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NATIONAL AGRICULTURAL AND FOOD CORPORATION OF TANZANIA

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Enquiry Document for

A TURN-KEY PROJECT

for
A National Cold Chain Operation and Fish Receiving Facilities

107 p. + annex.

and
A MANAGEMENT PROJECT

for
A National Cold Chain Operation

S/F Fishery industries

C/F TANZANIA

Prepared by:

INDUSTRIAL STUDIES AND DEVELOPMENT CENTRE, DAR ES SALAMU

170.

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Jens Hogard
Industrial Engineer

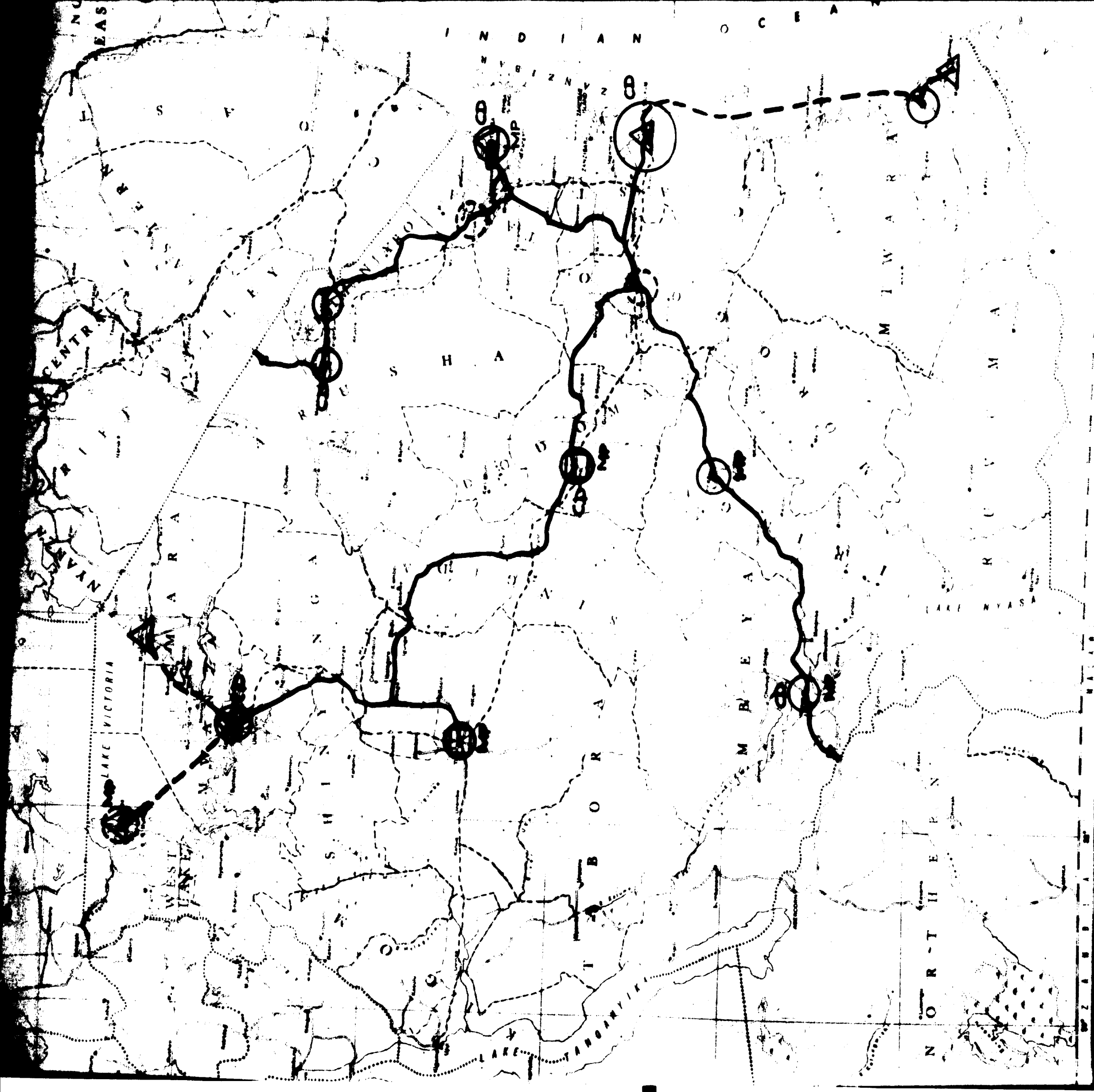
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M. J. Ebrahim
Industrial Engineer

Enquiry Document for A TURN-KEY PROJECT for A National Cold Chain Operation and Fish Receiving Facilities and A MANAGEMENT PROJECT for A National Cold Chain Operation

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CD - CHICKEN DRESSING
 MP - MILK PLANT
 □ - SLAUGHTER HOUSES

SCALE BAR

0 10 20 30 40 50 60 70 80 90 100

INDIAN OCEAN
 EAST AFRICA
 CENTRAL AFRICA
 SOUTHERN AFRICA
 LAKE VICTORIA
 WEST LAKES
 LAKE TANGANYIKA
 LAKE NYASA
 LAKE MALAWI
 NORTH AFRICA

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A NATIONAL COLD CHAIN OPERATION FOR TANZANIA

INTRODUCTION

The situation in Tanzania to-day as to production and trade in perishable foods is hampered very much by the lack of organized trade between the regions and by the lack of proper storing and transport facilities.

Though the major portion of the requirement for meat, fruit and vegetables is met by local production, there are many areas of shortages and over-supply and thus great price differences. There are also seasonal variations between the regions. Only lake and sea areas have supply of fresh fish. Dairy products and imported perishable foods are available in only a few towns.

