PPA/T/20

SECONDARY STANDARD DOSIMETRY LABORATORY (SSDL)

by

MD. SAION BIN SALIKIN

1983

Jabatan Kawalan Sinaran dan Kesihatan
Pusat Penyelidikan Atom Tun Ismail
(PUSPATI)

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Content

Preface

Peaceful uses of Atomic Energy for benefit of mankind is essential in the effort to upgrade the socio-economic status of the people. Radiation as well as Nuclear Techniques provide alternatives to the conventional means of solving various problems and in most applications the former have proved to be more superior than the latter. In Malaysia radiation is being used for peaceful purposes in various fields, such as in medicine, industry, agriculture etc. The increasing use of radiation has led to the realisation of the importance of standardisation of radiation measurements particularly in order to avoid confusion over legal implications and liabilities. It is our firm belief that time has come for a National Laboratory responsible for Radiation Metrology and standardization to be established in Malaysia. A national secondary standard and Dosimetry laboratory (SSDL) is being established at PUSPATI to meet the national requirements for Radiation metrology and standardization. In fact the main purpose of setting up SSDL-MOSHAM is to provide facilities to ensure and improve the accuracy and standardization of radiation measurements.

1. Introduction.

1.1 SSDL and its history.

SSDL is an abbreviation of secondary standard Dosimetry Laboratory. Standard means something which is used as a test or measure for weights, lengths or other qualities. SSDL is a standard Laboratory to measure or test radiation qualities by using secondary standard instruments, calibrated by PSDL (Primary Standard Dosimetry Laboratory).

The International Atomic Energy Agency (IAEA) and the World Health Organisation (WHO) have agreed to set-up an "IAEA/WHO Network of Secondary Standard Dosimetry laboratories". The main purpose of this Network is to improve accuracy in applied radiation dosimetry throughout the world. In the working arrangement between IAEA and WHO, the former will be responsible for its technical and scientific developments whereas the latter accepts the main responsibility for operating the network.

The objectives of the network of SSDL are as follows,

a. To improve dosimetric accuracy, particularly in medical applications and to promote the applications of radiation by supporting centres and laboratories for the creation and distribution of knowledge in applied dosimetry.

b. To help exchange experience between members and affiliated members and to provide support to each other where necessary.

c. To establish and facilitate links between members and the international system of radiation measurements through PSDLS (Primary Standard Dosimetry Laboratories).

d. To promote compatibility of methods applied for calibration and performance of dosimetry in order to achieve uniformity of measurements throughout the world.

1.2 Membership

The objectives of the network are actually in line with the objectives of PUSPATI. In 1979 PUSPATI was nominated by Malaysian Government to be a member of the network. At that time PUSPATI did not fully meet the criteria set for membership, therefore PUSPATI was accepted only as a provisional member of the network pending the development of the laboratories. PUSPATI has set-up "SSDL Unit" to make sure the project of establishing SSDL in PUSPATI is succesful.

2. Status in Malaysia.

2.1 Status of SSDL-PUSPATI

SSDL-PUSPATI is still a provisional member of IAEA/WHO Network of SSDL. A working paper was prepared to suggest and justify the SSDL should be given a national status in Malaysia. On 28th June 1982 the working paper was presented to the National Adivsory Committee on Nuclear Energy (NACNE) to get its consent and approval. NACNE decided in principle to give SSDL-PUSPATI a National Status however the details have yet to be worked out. The current developments of the SSDL is very much in progress now especially in construction work of the laboratories, in training of staffs (refer Appendix - A) and in carrying out activities according to the SSDL programmes (refer to section 4).

2.2 Objectives and Programmes.

In order to achieve the goals of setting up a national laboratory in PUSPATI, SSDL Unit has set a very clear objective. The objective provides guidelines to our staffs in planning future programmes and carrying out activities of the unit.

The objective of SSDL Unit is "To establish a secondary standard Dosimetry Laboratory as a national Laboratory in Malaysia and utilize the laboratory to provide services which include calibration service in Therapy and protection levels, for users from inside and outside PUSPATI".

We acknowledge the fact that a standard laboratory can not exist in isolation. Therefore it should be subject to regional or international intercomparisons with other standardization organisations. SSDL-PUSPATI has been receiving assistance from IAEA and WHO in forms of expert service and equipment. In addition to that, Japan also provides training in related areas under bilateral agreement between the two governments.

PUSPATI has been committed to the Network of SSDL since 1979. Since then we have been working to fomulate programmes which are practical and feasible from out points of view. Criteria such as number of staffs, training of the staffs, laboratory space and budget are given serious considerations.

Based on the objectives above, SSDL Unit has choosen and identified five programmes which are in line with our effort to promote peaceful uses of atomic energy in Malaysia.

The programmes are as follows,

1. Personnel Dosimetry
2. Calibration
3. Irradiation Service
4. Dosimetry Service
5. Advisory Service in Dosimetry

2.3 Training of the staffs.

At the moment there are eight people in SSDL-Unit. Four of them are qualified Research Officers with Masters Degrees in Medical Physics, Nuclear Technology, Non-Destructive Testing and Radiation and Environmental Physics. One of them has undergone training for 13 months in SSDL, West Germany and two of them are still undergoing training in various aspects of SSDL in Japan.

Two of the staff are technicians from Polytechnic Ungku Omar. Both of them have undergone on-the-job training in Philippines and Australia. Finally there are two laboratory assistants to help and support the others in implementing activities of the SSDL. (Please refer to Appendix - A).

