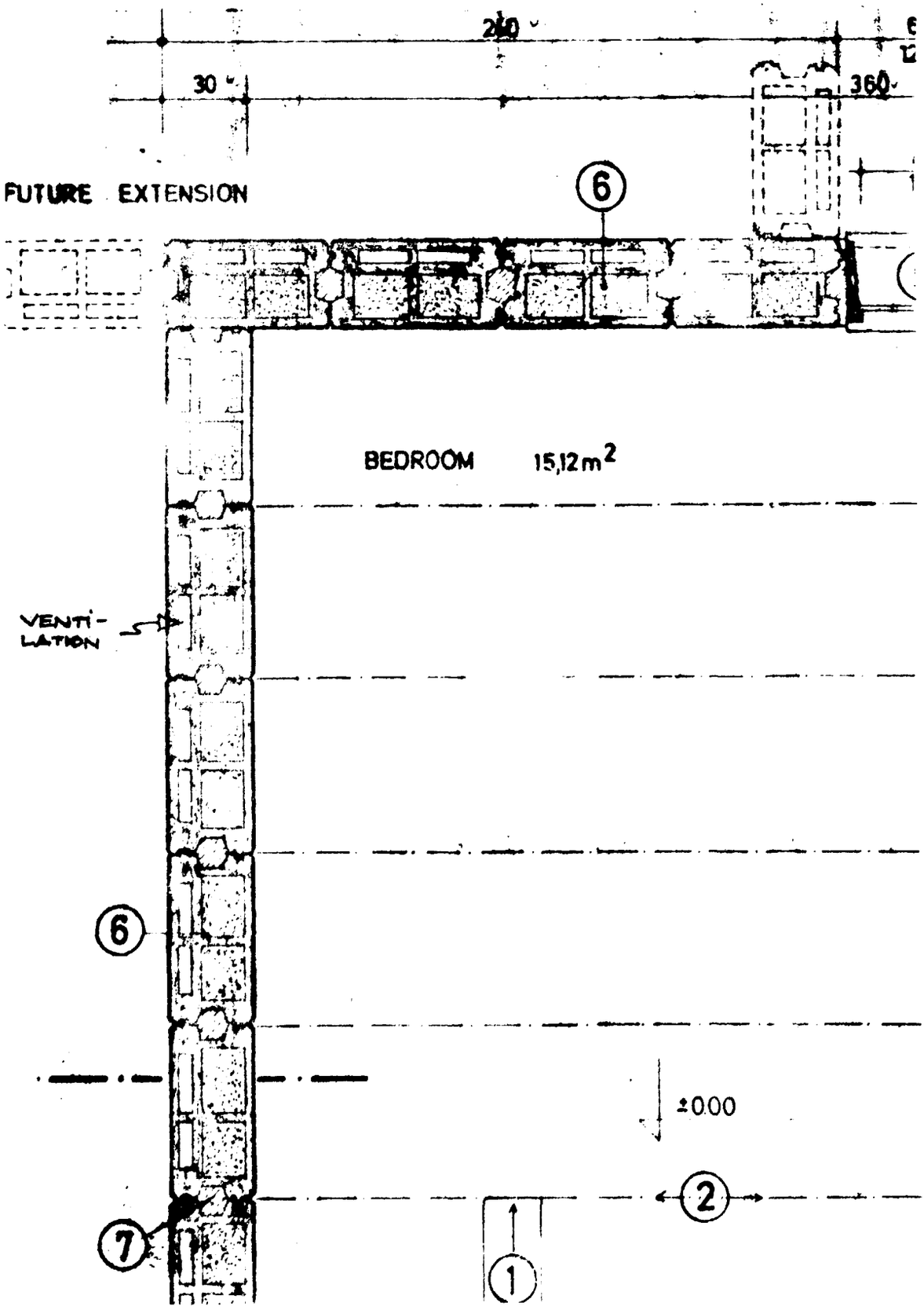
SYSTEM No: 2 BASIC BLOCK

SECTION 1-1

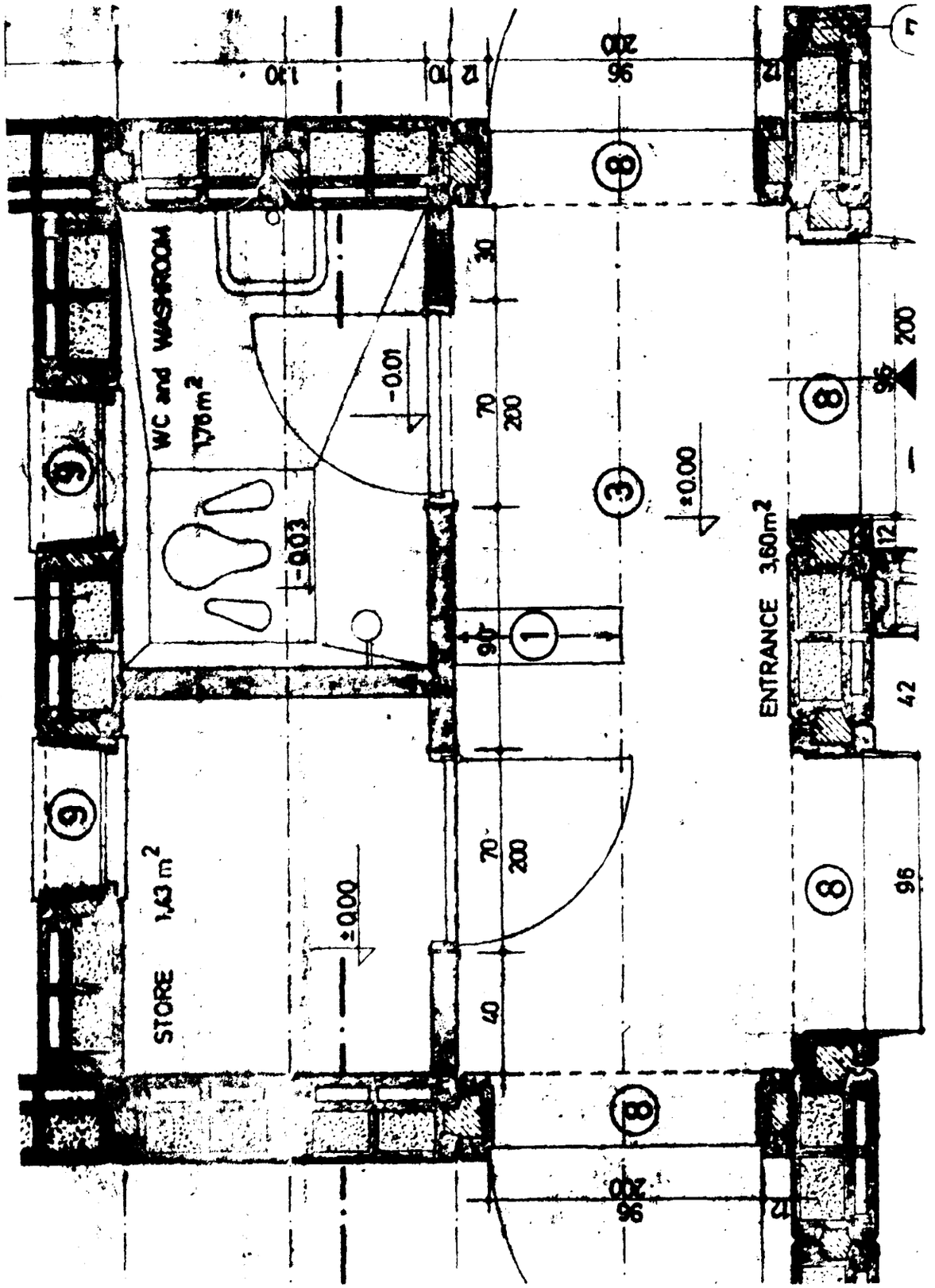




SYSTEM No: 2 CORNER DETAIL

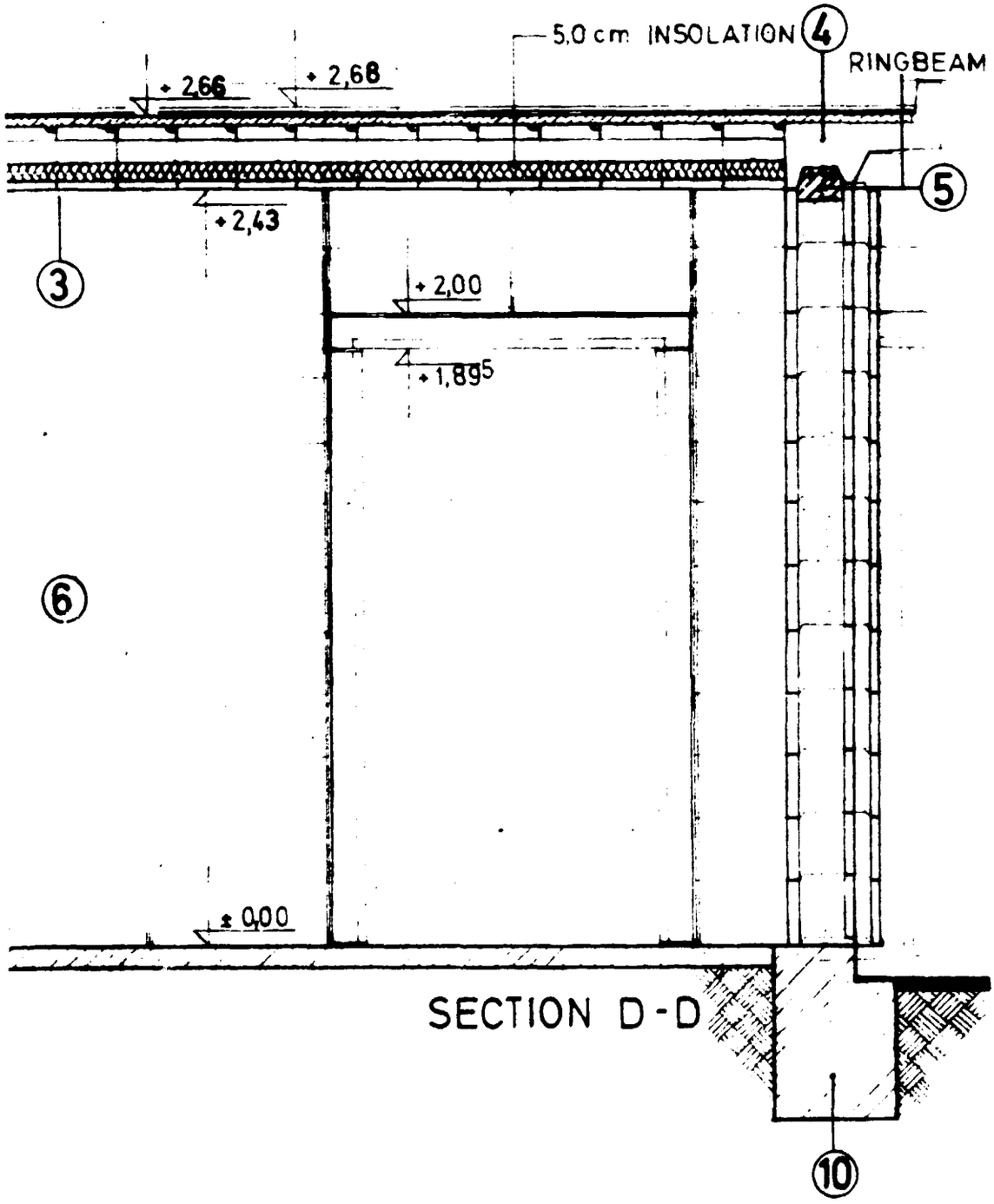


SYSTEM No: 2 WALL JUNCTION DETAIL



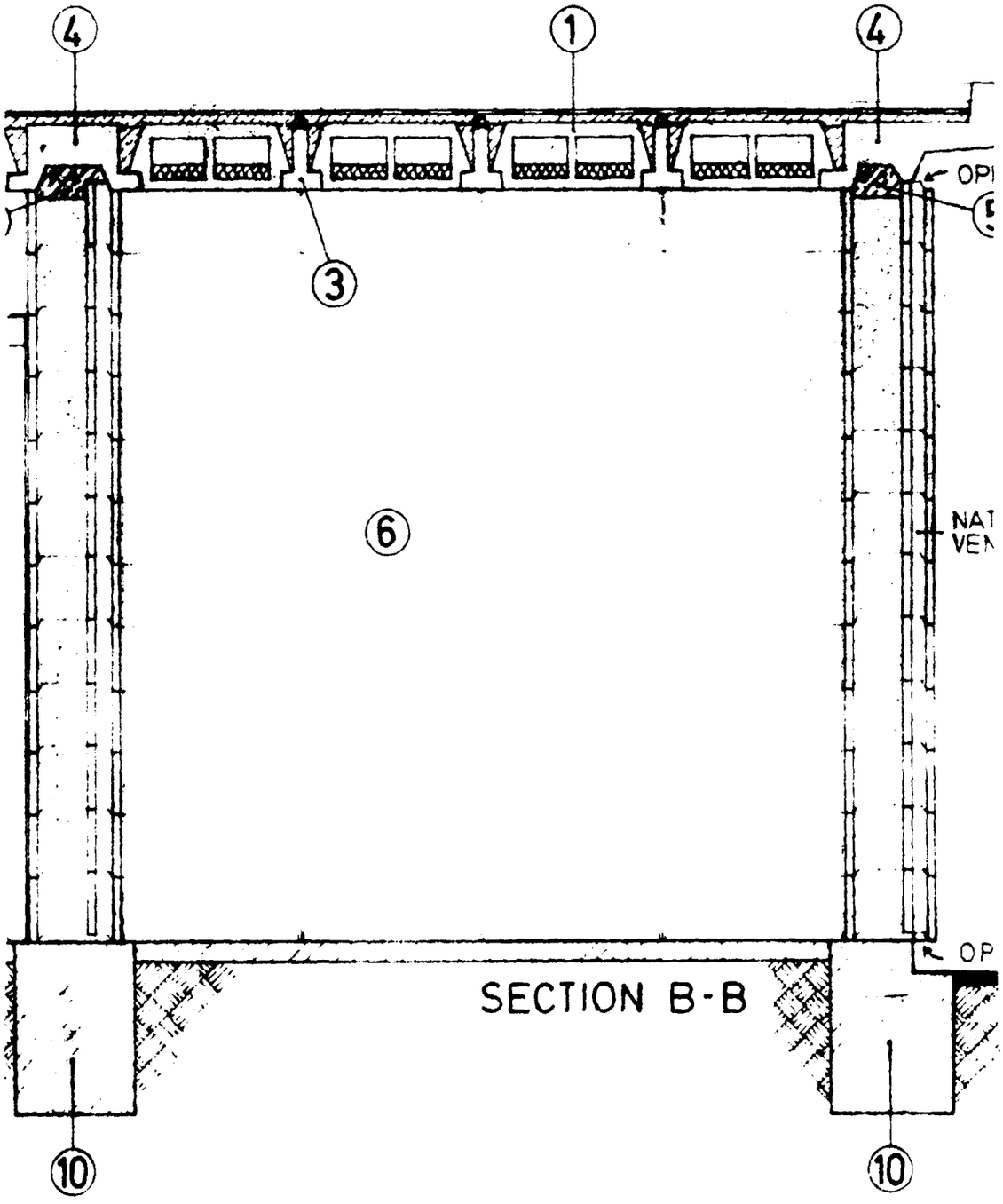
SYSTEM No: 2 SECTION

1,5 cm LIME STONE (GRAVEL)
0,5 cm BITUMEN
3,0 cm CONCRETE
20,0 cm CONCRETE HOLLOW BLOCK



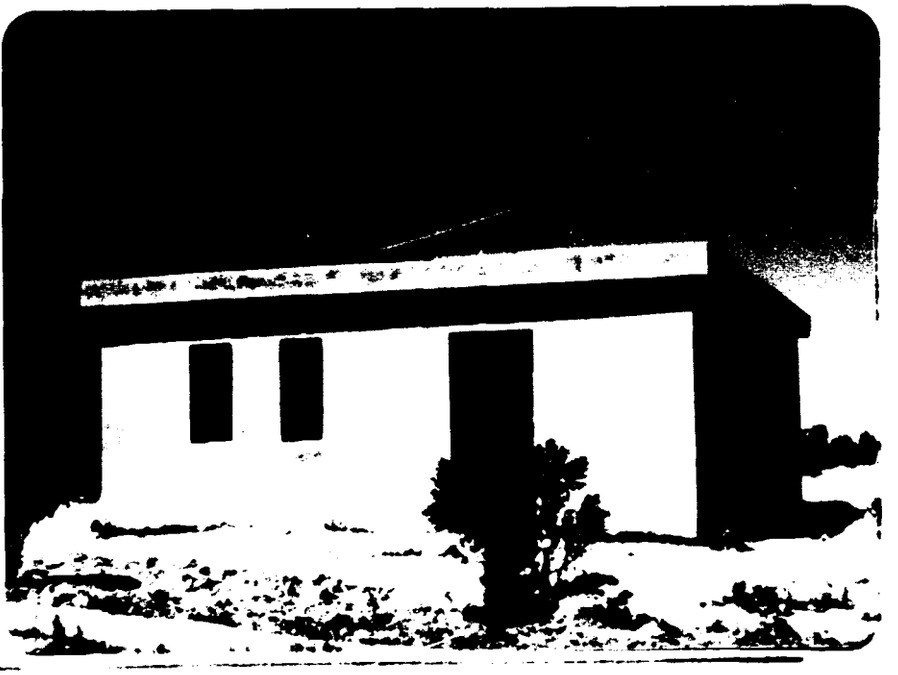
SECTION D-D

SYSTEM No: 2 SECTION



System No.: 3

The Test-House



