

マレーシア放射線利用研究  
プロジェクト  
計画打合せ調査団報告書

平成 3 年 2 月

国際協力事業団  
社会開発協力部

社協一

JR

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## 序 文

マレーシア国政府は、第5次社会経済開発計画（1986年～1990年）の重点項目に、生産性の向上、産業の多様化及び製品の質的向上等に資するための研究開発の促進を掲げ、原子力庁（UTN）における放射線利用の基礎的研究開発に係る技術協力を我が国に要請してきた。

これを受けて国際協力事業団は、1988年6月に事前調査団、1989年6月に実施協議調査団、をそれぞれ派遣し、マレーシア側との間で1989年7月5日に討議議事録（R/D）に署名、5年間のプロジェクトを開始した。本プロジェクトでは、①電子線による表面塗装の硬化、②電子線による医療用具の滅菌、③電子加速器の運転・保守、及び④放射線防護に係る技術協力を実施している。

本計画打合せ調査団は、協力開始後1年半が経過した本プロジェクトの進捗状況を把握するとともに、実施上の問題点及び今後の計画についてマレーシア側と協議することを目的として、1991年2月20日から27日まで派遣されたものである。

この報告書は、本調査団の調査結果をとりまとめたものである。

終わりに、本調査の任にあたられた団員各位、及び本調査団派遣に際して協力いただいた外務省、科学技術庁、在マレーシア日本大使館並びに内外関係機関の方々に対し、深甚の謝意を表する次第である。

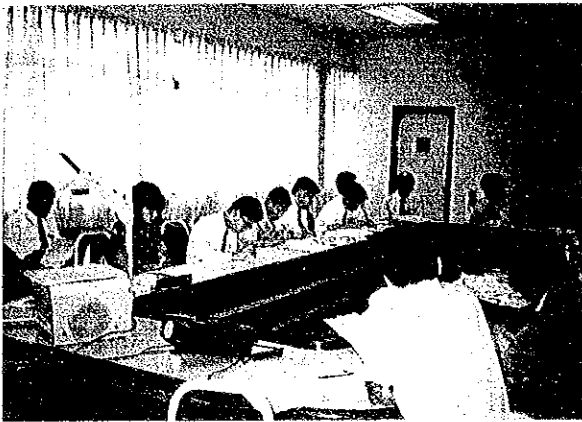
1991年2月

国際協力事業団

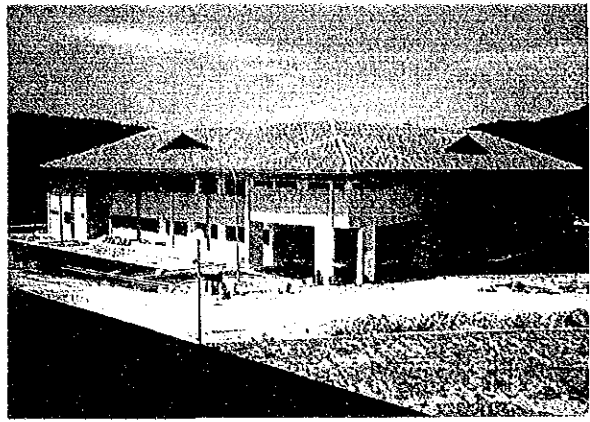
社会開発協力部

部長 小泉純作

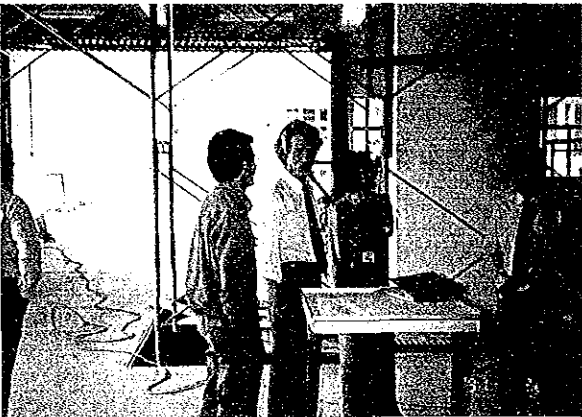




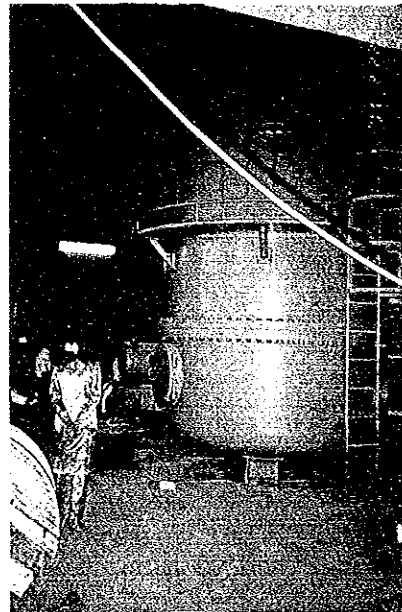
▲ マレーシア側との協議



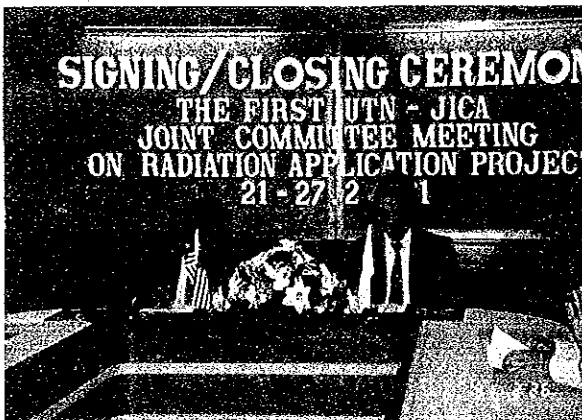
▲ 研究棟



▲ EBM 設置状況を  
視察する町団長



▲ EBM 設置状況



▲ ミニッツ署名



▲ 執務中の吉田リーダー





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## 1. 計画打合せ調査団の派遣

### 1-1 調査団の構成

- (1) 氏名 町 末男  
担当業務 総括  
現職和文 日本原子力研究所高崎研究所長  
現職英文 Director-General, Takasaki Radiation Chemistry Research Establishment, Japan Atomic Energy Research Institute
- (2) 氏名 石垣 功  
担当業務 放射線利用研究  
現職和文 日本原子力研究所高崎研究所照射利用開発室長  
現職英文 General Manager, Radiation Processing Development Laboratory, Takasaki Radiation Chemistry Research Establishment, Japan Atomic Energy Research Institute
- (3) 氏名 四本 圭一  
担当業務 照射試験施設  
現職和文 日本原子力研究所高崎研究所照射施設課長代理  
現職英文 Deputy General Manager, Irradiation Service Division, Takasaki Radiation Chemistry Research Establishment, Japan Atomic Energy Research Institute
- (4) 氏名 坂本 敏幸  
担当業務 協力計画  
現職和文 科学技術庁原子力局調査国際協力課係長  
現職英文 Chief of Section, Research and International Affairs Division, Atomic Energy Bureau, Science and Technology Agency
- (5) 氏名 服部 直人  
担当業務 協力企画・業務調整  
現職和文 国際協力事業団社会開発協力部社会開発協力第一課職員  
現職英文 Staff, First Technical Cooperation Division, Social Development Cooperation Department, JICA

## 1-2 調査方針及び調査内容

### 1-2-1 調査方針

協力開始後1年半が経過したプロジェクトの現状を把握するとともに、第1回合同委員会（Joint Committee Meeting）に出席し、プロジェクト実施上の問題点及び今後のとり進め方についてマレイシア側と協議する。

### 1-2-2 調査内容

- (1) プロジェクト進捗状況
  - ア. 専門家活動状況
  - イ. 施設建設状況及び機材設置状況
  - ウ. 技術移転進捗状況
- (2) プロジェクト実施体制
  - ア. 組織体制及びカウンターパート配置状況
  - イ. 予算執行状況
- (3) 今後の実施計画
  - ア. マレイシア側実施計画
  - イ. 日本側投入計画

1-3 調査日程

月 日 (曜)		内 容
2月20日(水)	16:15	団員4名到着(JL721)
21日(木)	9:30	ファティマ副長官表敬
	10:30	施設の視察
	11:30	日本人専門家との打合せ
	13:00	ノリマ研究部長主催昼食会
	14:00	マレーシア側とのプレディスカッション
	21:35	町団長到着(SQ118)
22日(金)	9:00	ガザリ長官表敬
	9:30	オープニングセレモニー
	10:30	E・B・M施設見学
	12:30	JICA事務所主催昼食会
	14:30	日本人専門家との打合せ
	20:30	ガザリ長官主催夕食会
23日(土)	9:00	合同委員会
	13:00	吉田リーダー主催昼食会
24日(日)	資料整理	
25日(月)	9:00	合同委員会
	12:45	ファティマ副長官主催昼食会
	14:00	合同委員会(ミニッツ案検討)
	20:30	町団長、吉田リーダー主催夕食会
26日(火)	9:00	ミニッツ作成(町団長は天木公使表敬)
	15:00	ミニッツ署名
	23:00	町団長帰国(JL722)
27日(水)	7:20	団員4名帰国(MH640)

1-4 主要面談者

マレーシア側

(1) UTN :

Y. Bhg. Datuk Dr. Mohd. Ghazali b. Hj. Abdul Rahman	Director General, NTN
Ms Fatimah bt. Mohd. Amin	Dep. Director General, UTN
Mr. Razali b. Hamzah	Director of Operation, UTN
Dr. Norimah bt. Yusof	Director of Research, UTN
Dr. Khairul Zaman b. Hj. Mohd. Dahlan	Head, Radiation Processing Program, UTN
Dr. Zahrah bt. Abd. Kadir	Radiation Processing Program, UTN
Mr. Dahlan b. Hj. Mohd.	Radiation Processing Program, UTN
Mr. Wan Abd. Hadi b. Wan Wan Abu Bakar	Head, Engineering Department, UTN
Mr. Nik Ghazali b. Nik Salleh	Radiation Processing Program, UTN
Mr. Raja Abdul Aziz b. Raja Adnan	Planning Unit, UTN
Ms. Noriah bt. Mod. Ali	Health & Radiation Control Department
Mr. Mohd. Sidek b. Othman	Engineering Department
Mr. Zulkifli b. Md. Nor	Health & Radiation Control Department

(2) E P U

Mrs. Wan Norma bt. Wan Daud	EPU, Prime Minister's Department
-----------------------------	----------------------------------

日本側

(1) 在マレーシア日本大使館

天木 直人

公使

伊藤 友孝

二等書記官

(2) J I C A マレーシア事務所

湊 芳郎

次長

山下 良恵

所員

(3) U T N

吉田 健三

チームリーダー

本間 清

調整員

## 2. プロジェクト協力実績

### 2-1 プロジェクト活動実績

これまでのプロジェクト活動実績をまとめると、別紙2-1-1のとおりである。主な項目毎に概観すれば、以下のとおり。

#### (1) 建屋の建設

加速器建屋と研究棟の建設については、UTN側の予算措置により、UTN側の責任において進められることになっている。建設は、ほぼ予定どおり開始された（加速器建屋：1990年3月、研究棟：1989年12月）ものの、現時点において、加速器建屋が3カ月、研究棟が9カ月の遅れを出している。

#### (2) 加速器の据付け

加速器は、1990年8月に製造が終わり、工場テストの後日本から発送された。UTNには11月15日～16日に配送されて据付け作業が開始された。組立て作業は12月20日に終了し、その後配線・配管作業がUTNにより開始された。配線作業は予想より時間がかかったが、1991年3月末までにはアクセプタンス・テストを終了する見込みとなっている。

#### (3) 研究機器

##### ① 低エネルギー加速器（キュアトロン）

キュアトロンは、1990年10月13日にUTNに配送された。この機器は、表面塗装の研究に使われるものであるが、1991年2月現在は研究棟が完成していないため、コバルト-60の建屋に保管されていた。3月からは研究棟での据付け作業が開始されることとなっている。

##### ② その他の機器

その他の機器も、R/Dに記載されているものは全てキュアトロンとともに購入、1990年10月13日にUTNに配送されている。ほとんどは、未だパッケージの中に保管されていた。90年度予算で購入された5つの機器も1991年1月に配送済みである。また、専門家派遣時の携行機材として、パソコン、ビデオ・システム等も供与されている。

#### (4) 専門家派遣

長期専門家については、1990年5月にチームリーダー及びコーディネーターが派遣されている。また、表面塗装の長期専門家は90年度中には選定できず、1991年6月以降に派遣されることとなっている。

短期専門家については、加速器の据付け、建屋の建設等に関する指導のため、これまで合計10名が派遣されている。

(5) 研修員の受入れ

加速器の据付け、運転のため、2名の研修員が原研及び日新ハイボルテージで受け入れられたほか、これまでに3名の研修員が線量評価、表面塗装、滅菌の各研究テーマのために受け入れられている。また、1991年3月からは、表面塗装のテーマで更に1名の研修員が原研に受け入れられる予定である。

(6) 研究活動

加速器及びキュアトロンが使用可能な状態になっていないため、実質上の研究活動は未だ開始されていないのが現状である。

2-2 プロジェクト投入実績

2-2-1 日本側投入実績

(1) 専門家派遣

派遣実績を表2-2-1-1に示す。

ア. 長期専門家

現在、長期専門家として、チームリーダーと調整員の2名が派遣されている。マレーシア側のカウンターパートとの意思疎通は非常に順調にいらっている。

イ. 短期専門家

短期専門家については、現在までに10名が派遣されている(今年度中に更に2名派遣予定)。線量測定、照射条件整備、放射線防護の専門家については、当初、加速器運転開始後に派遣する予定であったが、建設工事の遅延により加速器設置が遅れたため、運転開始前の派遣となってしまった。これに関してマレーシア側から専門家の派遣時期の変更について、「もっとフレキシブルに対応してほしい」との要望がなされたが、年度末ということもあり、専門家の日本での業務の都合上、やむを得なかったと考えられる。

(2) 研修員受入れ

今年度は現在までに2名を既に受け入れており、日本原子力研究所高崎研究所などで研修を行っている。3月中旬から更に1名を受け入れる予定であり、計画どおり3名の実績となる見込みである(表2-2-1-2)。

(3) 機材供与

機材については、表2-2-1-3に示すとおり、順調に供与されている。据付け・活用状況については3-2-3で詳細を述べる。

(4) ローカルコスト負担

今年度のローカルコスト負担として立ち上がり経費620千円を支給している。



Overview of the Project' Progress - Mr. K. Yoshida

1. Construction

Construction of the EB building was started in March, 1990. In Original schedule, the building will be complete in December. Especially, the shielding structure for the installation of EBM should be finished in September prepared for the delivery of EBM. Actually it was completed by the end of October. The whole construction is estimated to finish at the end of February, 1991.