3. Building and Development of SSDL-PUSPATI.

3.1 Laboratories in PUSPATI's Complex.

In the first phase of the PUSPATI Project, the SSDL Unit is allocated with eight laboratories, three irradiation bunkers, two control rooms, one laboratory for personnel monitoring and two laboratories for chemical Dosimetry and TLD. The total floor area is about 3,272 sq.ft. (for detail please refer appendix B).

3.2 New Building of National SSDL.

In the second phase of the PUSPATI project the SSDL will be provided with adequate laboratory space as well as staff rooms to carry out programme at the national level. (Please refer Appendix - C).

3.3 Expert Service.

In a working arrangement between IAEA and WHO, IAEA will provide technical Assistance such as expert service

instrumentation, training of the staff etc., whereas WHO will be involved more in coordination work. Under Technical Assistance programme MAL/003, SSDL-PUSPATI has received a few man-months expert service (refer Appendix - F).

3.4 Instruments and Equipment

(a) From IAEA

About US$123,000.00 worth of equipment and instruments has been received from IAEA under Technical Assistance project MAL/003. (Please refer to Appendix - D).

(b) From Malaysia

We have spent a considerable amount of money to purchase the necessary equipment and instruments. The amount spent for the SSDL-project is about M$89,000.00 exclusive of the building cost. (Please refer to Appendix - E).

4. Detail Programmes of SSDL-PUSPATI.

4.1 Calibration

4.1.1 Calibration of survey meters and Dosimeters.

One of the main programmes of establishing SSDL-PUSPATI is to provide calibration service for the whole of Malaysia. The SSDL will be equipped with secondary standard instruments, as well as radiation sources such as Co-60 (Gamma Energy ≅ 1.2 Mev), Cs-137 (Gamma Energy = 0.661 Mev) and X-ray Generator (320 kv) and other gamma and Beta sources.

In radiation protection, radiation personnel rely on the direct reading of radiation detecting instruments to know the dose level at a particular place and time. Radiation can not be seen, heard or touched , so we need a device to detect its existence and to know its quality as well as quantity (dose). The most common devices available are

survey meters, Dosimeters and other personnel monitoring devices.

In Radiotherapy Centres, dosimeters are used to measure the radiation doses and the machine output i.e. : Co-60 Machine, Betatron etc. In the treatment planning the amount of dose to be exposed to a patient is determined. During the real treatment, the patient will be exposed with the radiation doses determined earlier.

Referring to the examples given above, we can draw a conclusion that the instruments such as survey meters and dosemeters must be calibrated and recalibrated to ensure the reading of the instruments is acceptable, reliable and accurate.

In Malaysia it is recommended that every survey meter and dosimeter should be calibrated and recalibrated at least once every twelve months. In calibration the performance of the instrument is checked thoroughly. The calibration process involves a series of checks and tests to determine:

- Its energy reponse, angular and doserate response.
- Instrument scale linearity.
- Range change errors.
- Fall back effects at radiation level above the maximum level, indicated on its scale.
- Its response to other radiations for which it was designated.
- Environment test i.e. effect of temperature, pressure and humidity.

4.1.2 Radiation Sources

For calibration purpose the following radiation sources at protection and therapy levels are going to be

made available

(1) Co-60 Therapy head ; activity ≅ 4 kCi
(2) Cs-137 Therapy head ; activity ≅ 4 kCi
(3) Beta sources ; A set of secondary standard Beta sources which includes Pm-147, Sr-90 and Tl-204.
(4) Other protection level sources such as Am-241 , Ra-226 etc.
(5) X-Ray Machine (320 kv).

4.2 Personnel Dosimetry

International Organisations dealing with radiation protection such as ICRP and NCRP, have set for radiation personnel, five Rem per year as a maximum permissible Dose for whole body. However whenever possible concept of ALARA (As Low As Reasonably Achievable) must be practiced

Inspite of all the precautionary steps and measures, radiation personnel still receive radiation dose while performing their duties. Every personnel needs a personnel monitoring device(s) to monitor the amount of dose received. Eventhough, there are many devices or system available such as TLD badges, TLD rings, film badges, pocket chambers etc., but most countries accept film badge system as an official means to record dose.

In PUSPATI, SSDL Unit is now establishing a film badge system which is able to monitor X-Ray, Gamma-Ray, Beta-Ray and Neutrons. Basically the system consists of a cassette with filters and films. Film response varies with radiation quality (Energy). The system is able to analyse X-Ray and Gamma-Ray by using copper filters of different thickness. The film packing can stop beta radiations of lower energy (around 150 kev). Higher energy beta dose is

evaluated by comparing the blackness between the bare zone of the film and a zone covered by a plastic or aluminium shield. Cadmium filter due to its high cross-section to thermal netrons, is used to detect thermal neutrons. Accuracy of the system is about 20% and is acceptable for this purpose.

In personnel monitoring the main programme of SSDL Unit now is to establish a film badge system by using the standard laboratory to check and ensure the accuracy of the system. This involves setting up of the facility (refer to Appendix - B), establishing a standard procedure in calibration, developing of the film, evaluating the dose and providing personnel monitoring service to the whole Malaysia. TLD (Thermoluminesecence Dosimetry) is also included in this programme because it is expected that TLD system could offer better accuracy in the future.

4.3 Irradiation Service

All radiation sources available for calibration service are used also for irradiation service. In a research organisation like PUSPATI, a lot of research activities which use radiation, can be carried out.