It is further a fact, that there are many production possibilities which are not utilized because of lack of market outlets. Export, not the least to Zambia, can be initiated, if proper trade facilities are available.

Dar es Salaam is in a severe need for an export-import coldstorage, which also should facilitate transit trade to Zambia.

Based on a study by the Industrial Studies and Development Centre in Dar es Salaam, it has been decided that the National Agricultural and Food Corporation (NAFCO) shall implement a Cold Chain Operation that will improve this situation. NAFCO is a parastatal organization wholly controlled by the Government.

Objectives of the Cold Chain Operation

1. Importation and exportation of refrigerated perishables.
2. Wholesale purchasing and selling of perishables to be moved between regions.
3. Collection, storing and transport of perishables requiring refrigeration and of fruits and vegetables.
4. Handling of perishables in transit trade with Zambia.
5. Simple processing like freezing and chilling, production of ice, cooling and pasteurization of milk and slaughtering on a small scale.

Services and Facilities in General for N.C.C.O.

Based on these objectives the services and facilities of the Cold Chain Operation are suggested to be:

1. A Central Import - Export Coldstorage in Dar es Salaam, which will also have limited long time storage facilities and a tunnel freezer, but no ice plant. The whole city distribution in Dar es Salaam is to be undertaken by means of already existing Coldstorage facilities. Ice will be produced at a planned Fish Receiving Station.

2. A number of Cold Centres in the larger towns, which will be distribution and collection centres for refrigerated perishables and for fruits and vegetables for inter-regional distribution. These centres will in principle deal little with perishables produced and consumed locally. Each the Centres will only have very small short term coldstorage facilities, i.e. a walk-in cooler and a walk-in freezer. In towns without fish receiving stations the cold centre will also have a small ice plant.

There will, in general, be simple processing facilities: Room for slaughtering and dressing and icing of chicken, air-conditioned handling room for (re)packing perishables (re)icing fish, etc. and a separate air-conditioned room for collection and grading of fruits and vegetables. In certain places there will be simple milk plants for cooling and pasteurising milk and there may also be special slaughtering, freezing and chilling facilities primarily to take care of meat production to be exported to other regions.

The planned Cold Centres are indicated on the enclosed map.

3. A transport system for inter-regional transport and export of perishables, consisting of:

- a) A number of trucks and trailers where the trucks are insulated with a small compartment for frozen food, kept at freezing temperature by hold-over inserts (eutectic plates) and two larger compartments for chilled food kept cool by ice bunker. The trailer is insulated and to be used for fruits and vegetables not requiring special attention and for separate insulated containers.

The idea behind this system is based on the fact that there will be at most a 24 hours transport time between two Cold Centres, so the ice bunker can be refilled with ice, and hold-over inserts refrozen in the Cold Centres can be inserted in the truck and the old ones be refrozen for next transport arrival.

- b) A number of refrigerated trucks for transit of frozen food via Dar es Salaam to Zanzibar.
- c) Small insulated vans - one at each Cold Centre for local collection and distribution.
- d) A number of larger insulated containers for ship, rail (and trailer) transport to and from towns not easily accessible by road.
- e) A large number of small insulated containers for local distribution.

4. A Central Operations Centre in Dar es Salaam in connection with the Export-Import Cold Storage having office facilities for staff controlling the whole operation, workshop for equipment maintenance and general stores of spares, consumables, etc.

Note

There will be a number of Fish Receiving Stations with simple cold storage facilities for fresh fish and ice plants. These stations will be established and operated independently by Fisheries but the Cold Chain Operation will buy fish from the auction floor of the stations and distribute it to other regions and the Fish Receiving Stations will deliver ice to the stations.

Fish Receiving Facilities

Objectives

The objectives for the Fish Receiving Stations are by Fisheries described as follows:

At the main centres of communication, Dar es Salaam, Tanga and Mtwara/Mikindani on the coast and at Bukoba and Musoma at Lake Victoria to establish bases which will lead to the development of centralization of whole-sale marketing and distribution of fish. The chief objects of the project may be summarized as follows:

- a) To provide facilities to replace the existing unhygienic arrangements, which are a potential danger to public health, and a deterrent to increased fish production and consumption.
- b) To provide at the main centres of communications, facilities through which fish from outlying villages in addition to that landed locally can be handled and whole-sale marketed hygienically and efficiently.
- c) To provide facilities which will enable an improved system of wholesale marketing to be introduced to replace the existing system which has remained unchanged and unimproved for many years and under which the fishermen are held in a state of economic bondage to the traditional traders and fishmongers.
- d) To provide facilities and the infrastructure which will most likely create the basis for co-operative marketing of fish and the development of a fish processing industry.
- e) To provide facilities for the manufacture of ice for use by the fishermen, during wholesale marketing and the traders.

Cold storages for village fishing units are to be provided to enable fish landed to be handled more hygienically and marketed more efficiently. There will, in all, be 21 units requiring a cold store. The introduction of these facilities is part of a general development programme including the introduction of better boats and fishing gear and training of fishermen.

Facilities in General

The Fish Receiving Stations will all be identical except that the Dar es Salaam station should have a 10 tons/24 hours ice plant and a 30 cu. m. ice store. Each station will otherwise have:

- One 5 ton/24 hours ice plant
- One chilled storage for ice blocks 20 cu. m.
- One chilled storage for iced fish 60 cu. m.

Furthermore a working area for sorting and packing fish, an auction hall, and stores for dealers, offices, toilets and washing facilities and fish box stores.