Construction system : [illegible] (None)

No. of components : [illegible]

Exterior walls : [illegible] concrete reinforced panels. [illegible] needed. Ext. [illegible] int. plaster.

Interior walls : Thinner light concrete reinforced wall-panels. Plaster.

Columns : No columns.

Floor : Concrete.

Roof : Flat concrete reinf.panels. [illegible] needed. Bitumen, gravel.

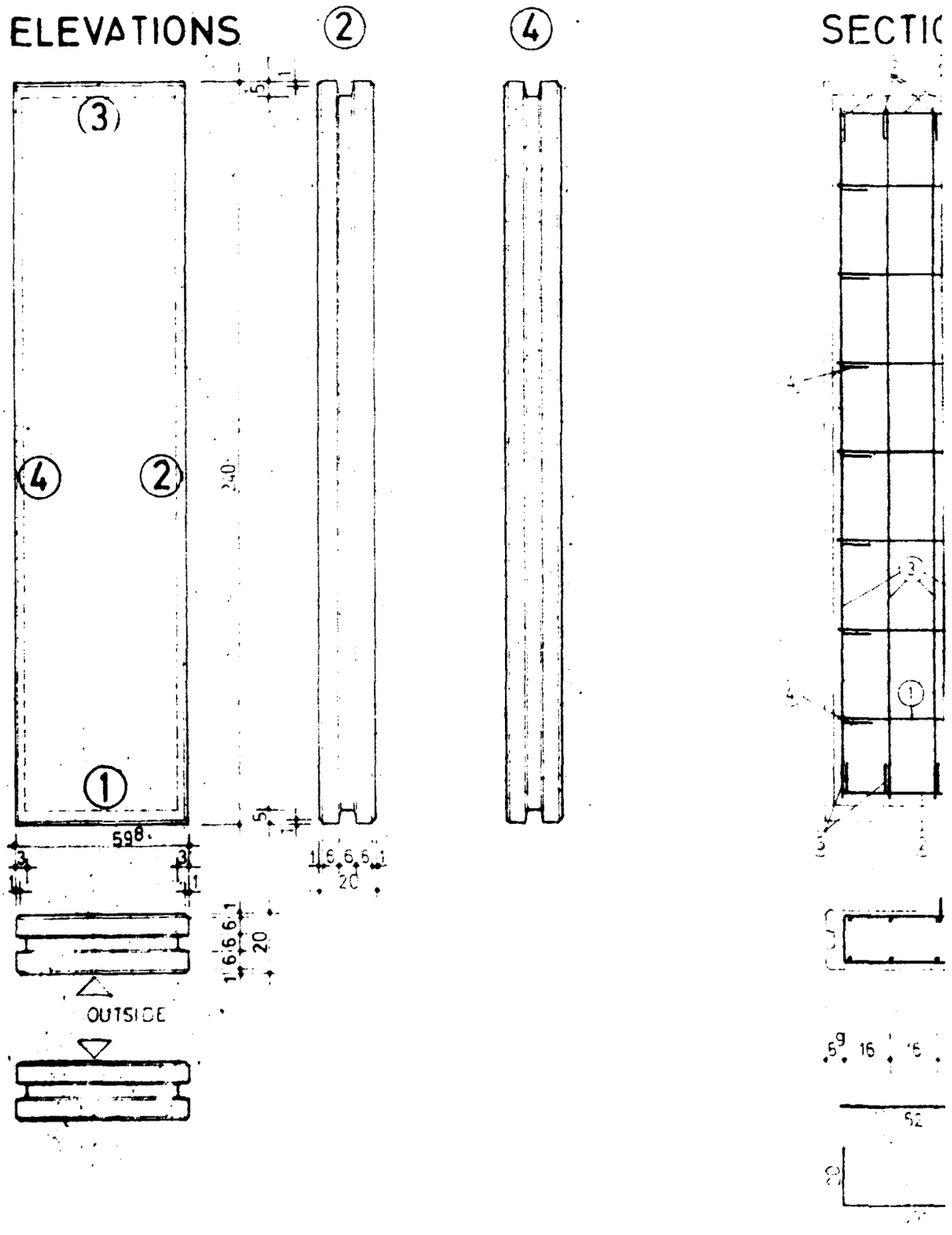
Stair : No stair system.

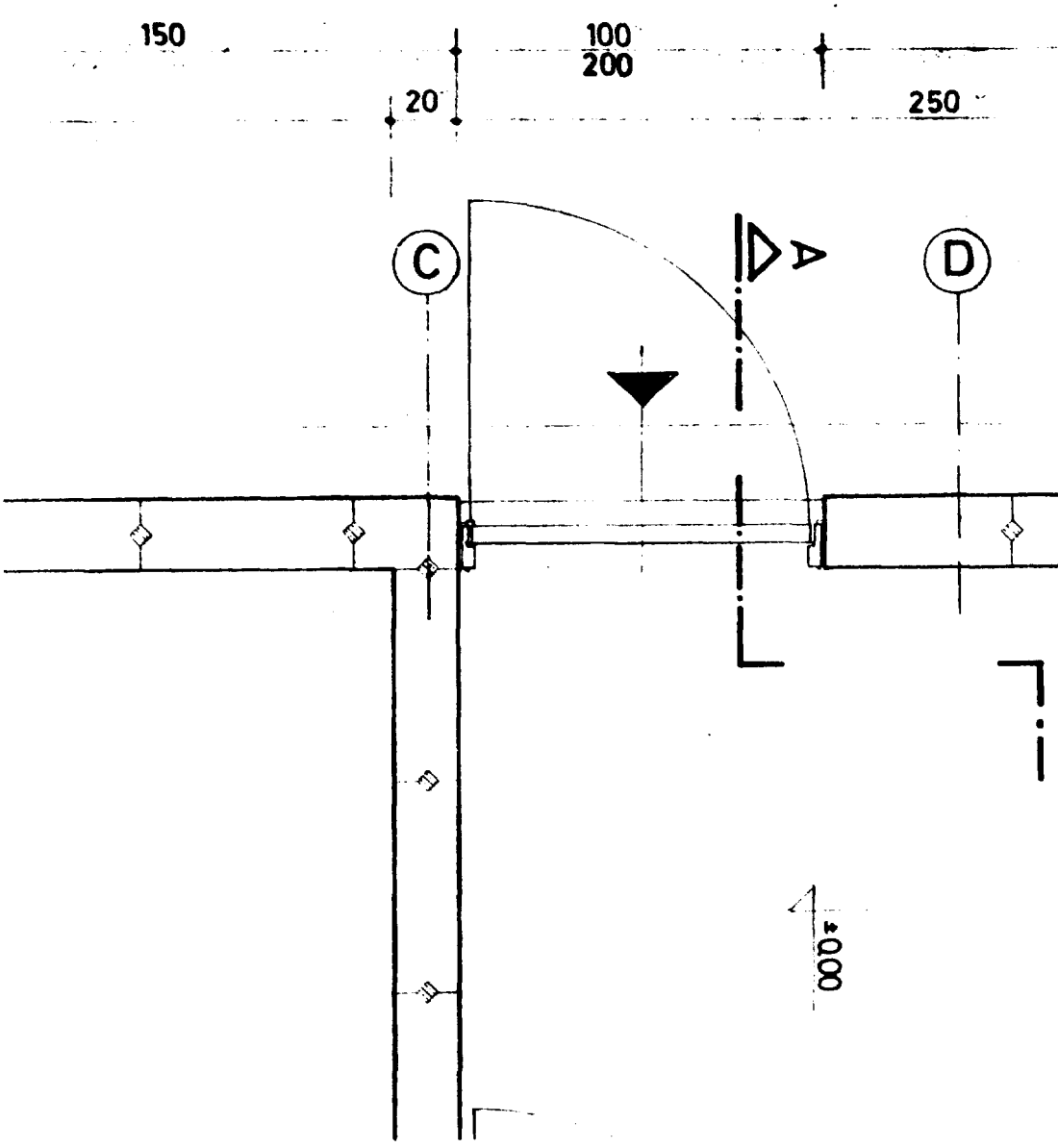
Doors : Wood.

Windows : Steel.