The unit can provide the following:

1) Gamma-Ray Irradiation
   Co-60, Cs-137, Am-241, Ra-226, etc.

2) X-Ray Irradiation
   Up to 320 kv

3) Beta Irradiation
   Sr-90, Pm-147, TL-204.

Every radiation source is equipped with irradiation jigs and a calibration bench. The exposure rate is limited by the activity of the source and the maximum current of the X-Ray machine.

4.4 Dosimetry

Dosimetry basically deals with radiation measurements which covers principles, techniques, method and procedures and instrumentations required for dose measurement. The system used must be suitable with the dose range to be measured. The most common technique in Dosimetry are using ionization chambers, TLD (Thermoluminescence Dosimetry), film Dosimetry, Chemical Dosimetry and others.

The systems, techniques and procedures have to be tested again and again in the SSDL. This is to ensure the accuracy of the system, always up to date and keep up with the new development. The unit will provide service to measure dose in various aspects of applied Dosimetry. In order to provide the service the unit requires proper dosimetric instrumentation, standard procedures, proper method and techniques and so on.

Under this programme a few Dosimetry Systems which are listed below have been considered

(1) Ionization chambers
(2) TLD (Harshaw System)
(3) Chemical Dosimetry
(4) Film Dosimetry

4.5 Advisory Services

Since the applications of dosimetry are relatively very wide, SSDL unit will provide Advisory service in Dosimetry. This is to help the user to find the most practical and in choosing the best available Dosimetry system for a specific application.

The fact is in any situation the radiation dose must be measured as accurately as possible. Generally in the lower dose range which is comparable to natural background, measurement of dose becomes more and more difficult and less accurate. Advisory services in dosimetry are given to ensure the result of the dose measurement is reliable and accurate.

5. Conclusion

From PUSPATI's perspective, our commitment of establishing SSDL is to serve the country in the field of Radiation Metrology and Standardization. The SSDL should be given a national status in order to facilitate the SSDL in carrying out its programmes and activities.

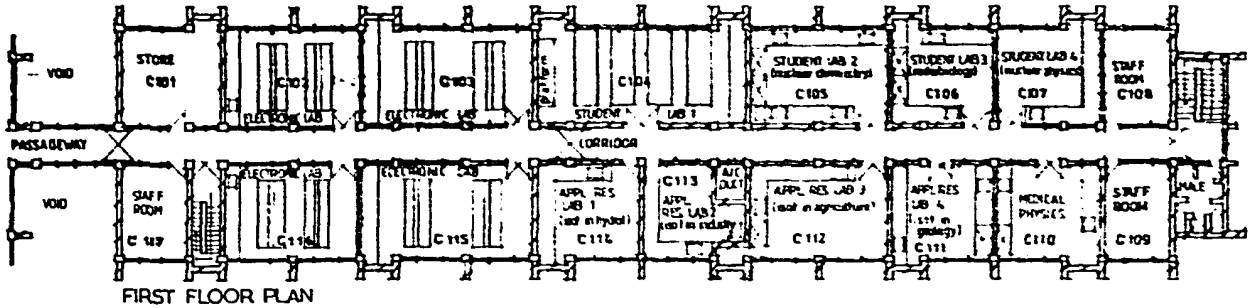
However we still need support from IAEA and WHO Network of SSDL, in order to get access to other standardization organisations, to get technical help, up-to-date informations, places of training and international exposure as well as international recognition.

At the moment we have adequate staff in PUSPATI to establish the SSDL. Our staff have undergone sufficient training in other secondary standard Dosimetry Laboratories such as in West Germany and Japan.