The Village Fishing units will only have small buildings which will be established by the local authorities and only a 20 cu. m. chilled storage with chilling capacity will be supplied by this project. As there will be no power supply at the villages the units will be operated by diesel engines.

Table 1

GENERAL REVIEW OF FACILITIES, DISTANCES AND TRANSPORT COSTS (MCCO PLUS FISHERIES)

Location	Fish Receiving Stations	No. of Cold Rooms	Fruits & Vegetables	Ice Plants Tons/24 hrs.	Chicken Dressing	Milk Plants	Slaughter houses	Freezers Chillers	Important Distances Km. (Miles) To	Est. Hrs. Truck or Sailing Time (No Stops)	Approx. Costs US. \$/Ton	Remarks
Dar es Salaam	x	(10)2	(x)	10	(x)			(1)	Nairobi: 921 (576) Lusaka: 2020 (1262)	20 39	35 42	() DSM. Cold Stor. Hrs. on new Rd.
Tanga	x	4		5	x	x			Mombasa: 139 (87) DSM: 374 (234)	3 7	17	Exist. Tarmac Rd.
Mombasa			x						Moshi: 208 (130) DSM: 350 (219)	7	17	Exist. Tarmac Rd. Exist. Tarmac Rd.
Moshi		2	x	5		Cooler			Arusha: 76 (48) DSM: 570 (356)	1 1/2 10 1/2	21	Exist. Tarmac Rd. Exist. Tarmac Rd.
Arusha		3	x	2 1/2	x				DSM: 645 (404)	12	22 1/2	Exist. Tarmac Rd.
Mwanza		2	x		x				Tabora: 364 (228) DSM: 1191 (745)	10 30	56	Not via Tabora
Bukoba	x	2	x	5		x			Mwanza: 180 (112)	8	7	Via L. Victoria
Lusoma	x	2		5					Mwanza: 120 (75)	6	9	Via L. Victoria
Tabora		2	x	2 1/2			x	2	Dodoma: 580 (362) DSM: 1068 (667)	15 20	53	Gravel Rd.
Dodoma		2	x	2 1/2	x	x	x	1	Morogoro: 291 (182) DSM: 488 (305)	7 10	26	Gravel Rd. Gravel Rd.
Morogoro			x						Iringa: 315 (198) DSM: 147 (123)	6 4	11	Hrs. on new Rd. Hrs. exist. Rd.
Iringa		2	x	2 1/2		x			Mbeya: 366 (224) DSM: 514 (321)	7 10	30	Hrs. on new Rd. Hrs. on new Rd.
Mbeya		2	x	2 1/2	x	x		1	Lusaka: 1140 (712) DSM: 880 (550)	22 17	35	Hrs. on new Rd. Hrs. on new Rd.
Lindi		2	x	2 1/2					Mikindani: 70 (44) DSM: 360 (225)	4 24	13	Via sea Via sea
Mikindani	x	2		5					DSM: 430 (269)	28	15	Via sea
Total	5	29	11	50	6	5 + 1	2	4				

Note: Number of Cold rooms is total frozen and chilled storages in Fish Receiving Stations and Cold Centres together.

Furthermore: 21 village cold stores, 12 trucks, 6 trailers, 14 vans, insulated containers, a mobile slaughter unit and office and workshop facilities.

DSM. - Dar es Salaam

A Fish Receiving Station is presently being installed in Mwanza.

SCOPE OF TENDERING

The Tenderers are invited to bid for the following projects:

1. A Turn-Key project comprising the complete responsibility of designing and sub-contracting, building and construction, equipment supply, delivery and installation and commissioning of all facilities, in separate quotations, for Fisheries and KCCO's facilities.
2. A Management project including operation and training for up to four years during which time local counterparts should have been indoctrinated to run the operation by themselves.

It is envisaged that there should be two separate contractors only, one for the turn-key project and one for the management project with whom NAFCO would have to deal.

Turn-Key Project and Local Manufacture

In connection with the turn-key project the tenderers shall suggest local manufacture of as many components as possible both with regard to building construction as well as equipment. In particular as regards equipment, it is visualized that a local Mechanical Manufacturing and Engineering industry should be developed, based on the manufacture of simpler components for the Cold Chain Operation such as sectional walk-in coolers, (excluding refrigeration machinery and controls), insulated containers, simple insulated display cases, insulated bodies for transport vehicles, tanks and cans for ice plants and milk plants, steel structures, duct and pipe work, etc.

The Tenderer may suggest which parts possibly could be manufactured locally and what assistance he would offer to start such manufacturing and the cost of his assistance.

The costing in the quotation for the turn-key project should not anticipate local manufacture of equipment.

Financing and Aid

The Tenderers for both projects are invited to offer long term credit facilities and to investigate with their Governments what kind of financial and technical assistance facilities could be made available from their Governments to the Government of Tanzania for this project such as:

- a) Long term Government loans on favourable terms;
- b) Technical assistance for training and management of the Cold Chain Operation;
- c) Technical Assistance to establish local manufacturing facilities for components as mentioned above.

In selecting the contractors, emphasis will first of all be on price and quality of facilities. However, financing and aid facilities offered may form part of the cost picture in the evaluation work following the tendering.