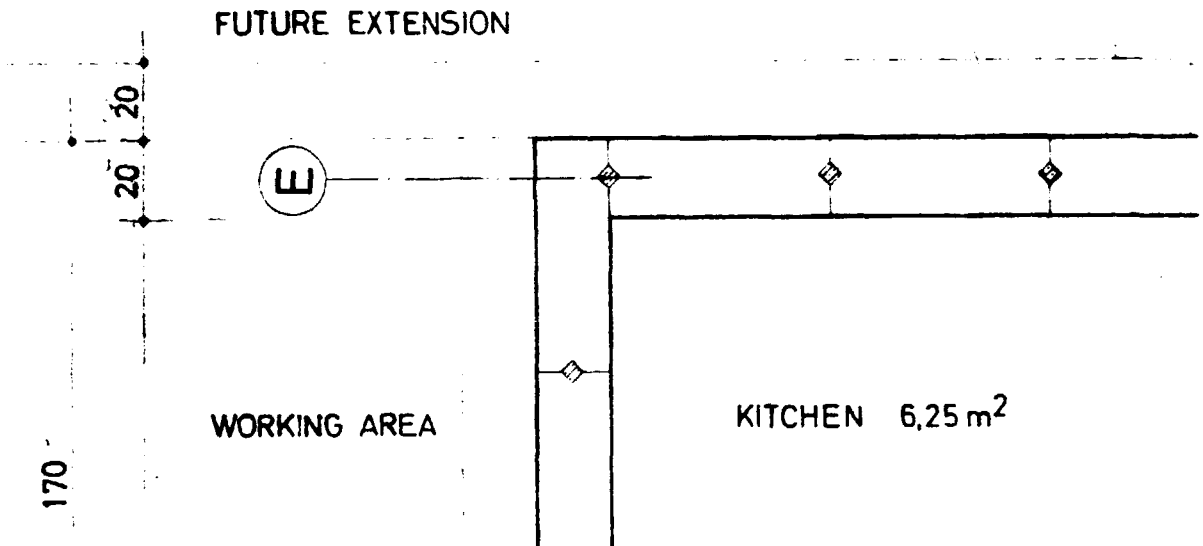
SYSTEM No: 3 BASIC WALL PANEL

ELEVATIONS

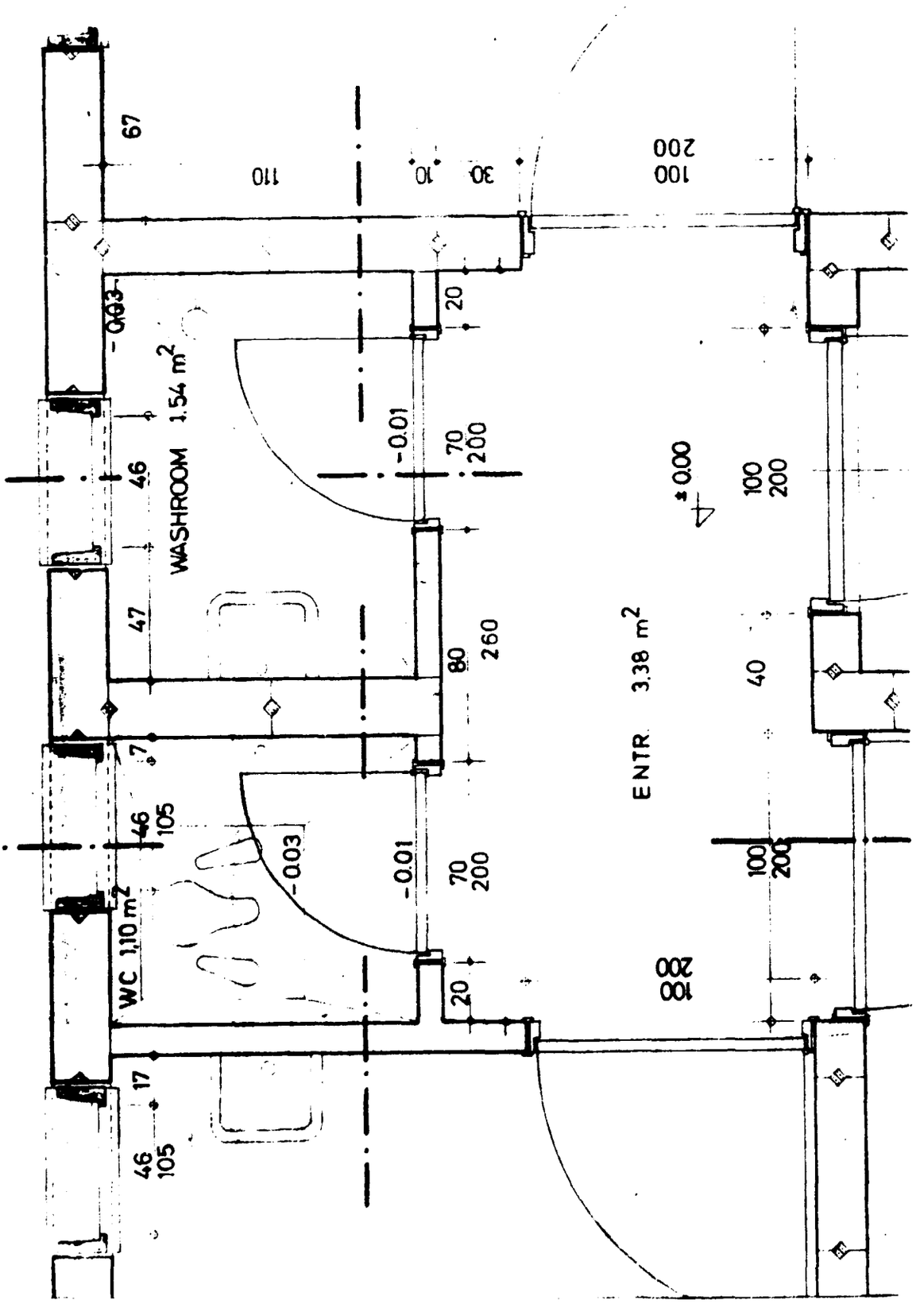



150
100
200
20
250
C
A
D
800

SYSTEM No: 3 CORNER DETAIL



SYSTEM No: 3 WALL JUNCTION DETAIL



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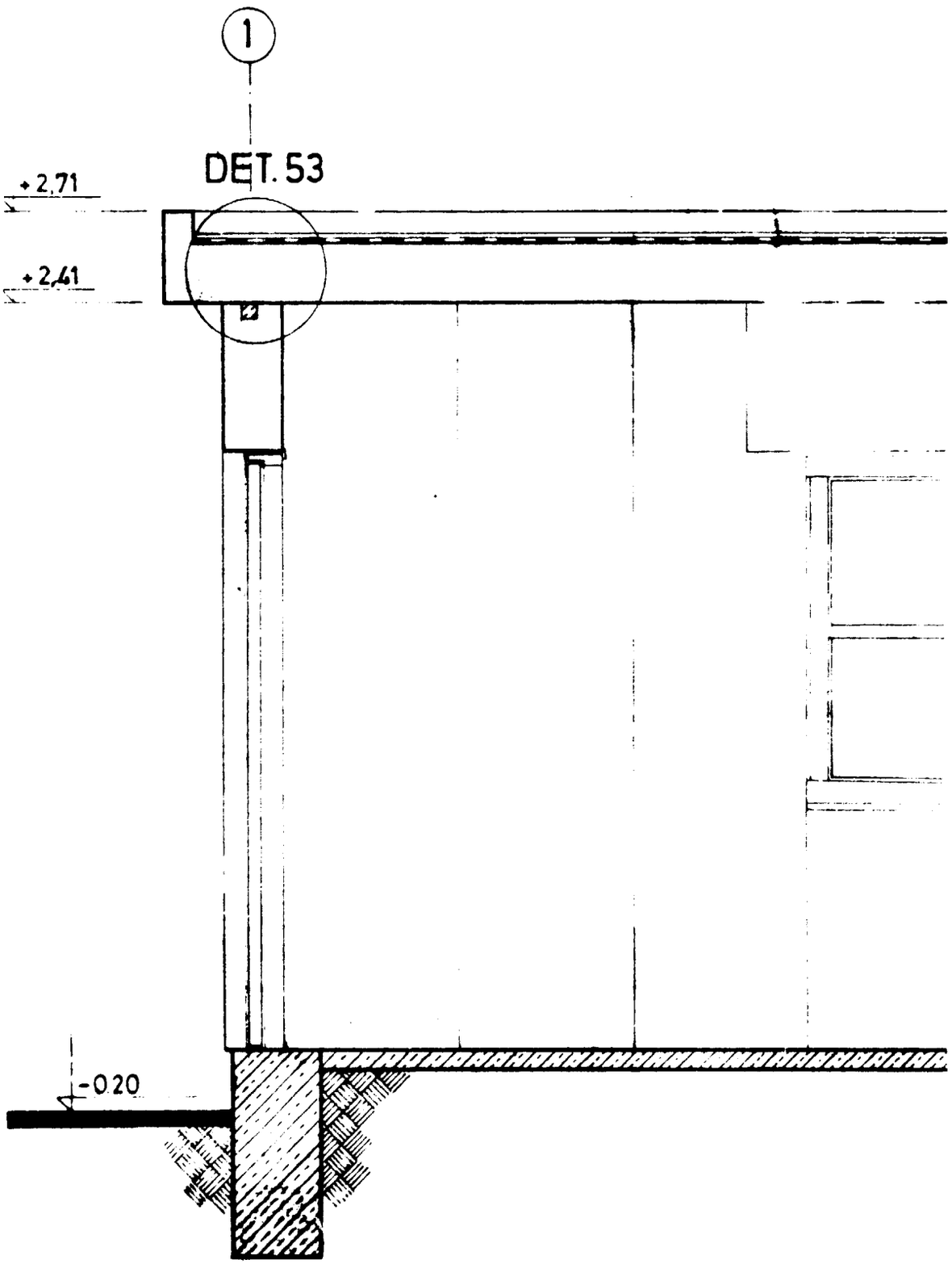