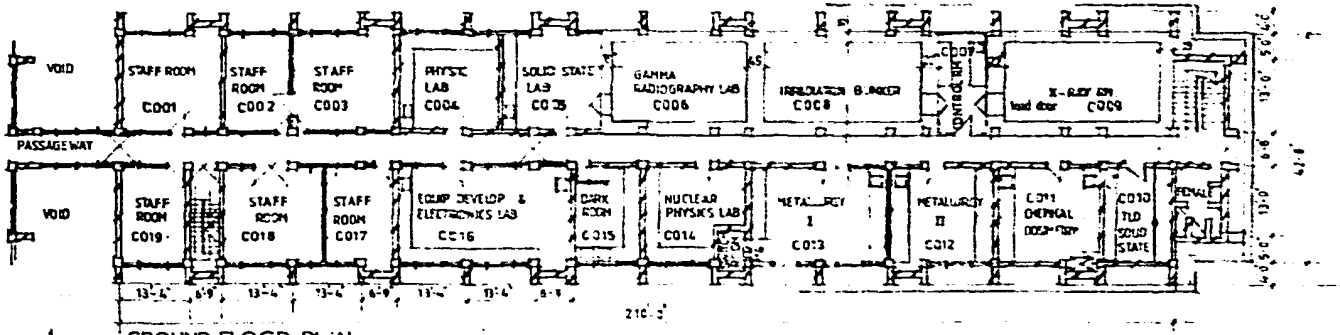
APPENDIX-A: STAFFS AND TRAINING

No.	Name	Qualification	Post	Experience/Training
1	Md. Saion bin Salikin	MSc Medical Physics	Senior Research Officer	(1) Nine months on-the-job-training in Health Physics Department at General Atomic Company, U.S.A. (2) Thirteen months, training in SSDL, West Germany.
2	Taiman bin Kadeni	MSc Nuclear Technology	Research Officer	(1) Undergoing training in Neutron Standardization at Tokyo University, from Oct. 1982 - Sept 1983
3	Abd. Aziz bin Ramli	MSc Non-Destructive Material Testing	Research Officer	(1) Undergoing training in photon standardization at Electrotechnical Laboratory, from Oct 1982 - Sept 1983.
4	Noriah bte Mod Ali	MSc Radiation Environmental Physics	Research Officer	(1) In the job training in PUSPATI.
5	Anuar bin Abd. Majid	Ungku Omar Polytechnic's Certificate	Technician	(1) 16 months on-the-job training in Philippines Atomic Energy Commission (2) 6 months on-the-job training in Australian Atomic Energy Commission
6	Abd Halim bin Ramli	Ungku Omar Polytechnic's Certificate	Technician	(1) On-the-job training in Philippines Atomic Energy Commission and in Australia.
7	Sahak bin Daud	SPM	Lab-Assistant	-
8	Misman bin Sumin	SPM	Lab-Assistant	-

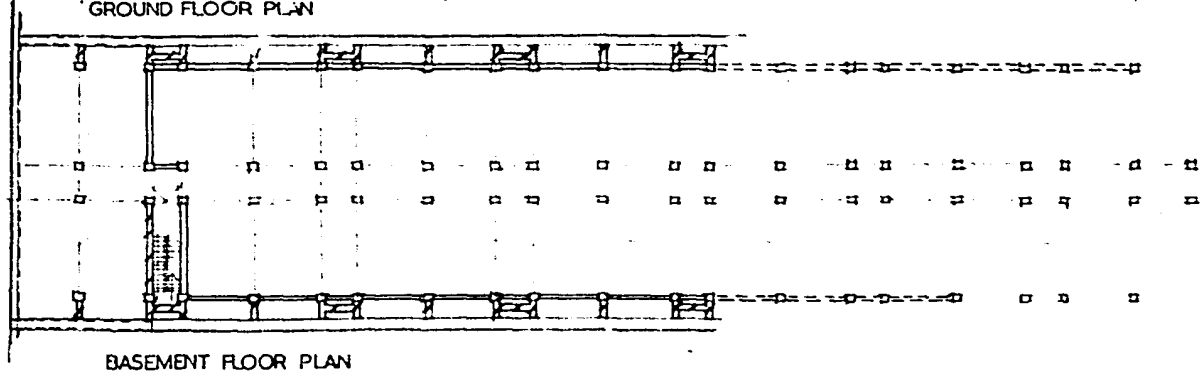
APPENDIX B(1)



FIRST FLOOR PLAN



GROUND FLOOR PLAN



BASEMENT FLOOR PLAN

PINDAAN

A. A STORE IS ADDED TO SOLID STATE PHYSICS LAB 2 ON GRD. FL. & ELECTRONIC LABS ON 1st FLOOR
STAFF RM. NEXT TO EQUIP DEVELOP & ELECTRONIC LAB REPLACED BY DARK RM.
SIZES OF OF SWITCH ROOM & ELEC DUCT ALTERED
WORK BENCHES WITH LAB SINKS & FUME CPDS INTRODUCED TO VARIOUS LABS
28-3-79

B. FINISHES FOR BENCHS TOPS ADDED
25-10-79

C. 1 FUME CPDS. ADDED IN SEC. STANDARD LAB (neutron & A source) & (2 source)
11-6-80

DISAHKAN

PENGARAH

TIM PENGARAH

PUSAT PENYELIDIKAN ATOM TUN ISMAIL BANGI SELANGOR

TAJUK

LABORATORY C

BASEMENT, GROUND AND FIRST FLOOR PLAN

SKALA 3/64"=1'0"