INSTRUCTIONS TO TENDERERS

1. You are invited to tender for the turn-key project for a National Cold Chain Operation and Fish Receiving Facilities, or the management project for the National Cold Chain Operation in accordance with the attached forms of tender. The National Cold Chain Operation (NCCO) will be established by the National Agricultural and Food Corporation (NAFCO) of Tanzania, while the Fish Receiving Facilities will be established by the Fisheries Division of Tanzania's Ministry of Agriculture, Food and Co-operatives.
2. The closing time for the receipt of tender will be 12 noon on December 31, 1970.
3. You are required to submit two copies of your tender.
4. A general description is given in the attached specifications of both projects.
5. You are welcome to submit alternatives or other variations. However, you shall, notwithstanding the submission of such alternatives or variations, submit a tender based on the specifications attached.
6. You are invited to put forward suggestions for application of recognized standard contracts with possible amendments as basis for a formal agreement. No undertaking is given by NAFCO that such suggestions by you will be accepted.
7. Your tender should be accompanied by detailed specifications and drawings to describe fully your offer. You are required to complete all the specification sheets in two copies relating to the project for which you are tendering. Two sets of sheets are enclosed for this purpose.
8. You must provide with your tender two sets of brochures illustrating the major pieces of equipment offered by you (turn-key project).
9. Your tender must remain valid until July 1, 1971.
10. You are required to submit your tender without stipulations for price escalation, i.e. with a fixed price covering the whole project period.
11. Whether your tender is accepted or not, you shall treat details of the specification and the documents attached hereto as private and confidential and in the event of a tender not being submitted the specification and drawings shall be returned. Any drawings issued to you are intended to be typical of the works to be executed and shall not be used as working drawings.
12. No tender shall be deemed to have been accepted unless such acceptance shall have been notified to the tenderer in writing by or on behalf of the National Agricultural and Food Corporation.
13. The purchaser does not bind himself to accept the lowest of any tender. On acceptance of a tender by the purchaser, the successful tenderer will be required to enter into a formal agreement for the proper fulfilment of a contract.

14. The purchaser will not be responsible or pay for any expenses or losses which may be incurred by you in the preparation of your tender.
15. The Tender and accompanying documents filled in as directed must be sent to:

The General Manager
National Agricultural and Food Corporation
P. O. Box 903
DAR ES SALAAM
Tanzania, East Africa.

to whom all inquiries and correspondence should be addressed.

16. You are required to state in your tender whether you can accept the time table suggested by the purchaser. If you cannot accept it you are requested to suggest your best alternative.
17. You are required to quote in the price specifications your handling fee for construction work to be undertaken by sub-contractors (turn-key project). The items shown will be subject to sub-contracts for which the successful contractor will invite tenders from a list of sub-contractors to be agreed upon with the purchaser.
18. For the turn-key project it is emphasized that the successful contractor shall be fully responsible for executing and delivering of all parts of the project from initial designs and surveys to commissioning of facilities.
19. The Tenderers for the turn-key project are further invited to submit a proposal for setting up a Mechanical Food Engineering Company in co-operation with a Government body to execute whatever local production and installation work the tenderer may judge could feasibly be produced in Tanzania for the turn-key project. Tenderers for the management project could participate in such a venture also.
20. The Tenderers are required to investigate with their respective Governments the possibility for financial and technical assistance through aid programmes in executing the projects.
21. The Tenderers are requested to submit their price quotations without including savings that could be obtained through such aid programmes or through establishing of a Mechanical Food Engineering Project. Such possible savings may be presented separately.
22. All correspondence, documentation, etc. should be in English.
23. Units of measurement should be in the metric system. Contractors who normally use British Units may put forward offers using these units. However principal dimensions, capacities and quantities must on all documentation also be shown in metric units.
24. In addition to brand names for equipment requested in the specifications, the Tenderer should list names of major sub-contractors.
25. The Tenderers are required to submit information about their background and business to enable the purchaser to evaluate their suitability for executing the project.

TURN-KEY PROJECT

for

Establishing Facilities for

A NATIONAL COLD CHAIN OPERATION

and for

FISH RECEIVING

GENERAL INFORMATION ABOUT SITES

On the enclosed map the location of the different Cold Centres are shown. The Centre towns and their climatic conditions are shown on Table II.

Distances, truck times and trucking costs are shown on Table I.

There is all-year-round road or boat service to all places. The roads to Tanga, Mombasa and Arusha are all high quality Tarmac roads and by the end of 1971, the same will be the case to Morogoro, Iringa and Mbeya, though great parts of the latter are already tarmac. To Dodoma, Tabora, Mwanza and Bukoba there are all weather gravel roads from Morogoro.

All sites will be accessible by truck and be in the mentioned towns or their immediate vicinity. There will be water and electricity available at the sites, but normally not a public sewage system.

All places have regular air service and have telephone service, through the East African Posts and Telecommunications Corporation. As site surveys and investigations of ground conditions have not been undertaken, provisional costs will have to be allocated by the tenderers for surveys, site preparation, building foundations and sewers and other site dependent costs (water and power connection).

Sea Water temperatures along the coast are 27°C. in average year round and maximum temperature 30°C. The same temperatures apply to the water in Lake Victoria (Musoma, Mwanza, Bukoba).

The sizes of the plots for Cold Centres will be minimum 2000 sq. m. For larger Cold Centres and Fish Receiving Stations minimum 3000 sq. m. For Dar es Salaam Cold Storage is requested minimum 10,000 sq. m.