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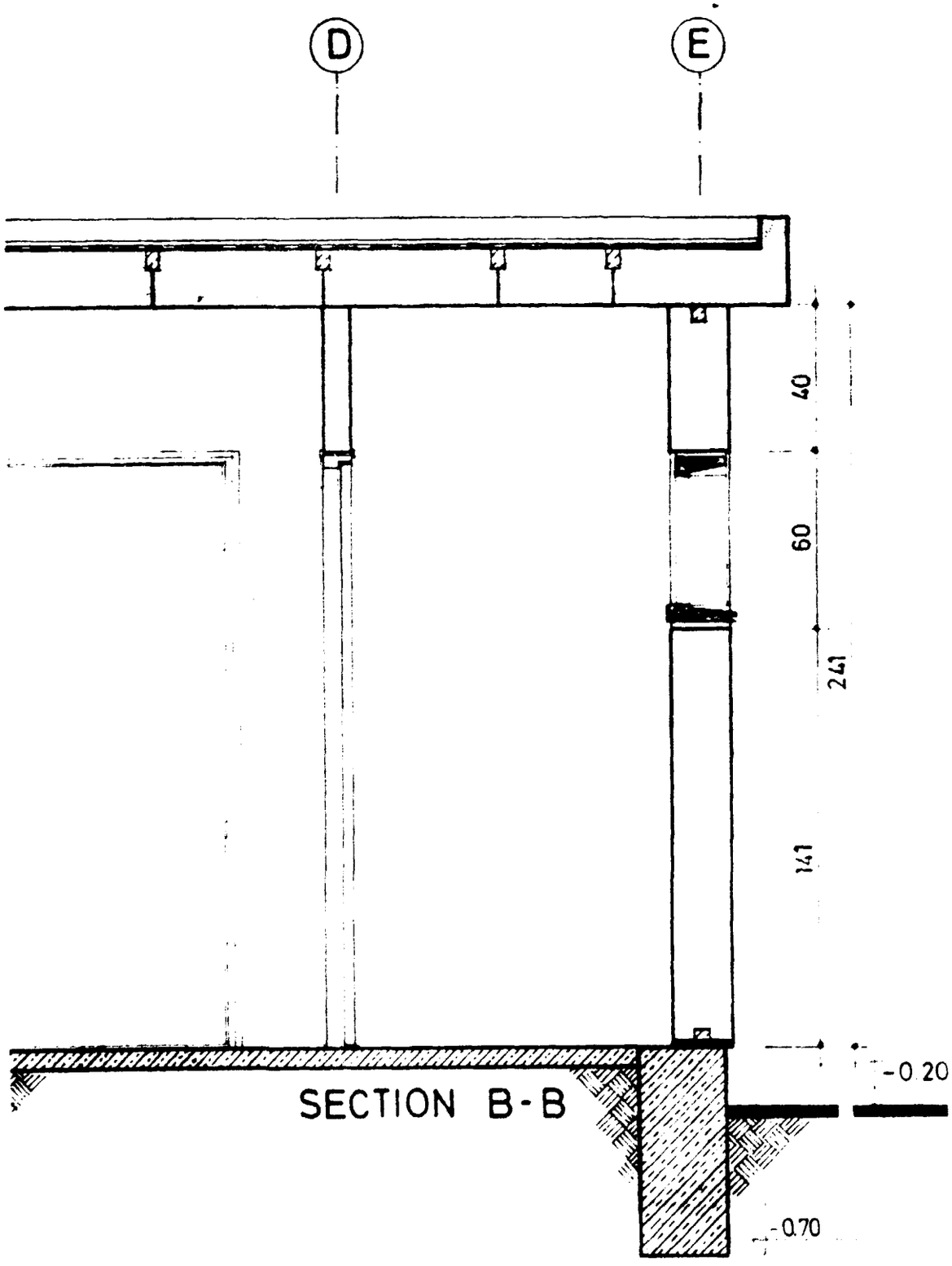
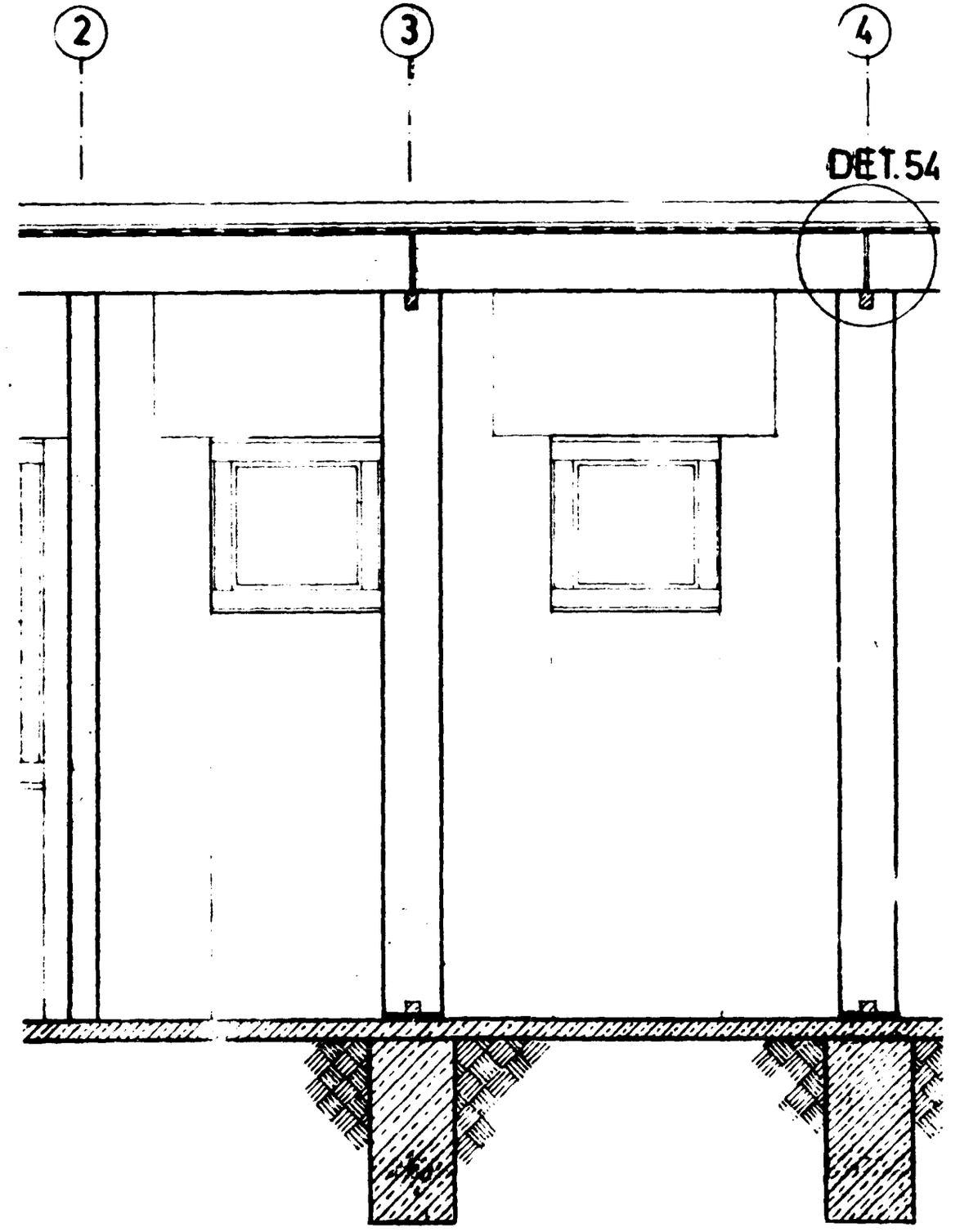


SECTION B-B

SYSTEM No: 3 SECTION



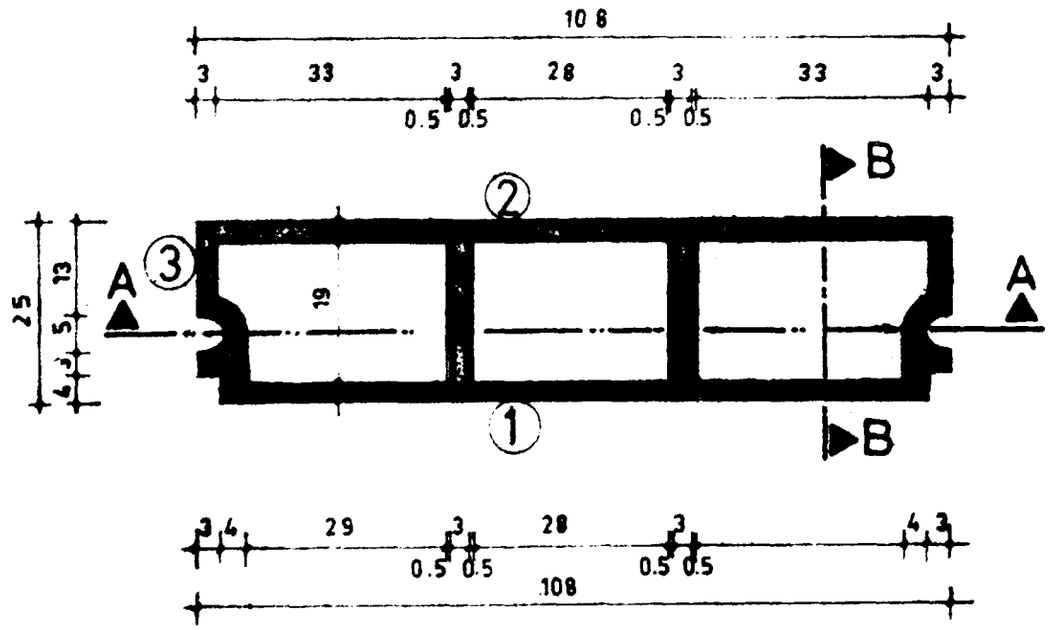
System No.: 4

The Test-house

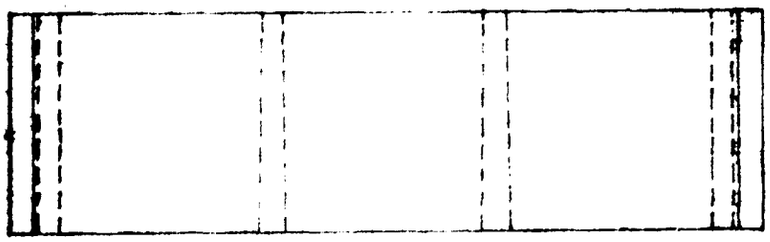
Construction System: Semi-industrialized (BMRC)

No.of components	:	8
Exterior walls	:	Hollow concrete wall-blocks. Drywall. Precast columns between blocks. Ext. and int. Plaster.
Interior walls	:	Same system as exterior walls.
Columns	:	Precast columns at block-connections.
Floor	:	Concrete.
Roof	::	Beams and hollow blocks.Thin concr. slab, insulation, bitumen, gravel.
Stair	:	No stair system.
Doors	:	Wood.
Windows	:	Steel.