Construction of MTS building (Radiation Technology Laboratory) was started in December, 1989. Its construction period was estimated 9 months. However, Construction was delayed for very long time. The completion is estimated at the end of March, 1991.

2. Installation of 3 MeV EBM

3 MeV EBM manufacturing finished in August, 1990 and after factory test it was disassembled, packaged and shipped. The packages were delivered at UTN on 15 and 16 November. With the supervision of two Nissin-High Voltage engineers, Mr. Takayama and Mr. Moriwaki, who visited on 14 November, installation work started. Assembling and installation of EBM was finished on 20 December.

Wiring and plumbing work were then started under the UTN supervision. Mr. Mikihara, NHV, was despatched to supervise the adjustment and test operation of the machine on 21 January. Wiring work takes longer time than Nissin's estimation. We will start checking and testing work from the next week. The acceptance test will be finished by the end of March.

3. Research equipments

(1) Curetron

Curetron, a small laboratory-type low energy electron accelerator manufactured by NHV, was delivered at UTN on 13th October. This equipment is used for surface coating research and stored in the Co-60 building until MTS building become available. NHV expert, Mr. Terazawa, will be despatched from 26th February and engaged in the assembling and commissioning of the machine.

(2) Other equipments

Almost all equipments which are listed in the Record of Discussion were purchased and donated to UTN. These equipment were delivered on 13 October together with Curetron and stored in the Co-60 building. Most of the equipments are still in the packages. 5 items purchased by using FY 90 budget were

delivered in January 1991.

Some of the equipments supplied as Keiko-Kizai of the experts include personal computer, video system, accesories of the accelerator, etc.

#### 4. Expert

10 short term experts were despatched for the installation & commissioning of the accelerator and the construction of the shielding rooms, whilst 2 experts for research adviser. A long term expert for supervising the curing program could not be selected during FY 90. The duration of despatch is rather short. The longest is 6 weeks.

#### 5. Trainee

For the installation and commissioning of the accelerator, 2 persons were sent to JAERI and NHV. One researcher will be send JAERI in March for the study of surface coating technology.

#### 6. Research Activity

Radiation Application Project has two research program, Curing of surface coating and Sterilization of Medical Products. Both programmes can not start real activity because the accelerators and research equipments are not ready for use.

表 2-2-1-1 専門家派遣実績

項 目	4	5	6	7	8	9	10	11	12	1	2	3
1. 長期専門家												
新規(リーダー)		5/25		吉田 健三								
新規(コーディネーター)		5/25		本間 清								
2. 短期専門家												
村上 一夫(打設工法)	4/18	4/25										
渡辺 俊朗(施工管理)	—				8/6	8/12						
林 啓三(BBM据付け打合)								11/14	12/22			
高山 博史(BBM据付け)												
森脇 巧(BBM据付け)										1/10		
三木原和芳(BBM据付け)												2/26
寺沢 隆裕(小型EBM据付け)(予定)										1/21	2/16	
渡辺 祐平(滅菌)										1/23	2/20	
綿貫 孝司(放射線防護)										1/23		3/2
金沢 孝夫(照射条件整備)												
橋 宏行(線量測定)											2/20	3/14
佐々木 隆(表面塗装)(予定)												

表 2-2-1-2 研修員受入れ実績

実績

	4	5	6	7	8	9	10	11	12	1	2	3
Dr. Khairul Zaman Hj. Mohd Dahlan (プロジェクト・コーディネーター)	1月23日から(前年度分)											
Dr. Zahrah Abd. Kadir (医療用具滅菌グループリーダー)			3月13日から(前年度分)									
Ms. Noriah Mod Ali (研究員、線量測定)							3月13日から(前年度分)					
Mr. Wan Abd. Hadi Wan Abu Bakar (施設管理部門、課長)												
Mr. Sharif Jahar (加速器運転員)												
Mr. Nik Ghazali Nik Salleh (研究員、表面塗装)	(予定)											3年9月まで

表2-2-1-3 機材の利用・管理状況表

(89年度供与機材)

平成3年2月20日現在

管理番号	機材名	金額 (単位千円)	到着日	引渡日	保管場所	保管状況	利用状況	備考
A-89-1	2.KeV小型電子加速器 (Low energy electron beam machine)	23,900	90.10.1		M T S棟 [放射線 利用 研究棟]	据付け調整 中		表面
A-89-2	赤外分光光度計 (Infrared spectrometer)	3,872	90.10.1		"	良		表面
A-89-3	ロールコータ (Roll coater)	3,729	90.10.1		"	良		表面
A-89-4	フローコータ (Flow coater)	1,260	90.10.1		"	良		表面
A-89-5	表面摩耗試験機 (Tabor type abrasion tester)	815	90.10.1		"	良	M T S棟 完成(引越) 後、利用 予定	表面
A-89-6	接触角計 (Contact angle meter)	1,220	90.10.1		"	良		表面
A-89-7	C T Aフィルム線量測定器 (CTA film dose reader)	2,550	90.10.1		"	良		表面
A-89-8	自動塗工機 (Automatic film applicator)	958	90.10.1		"	良		表面
A-89-9	ラミネータ (Press roll)	1,987	90.10.1		"	良		表面
A-89-10	万能試験機 (Tensile strength and compression tester)	4,065	90.10.1		"	良		医務

( 89 年度供与機材 )

管理番号	機 材 名	金 額 (単位千円)	到 着 日	引 渡 日	保 管 場 所	保 管 状 況	利 用 状 況	備 考
A-89-11	クリーンベンチ (Clean bench)	1,150	90.10.1		<sup>60</sup> Co 棟	良		医療
A-89-12	滅菌用オートクレーブ (SS-autoclaves)	508	90.10.1		"	良		医療
A-89-13	ギアオーブン (Gear type aging tester)	1,570	90.10.1		M T S 棟	良		医療
A-89-14	高速冷凍遠心分離機 (High speed Refrigerated centrifuge)	2,215	90.10.1		<sup>60</sup> Co 棟	良		医療
A-89-15	偏光顕微鏡 (Crystalization rate analyzer)	2,540	90.10.1		M T S 棟	良	M T S 棟 完成(引越) 後、利用 予定	医療
A-89-16	ロックウェル硬度計 (Hardness tester rockwell type)	1,500	90.10.1		"	良		医療
A-89-17	衝撃試験機 (IZOD impact tester)	1,680	90.10.1		"	良		医療
A-89-18	ダンベルカッター (Super dumbbell cutter)	168	90.10.1		"	良		医療
A-89-19	サンプル調整装置 (Sampling machine)	914	90.10.1		"	良		医療
A-89-20	3 MeV 電子加速器 (High energy electron beam machine)	283,113	90.11.15		E B M 棟	良		医療

( 90年度供与機材 )

管理番号	機 材 名	金 額 (単位千円)	到 着 日	引 渡 日	保管場所	保管状況	利用状況	備 考
A-90-1	搬送台車 (Conveyor cart)	1,660	90.11.15		EBM棟	良	MTS棟完成 (引越)後 利用予定	EBM
A-90-2	プロジェクト用車 (マツダボンゴ1800)	1,911	90.11.20		(衝突事故(91.2.7)により 現在修理中)			
A-90-3	ゲルパーメイション クロマトグラフィー (Gel permeation chromatography)	4,300	91. 1. 25		MTS棟	良		
A-90-4	ウェザーオومتر (Weather O meter)	12,200	91. 1. 25		農業研究棟	良	MTS棟	
A-90-5	線量分布測定装置 (Electron beam intensity distribution measurement apparatus)	6,500	91. 1. 25		PUSPATI (本部研 究棟)	良		低EBM EBM

( 90年度携行機材 )

管理番号	機 材 名	金 額 (単位千円)	到 着 日	引 渡 日	保管場所	保管状況	利用状況	備 考
B-90-1	RCDフィルム線量計 (Radiachromics)	1,050	90. 8. 10		PUSPATI	良	MTS棟 完成(引越) 後、利用 予定	低EBM EBM
B-90-2	コンプレッサー・N <sub>2</sub> ガス 供給装置 (Air compressor & N <sub>2</sub> gas evaporator)	1,320	90. 10. 13		MTS	良		低EBM
B-90-3	パーソナルコンピュータ	891	90. 10. 27		農業研究棟	良	大	
B-90-4	セーフティボックス	250	90. 11. 15		EBM棟	良	MTS棟 完成(引越) 後、利用 予定	EBM
B-90-5	照射回数自動設定装置 (Automatic conveyor controller)	300	90. 11. 15		EBM棟	良		EBM
B-90-6	侵入警報システム (Invasion alarm system)	1,000	90. 11. 15		EBM棟	良		
B-90-7	3φスライダック (3φ voltage regulator)	45	90. 11. 3		農業研究棟	良	大	
B-90-8	33インチマルチシステム テレビ	425	91. 1. 14		PUSPATI	良	小	
B-90-9	マルチシステムビデオ レコーダ	160	91. 1. 14		PUSPATI	良	小	
B-90-10	CCD-V200E V <sub>8</sub> カメラ	210	91. 1. 14		PUSPATI	良	中	



( 90年度現地業務費購入 )

管理番号	機 材 名	金 額 (単位千円)	到 着 日	引 渡 日	保管場所	保管状況	利用状況	備 考
C-90-1	冷 蔵 庫	38	90.11.8		農業研究所	良	大	
C-90-2	電圧安定器 (Voltage stabilizer)	95	91.3月 到着予定		M T S 棟		M T S 棟 完成(引越) 後、利用 予定	表面

## 2-2-2 マレーシア側投入実績

### (1) プロジェクト実施体制

本プロジェクトのマレーシア側の実施体制は、R/D (ANNEX VII) で合意されているように、

#### ① 研究部長

#### ② 研究部 R I 放射線産業利用プログラムの放射線加工処理グループ長

をヘッドとして、研究部、運営部 (OPERATIONS DIVISION < 研究炉、加速器等の運転、管理を担当する部門 >) の研究者等から構成されることとなっている。実際のプロジェクト実施体制も、概ねこの R/D の規定どおりとなっており、日本側のチームリーダー、コーディネーターが、それぞれ上記 U T N 側の研究部長、放射線加工処理グループ長のカウンターパートとなって効果的にプロジェクトを推進していた (表 2-2-2-1)。

なお、U T N を所管する省庁が、90年11月に、総理府から科学技術環境省に変更となった。

### (2) カウンターパート配置

U T N 側のカウンターパート配置としては、R/D 署名当時以降、研究部長の変更があったほかは、大きな変更はなく、本プロジェクト実施の核となるカウンターパートの定着状況は良好であった (表 2-2-2-2 参照)。他の開発途上国の原子力庁に比べ、U T N の場合、研究者の定着率は比較的良いようであり、今後とも表 2-2-2-2 に掲げる研究者が中心となって本プロジェクトを進めていくことが十分に期待できよう。また、研究部長の交替も、新任の部長が医療用具の滅菌プロジェクトに携わっていた Dr. Norimah Yusof であることから、本プロジェクトの実施には影響がなかった模様である。

現在のところ、表面塗装、医療用具の滅菌の両プロジェクトに参加するカウンターパートの数はやや少ないが、これはまだ加速器 (低エネルギー加速器も含めて) が利用可能となっておらず、本格的な研究が開始されていないことも一因と考えられる。実際のところ、ガザリ長官によると、U T N は現在 200 名の人員増加を要求している (うち約 100 名は研究者) ところであり、建物の建設が終了し、加速器が利用可能となって、研究活動が本格化してくれば、今後、本プロジェクトに携わる人員の数も増加するものと考えられる。

現時点において、カウンターパートの配置について問題点と考えられることとしては、加速器の据付けに携わる運営部のカウンターパートの数、能力が若干不足していることが挙げられる。上述のように、本プロジェクトは研究部長が中心となって進められる体制となっているため、加速器の据付けに携わる運営部の参加が必ずしも十分ではなく、加速器の利用開始の遅れの一因ともなっている。加速器の据付け指導を行う日本人短期専門家の語学力不足も U T N 側から問題点として指摘されたが、今回の調査団の町団長か

ら、加速器の据付けに携わるカウンターパートの配置につき、早急に改善するよう、FA-TIMAH 次官に進言しておいた。

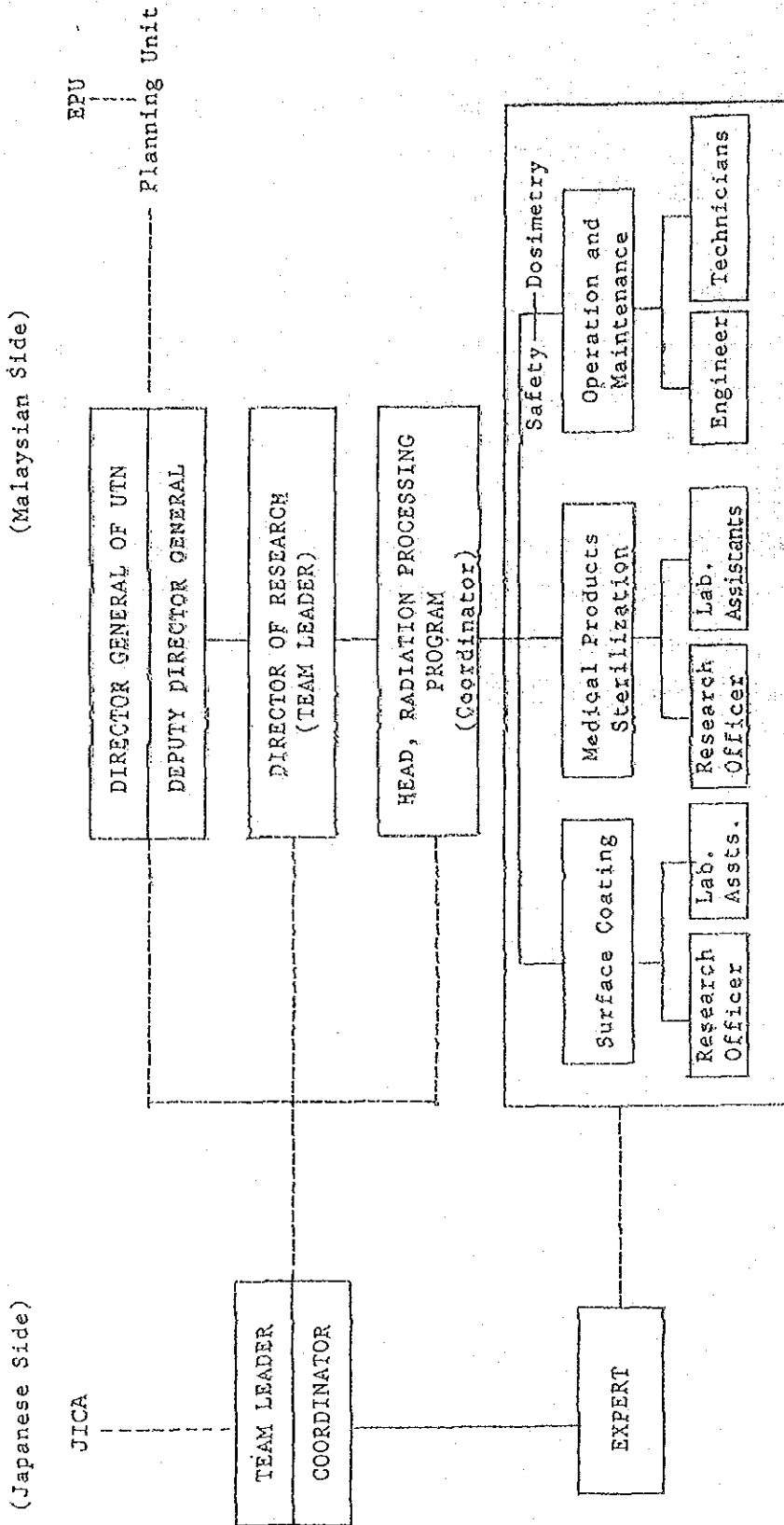
また、現時点では、放射線防護等の加速器の安全措置に係る事項が、研究部で担当されるのか、それとも運営部で担当するのかが明確となっておらず、この点も担当を明確にするよう U T N 側に要求しておいた。