TABLE

SITE CONDITIONS

LOCATION OF FACILITY	DAY TEMP. & RESP. REL. HUM.				NIGHT TEMP. & RESP. REL. HUM.				ALSO NOTE		ARTIFICIAL METERS	RAINY SEASONS 100 mm/HR	WATER	RATES
	HIGHEST MEAN °C	R.H. %	LOWEST MEAN °C	R.H. %	HIGHEST MEAN °C	R.H. %	LOWEST MEAN °C	R.H. %	MAX. TEMP. °C	MIN. TEMP. °C				
1 Dar es Salaam	31.1 MAR.	75	28.7 JULY	60	25.2 MAR.	94	18.9 AUG.	90	29.3 MAR.	15.0 AUG.	15	Nov.-Dec.		0.10
2 Tanga	32.9 MAR.	65	28.2 JULY	68	23.9 MAR.	93	19.8 AUG.	95	36.5 APRIL	15.0 AUG.	25	Mar.-May		0.07
3 Mombasa	34.4 FEB.	44	27.5 JULY	50	20.7 MAR.	93	15.6 AUG.	91	39.7 JAN.	11.5 AUG.	411	Mar.-Apr.	3/70	0.11
4 Moshi	33.3 FEB.	41	25.6 JULY	58	19.1 APRIL	91	15.5 AUG.	87	37.9 MAR.	9.7 JULY	432	Apr.-May		0.03
5 Arusha	28.4 FEB.	53	21.7 JULY	62	15.8 APRIL	98	12.1 JULY	95	32.7 FEB.	5.4 JULY	1507	Nov.-Dec.		0.02
6 Mwanza & Musoma	28.4 SEPT.	52	27.1 DEC.	63	18.6 NOV.	87	15.5 JULY	77	35.0 MAR.	10.0 JULY	1146	Nov.-Dec.	1/5	0.08
7 Bukoba	26.6 JAN.	70	25.7 AUG.	69	16.8 MAY	89	15.2 JULY	83	38.0 JAN.	15.0 AUG.	1137	Mar.-Apr.		0.09
8 Tabora	32.1 OCT.	32	28.5 JAN.	54	18.8 OCT.	65	13.8 JULY	71	35.7 OCT.	8.8 JULY	1150	Sept.-May		0.10
9 Dodoma	31.7 NOV.	36	26.6 JULY	40	18.6 DEC.	87	13.0 JULY	87	36.4 DEC.	7.0 JULY	1120	Nov.-April		0.10
10 Morogoro	32.0 DEC.	53	27.2 JULY	54	21.1 DEC.	86	15.0 JULY	90	36.7 FEB.	9.2 AUG.	579	Dec.-Mar.		0.05
11 Iringa	27.7 NOV.	40	24.4 JULY	45	14.9 APRIL	95	11.1 JULY	79	37.2 SEPT.	5.9 SEPT.	1640	Feb.-May		0.03
12 Mbeya	26.7 OCT.	44	21.0 JUN	57	14.1 JAN.	90	7.9 JULY	83	31.5 NOV.	1.1 AUG.	1736	Dec.-April		0.06
13 Lindi & Mikindani	31.3 FEB.	73	29.5 SEPT.	66	23.7 JAN.	93	10.8 JULY	92	36.2 MAR.	12.3 JULY	41	Dec.-April	2750	0.11

REQUIREMENTS FOR BUILDINGS

General

1. Buildings should be designed to meet reasonable standards for sanitary conditions, at lowest cost.
2. Local raw materials and components should be utilized as extensively as possible.
3. To give shade on walls all roofs should have extended eaves (minimum 4 feet, horizontally measured) and buildings preferably oriented East-West lengthwise.
4. Windows, except for office building, should be located close to roof to admit as little sunshine as possible and be sealed in all air-conditioned rooms.
5. All air-conditioned rooms should have insulated ceilings or roofs.
6. As there will be no town sewage systems, suitable provision will have to be made for soakaways, septic tanks or the like.
7. Building and construction work must meet local building requirements and standards, which to a great extent are of British origin.
8. All buildings must be burglar proof, e.g. with 15 mm. iron bars spaced 15 cm. in front of all windows.
9. Minimum requirements for roofing material - corrugated aluminium sheets or asbestos cement sheets.
10. For non-air-conditioned fish handling areas, chicken dressing rooms and slaughter houses, the buildings should be very open with walls to a height of 2 metres and opening between wall and roof covered with gauze wire and be bird/fly proof. Furthermore, non-slip floors in areas of passages. Junction between floors and walls to be rounded, proper drainage of floor. Hard walls, plastic painted which will stand up for water washing.

Cold Centre Buildings

A provisional sketch for one type of Cold Centre is shown enclosed. The Tenderer may suggest other lay-outs and sizes, but the indicated (below) sizes of the individual rooms are minimum requirements.

The Cold Centre should be divided into the following separate rooms for minimum hygienic requirements:

1. Main room for handling refrigerated perishables and housing ice-plant and sectional cold rooms and possibly water chiller. Space requirement minimum 25 sq. m. plus space for specified equipment and plus 100% expansion allowance for cold rooms.
2. Fruits and Vegetable handling room minimum 40 sq. m.
3. Office plus delivery room with hand washing facilities minimum 15 sq. m.
4. Chicken dressing room minimum 25 sq. m.

5. Workshop plus garage minimum 35 sq. m.
6. Toilet and washroom with shower and lockers.
7. Covered porch (under extended eaves) for condensing units, (water economisers), crate storage and live-chicken shed, fenced in with heavy wire mesh, in size to suit equipment.

Toilet and washroom, garage for 1½ ton van and chicken dressing facilities may possibly be located in a separate building.

Ceiling height in all rooms minimum 3 metres.

Doors for handling rooms to suit the width of truck bodies that they, when they back up, will close the opening. The trucks will back up to the gate going down a ramp for the deck of the truck to be level with the floor of handling rooms or the floors in the handling rooms may be elevated whatever is cheapest.

The roads to the building need only be gravel roads.

The plot should be fenced in with 2.4 m. high rigid wire mesh.

In places where limited facilities are planned (like Fruit and Vegetables Centres only), the buildings should be designed so as to allow for expansion with additional rooms to a fully built Cold Centre having cold rooms, chicken dressing and even milk plant.