LUKISAN HOAN91: 2091(1-K

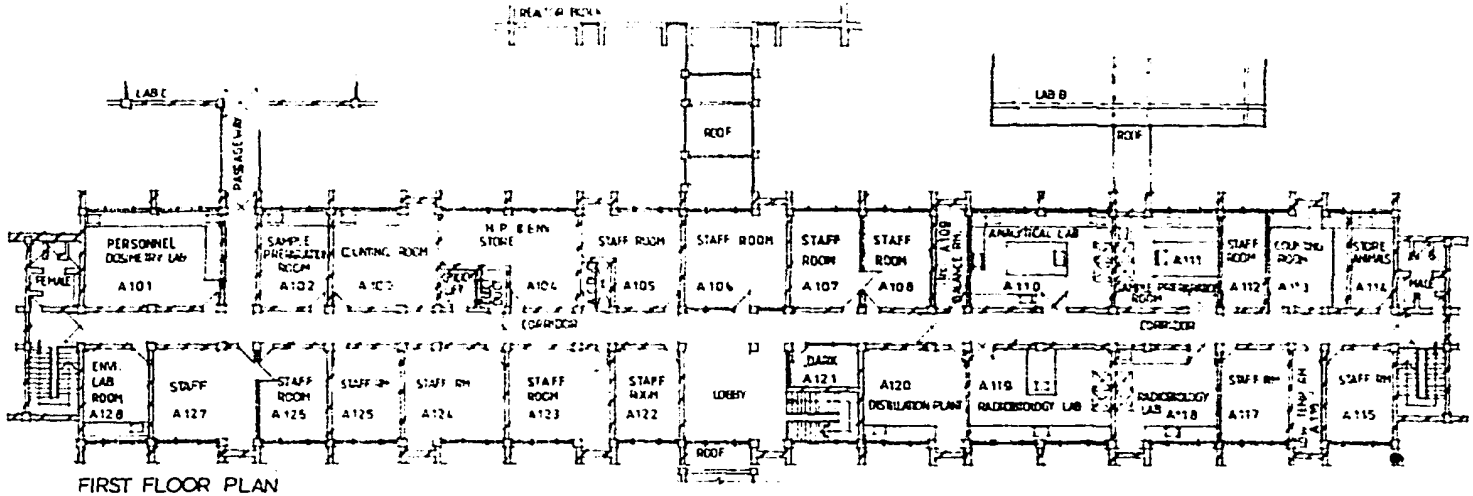
DILUKIS Zawiyah | DISEMAK

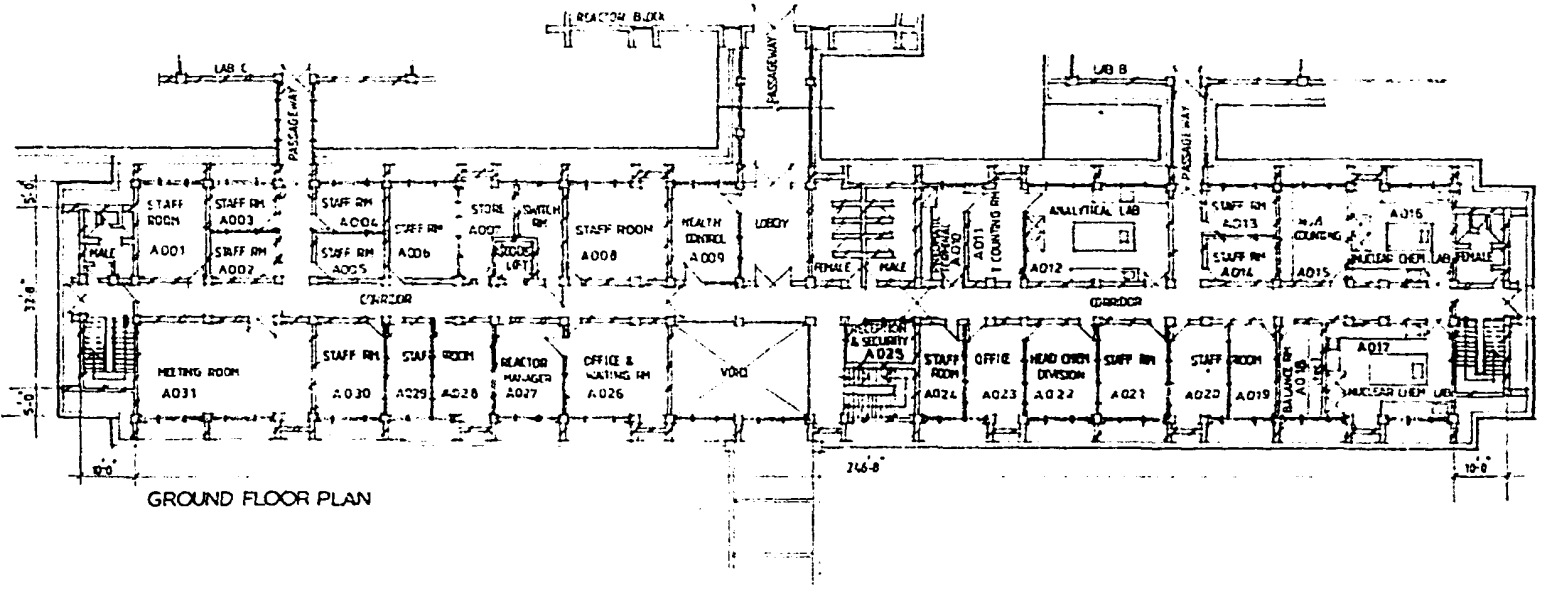
TARIKH 16-5-81

NO. LUKISAN PUS (02/1) PK3012

PINDAAN A | B

APPENDIX B(ii)





DISAHKAN

PENGURUSAN

TAN PENGGUNA

PUSAT PENYELIDIKAN ATOM TUN ISMAIL BANGI SELANGOR

TAJUK

LABORATORY A

GROUND & 1st FLOOR PLAN

SKALA 3/64" = 1'-0"