(3) ローカルコスト

今回、U T N との協議において、これまで本プロジェクトに投入されてきたローカルコストを年度別に整理した資料を提出するよう U T N 側に要請し、表 2-2-2-3 が提出された(ただし、92 年以降は U T N の要求額)。U T N 側は、同機関での予算の執行システム上、本プロジェクトに使用された予算を抜き出して算出することはやや困難である旨述べた。

今回の調査団の受けた印象を紹介すれば、建物等の建設は遅れているものの、これは U T N 側の予算措置に問題があるわけではなく、次々と新しく建設されていく U T N の施設を見る限りにおいては、今後、ローカルコストの手当が本プロジェクトの進行の障害となるとは考えにくいものと思料される。

表 2 - 2 - 2 - 1 ORGANIZATION CHART FOR THE IMPLEMENTATION OF THE PROJECT - 1991



THE UTN PERSONNEL FOR THE IMPLEMENTATION  
OF THE PROJECT - PY 1991

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Overall Implementation:

Datuk Dr. Mohd. Ghazali Hj. Abd. Rahman - Director General  
Ms. Fatimah Mohd. Amin - Deputy Director General

Team Leader/Counterpart:

Dr. Norimah Yusof - Director of Research

Coordinator:

Dr. Khairul Zaman Hj. Mohd. Dahlan - Head, Radiation  
Processing  
Programme

A. Operation & Maintenance

Ir. Wan Abd. Hadi Wan Abu Bakar - Head, Engineering Department  
Ir. Mohd. Sidek Othman - Research Officer  
Mr. Kamaruddin Hashim - Research Officer  
Mr. Shaari Jahar - Technician  
Mr. Kamaruddin Buyong - Technician  
Mr. Rosli Che Ros - Technician  
Mr. Ayub Mohamad - Technician

B. Surface Coating Project

Mr. Nik Ghazali Nik Salleh - Research Officer  
Mr. Dahlan Hj. Mohd. - Head, Surface Curing Group.  
Mr. Mohd. Hilmi Mahmood - Research Officer

4 Research Officers ) Research assistant under Research  
2 laboratory Assistants) Grant.

C. Medical Product Sterilization Project:

Dr. Zahrah Abd. Kadir - Head, Effect of Radiation  
Polymer Group

Mr. Kamaruddin Bahari - Research Officer

Mrs. Sharifah Hanisah S.A. Azia - Experimental Officer

Mrs. Asnah Hassan - Experimental Officer

2 Research Officers | Research Assistants under  
2 Laboratory Assistants | Research Grant

D. Dosimetry

Ms. Noriah Md. Ali - Research Officer

Mr. Abdul Halim Md. Ali - Technician

E. Safety

Mr. Zulkafli Mohd. Nor - Research Officer

JICA - UTN EBM PROJECT

UTN BUDGET :

1) <u>Development Budget</u>		8,000,000
Building (EBM and MTS), Equipment and Modification		
2. <u>Research Budget (IRPA Mechanism)</u>		
Equipment, research assistants	1989	
mileage, materials, rental etc.	1990	200,000
	1991	800,000
	1992-1995 (estimated)	3,000,000
3. <u>Operating Budget</u>		
Supplies & materials, services, mileage etc.	1989	100,000
	1990	100,000
	1991	100,000
	1992-1995	600,000
		(150,000x4)
		<hr/>
		12,900,000
		<hr/>

### 3. プロジェクトの進捗状況

#### 3-1 当初計画と実績

当初計画と実績の差異をまとめると表3-1-1のとおりとなる(二重線がR/D作成時の当初計画、実線が実績)。総じてみれば、1991年2月末現在、当初計画より約3カ月の遅れとなっている。主な項目毎に概観すれば、以下のとおり。

##### (1) 加速器の据付け

当初計画では、1991年初めから、テストを終えて運転開始となる予定であったところ、実績としては1991年3月末にアクセプタンス・テストを終えて運転開始となることとなっており、約3カ月の遅れとなっている。この遅れは、建屋の建設の遅れに加え、据付けに係る配線作業が適切に進まなかった(UTN側が日本人専門家の派遣を不要と判断したことが一因)ことによる。

##### (2) 加速器建屋の建設

当初計画では、1990年末には建設終了となる予定であったところ、実績としては1991年2月末に建設終了となり、約2カ月の遅れとなった。

##### (3) 低エネルギー加速器(キュアトロン)

当初計画では、1990年6月末から使用開始となる予定であったところ、実績としては、本機器が据え付けられる研究棟の建設の遅れにより1991年3月末から運転開始となることとなっており、約9カ月の遅れとなっている。

##### (4) 研究棟の建設

当初計画では、1990年6月末には建設終了となる予定であったところ、実績としては1991年3月末に建設終了となり、約9カ月の遅れとなっている。



表3-1-1 その1

Progress of the Project in FY 90 (Provision of Equipment & construction)

Provision of Equipment	1989				1990				1991										
	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
Provision of Equipment																			
(1) EB Machine																			
(2) Curetron																			
(3) Surface Coating Research Instruments																			
(4) Medical Product Sterilization Research Instruments																			
(5) Construction of EB Building																			
(6) Construction of Radiation Technology Laboratory (MTS) Building																			

表 3-1-1 その 2

Progress of the Project in 1990(Experts)

	1989			1990												1991				
	11	12		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	
Long Term Expert (1) Project Leader																				
(2) Coordinator																				
(3) Curing Supervisor								1 - 1.5 year												
Short Term Expert (1) Surface Coating Selection of Substrate and Coating Materials																				
(2) EBM-High Energy Construction and Shielding Checks									3-4 weeks											
(3) Sterilization Study of Products Items										3 weeks										
(4) EBM-High Energy Installation and Test Operation																				
(5) EBM-High Energy Radiation Protection																				
(6) EBM-Low Energy Installation and Test Operation																				
(7) Surface Coating Coating Technology																				

表 3 - 1 - 1 - 1 その 3

Progress of the Project in 1990 (Experts)

	1989			1990												1991			
	11	12		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
Short Term Expert (Continued) (8) Surface Coating Lamination Technology											1-2 month								
(9) EBM-Low Energy Dosimetry										2-3 weeks									
(10) Surface Coating Coating Formulation																6 months			
(11) Surface Coating Product Characterization														3 months					
(12) EBM-High Energy Dosimetry																			1-2 months
(13) EBM-High Energy Supervision of Operation																6 months			
(14) Sterilization Dose Requirement Study																6 months			
Expert not included TSI (1) EBM-High Energy Shielding Construction Advice																	2 persons, 4/18-25		
(2) EBM-High Energy Commissioning																			1/23-3/2

表 3-1-1-1 その4

Progress of the Project in 1990 (Mission & Trainee)

	1989			1990												1991			
	11	12		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
Mission (1) Joint Committee																	—		
Trainee (1) Dosimetry				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Surface Coating Research Plan				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(3) Sterilization Research Plan				—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
(4) EBM-High Energy Operation & Maintenance																	—	—	—
(5) Surface Coating Formulation Study																			6 months

### 3-2 項目別進捗状況

#### 3-2-1 技術移転状況

1990年7月完成予定の放射線プロセス研究棟の建設が遅れているため、研究課題の医療用具の放射線滅菌及び電子線キュアリングについて、これらの施設及び供与機材を用いての実質的活動は未だ行われていなかった。しかし、昨年、滅菌のテーマで2名、キュアリングで1名のUTN研究員を高崎研で受け入れ、それぞれ研修を行ったので、彼らが帰国後、研究に着手しており、また、1991年1月21日から3週間短期専門家を派遣したため、対象物の選定等が進みつつあった。一方、キュアリングでは、UVを用いた研究が続けられており、調査団と同時に派遣された短期専門家の指導のもとに電子線での研究が開始されるものと考えられる。

#### 3-2-2 建屋の建設状況

##### (1) 照射施設建設の進捗状況

1989年7月の実施協議を経て9月には電子加速器の機種が決定し、これを受けて10月にはマレーシア側が担当する建屋の詳細設計が行われた。建屋の着工は90年の3月、竣工予定は12月13日であった。工事は、まず加速器を設置する照射室部分について建設が進められたが、工期の設定が短すぎたこと、国の経済が好況になったことによる労働力の不足や天候不順などの原因で9月末までを予定した工事は約5週間遅れた。11月中旬に加速器本体が搬入された後も並行して遮蔽扉等の付帯設備も含めて工事が行われ、平成3年2月末の段階で約90%の工事が終了し、3月末には竣工の予定である。

一方、加速器本体については、2年9月末までに製作を終了し、工場立会い試験において仕様性能を確認した。11月15日から現地での据付け作業が開始され、電源装置の据付け等に若干のトラブルがあったが、ほぼ順調に工事が進められた。12月に入りマレーシアの会計年度末ということもあって労働力が不足し、工事が進まなくなったが、今年1月末になって回復し、2月末の段階で据付け作業は完了した。今後は調整運転を行い、3月末までに受入れ試験を完了する予定である。

2月22日はフアティマ副長官出席のもとにUTN担当者と建設整備及び加速器の受入れ試験について検討を行い、冷却水設備の仕様、照射室の床面、インターロック等の安全設備その他について技術的なアドバイスを行った。

##### (2) 建屋の放射線遮蔽設備について

電子加速器照射施設の建屋については、放射線遮蔽を含めてUTNが担当して建設が進められてきた。詳細設計に際しては調査団が派遣され(1989年10月15日～25日)、UTN側の建屋建設計画を確認するとともに必要な技術指導を行ったが、この段階で遮蔽コンクリートの密度は2.1で、一次遮蔽壁の厚さは2.2mとするというものであった。と

ころが実際に発注され、建設された遮蔽壁は、密度 2.20、2 m の厚さで設計施工された。そして施工時にテストピースで実測された打設コンクリートの密度は 2.27 であったことが、今回の合同会議で報告された。同時に外壁面での漏洩線量率は詳細設計時には 1.0 mR/h であったが、これを 2.5 mR/h としたことも報告された。種々の事情があつてのことと思われるし、現段階では何も言えないが、放射線防護の観点から、この設計は疑問であり、調査の段階での助言が活かされなかったことは遺憾である。

### 3-2-3 供与機材の据付け・活用状況

低エネルギー加速器を含む FY1989 及び FY1990 供与機材（研究用機器）は、研究棟建設遅れのため、コバルト-60 照射棟に保管されており、総数 22 点のうち、15 点が日本から送付したままの梱包状態にあり、輸送時の破損の有無など点検されていなかった。既に開梱された機器については、外観、性能等が点検されていた。ある機器については、仕様書作成時に参考にしたメーカーと異ったメーカーの製品が供与されたことに対する若干の不満が示されたが、仕様書どおりの性能が満たされている限り、やむを得ないことを説明した。開梱された 7 点全てが、滅菌関連の機器であり、これらについては、上記派遣専門家からカウンターパートに運転及び取扱い方法等の技術指導が行われた。英文の取扱い説明書の不完全なものが一部あるため、業者に要望することで改善することとした。一方、未開梱の機器は、研究棟に移した後、開梱され、派遣中の専門家によって点検、取扱いの技術指導が行われる予定である。

## 4. 今後の日本側投入計画（ミニッツ Appendix 7 参照）

### 4-1 専門家派遣

上述のように、1989年7月に策定された実施計画（R/D）より遅れているため、各研究項目の実施及び専門家の派遣などについて、実情に合せたタイムスケジュールに修正された。キュアリングの長期専門家については、企業からの専門家を予定しており、人選が難航しているため、必ずしも長期（1年）にこだわらずに、2～3カ月の短期で交替するなど流動的に考える必要のあることが合意された。91年度の派遣計画を表4-1に示す。

### 4-2 研修員受入れ

実施計画（R/D）に基づき、研修期間の長短にかかわらず、3名/年度の頻度で研修員を受け入れることが確認された。91年度の受入れ計画を表4-2に示す。

### 4-3 機材供与

FY1991及び、以降の研究用機器及び加速器予備品等の供与希望リストが提出されたが、これらがR/D以降に必要となった経緯について、マレーシア側に対し、説明を求めていく必要がある。