Dar es Salaam Export-Import Cold Storage and Central Operations

Building

This larger Cold Storage and the Central office for the whole operation is suggested to be placed in the same building, which is proposed to be located in the immediate vicinity of the Harbour. A site within 200 metres of the water front is being negotiated. The building will have access to a main road.

The storage shall cater for:

- 1) Transit trade to Zambia
- 2) Import to Tanzania
- 3) Export of Crustacean and Fish
- 4) Possibly some meat export
- 5) Storage of smaller quantities of fish, poultry and meat for local market regulation and for transit trade from one part of the country to another.

Some of the rooms will have to be bonded storage for transit trade and imports as the storage will be placed outside customs area.

As to the volume of trade, this is described in more detail in the management project.

The Building for the Cold Storage should meet international requirements for hygiene, storing and handling to satisfy export requirements for frozen beef, fish, etc. otherwise more expensive design requirements to meet purely aesthetic goals should be avoided.

The room requirements shown on pages 29 and 30 are inside volumes of the rooms. Though the Tenderer should feel free to select the principle of design, which he believes will be most economical, taking into account both first cost and operational costs, it may be suggested, that the mixture of larger and smaller rooms lends itself to a principle where the larger rooms are in one floor only say 5 - 6 metre internal height and the smaller rooms and freezer on two floors with internal heights of 2.5 metre .

Insulation for cold rooms should have proper vapour barriers and the Total Heat Transmission $K(t_1 - t_2)$ for all walls should not exceed $7.5 \text{ kcal/m}^2/\text{hr.}$ at -25°C for frozen storages and at $+2^\circ\text{C}$ for chilled storages and at plus 25°C . ambient.

There should be a ventilated loft over the cold rooms and a guard space between the cold rooms and the ground.

A Handling area should be provided to fit room lay-out and with access to platforms for truck and railcars. Doors to handling room to suit the width of truck bodies. A separate handling room minimum 60 sq. m. with direct access to ramp should be provided for Fruits and Vegetables in transit from other regions.

The Cold Storage and office facilities should be designed to allow for at least 100% expansion. The expansion in cold store rooms would be for the larger rooms presumably and possibly for an additional freezer tunnel. The machine room should from start be big enough to allow for machinery for 100% expanded Cold Storage.

Though labour cost is low, powered fork lift trucks should be used because of stacking in the larger rooms whereas hand lift trucks may be used in the smaller rooms. In case of two floors, a goods elevator is, of course, a necessity.

A Chicken Dressing room may be placed where most suitable to prevent contamination to other food stuffs. It should however be somewhat larger than for cold centres, min. 40 sq. m.

Office facilities should not be extravagant, but should include individual room air-conditioners and office installations to efficiently manage this type of operation. There should be 6 offices each 20 sq. m. for Managers and two offices 35 sq. m. for General Manager and a Conference Room. Furthermore, one common office for approximately 25 people minimum 300 sq. m. with sound dampening ceiling and floor (e.g. sisal carpet on felt). Otherwise furnished as a modern office landscape with desks, filing cabinets, etc. Finally a storeroom for office stationery and room for reception, switchboard and Telex. The 6x20 sq. m. offices may be part of the office landscape. Reasonable canteen facilities common for all employees should be available for 40 people.

Workshop and Spares Department should cater for the equipment the following ways:

Room for Spares and Supplies should be designed to allow:

For transport equipment, only the most used spares like V-belts, spark plugs, fuses, filters, etc. in small quantities as local agents are otherwise maintaining stocks of spares.

For refrigeration equipment, spares should be kept to assure a continuous operation without depending upon local supplier, e.g. complete spare standard units for cold centres.

Workshop:

For transport vehicles, only simple service and smaller repairs should be undertaken by the Workshop.

For refrigeration equipment, all common repairs like brazing, welding, charging, sheet metal repair, exchange of compressor parts, etc. should be undertaken.

Filling station for diesel oil should be planned on the site.

The whole area should be fenced in and parking space, not covered, should be available for the whole fleet of long haulers.

Roads on the plot should be tarmac.

Fish Receiving Station Buildings (See enclosed provisional lay-out)

The Fish Receiving Stations will all be located at the water front, with the landing beach or jetty for fishing boats in front of the building.