SYSTEM No: 4 BASIC BLOCK

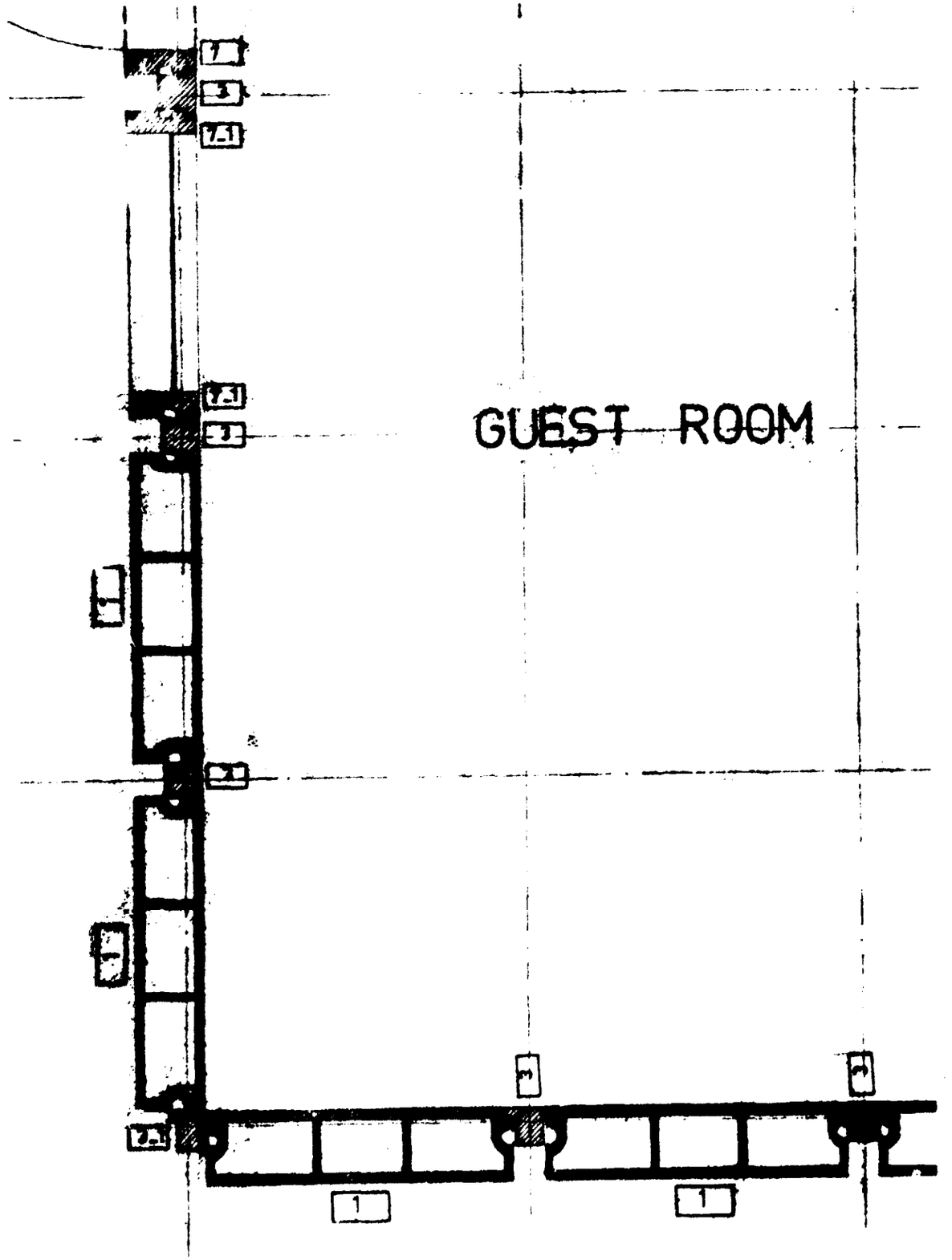


PLAN

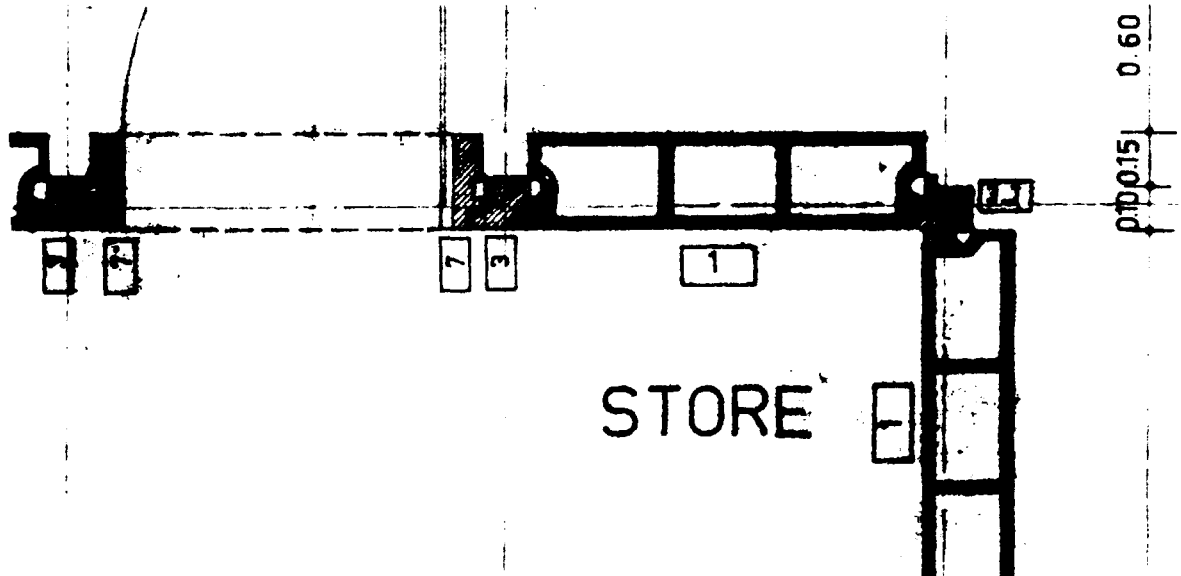


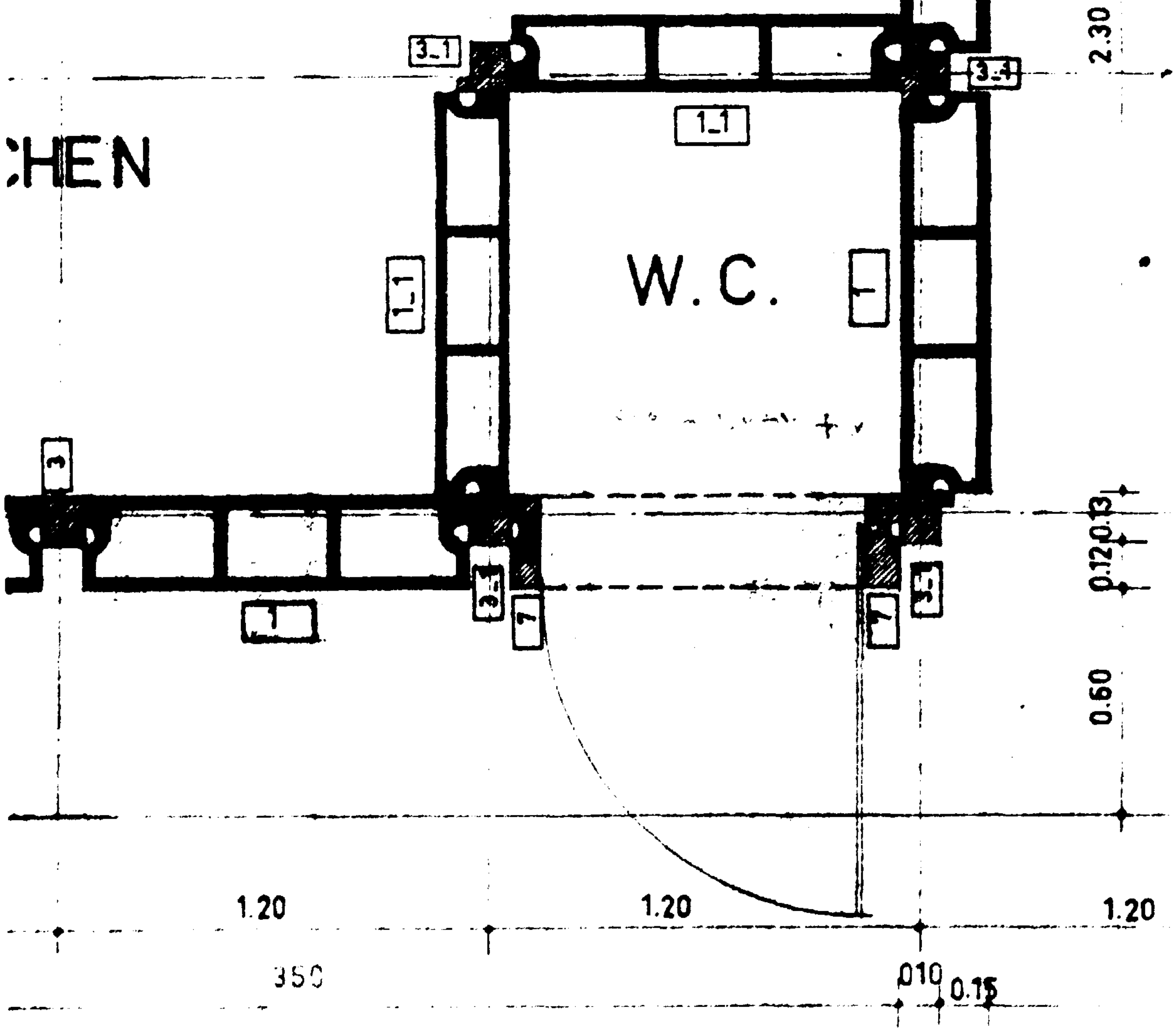
ELEVATION 1

SYSTEM NO: 4 CORNER PLAN



SYSTEM No: 4 WALL JUNCTION DETAIL





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3_1
3_4
3
3_1
3_1
7
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1.20
1.20
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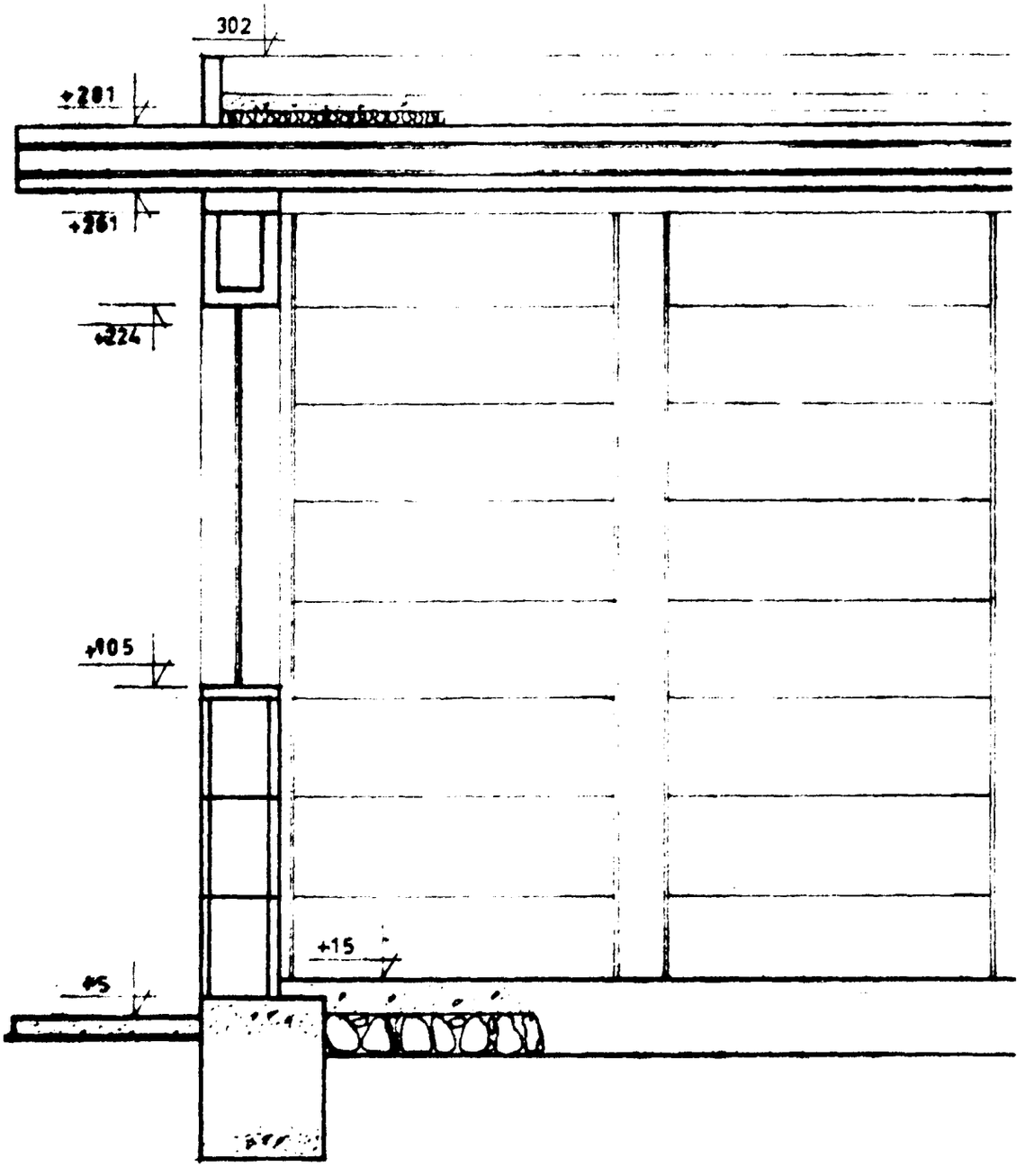
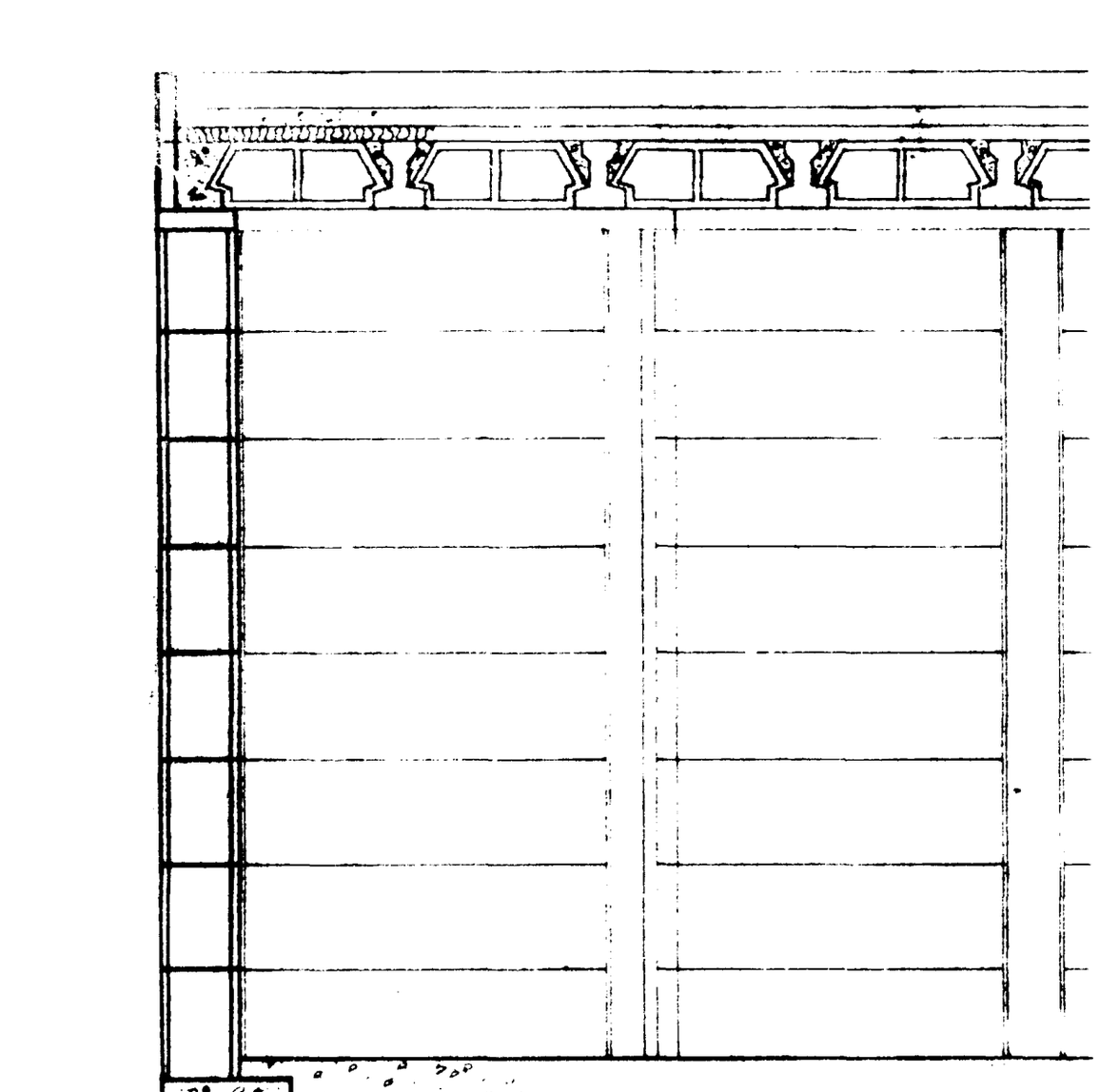
1.20
350
0.10
0.15