### 4-4 ローカルコスト負担

1991年度のローカルコスト負担について、マレーシア側から以下の項目について要請がなされた。

(1) ドライバー備上費 500千円

1992年度からマレーシア側で予算措置される予定であり、来年度のみ日本側で負担することとなった。

(2) 開所式開催費 3,000千円

開所式については、本年6月に開催される予定であるが、計画の詳細は、未だ確定していない。確定次第、計画書を提出するよう、マレーシア側に要望しておいた。

表4-1 91年度専門家派遣計画

項目	4	5	6	7	8	9	10	11	12	1	2	3
(1) 長期専門家												
プロジェクトリーダー(継続)												
コーディネーター(継続)												
表面塗装スーパバイザー (新規)	△	○	—	—	—	—	—	—	—	—	—	—
(2) 短期専門家												
1) 表面塗装(塗膜性能評価)				△	○	—	—	—	—	—	—	—
2) (線量測定)				△	○	○	—	—	—	—	—	—
3) (塗工機取扱説明)	△	○	—	—	—	—	—	—	—	—	—	—
4) 滅菌(研究機材取扱説明)	△	○	—	—	—	—	—	—	—	—	—	—
5) (生物学的検討)	△	○	—	—	—	—	—	—	—	—	—	—
6) (照射効果)				△	○	—	—	—	—	—	—	—
7) (照射工学的検討)										△	○	—
8) 加速器運転(定期点検)										△	○	—
9) (照射条件整備)	△	○	—	—	—	—	—	—	—	—	—	—
10) (放射線管理)	△	○	—	—	—	—	—	—	—	—	—	—
11) (データロガー)										△	○	—

△: A1取付け、○: 派遣決定(アグレマン取付け)、—: 派遣期間



表4-2 91年度研修員受入れ計画

	4	5	6	7	8	9	10	11	12	1	2	3
1) 医療用具滅菌(生物学的検討)	△	—	—	○	—	—	—	—	—	—	—	—
2) 加速器(保守技術)	—	—	—	—	△	—	—	—	—	—	—	—
3) 加速器(運転サーベイス)	△	—	—	—	—	—	—	—	—	—	—	—
4) 安全管理	—	—	—	—	—	—	—	—	—	—	—	—

△: A2-3取付け, ○: 受入れ決定通知, —: 受入れ期間

## 5. ミニッツ

### 5-1 ミニッツ署名に至る経緯

調査団のミニッツと合同委員会のミニッツをそれぞれ作成のうえ、署名し、後者を前者に添付することとした。別々にミニッツを作成したのは、署名者が異なるためである。つまりR/Dによれば、合同委員会における議長はUTN長官が務め、マレーシア側代表はUTN副長官、日本側代表はチームリーダーが、それぞれ務めることになっており、合同委員会のミニッツにはこの3者が署名すべきであると考えられる。これに対して、調査団のミニッツには、調査団長とマレーシア側代表、即ち今回はUTN長官が署名すべきだからである。

なお、調査団の派遣は原則年1回であるが、R/Dによれば、合同委員会は年1回以上開催することが可能である。したがって、調査団の派遣がなくても合同委員会を開催できることは言うまでもない。

### 5-2 ミニッツ(別添)

別添

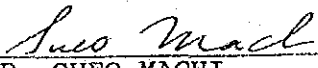
THE MINUTES OF MEETING  
BETWEEN THE JAPANESE MUTUAL CONSULTATION TEAM  
AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT  
OF MALAYSIA ON THE RADIATION APPLICATIONS PROJECT


The Mutual Consultation Team (hereinafter referred to as "The Team"), organised by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Dr. Sueo Machi, Director General, Takasaki Radiation Chemistry Research Establishment, Japan Atomic Energy Research Institute, visited Malaysia from February 20 to February 27, 1991, for the purpose of understanding the progress and achievement concerning the Radiation applications Project (hereinafter referred to as "the Project") and reviewing the technical cooperation with the authorities concerned of the Government of Malaysia.

During its stay in Malaysia, the Team exchanged views and had a series of discussions with the Malaysian authorities concerned.

As a result of the discussions, both sides came to the understanding concerning the matters referred to in the documents attached herewith.

Malaysia, February 26, 1991

  
DR. SUEO MACHI  
TEAM LEADER,  
MUTUAL CONSULTATION TEAM,  
JAPAN INTERNATIONAL COOPERATION  
AGENCY (JICA)

  
DATUK DR. MOHD. GHAZALI  
B. HJ. ABDUL RAHMAN,  
DIRECTOR GENERAL,  
NUCLEAR ENERGY UNIT (UTN)

THE ATTACHED DOCUMENT

- I. The Team attended the First Joint Committee. The list of participants from the Malaysian side and the Japanese Side appears as Annex 1.
- II. The progress report of the project since its commencement on July 5, 1989, was reviewed and evaluated. The significant accomplishments appear as the minutes of the First Joint Committee Meeting.
- III. The team appreciated the Malaysian side's effort to construct the EB building and the Malaysian side informed the Team that they would continue to make effort to make the EB machine operational as soon as possible.
- IV. The project plan for JFY 1991 was discussed in a series of meetings. The proposed plan is shown in the minutes of the First Joint Committee Meeting.

LIST OF PARTICIPANTS

## A. Malaysian Side

## (1) UTN:

- |     |   |   |
|-----|---|---|
| 1.  | Y.Bhg. Datuk Dr. Mohd. Ghazali<br>b. Hj. Abdul Rahman | Director General, UTN                         |
| 2.  | Ms Fatimah bt. Mohd. Amin                             | Dep. Director General,<br>UTN                 |
| 3.  | Mr. Razali b. Hamzah                                  | Director of Operation,<br>UTN                 |
| 4.  | Dr. Norimah bt. Yusof                                 | Director of Research,<br>UTN                  |
| 5.  | Dr. Khairul Zaman b. Hj.<br>Mohd. Dahlan              | Head, Radiation<br>Processing Program,<br>UTN |
| 6.  | Dr. Zahrah bt. Abd. Kadir                             | Radiation Processing<br>Program, UTN          |
| 7.  | Mr. Dahlan b. Hj. Mohd.                               | Radiation Processing<br>Program, UTN          |
| 8.  | Mr. Wan Abd. Hadi b. Wan<br>Wan Abu Bakar             | Head, Engineering<br>Department, UTN.         |
| 9.  | Mr. Nik Ghazali b. Nik Salleh                         | Radiation Processing<br>Program, UTN          |
| 10. | Mr. Raja Abdul Aziz b. Raja<br>Adnan                  | Planning Unit, UTN                            |
| 11. | Ms. Noriah bt. Mod. Ali                               | Health & Radiation<br>Control Department      |
| 12. | Mr. Mohd. Sidek b. othman                             | Engineering Department                        |
| 13. | Mr. Zulkifli b. Md. Nor                               | Health & Radiation<br>Control Department      |

## (2) EPU

- |    |                             |                                      |
|----|-----------------------------|--------------------------------------|
| 1. | Mrs. Wan Norma bt. Wan Daud | EPU, Prime Minister's<br>Department. |
|----|-----------------------------|--------------------------------------|

B. Japanese Side

(1) Long-Term, Experts

1. Mr. Kenzo Yoshida                      Team Leader, UTN-JICA
2. Mr. Kiyoshi Honma                      Coordinator, UTN-JICA

(2) Short-Term Experts

1. Mr. Hiroshi Tachibana
2. Mr. Takeo Kanazawa
3. Dr. Takashi Sasaki

(3) Mutual Consultation Team

1. Dr. Sueo Machi
2. Dr. Isao Ishigaki
3. Mr. Keiichi Yatsumoto
4. Mr. Toshiyuki Sakamoto
5. Mr. Naoto Hattori

(4) JICA Malaysia Office

Mrs. Yoshie Yamashita

(5) Embassy of Japan

Mr. Tomotaka Ito

THE FIRST UTN-JICA JOINT COMMITTEE MEETING  
ON THE RADIATION APPLICATIONS PROJECT  
22-26 FEBRUARY, 1991


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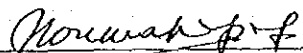
The First UTN-JICA Joint Committee Meeting on the Radiation Applications Project (hereinafter referred to as "the Meeting"), was held at the Nuclear Energy Unit, The Ministry of Science, Technology and the Environment, Malaysia, on the 22nd - 26th February, 1991 for the purpose of evaluating the progress and the achievements in the implementation of the Radiation Applications Project (hereinafter referred to as "the Project") and reviewing of the technical cooperation between the authorities of the Governments of Malaysia and Japan.


The meeting was held in accordance to Para.VII(5) of the Record of Discussions between the Japanese Implementation Survey Team and the Authorities Concerned of the Government of Malaysia on the Technical Cooperation for the Radiation Applications Project signed on 5 July 1989.

As a result of the meeting, both sides came to the understanding concerning the matters referred to in the minutes of the meeting attached herewith.

Malaysia, February 26, 1991.

  
\_\_\_\_\_  
MR. KENZO YOSHIDA  
TEAM LEADER  
JAPAN INTERNATIONAL COOPERATION  
AGENCY (JICA)  
JAPAN

  
\_\_\_\_\_  
DR. NORIMAN BT. YUSOF  
DIRECTOR OF RESEARCH, UTN  
For MS FATIMAH BT. MOHD. AMIN  
DEPUTY DIRECTOR GENERAL  
NUCLEAR ENERGY UNIT (UTN)  
MINISTRY OF SCIENCE,  
TECHNOLOGY AND THE ENVIRONMENT  
MALAYSIA

  
\_\_\_\_\_  
Y. BHG. DATUK DR. MOHD. GHAZALI B. HJ. ABD. RAHMAN  
CHAIRMAN OF THE MEETING  
DIRECTOR-GENERAL  
NUCLEAR ENERGY UNIT (UTN)  
THE MINISTRY OF SCIENCE TECHNOLOGY AND  
THE ENVIRONMENT  
MALAYSIA

MINUTES OF  
THE FIRST JOINT COMMITTEE MEETING OF UTN-JICA  
RADIATION APPLICATIONS PROJECT  
23-26 FEBRUARY, 1991

DATE : 22nd, 23rd, 25th and 26th February 1991

PLACE : Nuclear Energy Unit (UTN)  
Ministry of Science, Technology and the  
Environment,  
PUSPATI Complex, Bangi  
43000 Kajang  
Selangor Darul-Ehsan

CHAIRMAN : Y.Bhg. Datuk Dr. Mohd. Ghazali b. Hj. Abd. Rahman  
Director General, UTN

MEMBERS

A. UTN

1. Ms. Fatimah bt. Mohd. Amin Deputy Director General, UTN
2. Mr. Razali b. Hamzah Director of Operations, UTN
3. Dr. Norimah bt. Yusof Director of Research, UTN
4. Dr. Khairul Zaman b. Hj. Mohd. Dahlan Head, Radiation Processing Programme, UTN
5. Mrs. Wan Norma bt. Wan Daud Economic Planning Unit  
Prime Minister's Department
6. Dr. Zahrah bt. Abd. Kadir Radiation Processing Programme,  
UTN
7. Mr. Dahlan b. Hj. Mohd. " " "
8. Mr. Wan Abdul Hadi b. Wan Abu Bakar Head, Engineering Dept., UTN
9. Mr. Nik Ghazali b. Nik Salleh Radiation Processing Programme,  
UTN



B. JICA

- |    |                        |                          |
|----|------------------------|--------------------------|
| 1. | Mr. Kenzo Yoshida      | Team Leader, UTN-JICA    |
| 2. | Mr. Kiyoshi Honma      | Coordinator, UTN-JICA    |
| 3. | Dr. Sueo Machi         | JAERI, Japan             |
| 4. | Dr. Isao Ishigaki      | JAERI, Japan             |
| 5. | Mr. Keiichi Yotsumoto  | JAERI, Japan             |
| 6. | Mr. Takashi Sasaki     | JAERI, Japan             |
| 7. | Mr. Toshiyuki Sakamoto | STA, Japan               |
| 8. | Mr. Naoto Hattori      | JICA Headquarters, Japan |
| 9. | Mrs. Yoshie Yamashita  | JICA Malaysia Office     |

OBSERVERS

Malaysia

Japan

- |    |   |  |
|----|---|--|
| 1. | Mr. Raja Abdul Aziz b. Raja Adnan<br>(UTN)            | Mr. Hiroyuki Tachibana<br>(JAERI)      |
| 2. | Ms. Noriah bt. Mod. Ali<br>(UTN)                      | Mr. Takao Kanazawa<br>(JAERI)          |
| 3. | Mr. Mohd. Sidek b. Othman<br>(UTN)                    | Mr. Tomotaka Ito<br>(Embassy of Japan) |
| 4. | Mr. Zulkifli b. Md. Nor<br>(UTN)                      |  |
| 5. | Mrs. Sharifah Hanisah bt.<br>Syed Abdul Aziz<br>(UTN) |  |

AGENDA OF THE FIRST UTN-JICA JOINT COMMITTEE MEETING  
ON RADIATION APPLICATION PROJECT  
22-26 FEBRUARY, 1991

Friday, 22 February, 1991

- 0930 hrs - Opening of the First UTN-JICA Joint Committee Meeting on "Radiation Applications Project"
- UTN  
JICA
- Adjournment of the Meeting
- 1030 hrs - Tea/Coffee Break
- 1100 hrs - Visit to EBM Site

Saturday, 23 February 1991

- 0900 hrs - Adoption of Agenda
- General Views
- UTN  
JAERI  
JICA
- Reviews of Progress FY 1990  
UTN:
1. "Construction and Installation of EBM Facilities"  
by Mr. Razali b. Hamzah,  
Director of Operations, UTN
  2. "Review of the Project Implementation FY 1990"  
by Dr. Khairul Zaman b. Hj. Mohd. Dahlan,  
Head, Radiation Processing Programme, UTN.

JICA:

1. "Overall Progress of Project FY 1990"  
by Mr. K. Yoshida, Team Leader, JICA-UTN,  
Malaysia

- General Discussion
- Adjournment of the Meeting.

Monday, 25 February 1991

- 0900 hrs - Planning Schedule for FY 1991 and Future Plans  
UTN  
JICA
- 1245 hrs - Adjournment of the Meeting

Tuesday, 26 February 1991

- 0900 hrs - Confirmation of Minutes of the Meeting
- 1300 hrs - Lunch
- 1500 hrs - Signing of Minutes of the First UTN-JICA Joint  
Committee Meeting on the Radiation Applications  
Project
- 1530 hrs - Closing Remarks  
JICA  
Chairman, UTN

## MINUTES OF THE MEETING

### 1. Opening of the Meeting

1.1 The First UTN-JICA Joint Committee Meeting on "Radiation Applications Project" was chaired by the Director General of Nuclear Energy Unit (UTN).

1.2 The meeting was officially opened by the Chairman and his opening remarks is as in Appendix 1.

1.3 The leaders of the Mutual Consultation Team and the JICA - UTN Radiation Applications Project delivered their opening remarks as in Appendices 2 & 3 respectively.

### 2. Adoption of Agenda

2.1 The tentative agenda of the meeting was adapted by the meeting with an amendment to the title of the paper presented by Dr. Khairul Zaman Hj. Mohd. Dahlan.