DISEDIAKAN HOA(S)1) 2019 A1 - H

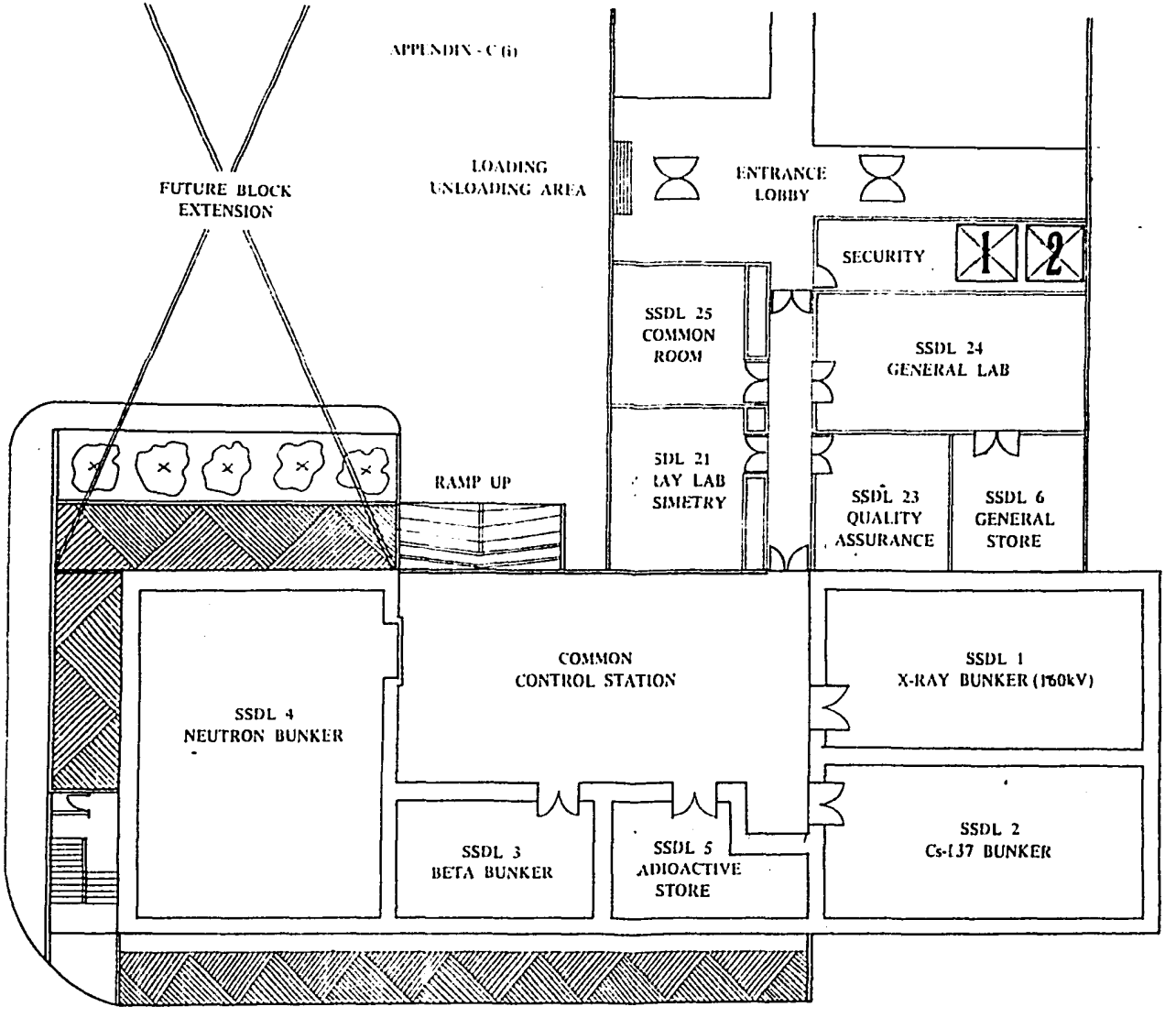
DISEMAK zanjyah

TARIKH 21-5-81

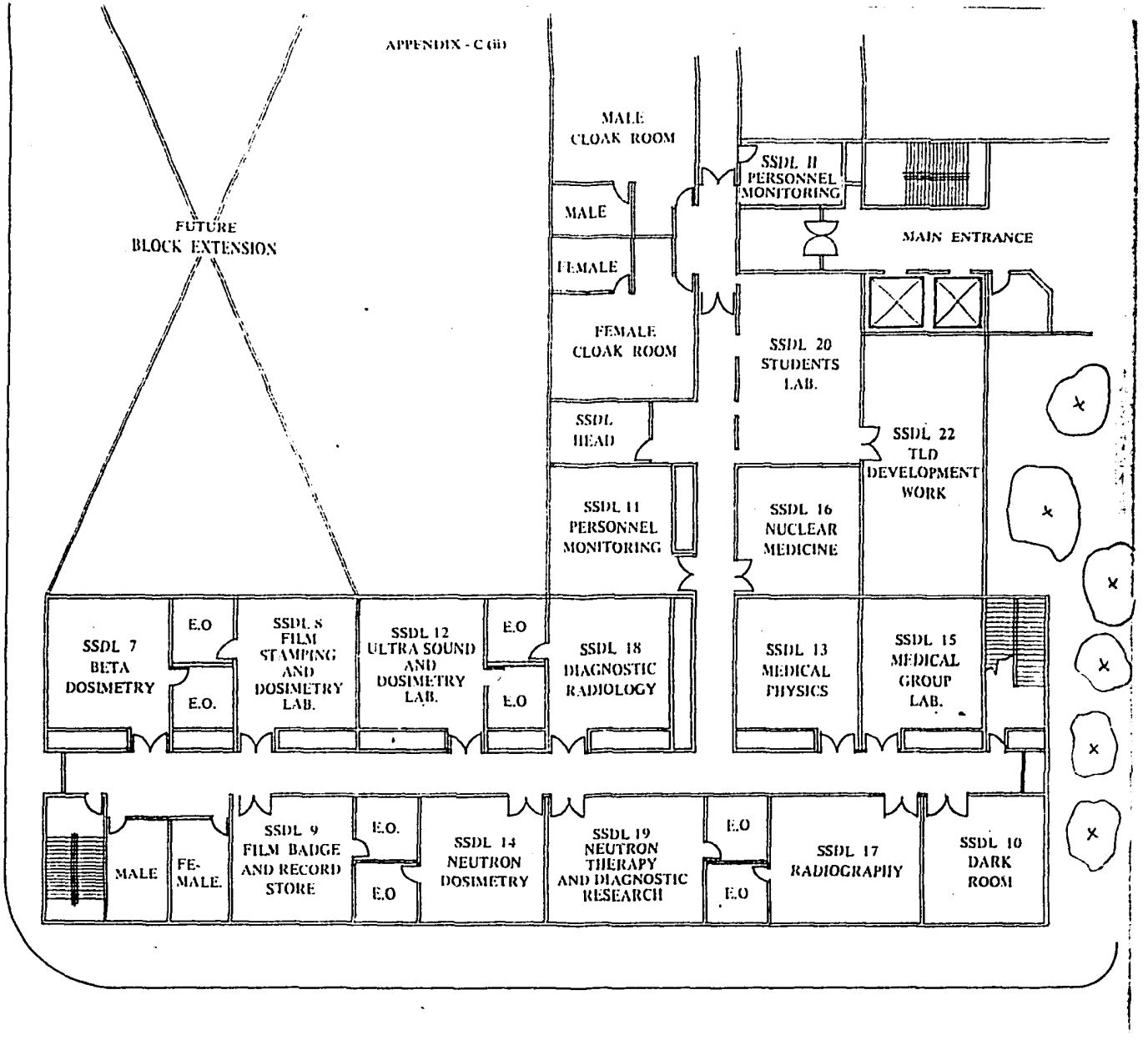
NO. LUKISAN PUS(0211)PK0024

PINDAAN A

Fig. 2.9


APPENDIX - C (i)
FUTURE BLOCK EXTENSION
LOADING UNLOADING AREA
ENTRANCE LOBBY
SECURITY
1
2
SSDL 25 COMMON ROOM
SSDL 24 GENERAL LAB
SDL 21 LAY LAB SIMETRY
SSDL 23 QUALITY ASSURANCE
SSDL 6 GENERAL STORE
RAMP UP
SSDL 4 NEUTRON BUNKER
COMMON CONTROL STATION
SSDL 1 X-RAY BUNKER (160kV)
SSDL 3 BETA BUNKER
SSDL 5 ADIOACTIVE STORE
SSDL 2 Cs-137 BUNKER

APPENDIX - C (ii)



APPENDIX-D : IAEA TECHNICAL ASSISTANCE

No.	DESCRIPTION OF ITEMS	QUAN.	PRICE US $
1.	179 TRMS Digital Multimeter	1	427.00
2.	RAD - 21 Pocket-size Radiation Dosimeter and Dose Rate Alarm monitor with rechargeable batteries.	3	1700.00
3.	WBC-3 Batery charger for 3 RAD-21L.	1	
4.	NE 2566 perspex intercomparison phantom with 2 off type NE 2567/a and 1 off NE 2567/b perspex rod.	1	710.00
5.	Reference check source 119, ^{90}Sr, 0.9mCi, special execution to match NE 2561 Ionistion chamber, type 23261 special	1	1420.00
6.	Precision thermometers	4	
7.	Programmable electronic calculator with printer HP 97A.	1	650.00
8.	Precision aneroid barometer model 2039, range 710 to 810 torr. additional charges for special range.	1	295.00
9.	05-571 Minimonitor 11 survey meter	1	479.00
10.	ND-1000 large size radiation protection level Ionisation chamber, complete incl. calibration.	1	5,820.00
11.	ND-1001 small size Radiation protection level ionisation chamber.	1	