SYSTEM No: 4 SECTION



SECTION B_B

SYSTEM NO: 4 SECTION



SECTION D_D

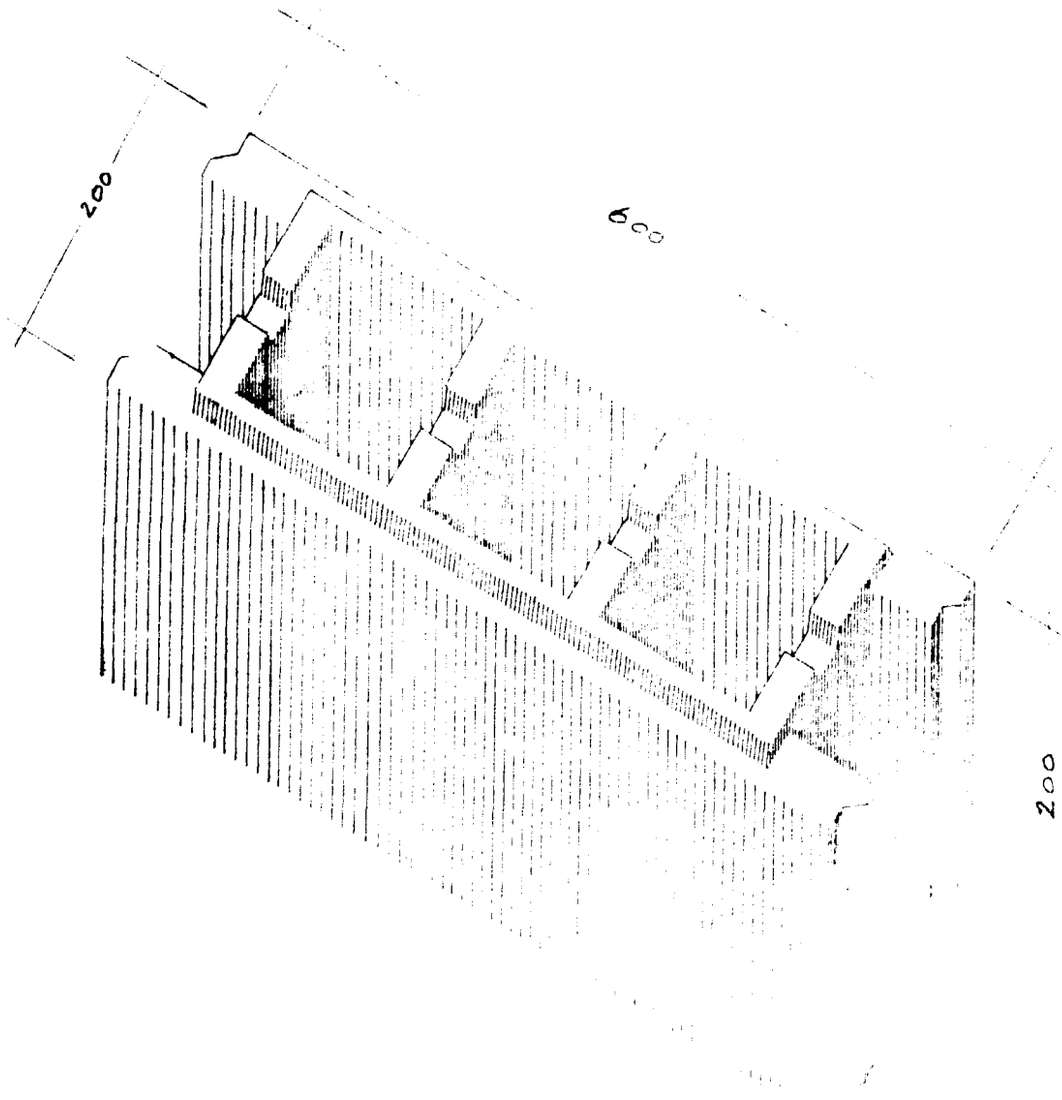
System No.: 5

Test-house under design.
Will be erected before the
end of 1980

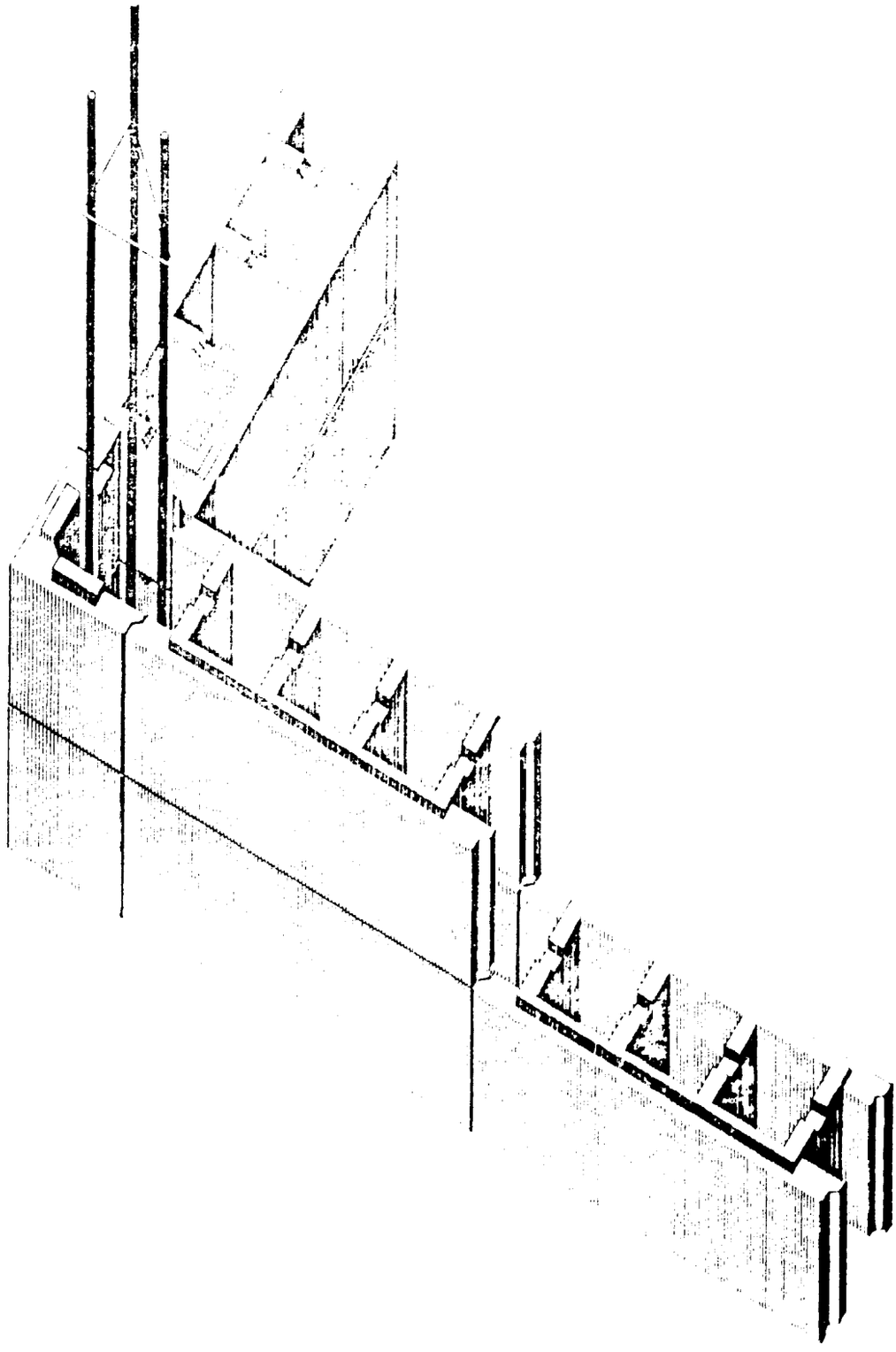
The Test-house:

Construction System:		Semi-industrialized. (BMRC)
No.of components	:	12
Exterior walls	:	Hollow concr.blocks, space for insitu concr.columns, meccano type system for beams and openings. ext.+int.plaster.
Interior walls	:	Like ext.walls, jointing.
Columns	:	In situ concrete columns between floor, reinforced where necessary.
Floor	:	Tiles.
Roof	:	Beams and hollow blocks, insulation. Thin concrete slab, bitumen, gravel.
Stair	:	Stair system part of construction system.
Doors	:	Wood.
Windows	:	Steel.