### 3. General Overview

3.1 The meeting recognised that this is the First JICA-UTN Joint Committee Meeting on "Radiation Applications Project" which involves both parties since the planning stage.

3.2 The meeting also recognised the need to revise the workplan in order to improve the implementation.

#### 4. OVERVIEW OF PROGRESS FY 1990

##### 4.1 Presentation by UTN

4.1.1 Construction and Installation of EBM facilities by Mr. Razali Hamzah (Appendix 4)

4.1.2 Review of the Project Implementation in Fiscal Year 1990 by Dr. Khairul Zaman (Appendix 5)

##### 4.2 Presentation by JICA

4.2.1 Overall progress of Project in FY 1990 by Mr. Yoshida (Appendix 6)

##### 4.3 General Discussion

4.3.1 Construction and Installation of EBM facilities

###### a. Cooling System

The present cooling system is found to be inadequate. It was explained that the present cooling system was designed based on the advice given by NHV as follows:

Beam output 90 kW

Flow rate 110 l/min. at 30°C

In order to overcome this inadequacy, UTN will construct a heat sink after receiving advice and specifications through JICA.

b. Floor Finish

The present floor finish needs to be improved to ensure the smooth movement cause of the conveyor system. UTN will ensure that the floor finish is improved before commissioning of the High Energy EBM.

c. Safety System

It was stressed that the safety system has to be completed before beam conditioning. UTN will ensure that interlock system and other related system are operational before the beam conditioning.

d. Entrance to the conveyor system

The present door is made of fire resistance wood as prescribed by the Malaysian Fire Department. It was recommended that this door be replaced with a steel door. UTN would check with the Fire Department before implementing this recommendation.

e. Sound Level

From the JICA experts's experience, the noise level outside the duct is expected to be greater than 80 decibels and from inside the room > 100 decibels.

UTN will add a silencer if necessary to reduce the noise level after the appropriate measurements are made.

f. Future Experiments

It was pointed out that for experimental work, the irradiation room needs to be equipped with water supply, drain and ceiling hooks for the sleeves.

UTN will attend to these matters.

4.3.2 Review of the Project Implementation Fiscal Year 1990.

a. It was pointed out that Mr. Sasaki's mission is to assist the counterpart in the selection of suitable substrates and resins for the curing project.

b. The schedule for implementation of the research activities has to be revised due to the delay in the construction and installation of both the electron beam machines.

c. It was noted that the research equipments for the curing project have not been unpacked due to the delay in the MTS building construction. Although insurance for these research equipments has expired, it was confirmed that the warranty is still valid for one year.

d. It was stated by UTN that research activities related to both projects are on-going by using the UV curing system and Co-60 facility.

e. Selection of products to be studied for medical products sterilization project has been carried out during Mr. Watanabe's mission recently and priority was given to surgical rubber glove. The reasons for selecting surgical rubber gloves were because that they are of Malaysia major rubber-based medical products and that they are suitable for EB sterilization

#### 4.3.3 Overall Progress of Project FY 1990

a. UTN requested JICA to be more flexible on the implementation of future schedule to avoid unnecessary shortcomings. The implementation should be more timely taking into considerations the delays in the progress of the project such as the construction work.



b. JICA requested UTN to send the applications for expert despatches at least one month in advance.

c. UTN requested JICA to notify EPU regarding the despatch of experts in not less than 2 weeks before commencement of the mission.

d. The despatch of the curing supervisor for one year is still being negotiated and the earliest date of this mission is June 1991.

e. The meeting requested the annual breakdown of the budget for this project from UTN and JICA.

## 5. Planning Schedule for FY 1991 and Future Plans

5.1 The draft Workplan for FY 1991 prepared by UTN and JICA was presented by Mr. Yoshida and some amendments were introduced. The Final Workplan for 1991 was adopted and agreed by the meeting to be proposed to JICA for approval (Appendix 7).

5.2 The Overall Future Plan was also discussed and the necessary amendments were mutually agreed as in Appendix 8.

WELCOMING ADDRESS BY DIRECTOR GENERAL OF  
THE NUCLEAR ENERGY UNIT:  
FIRST JOINT COMMITTEE MEETING OF UTN-JICA  
RADIATION APPLICATIONS PROJECT  
22-26 FEBRUARY, 1991

Dr. S. Machi, Director General of Takasaki Radiation Chemistry Establishment (TRCRE), and leader of mutual consultation team, Dr. K. Yoshida, the team leader of JICA Project, distinguish experts, ladies and gentlemen. At the outset, I wish to welcome you and your mission to UTN. This is not the first time we meet. We are already familiar with one another and this will make our task easier. I hope the UTN-JICA Co-operation will not only transfer radiation technology to Malaysia, but will continue to foster close cooperation in nuclear science and technology between the two countries.

As you may have noticed the opening of this meeting is being held in our new building dedicated to tracer and NDT research work. This was recently opened as part of the UTN's expansion and commitment in providing adequate facilities for the development of nuclear technology in Malaysia. Unfortunately, the new buildings that house the radiation processing laboratories and facilities are still not completely ready.

The electron beam facility at the UTN will be the first ever to be set up in Malaysia. The establishment of this facility will give us a new and valuable experience, not only to UTN's staff but also to the Malaysian architects, contractors and workers. I am happy to note that our staff have been participating fully in the installation of

the machine under the supervision of the able Nissin high Voltage Engineers. Our staff and the experts from NHV and JICA have been working very hard to complete the task as scheduled. I would like to take this opportunity to thank those who are involved, and I hope they will continue working as hard as ever towards the completion of the task as soon as possible.

The installation of low energy EBM will start at the end of this month. It is very unfortunate that the radiation technology building to house the low energy EBM is far behind schedule eventhough the construction of the building started very much earlier than the one for the high energy EBM.

However, the training programme is being implemented as schedule. So far five of our staff have undergone on the job training at Takasaki Radiation Chemistry Establishment in Japan. The expert mission is also being implemented as schedule. However, I wish to mention here that it is important for the experts be despatched in accordance with the progress of work in order to get the full benefit and contribution from the experts towards the implementation of the project.

In view of the present status with regard the installation of the EBM, new schedule should be thought off. This will in turn affect the despatch of experts and the training programme. In fact, this matter will be discussed in detail in the Joint Committee Meeting.

Radiation sterilisation of medical products and radiation curing of surface coatings are the two research areas that need to be developed during the remaining part of the UTN-JICA technical Cooperation. In

this respect, I wish to inform you that this Technical Cooperation is timely i.e. when the government is placing great emphasis on R&D towards applications-oriented, market driven and commercially relevant. The use of modern technologies to produce high quality products and to increase productivity is given high priority in our industrial development. Thus, R&D carried out by UTN is very much in line with government policies and strategies for industrial technology development. Subsequently, radiation processing technology which will be developed under the UTN-JICA Technical Cooperation has much to offer the industrial sector.

The UTN-JICA Technical Cooperation in the promotion of the technique of radiation sterilisation of medical products using EBM can be developed.

Beside the radiation sterilisation work, UTN intends to carry out R&D in radiation crosslinking in plastic materials such as polyethylene (PE) and polypropylene (PP) for the applications in wire and cable insulations and heat shrinkable films or tubing. Radiation crosslinking of plastic is another research to be carried out using the high energy EBM. UTN will receive an expert from Japan under the Scientist Exchange Programme. At the same time, one of our staff is currently on the job training at TRCRE in the modification of polymer by radiation crosslinking.

EB curing of surface coatings in Malaysia is still at the infancy stage compared to UV curing which has been well developed and is being utilised by many industries, particularly the printing industry. This is an area which requires intensive R&D. Close collaboration with

TRCRE through UTN-JICA Technical Programme will produce tangible results that can be used to promote the industrial application of this technology.

Ladies and gentlemen, before I end the speech, I would like to highlight the main functions of the Joint Committee which has been agreed upon before:

1. To formulate the annual work plan of the project in line with the tentative schedule of implementation.
2. To review the overall progress of the technical cooperation programme as well as the achievements in accordance with the annual work plan.
3. To review and exchange views on major issues arising from or in connection with the technical cooperation programme.

We have only one and a half day to complete our deliberation. With your expertise and wisdom, I am confident we will be able to complete our work in time and to proceed with the implementation of the projects accordingly.

Lastly, I wish Dr. S. Machi and his mission an enjoyable stay under the warm sun in Malaysia, away from the cold Japanese winter and once again to welcome you and your mission to UTN.

OPENING REMARKS BY DIRECTOR-GENERAL OF  
TAKASAKI RESEARCH ESTABLISHMENT, JAERI  
FIRST JOINT COMMITTEE MEETING OF UTN-JICA  
RADIATION APPLICATIONS PROJECT  
22-26 FEBRUARY, 1991

Datuk Dr. Ghazali b. Hj. Abdul Rahman, Director General of Nuclear Energy Unit (UTN) and Chairman of the Joint Committee Meeting of UTN - JICA Radiation Applications Project, Ladies and Gentlemen.

It is my pleasure to be back at UTN. My last visit was in July last year.

First of all I would like to convey my appreciation for the kind arrangement for this First Joint Committee of the Cooperation for the Radiation Application Project between the Government of Malaysia and JICA.

The purpose of this Joint Committee is to review the progress and achievement of the project since July 1989 when the project was started, and to formulate the action plan of the project for the coming new fiscal year.

Industrial application of radiation processing is ever expanding because of its technological and economic benefits. This JICA project places emphasis on two applications, namely curing of surface coating by EB and sterilisation of medical products.

Both applications are very beneficial for the people in terms of not only economics but also for environmental conservation.

We have received UTN personnel in JAERI, Takasaki to transfer our technology. This exchange of scientist and engineers is very important for cooperation and mutual understanding.

I am afraid that the schedule of the meeting is quite tight, therefore, we should work hard. I wish that you make as much contribution as possible to make the committee meeting successful and fruitful.

Thank you for your attention.

OPENING REMARKS BY TEAM LEADER (JICA)  
FIRST JOINT COMMITTEE MEETING OF UTN-JICA  
RADIATION APPLICATIONS PROJECT  
22-26 FEBRUARY, 1991

It is a great honour for me to extend my most sincere congratulations on the happy occasion of the opening of the First Joint Committee Meeting, on behalf of Japanese team of JICA-UTN Radiation Application Project.

The project is aimed to promote the technology transfer on the practical applications of radiation by means of cooperation between Japan and Malaysia. JICA has extended technical cooperation by donating a number of research equipments, including the electron accelerator which has top class capabilities in the Asian region, and also the despatch of many experts. On the other hand, UTN is constructing the EBM building and Radiation Technology Laboratory.

In this meeting, the activity of the Project in 1990 will be reviewed and the original schedule revised through discussions because the commissioning of EBM was considerably delayed. However, the Project still has enough period to recover the delay with close cooperation of both the Project teams according to appropriate revision.

Finally, I would like to express my hope that this committee meeting will help more efficient implementation of the Project and further strengthen the friendly relations existing between Japan and Malaysia.



CONSTRUCTION & INSTALLATION OF ELECTRON BEAM MACHINE

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Razali Hamzah, Wan Abd. Hadi , Sidek Othman, Shari Jahar,  
Kamaruddin Buyung & NHV Team

1. Introduction

The EBM is a joint project between Malaysian Government and Japanese Government. Under the agreement, Japan supplies EBM and its associated equipment while the Malaysian Government provides the building and its associated services. The project initially started wayback in 1988 and scheduled to be completed in March 1991. The construction commenced in March 1990.

2. Project Description

Machine specification: 3 MeV, 30 mA, 120cm scanning width.  
Manufacturer: NHV.

3. Building

3.1 Design Criterias:

Safety : - Surface dose rate outside the concrete biological shield, should be below ICRP limit of 2.5 mR/hr.

Concrete density: 2.2 g/c.c

- Safety interlock system.  
To control access to irradiation room and radiation controlled areas.

Utilization: 1) R&D  
2) Industrial application

With the above application and its flexibility it is difficult to design a building to serve the whole range of applications and also to include 'future' requirements. Plan of the building is as shown in Attachment 1(a), 1(b), 1(c) and 1(d).

#### 4. Constructions

4.1 Initial discussion of the project started in mid-1988. Building sketches were based on two different machines, Nissin High Voltage (NHV) and Sumitomo Heavy Industries (SHI) and subsequently two different architectural and structural buildings layout were produced.

4.2 The plan of the building was finalised in October 1989 after confirmation of type of machine. Detailed design of the building took place at the same time which was discussed in detail with JICA experts and UTN staff assisted by local building consultants. Tender was called in January and contract was awarded in March. The building contract period is from March to December 1990.

4.3 Construction of the building is divided into two phases. The first phase is the sectional completion of cell area which was scheduled to be completed in September 1990. The second phase that is the final completion should be completed in December, 1990. Due to tight schedule, weather, variation orders and other site problems building will be completed in February, 1991.

4.4 The overall project implementation schedule is as shown in Attachment 2(a). Building construction schedule is as in Attachment 2(b).

#### 5. Installation

Installation of EBM machine commenced on 15th November, 1990 (delayed by a month) and is scheduled to be commissioned in March 1991. Installation work are executed by UTN staff and NHV team. All works are supervised by NHV. Generally installation works can be divided three phases:

5.1 FIRST PHASE - Mechanical & Electrical (Nov 15 - Dis 21, 90)

1. Unpacking and checklist.
2. Sorting and carrying equipments to their respective places.
3. Equipment positioning such as high frequency inverter, compensating reactor, window cooling blower and etc.
4. Installation of direct current power supply tank, Cockroft Walton circuit, accelerator tube and etc.
5. Plumbing works.

5.2 SECOND PHASE - Mechanical & Electrical (Dis 22, 90 - Jan 21, 91) without Japanese expert.

1. Conveyor system.
2. Installation of safety boxes, limit switches and other safety equipment.
3. Plumbing works.
4. Wiring works.
5. Installation of circuit breaker and transformer for the electron beam.

5.3 THIRD PHASE - Testing of Mechanical & Electrical (Jan 22 - Mar 30, 91)

1. Wiring works and inspection.
2. Plumbing works.
3. Inspection of tank.
4. SF6 gas charging.
5. Voltage conditioning.
6. Beam allignment.
7. Beam conditioning.
8. Acceptance Test and training for the relevant staff.

\* First phase and second phase is the implementation schedule.

\*\* Third phase is the planning schedule.

The installation schedule is as shown in figure in Attachment 3(a), 3(b) and 3(c).