12.	Full calibration of item 10 and 12 over the whole energy range (OHM primary lab.) 50kV, 100kV, 135kV, 220kV, 230kV and ^{60}Co.	1	
13.	VEW A 506 W.Nr. 1.4305, geschliffen, poliertnach ISA h8, in Erzeugungslange Von 3-3, 5m rund 40mm.	500	2,200.00
14.	46032 Optische Bank mit Normalprofil 1m lang.	6	2,600.00
15.	46048 stativreiter 120mm hoch	10	
16.	44245 Reiter fur Bogenlampe	20	

APPENDIX-D: IAEA TECHNICAL ASSISTANCE

No.	DESCRIPTION OF ITEMS	QUAN	PRICE US $
17.	Bestrahlungsbehalter fur die kalibrierung von GammameBgeraten mit einer 100 mCi co-60 quelle and all items as per attached specification sheet.	1	6,700.00
18.	Steuerung fur o.g. Behalter, besthand aus and all items as attached	1	
19.	Control unit, mod.	1	80,072.00
	Power supply unit, 3kW	1	
	Dicital unit	1	
	Housing for control unit, Digital unit and power supply, 240.	1	
	Inter connection Cable, 10m	1	
	Minus H.T. Generator with Selicon. Rectifiers.	1	
	Plus H.T. Generator with Selicon Rectifiers	1	
	H.T. Cables, 5m		
	Oil cooler, oil to air Heat Exchanging system	3	
	Oil Hose (Supply line), 5m	1	
	Oil Hose (Return line), 5m	1	
	MCN 321, 320kV metal ceraminc. Double focus Be-Window X-ray tube	1	
	High voltage potential devider 160 kV	1	
	MCN 161 - 160 kV metal ceramic Double focus Be Window Xray tube	1	
	Tube selector module	1	
	Water cooler	1	
20.	Roundway bearings RW 24V		8,000.00
21.	Roundway bearings RW 24S		
22.	STAR-Stahlwellen, NIRO, gehartet, geschliffen, 25Øh7 x 2000mm.	6	
23.	STAR, Stahlwellen, NIRO, gehartet, geschliffen, 25Ø7 x 1000mm	4	
24.	Wellenunterstutzugen	30	
25.	Tandem - linear sets B	28	
26.	M 8 x 35, 8G DIN 912	100	