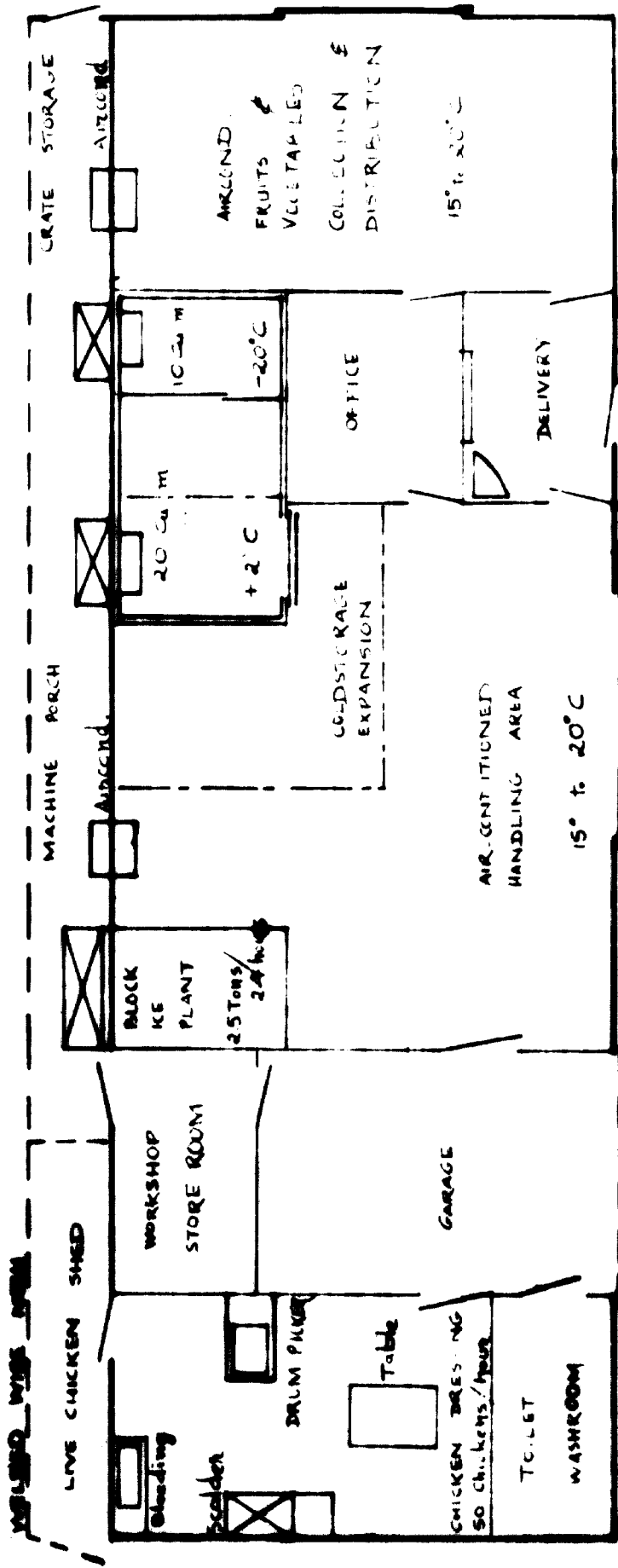
They should have ramp facilities both to the side away from the water for loading trucks and to the water side for intake, sorting and washing the fish on concrete stands. Both ramps covered with extended eaves. The working area between the intake and outlet side should have a minimum area of 120sq. m. plus space for cold stores and ice plant to one end of the building. The refrigeration equipment should all be mounted to the end wall of the building towards a common screened-in porch under extended roof. In the working area should be tables for sorting and packing of fish and a platform scale.

Adjacent to the working area should be an auction floor with facilities for quick presentation of the fish, (e.g. rolled in and out on table trolleys) an auction dais and with simple seating facilities (benches) for 75 people and a minimum floor area of 100 sq. m.

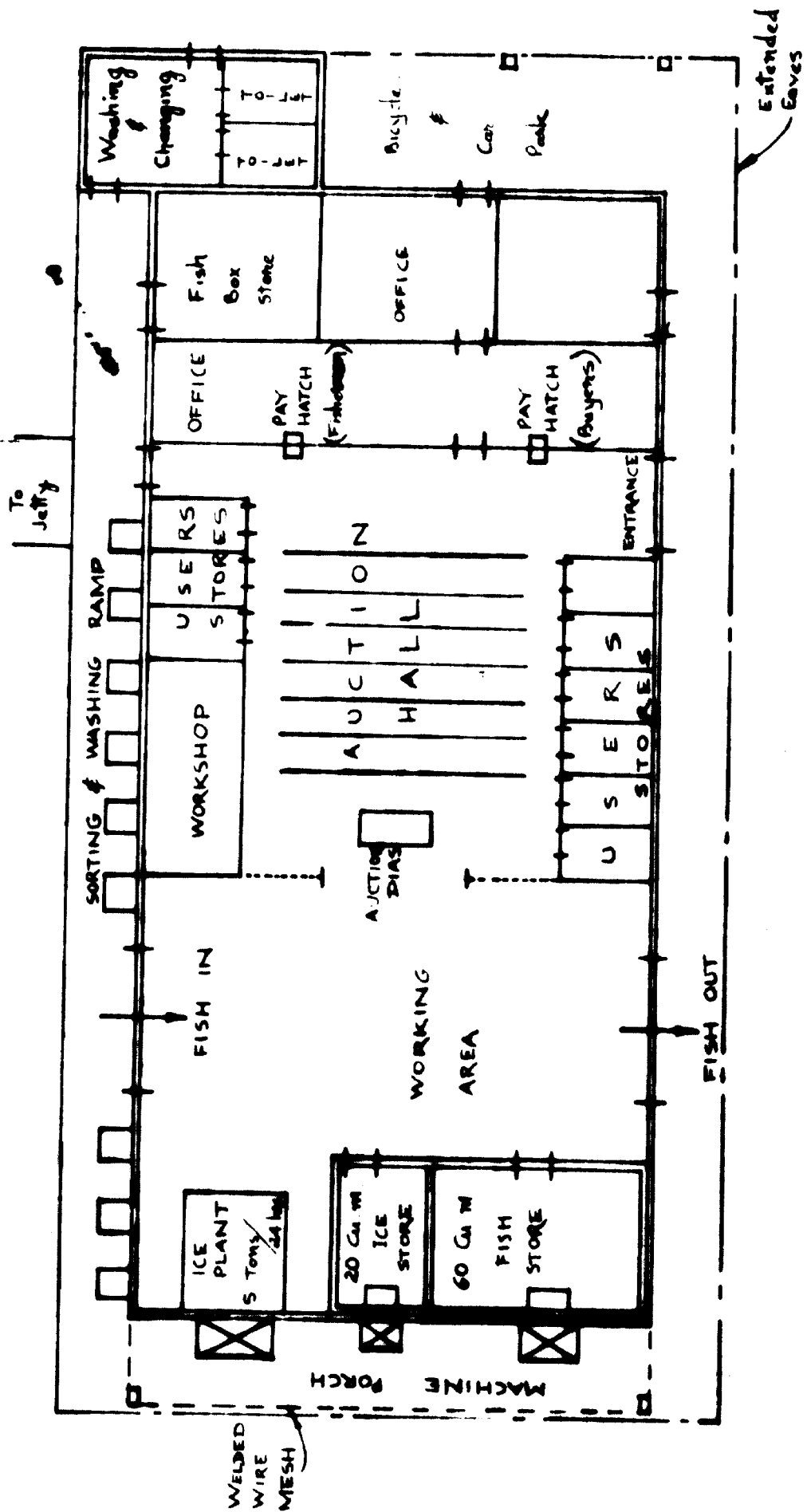
Other rooms will be washroom for personnel, 2 toilets with handwashing facilities. 2 x 20 sq. m. store rooms for fish boxes, one manager's office minimum 20 sq. m. and a larger office minimum 45 sq. m. with one pay hatch for dealers and one for fishermen. Furthermore, a minimum of 12 store rooms each minimum 4 sq. m. for fishermen and dealers, a minimum 20 sq. m. workshop and bicycle and car park under extended roof. Ceiling height should be 3 metres minimum.