## 6. Teething Problems:

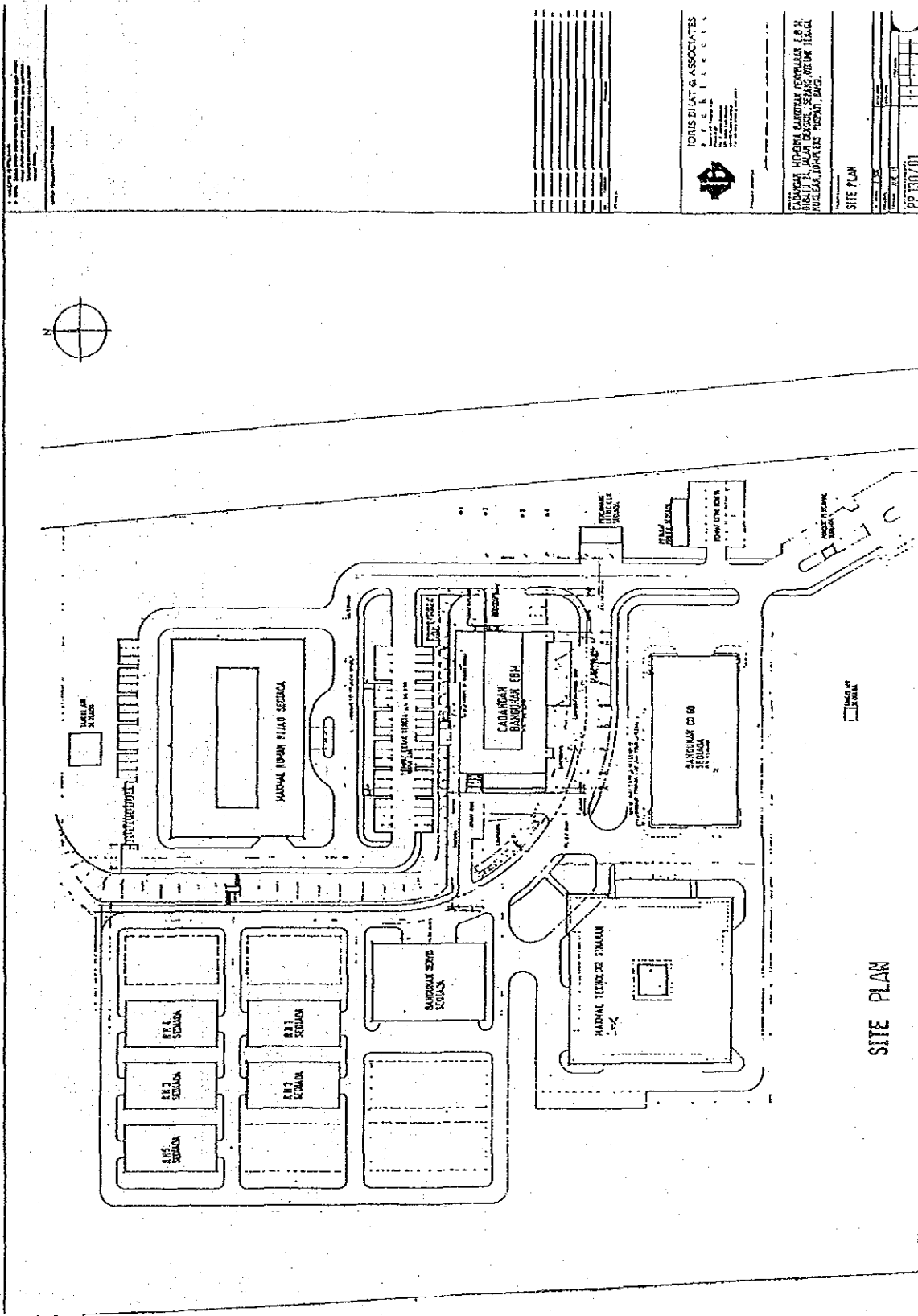
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- o Communication.
- o Demarcation of Responsibility.
- o Construction.
  - Tight schedule.
  - Weather.
  - Variation Orders.
    - Electrical
    - Plumbing
    - Building - additional steel.
  - Nominated Sub-contractor response.
- o Installation.
  - Accelerator tank - anchor bolt hole too small.
  - Welding set requirement.
  - Incorrect position of HF transformers.
  - Additional plumbing works.
    - . Incorrect size of matching hanges.
    - . Insufficient fitting.
  - EBM switch gear does not meet local standard.
  - NHV schedules.


## 7. Conclusion

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It is the first project carried out in Malaysia and the local has gained experiences in designing, building and installing and EBM facility in Malaysia. The experiences are shared not only by UTN staff but also the private sectors, engineering consultants, contractors and suppliers. Even though project is delayed by 2 months, all the participating parties, Malaysians and as well Japanese counterparts have been trying hard to hit the target.



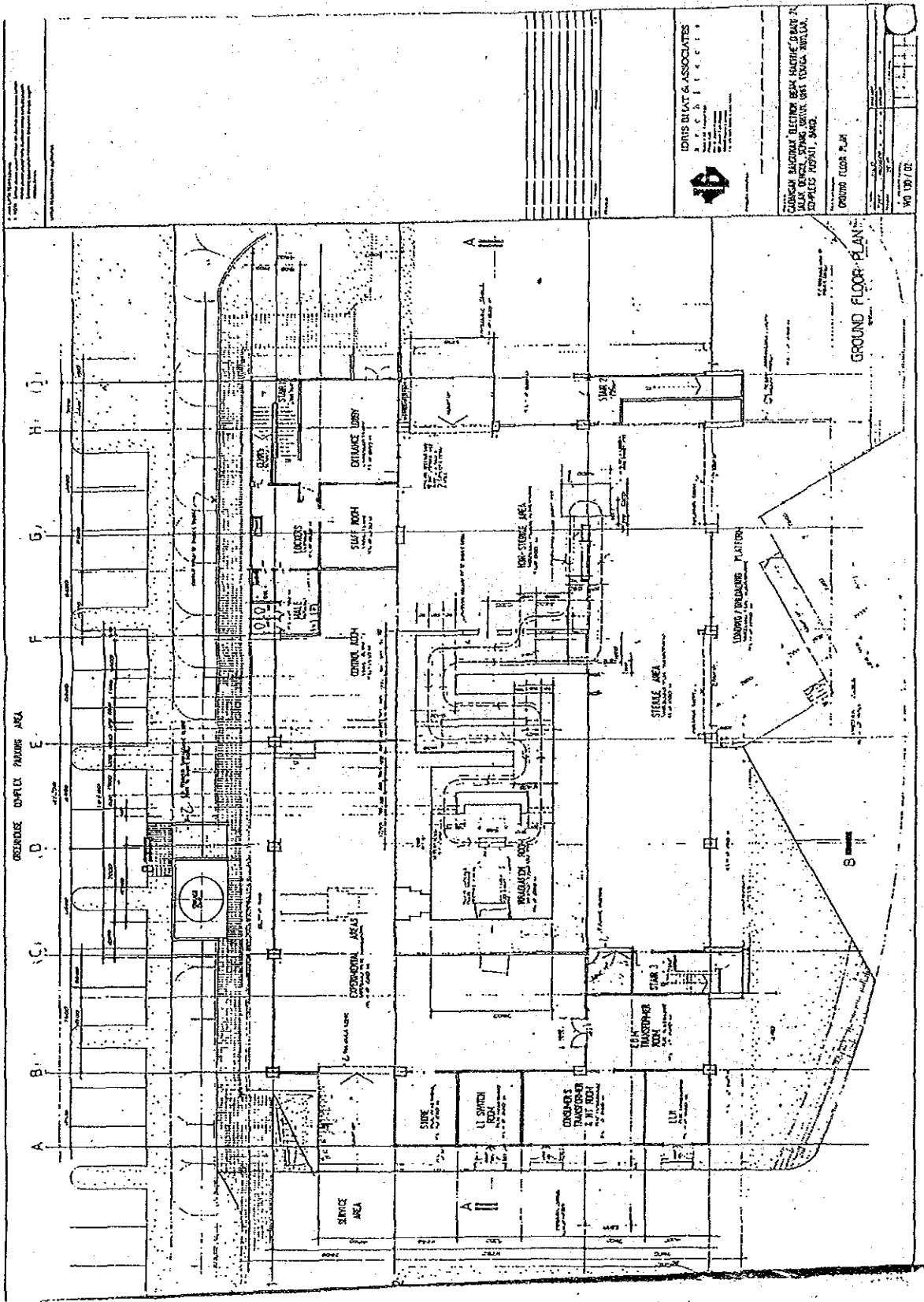
SITE PLAN


  
 IDRIS BILAL & ASSOCIATES

CAMARAN BANGUNAN TERBUKA L. B. P. 1  
 BUKIT TINGGI, JALAN TERBUKA, STRAUS MITUM TERGA  
 HILIR, KAMPUNG MERTANG, BANG.

SITE PLAN  
 No. 100/701

1(b)

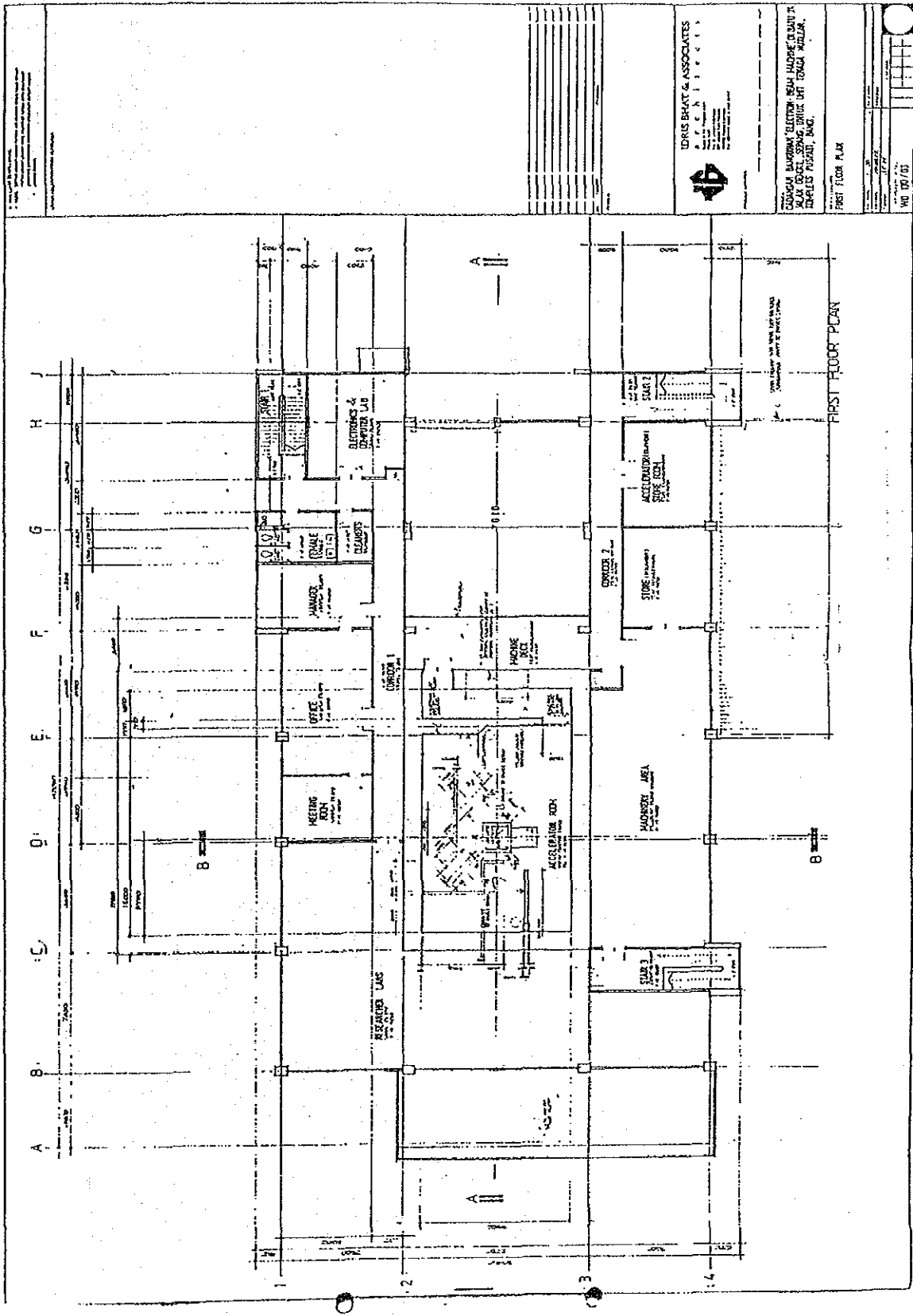


**IONIS BLAT & ASSOCIATES**  
 ARCHITECTS  
 1000 ...  
 ...

CONSTRUCTION SPECIFICATIONS SHALL BE BASED ON THE IONIS BLAT STANDARD SPECIFICATIONS FOR CONSTRUCTION OF BUILDINGS.

PROJECT NO.	...
DATE	...
SCALE	...
NO. OF SHEETS	...
TOTAL NO. OF SHEETS	...