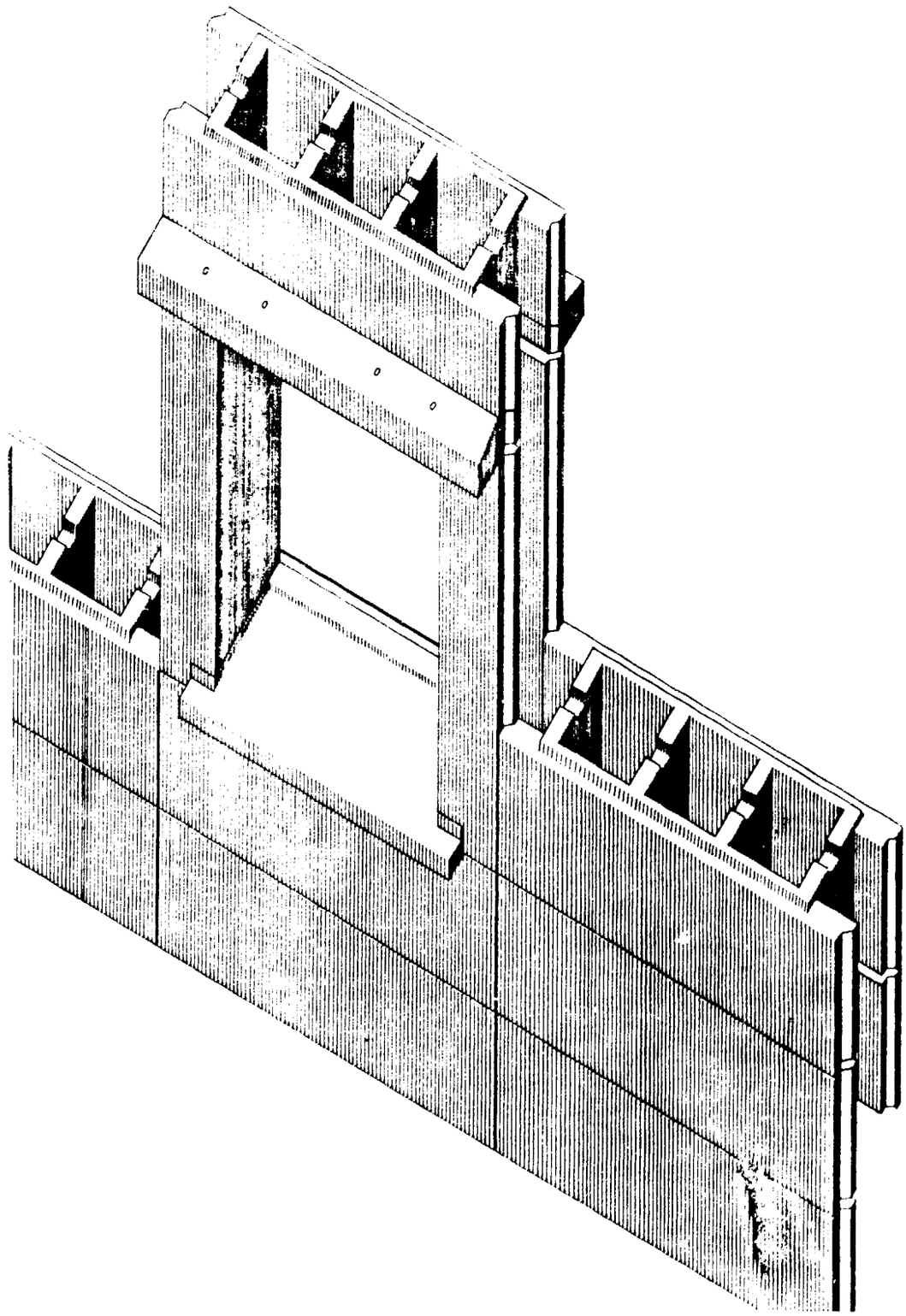
SYSTEM No: 5 BASIC BLOCK



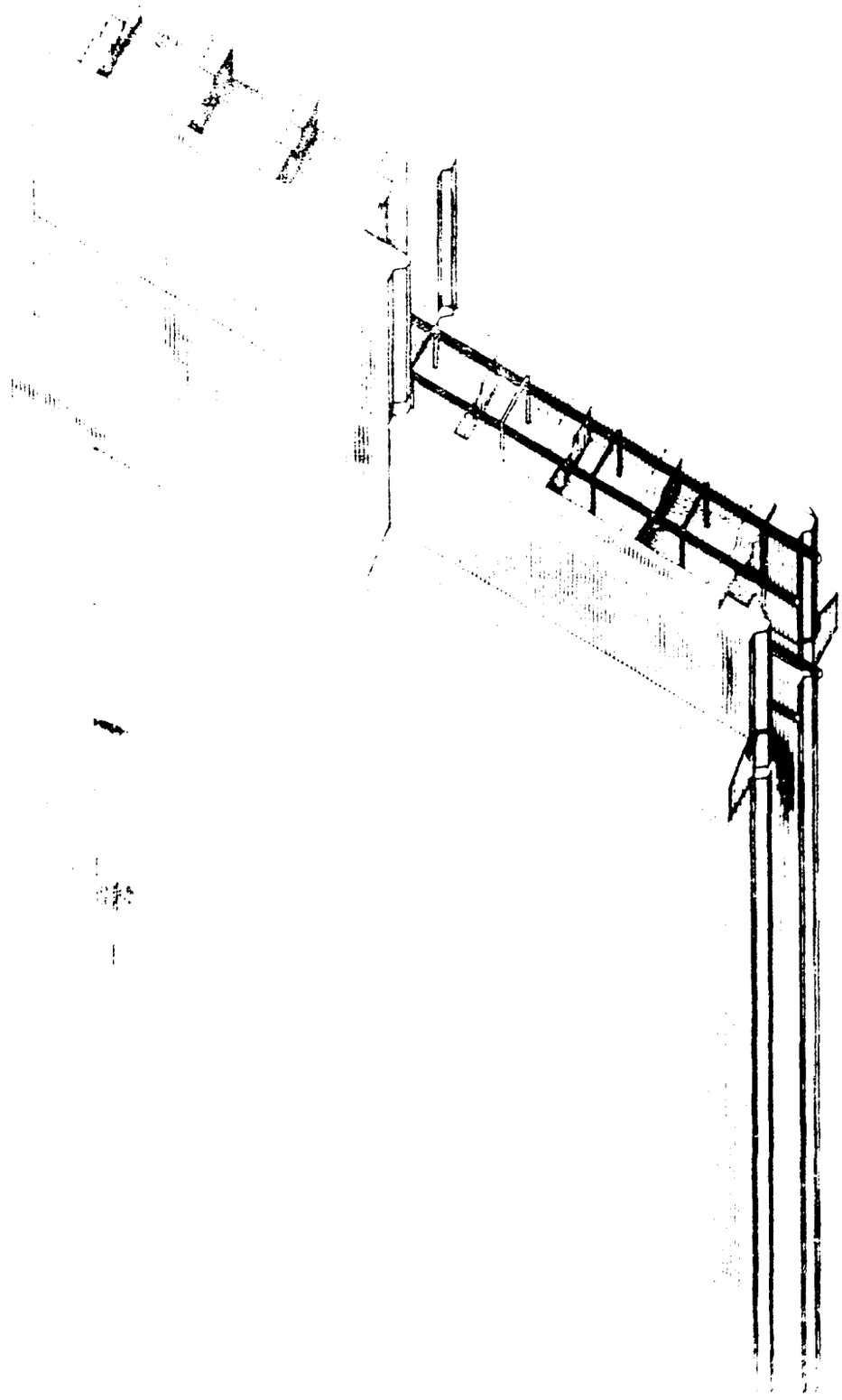
SYSTEM NO: 5 CORNER DETAIL



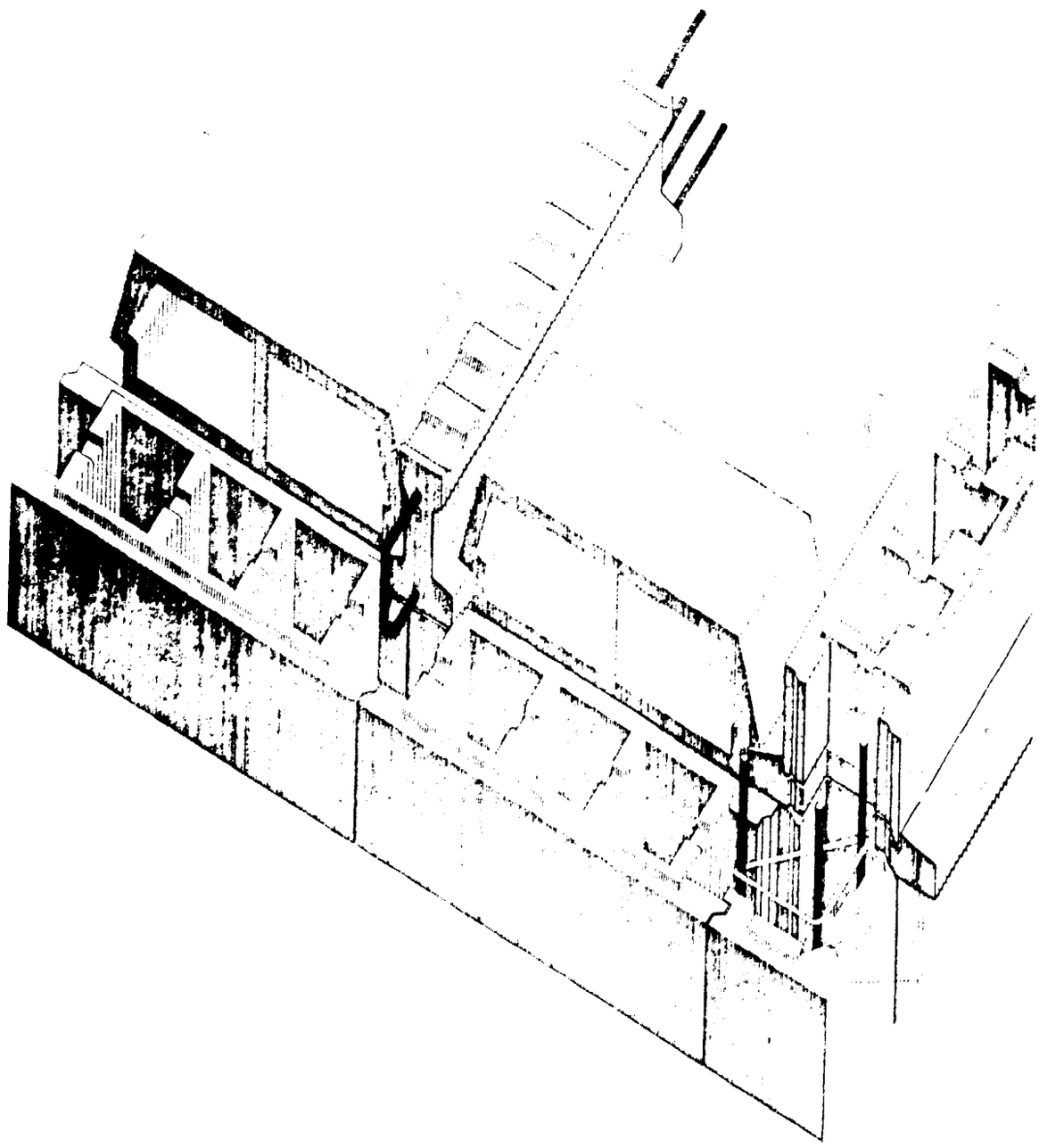
SYSTEM No: 5 WINDOW DETAIL



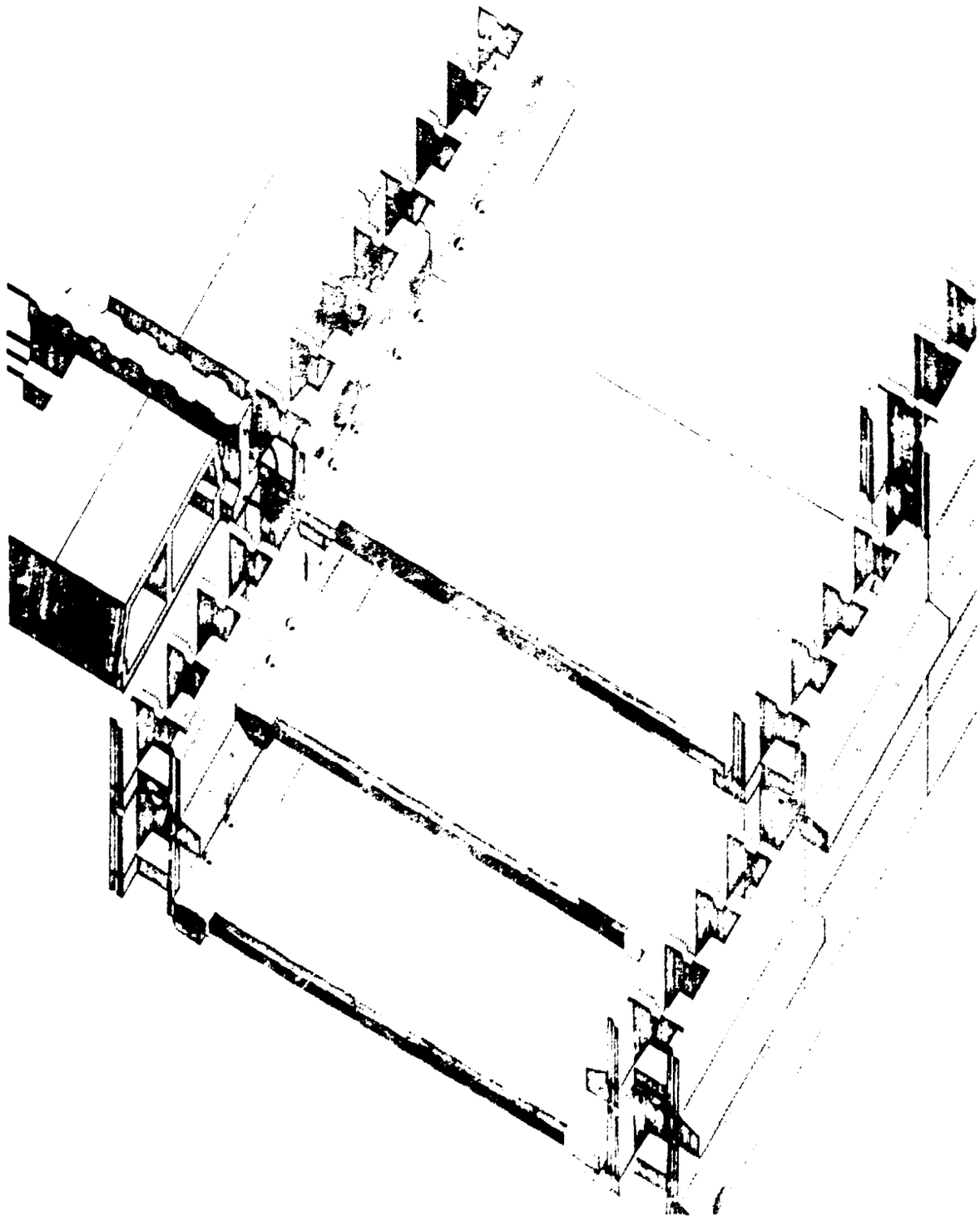
SYSTEM No: 5 LINTEL DETAIL



SYSTEM No: 5 SLAB DETAIL



SYSTEM No: 5 STAIR SYSTEM



PUBLICATIONS MADE BY THE BMRC

1 - Development of low cost housing from prefabricated Elements project No. 74.2211.6 ____ Interim report No. 1 - April 1/1979 March 31/1979 ____ prepared by Seyfeddin Muaz,

2 - Indoor climatic measurements of some houses in Sordan prepared by Dr. Jalal Dawani, Hans Douheimer August 1977.

3 - Development of low cost housing from prefabricated Elemnts Interim Report No. 3 April 1st - June 30th, 1977 ___ Project No. 74.2211.6
Prepared by Dr. R.L. Sharif
August, 1977.

4 - Development of low cost housing from prefabricated Elements. Interim Report No. 4 July 1st/September 30th, 1977 - Project No. : 74.2211.6
Prepared by R.L. Sharif.
November, 1977.

5 - Development of low cost housing from prefabricated Elements. Interim Report No. 5 October 1st-December 31st, 1977 - project No.: 742211.6
Prepared by Dr. R.L. Sharif.
February, 1978.

6 - Development of low cost housing from prefabricated Elements. Interim Report No. 5 October 1st-December 31st, 1948 - project No.: 742211.6
Prepared by Dr. R.L Sharif.
May, 1978.

7 - Development of low cost housing from prefabricated Elements. Interim Report No. 7 April 1st-June 30th, 1978 - project No.: 742211.6
Prepared by: Dr. R.L. Sharif. July, 1978.

8 - Laboratories Section - concrete mixes, properties and design. Prepared by Engineer: Najib Ayoub. July/1979.

9 - Draft of the National Building Regulations for Jordan part (1) chapter 4 ADMINISTRATION
Drafted by Dr. R.L. Sharif. D - Dr. Dauad F. Jabaji Ph.D Eng. Akram F. Abbassi Bsc., C.E
September/1979.

SYSTEM NO:

10 - Development of low cost housing from prefabricated Elements interim report No. 8 July 1st-September 30th, 1978-project No.: 742211.6. Prepared by Dr. R.L. Sharif and Dr. D. Jabaji.
October, 1978.

11 - Criticalpath method in project management
Lecture Notes by: Dr. Daud Jabaji Ph.D.

12 - Project management at the R.S.S.
Prepared by Dr. Daud Jabaji Ph.D.
January, 1979.

13 - Administration process in develping institutes
by R.L. Sharif Ph.D.
Submitted to Research Management Development Workshop
January, 1979.

14 - Development of low cost housing from prefabricated Elements interim report No. 9 October 1st 1978-March 30th, 1979-project No. 74.2211.6
Prepared by Dr. R.L. Sharif and Dr. D. Jabaji
June, 1979.