APPENDIX-D: IAEA TECHNICAL ASSISTANCE

No.	DESCRIPTION OF ITEMS	QUAN	PRICE US $
27.	Rahmen fur Messwagen I (Co 60)	1	
28.	Rahmen fur messwagen II (Ro)	1	2,100.00
29.	Drehtisch.	1	
30.	Laser Alignment system comprising one encysted He-Ne laser Tube 2mW with 15 x attached focussing device, laser beam deflector 90°, turnable, with clamp, power supply 12VDC, Sighting telescope 19X	2	8,000.00
31.	Blitzleuchten	4	402.67
32.	Nontagewinkel Alu	4	
33.	Zusatzlichen Drehtich	1	
34.	Kammerhalterungen	6	1,400.00
	Total		

APPENDIX E
SSDL – MALAYSIA

CONTRIBUTION OF MALAYSIAN GOVERNMENT

No.	DESCRIPTION OF ITEMS	QUANTITY	TOTAL PRICE (M$)
1.	Test pens	2	6.00
2.	Jewellery screw driver	5	16.00
3.	Silica gel	2 bottles	76.00
4.	Fixer (G334. 25 LTS)	3 bottles	105.30
5.	Developer (G150. 30 LTS)	3 bottles	119.40
6.	Aditan (1 LT.)	1 bottle	15.10
7.	Label maker tapewriter	1	145.00
8.	Label maker	6	21.00
9.	Agepon (1 LT.)	1 bottle	19.80
10.	E.C.S. Interval timer (code it 223)	2	100.00
11.	EX-9080, T.V. Camera	1	
12.	CCTV Monitor EXM-907	1	
13.	Mount Lens/CCTV EX.980C	1	3,351.00
14.	Teletron D.C. Power supply	1	
15.	Hand grinder (100 mm)	1	16.50
16.	Bench wice (100 mm)	1	53.00
17.	Stanley measuring tape (5 mm)	1	23.00
18.	Claw hammer (27 mm)	1	5.80
19.	Ballpun hammer (1½)	1	5.80
20.	Crobar (90 cm)	1	5.60
21.	Allen keys (1 set)	1 set	7.50
22.	250 mm Flat File and handle	2	15.20

APPENDIX E (Cont)

No.	DESCRIPTION OF ITEMS	QUANTITY	TOTAL PRICE (M$)
23.	250 mm half round file and handle	1	5.50
24.	200 Tringuler file and handle	1	4.60
25.	250 mm wood rasp file and handle	1	5.40
26.	150 mm round file and handle	1	2.40
27.	Screwdriver	1 set	14.00
28.	Chrome hack saw	1	5.30
29.	Hand saw (500 mm)	1	7.30
30.	Hand saw (600 mm)	1	8.30
31.	Angle adjustable wrench 200 mm	1	9.80
32.	Combination plier 250 mm	1	5.00
33.	Hack saw blade	24	9.60
34.	Centre punch	2	9.60
35.	Wire cutter 125 mm	1	.3.80
36.	Long nose plier 125 mm	1	3.80
37.	Wiring hammer	1	2.70
38.	Desicator	2 set	300.00
39.	Power drill	1 set	250.00
40.	Drill stand	1 set	180.00
41.	Blue bullet	1 set	175.00
42.	Soldering iron stand	2 set	26.00
43.	Soldering iron	2 set	41.80
44.	Power supply (Trio PA 654 regulated)	1	746.70

APPENDIX E (Cont)

No.	DESCRIPTION OF ITEMS	QUANTITY	TOTAL PRICE (M$)
45.	Pliers	2	12.00
46.	Water container	4	60.00
47.	Drawing pen	1 set	115.00
48.	Filem Badge (Brown)	550	12650.00
49.	Filem Badge (Green)	450	9450.00
50.	Filem Badge (Large Type-nutron)	100	4500.00
51.	Developer	3 bottles	119.40
52.	Fixer	3 bottles	105.00
53.	Aditan	4 bottles	60.40
54.	Densitometer	1	3000.00
55.	Freezer	1	900.00
56.	Steel meter ruler (30 cm)	1	2.80
57.	Multimeter	1	58.00
58.	Numbering Machine (film badge)	1	7000.00
59.	TLD Harshaw System	1	46,000.00
	Total		$89,957.30

APPENDIX F

Expert service under Project MAL/003

1) Name : Mr. J.G. Haider
Date : 13th and 14th July 1979.
Job-
Description: It was unofficial visit.
Anyway he was supposed to give advice on the planning of SSDL in Block C.

2) Name : i) Dr. G. Drexler
ii) Mr. Giryikowsky
Date : 17th October to 20th October 79.
Job-
Description: Give advice to local staffs on the planning of the SSDL laboratories in Block C. In addition to that they were supposed to teach and advice about calibration techniques.

3) Name : Mr. J.G. Haider
Date : 1st December to 29th December 1980.
Job-
Description: To give advice and do the detail planning of Block C (SSDL).

4) Name : Mr. J.G. Haider
Date : 8 March to 13th March 1982.
Job-
Description: To give advice and do the detail planning of Block C (SSDL).
Construction of the calibration benches and lead doors were supposed to be discussed