1/1/17

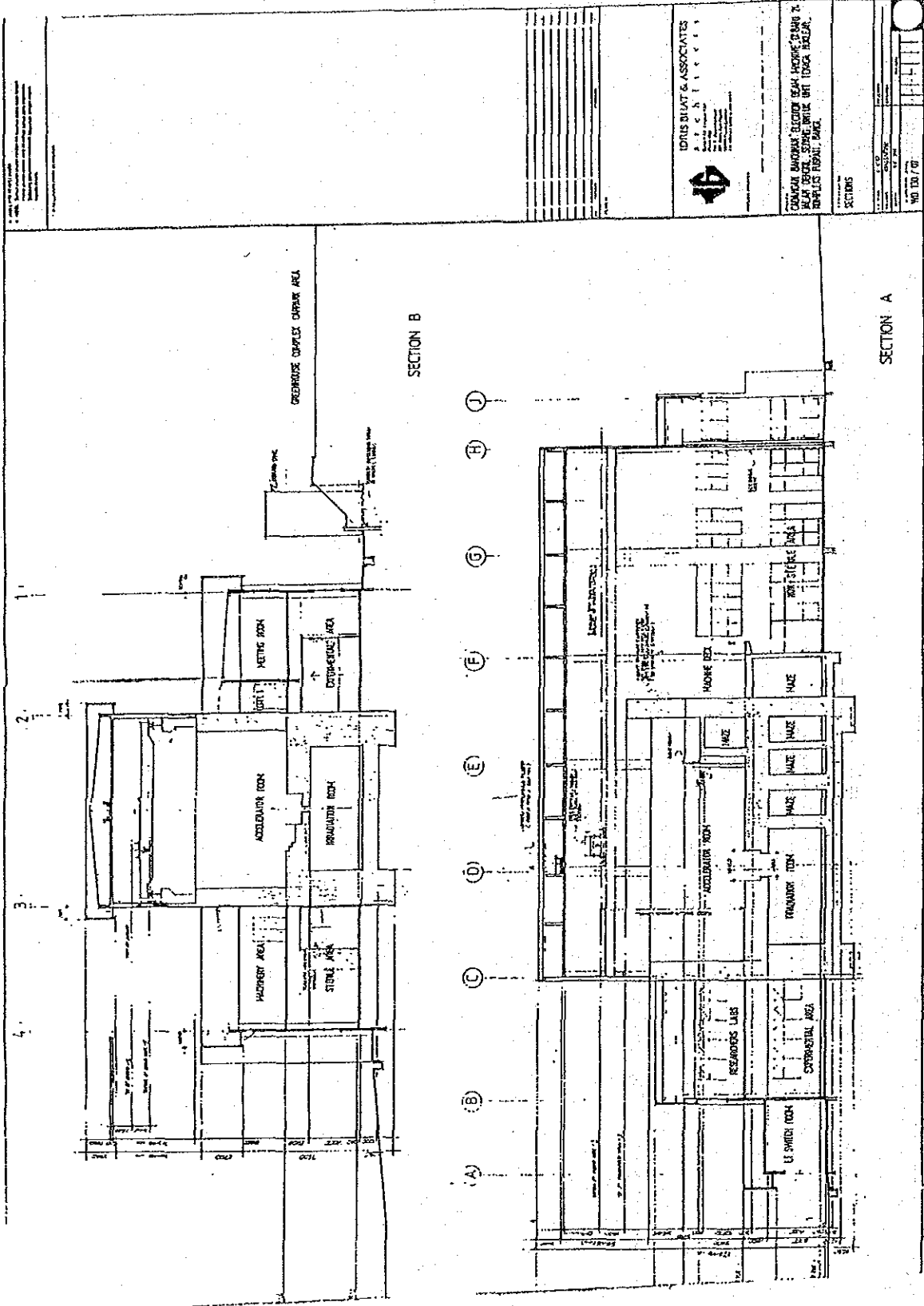


**IDRIS BHAT & ASSOCIATES**  
 ARCHITECTS  
 10, Jalan Sultan Ismail, 50100 Kuala Lumpur, Malaysia  
 Tel: +603 2148 8888  
 Fax: +603 2148 8889  
 Email: info@idrisbhat.com

GEOMETRIK BANGUNAN "ELITUM" NEAR HADRAH (UNIT 1)  
 NO. 100, JALAN SULTAN ISMAIL, KUALA LUMPUR, MALAYSIA.  
 NO. 100/01

PROJECT TITLE: ELITUM (UNIT 1)  
 PROJECT NO.: 100/01  
 DATE: 1/1/17  
 DRAWING NO.: 100/01/01  
 SCALE: 1:100  
 SHEET NO.: 1 OF 1

FIRST FLOOR PLAN



1. ALL DIMENSIONS ARE IN FEET AND INCHES UNLESS OTHERWISE NOTED.  
 2. ALL WALLS ARE 12" THICK UNLESS OTHERWISE NOTED.  
 3. ALL FLOORS ARE CONCRETE UNLESS OTHERWISE NOTED.  
 4. ALL CEILING ARE 8' HIGH UNLESS OTHERWISE NOTED.  
 5. ALL DOORS ARE 3' 6" WIDE UNLESS OTHERWISE NOTED.  
 6. ALL WINDOWS ARE 4' 6" WIDE UNLESS OTHERWISE NOTED.  
 7. ALL STAIRS ARE 36" WIDE UNLESS OTHERWISE NOTED.

**IDRIS BIYAT & ASSOCIATES**  
 ARCHITECTS  
 1000 15th Street, N.W.  
 Washington, D.C. 20004  
 (202) 331-1111

CONTRACT NUMBER: ELEC-75-001  
 DRAWING NUMBER: 100-100-100-100  
 DATE: 10/10/78  
 SHEET NO. 100-100-100-100

NO.	DATE	DESCRIPTION
1	10/10/78	ISSUED FOR PERMIT
2		
3		
4		
5		
6		
7		



**UNIT TENAGA NUKLEAR  
JABATAN PERKHIDMATAN KEMURUTERAAN**

BAHAGIAN	KENDALIAN	EEN PROJECT IMPLEMENTATION												TARIKH												
		PERAKAAN																								
B/L	ITEM	1988			1989			1990			1991			CATITAN												
		J	F	M	A	M	J	S	O	N	D	E	F		J	A	S	O	N	D	J	F	M	J	A	S
1	PRELIMINARY DISCUSSION																									
2	INITIAL CONCEPT																									EBN meeting not selected yet.
3	AGREEMENT UTILISATION																									RD approved. MAF approved. SHI approved. SPP approved.
4	FINALISE BUILDING LAYOUT																									EBN meeting determined.
5	PREPARATION AND CALLING FOR TENDER																									
6	TENDER FOR BUILDING CONST. AWARD																									
7	BUILDING CONST. CONTRACT PERIOD																									
8	SHIELDING STRUCTURE CONST.																									
9	EB FACILITIES INSTALLATION																									

CATITAN/NOTA:									

PUNCA SURAT			HELANAN	ULASAN	
PINDAAN					

JABATAN PERKHIDMATAN KEJURUTERAAN

		WORK SCHEDULE FOR ELECTRON BEAM MACHINE BUILDING																									
DATE	WEEK	16.3.90		12.4.90		10.5.90		7.6.90		5.7.90		2.8.90		30.8.90		27.9.90		25.10.90		22.11.90		27.12.90		14.1.91			
		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	31	32	34	36	38	40	42	44	46	48	
1	BUILDING CONSTRUCTION	[Gantt chart bars for Building Construction]																									
2	CELL STRUCTURE	[Gantt chart bars for Cell Structure]																									
3	HIGH VOLTAGE POWER SUPPLY SYSTEM	[Gantt chart bars for High Voltage Power Supply System]																									
4	CRANE	[Gantt chart bars for Crane]																									
5	BUILDING ELECTRICAL POWER SUPPLY/TELEPHONE	[Gantt chart bars for Building Electrical Power Supply/Telephone]																									
6	FIRE PROTECTION SYSTEM	[Gantt chart bars for Fire Protection System]																									
7	AIRCONDITIONING AND COOLING SYSTEM	[Gantt chart bars for Airconditioning and Cooling System]																									
8	EBM INSTALLATION	[Gantt chart bars for EBM Installation]																									

PROPOSED  
ACTUAL





# SCHEDULE FOR INSTALLATION AT SITE

DATE	2/91										3/91																																
	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
ITEM																																											
OPEN CHECK & TANK CLOSE																																											
VOLTAGE																																											
CONDITIONING																																											
BEAM ALIGNMENT (SCAN WIDTH & DOSE UNIFORMITY)																																											
BEAM CONDITIONING																																											
ACCEPTANCE TEST																																											
TRAINING																																											
NOTE:																																											
→ PLANNING SCHEDULE																																											
— IMPLEMENTATION SCHEDULE																																											

First Joint Committee Meeting of  
UTN - JICA Technical Cooperation  
on Radiation Applications Project.  
Review of the project implementation  
in Fiscal Year 1990.  
Dr. Khairul Zaman Hj. Mohd Dahlan

INTRODUCTION

The UTN - JICA Technical Cooperation on Radiation Applications Project was concluded with the signing of the record of discussion on 5 of July 1989. The Tentative Schedule of Implementation of the project for 5 Years (1989 - 1994) is shown in Table 1. Table 1 comprise of 5 main items;

- I. Provision of Equipments
- II. Research Work Plan: Curing of Surface Coating
- III. " : Medical Product Sterilisation
- IV. Schedule of EBM Building Construction
- V. Schedule of Radiation Technology Laboratories Construction.

For the supervision of the overall implementation of the project, the JICA Team Leader and Coördinator (Dr. K. Yoshida and Mr.K. Honma) were despatched to UTN. Their service started from 25 May 1990 to 24 May 1992 for two years term.

I. Provision of Equipments.

All of the equipments which were requested in the FY 1989 and 1990 have been delivered to UTN in 1990 in particular the main machines i.e, high energy EBM, low energy EBM and related equipments and accessories.

1. Low energy EBM (Curetron), web attachment and accessories arrived at UTN on 13th. October 1990.

2. Research equipments for radiation curing project as listed in Table 2 also arrived together with Curetron except for two equipments i.e. Accelerated Weather O-meter and Gel Permeation chromatography which arrived later on 28th January 1991.
3. High Energy EBM and related equipments and accessories arrived at UTN on 15 November 1990.
4. Research equipments for medical products sterilisation as listed in Table 3 arrived at UTN together with research equipments for radiation curing project.

The high energy EBM and related equipments have been installed upon arrival at UTN by stages by the NHV experts with the assistance of UTN personnel. Two NHV experts (Table 4) were at UTN from 14 November to 22 December 1990 for the installation of the high energy EBM. Their work was continued by another NHV expert starting from 22 January 1990 until the completion of the work.

The low energy EBM, Curetron will be installed starting from 26 February 1991 by another NHV expert. A few of the research equipments have already been inspected by JICA experts and UTN personnel. Most of the equipments are still in the boxes because of lack of rooms for the placement of the equipments. However, it is expected that by March the equipments will be installed and commissioned by stages. From our inspection on the equipments, we have found out that;

- i) the lens of the crystallization rate analyzer are not suitable for the purpose of our work (the magnification power is too low). JICA expert has personally checked the equipment and will take the necessary action for replacement of the lens.

ii) Gear oven is generally in good condition. The broken glass in the oven can be replaced locally.

iii) Tensile machine provided by JICA is a different model (Sangyo) than the one that we expected (Toyoseki) from our previous meeting and negotiation. We have already bought some accessories based on the earlier model of tensile machine (Toyoseki). At present, we are trying to find out whether these accessories can be used for Sangyo's model. Another important comment about this machine is that, it is still using chart recorder and do not has data processing system which are common features in most of modern scientific equipments today. The manual of this machine is in Japanese language only.

## II. Research Work Plan: Curing of Surface Coating

All of the research activities under this project are postponed until the commissioning and operation of Curetron. This affect the despatch of experts for the implementation of the research programme. However, starting from 26 of February, Curetron will be installed and it is expected that it will be in operation by middle of March 1991. In view of this, one expert from JAERI on radiation curing ( Dr. T. Sasaki) has arrived at UTN on 20.02.91 (Table 4) to assist in commissioning of research equipments and in planning of research activities. The Work Plan for research will be given in the discussion of future plan of FY 1991.

A training programme was implemented as scheduled as shown in Table 5. This training has given an invaluable experience and



knowledge to the counterpart on the related field of research and it is expected that the counterpart and other personnel will be able to continue their research using the facilities provided by JICA at UTN.

However, the studies on substrate and coating materials using UV irradiation has been carried out by the radiation curing group at UTN. Several type of oligomers and monomers such as polyester acrylate, epoxy acrylate and TPGTA, TPGDA etc. respectively have been applied. Table 6 shows some of the related equipments which are available at the radiation curing laboratories.

### III. Research Work Plan: Medical Products Sterilisation

Similarly, the research activities under this project are also differed until the completion of the installation of high energy EBM. This will surely affect the despatch of experts and also the schedule of training of UTN's personnel. The preliminary work on the selection of products to be studied under the UTN-JICA project has been carried out with the assistance of JICA expert (Dr. Y. Watanabe). Consequently, rubber glove has been chosen as the first medical product to be studied using EBM. One of the most important aspect in this research is the dose measurement study of the products. In view of the importance of the experiments on dose measurement of the particular products, the counterpart requires the assistance of the experienced expert. Such request will be discussed further in the review of work plan for FY 1991.

A training programme under this project was implemented as scheduled as shown in Table 5. Currently, most of the work on radiation sterilisation of medical products is using gamma irradiation at 25

kGy. With the rubber gloves, so far, there is no problem in term of radiation compatibility. Table 7 shows some of the equipments which are related to the project and are available at UTN.

Tentative Schedule of Implementation

	1989				1990				1991				1992				1993				1994						
	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	
Area of Cooperation																											
Division of Equipment																											
EB machine (with conveyor system for medical products)		Purchase Order (P/O)																									
		EB Exp.(2)																									
Test curing machine (Low energy laboratory type EB machine, research instruments)		P/O																									
Medical product sterilization Research Instruments (Biological test) (Dose measurement)																											

Remarks	P/O - Purchase Order	LEB - Low Energy EB	QC - Quality Control
	I/I - Installation and Test	Del. - Delivery	Exp - Expert
	EB - Electron Beam Machine	Op. - Operation	



	1990				1991				1992				1993				1994	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
<u>Research Work Plan</u> II Medical Products Sterilization (1) Study of product item  (2) Dose Measurement (Distribution) (3) Dose requirement study (Biological study) (Dose rate effect)  (4) Radiation damage of products  (5) Radiation Technology (Packaging) (Dose uniformity) (Conveyor system) (6) Test Production (Quality control)	Prod. Prod Exp(1)				ED Operation  Exp(Biology)(1) Training(1)				Training(1)  Engineering Exp(2)				Training(1)				DC Exp(1)	

Table 2. Research Equipments Received From JICA in FY 1990.

1. Grating Infrared Spectrometer
2. Roller Coater
3. Flow/Curtain Coater
4. Contact Angle Meter
5. Taber Type Abrasion Tester
6. CTA Film Dose Reader
7. Automatic Film Applicator
8. Accelerated Weather O-meter / Xenon Arc Lamp
9. High Performance Gel Permeation Chromatograph
10. Laminator

Table 3. Research Equipments Received In FY 1990

1. Tensile Strength and Compression Tester Model TE-902 with recorder.
2. Clean Bench Model VS-1302L.
3. Autoclave Micro-processor Control Model SS-325.
4. Geer Type Ageing Tester Model AG-301 with standard accessory.
5. High Speed Refrigerated Centrifuge Model RS-201V with accessory.
6. Crystallization Rate Analyzer Model MK-801.
7. Hardness Tester (Rockwell Type) Model HA-101 with accessory.
8. Impact Tester (Izod Type) Model IM-501 with standard accessory.
9. Super Dumbbell Cutter Model SDL-100 with standard accessory.
10. Sampling Machine Model SG 0902 with accessory.
11. Radiachromic Reader Model FWT-92.