15 - Technologies and organization for the sustainable provision of basic shelter. By Dr. R. Sharif, Ph.D. and Dr. D. Jabaji Ph.D.
presented to : Alecso/Aspen/unep joint seminar on technlogies for sustainable satisfaction of basic human needs. October 1979.

16 - A proposed system for housing low income groups in Jordan. Prepared by: Daud Jabaji, Ph.D.; Akram Abu-Hamdan, A.A. Dip-Josef Constantinian, B.Sc.; Bishr Zureikat, B.Sc.
Febrauary 1980.

17 - Request for assistance for the development of the BMRC at the R.S.S., submitted to UNDP (Science and Technology Interim Fund)
May 12. 1980

SYSTEM NO:

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT DOCUMENT

(DRAFT)

Title: "Assistance to the Building Material Research Centre in the RSS to a Building Research and Test Programme to receive comparable datas for different construction systems in the field of low-cost housing."

Project no.: Duration: 19 months

Purpose of project:
The project is to provide technical assistance in a building research and test programme for low-cost housing to receive comparable datas for different construction systems from traditional construction to rationalized construction and semi-industrialized construction.

Sector: Industry

Sub-sector: UNDP class:

Government implementing agency:

Executing agency: UNIDO

Estimated starting time: 1 January 1981

Government input:

UNDP input:

Signed:

(on behalf of the executing agency) Date:

(on behalf of the associated agency) Date:

(on behalf of UNDP Date:

PART I. LEGAL CONTEXT

PART II. A. DEVELOPMENT OBJECTIVES

The test-programme is a research programme within the objectives of the HABO, dealing with research and development of housing for low income groups. The urgent need for houses calls for the fast availability of comparable datas (labour, equipment, timing, cost) for the construction from traditional to rationalized and a newly developed semi-industrialized construction system to ease and support future decisions in the low-cost housing policy, and to influence future research in this field on a wide scale.

PART II. B. IMMEDIATE OBJECTIVES

Within the test-programme 16 houses in total should be built at the same time, on the same site, in accordance to the same design but following the four different construction methods as follows:

4 houses: traditional construction method
4 houses: rationalized construction method no. 1
4 houses: rationalized construction method no. 2
4 houses: semi-industrialized construction method.

Comparable datas will be received for example for:

1. material: cost, transport, disposal, storage space needed, lifting devices needed, time for handling, no.of different components... etc.
2. labour: skilled (man/hour), unskilled (man/hour), shelter needed... etc.
3. erection: time for material handling needed, time for erection:walls, roofs, installation, finishing... etc.
4. thermal insulation of walls and roofs.
5. sound insulation of walls and roofs.
6. ventilation,
7. influence of sun and shadow.
8. social acceptability.

PART II. C. SPECIAL CONSIDERATIONS

This test-programme for low-cost housing is concerned with the following objectives:

- reduction of costs,
- speeding up the construction,
- rationalization of traditional construction methods by using prefabricated components,
- rationalization of the design for floorplans, installation units... etc.
- rationalization of transports,
- rationalization of building erection,
- rational fabrication of components,
- simplification of components,
- rational use of land,
- rationalization of services.
- It will influence and improve environmental conditions and design.
- It will promote technical co-operation among all institutions dealing with low-cost housing in Jordan.
- It will promote technical co-operation among developing countries in this region.

PART II. D. BACHGROUND AND JUSTIFICATION

The urgent and rapidly growing need of shelter for low income groups, being allready expressed in several studies, reports, and publications, calls for fast reaction by all institutions and authorities involved. Up till now traditional construction methods were used to solve this problem. Rationalization and semi-industrialization in the field of low-cost housing is urgently required.

After having gained wide experience on rationalized and semi-industrialized construction systems, the BMRC developed a semi-industrialized construction system wich is most likely to be very successful.

In order to ensure, support and speed up economical, financial and political decisions on the field of low-cost housing, this test-programme should be run as soon as possible to receive exact and comparable datas for the different construction methods.
The BMRC being the country's research centre for low-cost housing needs all necessary support to fullfill its objectives.
Intensive and permanent co-operation between the BMRC on all executing institutions, authorities and construction firms is necessary to ~~concentrate~~ concentrate all research work on this sector in order to make all efforts as effective as possible.

PART II. E. OUTPUTS

The test-programme will enable the BMRC to provide numerous datas on labour, material, erection, costs to the executing institutions for future decisions. It will make a wide step forward to economize on speed up construction and all reasearch in this field.
(See PART II. F. SPECIAL CONSIDERATIONS.)

PART II. F. ACTIVITIES

The following list shows the main activities to be performed for the test-programme, indicating the activities for local staff and UNDP-assistance, and the approximate duration:

Activities:	aprox. duration:	to be carried out by:
1. Work preparation:	3 mm	
- clearance for finances and location (site) for the test-programme.		local staff
- lots, services, test-houses. (design)		local staff
- specifications		local staff
- data sheets for compareson		local staff + UNDP-ass.
- call for bids from contractors, selection of firms...etc.		local staff + UNDP-ass.
2. Work observation:	9 mm	
- taking datas during the construction of the test-houses.		local staff + UNDP-ass.
3. Work evaluation.	2 mm	
- evaluation of datas received.		local staff + UNDP-ass.
4. Work information.	2 mm	
- public relations and marketing of datas received.		local staff + UNDP-ass.
5. Project evaluation.	2 mm	
- final report, publications, decisions for further steps to be taken e.g. financially, further research on materials, design, rationalisation, new construction systems or methods...etc.		local staff + UNDP-ass.
Duration in total approx:	18 mm	

PART II. G. INPUTS

1) Government inputs:

i) Finacial aid to the execution institutions for the erection of the test-houses. (Housing Corporation or/and Jordan Valley Authority)

ii) Provision of the construction site for the test-programme.

iii) Local staff:

- National Project Director 18 mm
- Two Architects/Civil engineers 18 mm

2) UNDP/UNIDO Inputs

UNDP - Assistance:

i) UNIDO-Expert for the activities "Work Preparation" till "Work Evaluation." (See Part II. F. 1 - 3) 14 mm

ii) UNIDO-Expert for the activities "Public Relations and Marketing" till "Project Evaluation". (See Part II. F. 4 - 5) 4 mm

Please see budget sheet attached as Appendix 1.

PART II. H. PREPARATION OF WORK PLAN

A detailed work-plan for the implementation of the project will be prepared by the UNIDO-Expert assigned to the project in co-operation with the leader of the local staff. This will be done at the start of the project and brought foreward periodically. The agreed upon work-plan will be attached to the Project-Document as Annex I and will be considered as part of that Document.

PART II. I. PREPARATION OF THE FRAMEWORK FOR EFFECTIVE PARTICIPATION OF LOCAL AND INTERNATIONAL STAFF IN THE PROJECT

The activities necessary to produce the indicated outputs and achieve the project's immediate objectives will be carried out jointly by the national and international staff assigned to it. The respective roles of the local and international staff will be determined by their leaders by mutual discussion and agreement, [illegible] of the project, and set out in a framework for [illegible] participation. The framework, which will be attached to the project document as an annex, will be reviewed from time to time.

PART II. J. DEVELOPMENT SUPPORT COMMUNICATION

As shown under Part II. D. "Special considerations", this project will have an extensive [illegible] output towards future research and development activities and decisions for the HRC itself, and for the future housing policy of institutions, corporations, authorities and the construction industry. Therefore close co-operation should always be observed with all these institutions during the time the test-programme is running. During the work-preparation-Phase the housing Corporation and/or the Jordan Valley Authority should help to provide sites and services for the test-programme.

PART II. K. INSTITUTIONAL FRAMEWORK

The test-programme is a research programme within the objectives of the BMRC, Building technology division.
All activities listed under Part II. F. 1 - 5 will be carried out by this division with UNIDO-assistance.
The necessary material testing and component testing within the test-programme will be carried out by the BMRC - Laboratory division.
The construction site should be located not too far from the BMRC to facilitate supervision and observation.
The site and services should be provided by one of the country's existing great institutions dealing with low-cost housing, the Housing Corporation and/or the Jordan Valley Authority for they will take advantage of the datas received. For the erection of the test-houses should be financial help from the government.
The test-programme will be managed by the BMRC.

PART II. L. PRIOR OBLIGATIONS

Before UNDP/UNIDO-assistance starts, all questions about
financing of the project,
site and services, should be cleared,
design and specifications
shoud be cleared or at least outlined ready for action.

The project document will be signed by the resident representitive on behalf of UNDP, and UNDP/UNIDO - assistance to the project will be provided only if the prior obligations stipulated above have been met to UNDP's satisfaction.

PART II. H. FUTURE UNDP ASSISTANCE

The test-programme will lead in it's evaluation to numerous decisiones for new research and development programmes in the field of rationalization and semi-industrialisation of construction methods and systems, of prefabrication of components... etc. It is most likely, that future UNDP-assistance will then be needed.

PART III. A. SHEDULES OF MONITORING, EVALUATION AND REPORTS

The Project will be subject to periodic review in accordance with the policies and procedures established by UNDP for monitoring project and programme implementation.
No special reviews will be necessary by the executing agency and/or an independent consultant.

PART III. B. EVALUATION

The project evaluation is part of the project itself. (See Part II. H. 4), Two months time will be provided for this "project evaluation".

PART III. C. PROGRESS AND TERMINAL REPORTS

Progress reports will be made according to the different stages listed under Part II. F. 1 - 5.
A terminal report will be produced at the end of the project indicating the findings and giving recommendations for future activities.

APPENDIX 1

PART IV BUDGET

Estimated Project Budget covering UNDP Contribution

Country: Jordan

Project No.:

Project Title: Building research and test-programme

		Total m/m	Total US$	1981 m/m	1981 US$	1982 m/m	1982 US$
10	Project Personnel						
11	Experts						
11-01	Work preparation-Expert.	14		12	79.200	2	14.800
11-02	Public Relations- and Marketing - Expert.	4	-	-	-	4	29.600
11-99	Sub-total:	18		12	79.200	6	44.400
15	Experts travel						
19	Missions costs						
19	Component total:						
59	Misc.				2.500		1.250
	GRAND TOTAL:						

Job description for UNIDO-assistance "Work preparation".

(Draft)

JOB DESCRIPTION

Project No.:.....

Post title: Expert in work-preparation for traditional and precast low-cost housing projects.

Duration : [illegible] months.

Purpose of project : To assist the Building Materials Research Centre (BMRC) of Jordan in the preparation, execution and evaluation of a research and test-programme for traditional, rationalizised and precast low-cost housing construction.

Duties : The expert will be attached to the BMRC, Amman in the Royal Scintific Society (RSS), and will specifically be expected to:

1. Assist in the preperation, in the formulation of comparable specifications, calculations, time-planning and other data sheets for the building research and test-programme.
2. Assist in the most economical manner of execution of the test-programme.
3. Assist in the evaluation of the datas received during the execution of the test-programme.

The expert will also be expected to prepare a final report, setting out the findings of his mission and his recommendations to the Government on further action which might be taken.

Qualifications: Architct and/or civil engineer with extensive experience in work-preparation, execution and evaluation (specifications, calculation, time- labour-equipment-planning) for traditional and precast housing projects.
Past working experience in developing countries an asset.

Language : English.

Background information:

The Building Material Research Centre in the RSS has the following objectives:

- Research on low-cost housing including utilization of local materials.
- Preparation of codes and specifications.

- Testing of new materials and final products in the building materials industries.
- Research work with other institutions and research organizations.
- Surveying, on a continuous basis, the raw materials for building industries.

After having designed and judged several different construction systems for low-cost precast housing, and after the erection of one test-house per system, it is planned to run a first test-programme for traditional and precast low-cost housing in order to produce comparable data for time, labour, equipment, and construction methods on the site. Therefore traditional, nationalized and precast built houses will be erected on the basis of identical plans, at the same time at the same construction site.

Candidates requested by .....

- - - - - - - - -

Remark: If the test-programme should be started before the beginning of 1981, expert should be available by January 1981 the latest.

Job description for UNIDO-assistance "Public relations [illegible] marketing".

(draft)

JOB DESCRIPTION

Project No.: .....

Post Title: Expert in public relations and marketing for low-cost housing.

Duration : 4 months

Purpose of project: To assist the Building Material Research Centre (BMRC) of Jordan in evaluation, public relations and marketing of results received from a building research and test-programme for low-cost housing construction systems.

Duties : The expert will be attached to the Building Materials Research Centre (BMRC) in the Royal Scientific Society (RSS), Amman, and will specifically be entrusted to:

1. Assist in the preparation, formulation and execution of all public relations and marketing activities in order to introduce all results received by this test-programme for low-cost housing to the market.
2. Assist in the evaluation of all findings of this test-programme, and in the formulation of recommendations for future research and development work to be done in the low-cost housing field.

The expert will be expected to prepare a final report, to which will be his findings of this mission and his recommendations to the government on further action that might be taken.

Qualifications: Economist in low-cost housing with extensive experience in public relations and marketing. Prior work experience in developing countries an asset.

Language: English.

Background information: [illegible] "background information"