Table 4. JICA Expert Services at UTN in FY 1990

1.	Mr. K. Hayashi	NHV	06.08.90 - 12.08.90
2.	Mr. H. Takayama	NHV	14.11.90 - 22.12.90
3.	Mr. T. Moriwaki	NHV	14.11.90 - 22.12.90
4.	Mr. K. Mikihara	NHV	22.01.91 - until completion
5.	Mr. Y. Watanabe	JAERI	21.01.91 - 16.02.91
6.	Mr. H. Tachibana	JAERI	23.01.91 - 02.03.91
7.	Mr. T. Kanazawa	JAERI	23.01.91 - 02.03.91
8.	Mr. T. Watanuki	JAERI	23.01.91 - 19.02.91
9.	Mr. T. Sasaki	JAERI	20.02.91 - 14.03.91



Table 5. Training Programme in FY 1989 and 1990.

1.	Dr. Khairul Zaman Hj. Mohd Dahlan	23.01.90 - 24.04.90
2.	Dr. Zahrah Abd. Kadir	13.03.90 - 14.06.90
3.	Ms. Noriah Mod Ali	13.03.90 - 13.08.90
4.	Mr. Wan Abd.Hadi Wan Abu Bakar	14.08.90 - 18.08.90
5.	Mr. Shaari Jahar	14.08.90 - 28.08.90
6.	Mr. Nik Ghazali Nik Salleh	.03.91 - .09.91

Table 6. Equipment Available In UTN.

(related to the radiation curing project)

1. Brookfield Viscometer
2. Pendulum Hardness Tester (Labotron-Byk)
3. Pencil Hardness Tester (Ueshima)
4. Ultraviolet Machine (IST)
5. Vacuum Oven system (Eyela)
6. Reflected Optical Microscope (Olympus)
7. Hunterlab Tristimulus Colorimeter
8. Glossmeter (Sheen)
9. Coating Thickness Gauge (Sheen)
10. Ultraviolet Spectrophotometer (Hitachi)
11. TLC Densitometer (CAMAG)

Table 7. Equipments Available In UTN

(related to medical product sterilisation project)

1. Fourier Transform Infrared Spectrometer  
Model NICOLET 60SX.
2. Thermal Analysis System Model SHIDMAZU DT-40.
3. Universal Testing Machine Model INSTRON 4301.
4. Impact Tester (Izod Type) Model CEAST 6545/000.
5. Gear Oven Model TOYOSEIKI 60-P.
6. Hot Press Model TESTMATE.
7. Cold Press Model TESTMATE.
8. Laboratory Two-roll Mill Model TESTMATE.
9. Colorimeter Model HUNTERLAB D25.
10. Incubator Model JOUAN EB280.
11. Incubator Model MEMMERT BKE50.
12. Incubator Model MEMMERT UL60.
13. Laminar Flow Cabinet Model BIOHAZARD BH4.
14. Laminar Flow Cabinet Model BASAIRE 04HB.
15. Autoclave Model ASTELL AAJ041.

Overview of the Project' Progress - Mr. K. Yoshida

1. Construction

Construction of the EB building was started in March, 1990. In Original schedule, the building will be complete in December. Especially, the shielding structure for the installation of EBM should be finished in September prepared for the delivery of EBM. Actually it was completed by the end of October. The whole construction is estimated to finish at the end of February, 1991.

Construction of MTS building (Radiation Technology Laboratory) was started in December, 1989. Its construction period was estimated 9 months. However, Construction was delayed for very long time. The completion is estimated at the end of March, 1991.

2. Installation of 3 MeV EBM

3 MeV EBM manufacturing finished in August, 1990 and after factory test it was disassembled, packaged and shipped. The packages were delivered at UTN on 15 and 16 November. With the supervision of two Nissin-High Voltage engineers, Mr. Takayama and Mr. Moriwaki, who visited on 14 November, installation work started. Assembling and installation of EBM was finished on 20 December.

Wiring and plumbing work were then started under the UTN supervision. Mr. Mikihara, NHV, was despatched to supervise the adjustment and test operation of the machine on 21 January. Wiring work takes longer time than Nissin's estimation. We will start checking and testing work from the next week. The acceptance test will be finished by the end of March.

3. Research equipments

(1) Curetron

Curetron, a small laboratory-type low energy electron accelerator manufactured by NHV, was delivered at UTN on 13th October. This equipment is used for surface coating research and stored in the Co-60 building until MTS building become available. NHV expert, Mr. Terazawa, will be despatched from 26th February and engaged in the assembling and commissioning of the machine.

(2) Other equipments

Almost all equipments which are listed in the Record of Discussion were purchased and donated to UTN. These equipment were delivered on 13 October together with Curetron and stored in the Co-60 building. Most of the equipments are still in the packages. 5 items purchased by using FY 90 budget were

delivered in January 1991.

Some of the equipments supplied as Keiko-Kizai of the experts include personal computer, video system, accessories of the accelerator, etc.

#### 4. Expert.

10 short term experts were despatched for the installation & commissioning of the accelerator and the construction of the shielding rooms, whilst 2 experts for research adviser. A long term expert for supervising the curing program could not be selected during FY 90. The duration of despatch is rather short. The longest is 6 weeks.

#### 5. Trainee

For the installation and commissioning of the accelerator, 2 persons were sent to JAERI and NHV. One researcher will be sent JAERI in March for the study of surface coating technology.

#### 6. Research Activity

Radiation Application Project has two research program, Curing of surface coating and Sterilization of Medical Products. Both programmes can not start real activity because the accelerators and research equipments are not ready for use.

## Proposed Workplan FY 1991

## 1. The mission

- (1) June 1991, attend the opening ceremony of the New Complex.
- (2) December, 1991, the subsequent Joint Committee Meeting

## 2. Despatch of the short-term experts

- (1) Surface coating (Product characterization), 3 months (September 91)
- (2) " (Curetron Dosimetry), 4 weeks (August 91)
- (3) " (Instruction for Coating Machine from the supplier),  
2 weeks, (May, '91)
- (4) Sterilization (Installation and commissioning of research equipments),  
2 weeks, (May, '91)
- (5) " (Dose requirement), 3 months (Mid. May 91)
- (6) " (Radiation damage), 3 months (Mid. August 91)
- (7) " (Process control), 2 months (Mid. November 91)
- (8) Accelerator (Preventive maintenance), 3 weeks (February 92)
- (9) " (Commissioning), 4 weeks (May 91)
- (10) " (Mounting of Data Logger), 2 weeks, (February 92)
- (11) " (Radiation safety during commissioning), 2 weeks, (End of May  
91)

## 3. Equipments to be donated

Total request: 39.52 MYen

## 4. Keiko-Kizai

- |  |            |
|--|------------|
| (1) 0.5 MYen; Resins, test piece   | for 2.-(1) |
| (2) 0.5 " ; Dosimeter, model materials   | 2.-(7)     |
| (3) 0.5 " ; Necessary materials for maintenance  | 2.-(8)     |
| (4) 0.5 " ; Constant temperature & humidity bath                                       | 2.-(9)     |
| (5) 0.3 " ; Dessicator for film dosimeter  | 2.-(2)     |
| (6) 0.5 " ; Accessories for universal testing machine<br>(elastomeric cord and chucks) | 2.-(6)     |
| (7) 0.3 " ; Film thickness gauge   | 2.-(2)     |

5. Long-term expert

- (1) Kenzo Yoshida, Leader, - 23 May, 1992
- (2) Kiyoshi Honma, Coordinator, - 23 May, 1992
- (3) In progress , Surface Coating Supervisor, 1 year

In addition, 1 short term expert as follows will be despatched;  
Formulation technology; 3 months, (July 91)

6. Acceptance of trainee

- (1) Sterilization (Dose requirement), 6 months, (October 91)
- (2) Accelerator (Operation and maintenance), 3 months, date to be determined  
later but preferably at the same time as 6.(4)
- (3) Accelerator (Operation, service and dosimetry), 3 months, (August 91)
- (4) Safety , 1 month, date to be determined

7. Local cost

- (1) 3 MYen; Opening Ceremony, Seminar
- (2) Payment for Official car driver

8. List of research equipments requested (39.52 MYen)

(1) Plastics testing equipments	<u>21,000</u>
1) Labo Plasto Mill	<del>9,000</del>
2) Dynamic Mechanical Analyser	○ 10,000
3) Melt Flow Indexer	◎ 2,000
(2) Coating film quality testing machine	<u>10,000</u>
1) Universal scratching tester	○ 2,500
2) Adhesion endurance tester	5,500
3) Automatic sanding machine	◎ 2,000
(3) Accelerator operation related	<u>2,520</u>
1) Operation data logger	◎ 2,520
(4) Product wholesomeness evaluation	◎ <u>6,000</u>
1) Dissolution tester	

9. list of equipment to be requested for and after FY 1992 (84.0 MYen)

1) ESR	15,000
2) Panel sprayer	1,000
3) Accelerator tube	33,000
4) Accelerator accesaries	10,000
5) Chemiluminesence	20,000
6) HP Liquid Chromatograph	5,000



Overall Future Plan (1989 - 1994)

Provision of Equipment	1989				1990				1991				1992				1993				1994	
	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II		
Term of Cooperation	Supervisor (1), Coordinator (1)																					
Provision of Equipment (1) EB Machine	* Purchase Order (P/O) EB Exp. (3) Installation/Test Operation * Exp. (3) Installation (1) Exp. (1) Supervisor Exp. (1) Dose Measurement Exp. (1) Radiation Protection Exp. (1) Data Acquisition Training (2) I/T Operation * Exp. (1) LEB Exp. (1) Coater Exp. (1) Laminator Exp. (1) Res. Equip. Exp. (1) Maintenance Exp. (1) Maintenance																					
(2) Test Curing Machine, Research Instruments	* P/O Training (1) Del.																					
(3) Medical Product Sterilization Research Instruments	P/O Del.																					

Remarks	P/O - Purchase Order	LEB - Low Energy EB	QC - Quality Control
	I/T - Installation and Test	Del. - Delivery	Exp. - Expert
	EB - Electron Beam Machine	Op. - Operation	

	1990				1991				1992				1993				1994	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
Research Work Plan Medical Products Sterilization																		
Medical Products Sterilization																		
(1) Study of Product Item																		
(2) Dose Measurement (Distribution)																		
(3) Dose Requirement Study (Biological study) (Dose rate effect)																		
(4) Radiation Damage of Product																		
(5) Radiation Technology (Packaging) (Dose uniformity) (Conveyor system)																		
(6) Test Production (Quality Control)																		

Research Work Plan- I Curing of Surface Coating	1990				1991				1992				1993				1994	
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II
Curing of Surface Coating	Curing Supervisor (1)																	
(1) Study of Substrates and Coating Materials	Training (1)																	
(2) Dose Measurement (Uniformity)	Exp. (1)																	
(3) Coating, Lamination Technology (including pretreatment)	Exp. (1)																	
(4) Coating Formulation Study	Exp. (1) Training (1)																	
(5) Gas Inerting	Exp. (1) Training (1)																	
(6) Product Characterization (Hardness, Glossy, Weathering Test, etc.)	Exp. (1)																	
(7) Product Evaluation (Quality Control)	Training (1) Exp. (1)																	
	Curing Supervisor (1)																	
	Exp. (1)																	

	1989		1990				1991			
	III	IV	I	II	III	IV	I	II	III	IV
EBM Building Construction **										
1. Final Design	Detail Equipment Design made available in September 1989									
2. Tendering Process			* → *							
3. Construction			* ————— *							
4. Installation of EBM							* ← *			

\*\* Pending to detailed design requirement given by Japanese side.

	1989		1990				1991			
	III	IV	I	II	III	IV	I	II	III	IV
Radiation Technology Building										
1. Tender (Open)	* 1/7/89									
(Close)	* 10/7/89									
2. Tender Evaluation (QS)	* 21/7/89 - 2/8/89									
(UTN)	* 2/8/89									
3. Tender Board Meeting	* 3/9/89									
4. Award	* 15/9/89									
5. Construction Start	* 1/10/89									
6. Construction	*									

ANNUAL RESEARCH WORK PLAN - FY 1991

I. Research Subjects

1. Accelerator Operation	2. Curing of Surface Coating	3. Sterilization of Medical Product
1) Operation 2) Maintenance 3) Routine Dosimetry	1) Substrate, Material 2) Dose Measurement 3) Coating, Lamination 4) Coating Formulation 5) Gas Inerting 6) Product Characterization 7) Product Evaluation	1) Product Item Study 2) Dose Measurement 3) Dose Requirement Study 4) Radiation Damage of Product 5) Radiation Technology 6) Test Production

II. Schedule

	FY 1990			FY 1991											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1. Accelerator	Installation												Maintenance		
H.V. Operation	Installation												Maintenance		
L.V. Operation															
2. Curing															
1) Substrate	_____														
2) Dose Measr.	_____														
3) Coat. & Lam.	_____														
4) Formulation	_____														
5) Gas Inert.	_____														
6) Prd. Chara.	_____														
7) Prd. Evalu.															
8)															
3. Steriliztn.															
1) Prod. Item	_____														
2) Dose Meas	_____														
3) Dose Requir	_____														
4) Rad. Damage	_____														
5) Rad. Tech.	_____														
6) Test Prodn.															
7)															

Proposed Workplan FY 1991

		FY 1991											
		4	5	6	7	8	9	10	11	12	1	2	3
Mission	Progress Survey	--- July 1 week											
Comittee	Joint	--- December 1 week											
Expert	Long Term	1. Leader, Yoshida ( 24May '90) ----- 2 years 2. Coordinator, Honma ( 24May '90) ----- 2 years 3. Curing Supervisor ----- 1 year											
	Short Term	1. Product Charactn. ----- 3 months 2. Curetron Dosimet: ----- 4 weeks 3. Coating Machine --- 2 weeks 4. Instl.Res.Equip. --- 2 weeks 5. Dose Requirement ----- 3 months ----- 3 months 6. Radiation Damage ----- 3 months 7. Process Control ----- 2 months 8. Priv. Maintenance ----- 3 week 9. Commissioning ----- 4 weeks 10. Data Logger Inst. ----- 2 week 11. Radiation Safety ----- 2 weeks 12 13											
Trainee	1. Dose Requirement 2. Acc. Maintenance 3. Acc.Opr. & Serv. 4. Safety 5. 6.	----- ----- ----- -----											







JICA