The building should meet good hygienic standards and be suitable for cleaning with water spray and brooms on walls and floor. All inside steel parts to be galvanized.

A COLD CENTRE - PROVISIONAL LAYOUT



FISH RECEIVING STATION - PROVISIONAL LAYOUT



REQUIREMENTS FOR EQUIPMENT

Definitions

Condensing Unit:	Condenser and Compressor mounted on common frame with controls.
Refrigeration Unit:	Condensing unit mounted on common structure with evaporator, controls, defrosting system, etc.
Cold room:	Insulated room without refrigeration machinery.
Cold Storage:	Cold room including refrigeration unit.
Frozen Storage:	Cold room with appropriate insulation and refrigeration machinery for temperature from -10°C and colder.
Chilled Storage:	Cold room with refrigeration machinery for temperatures from -1°C to $+12^{\circ}\text{C}$.
Freezer:	Cold room with refrigeration machinery of excess capacity to freeze commodities.
Chiller:	Cold room with refrigeration machinery of excess capacity to chill commodities from ambient temperature to cold room temperature without freezing.
Water Economiser:	Cooling tower or similar device which will cool water through part-evaporation into the air.

General Requirements for Equipment for Cold Centres and Fish Receiving Facilities

The atmosphere in Tanzania is very corrosive thus galvanized steel and aluminium should be preferred to painted surfaces where these are not kept dry by generated heat.

The equipment should be as simple and robust as possible, taking into account that labour cost is very low, but also unskilled (Shs. 200/- per month), thus the operation of the refrigeration machinery should be automatic. All refrigeration machinery for Cold Centres shall, as far as possible, be designed to enable centralized repair, e.g. sectional coolers should have their refrigeration unit mounted on a wall section that can be exchanged with the whole unit (including Condenser and Evaporator).

The capacities of all refrigeration units should be designed to take up the full 24 hour heat load during 20 hours running time of compressors.

Condensers should be air cooled except for ice-plant and larger freezing units which can be offered with water cooled condenser with water economiser or evaporative condenser.

It is up to the Tenderer to evaluate if water cooled condensers for all units, using water economisers, would be a cheaper solution and if he so believes he may alternatively offer water cooled condensers. A mixture of water cooled and air cooled condensers will not be accepted for units of equal capacity.

Obviously the water prices in most places do not justify using city water for cooling.

Standard types and sizes of equipment should be used wherever possible so that spares stock can be reduced to a minimum.

As the contractor has the full responsibility for making a technically viable system, the specifications in this document shall in no way be considered complete. The contractor shall see to it, that all parts and components, that are normally considered necessary to operate the different parts of the system in a proper and efficient manner, are included and that all details of the system are compatible.

Requirements for Electrical Equipment

See Appendix I.

Equipment UNITS for Cold Centres and Fish Receiving Facilities

Sectional Cold Rooms

The cold rooms should be delivered in insulated sections (including floor sections) of standard size and interchangeable from one room to another independent of the size, to make it possible to expand rooms, change sections or move sections to another place. Each section should be a sealed unit with galvanized steel sheets (or better) inside and outside and bonded together with foamed-in-place polyurethane foam, and with insulating edging material and gaskets made from oil, fat and termite resistant materials.

Insulation thickness shall satisfy the Heat transmission coefficient, to be less than $0.25 \text{ kcal/hr/m}^2/^{\circ}\text{C}$ for frozen storage and $0.5 \text{ kcal/m}^2/\text{hr}/^{\circ}\text{C}$ for chilled storage.

Doors are to be sealed with extruded plastic gaskets with positive air tight seals. Latches shall have a key locking device and an inside safety release device, which will open the locked doors without key.

Refrigeration Machinery Units should be mounted on one wall section with the condensing unit mounted on the outside and evaporator on the inside. The whole unit including the wall section should be built for easy exchange with unskilled labour.

All units should have automatic defrosting system. Design temperatures should be: Frozen storage minus 20°C , Chilled storage minus 1°C with 20 hours running time of compressors/24 hours. Outside temperatures to be considered ambient temperatures inspite of airconditioners.

Accessories. Floors and walls should be appropriately protected against mechanical damages, e.g. wooden framework on floors.

An alarm signal device is to be installed in each room to prevent trapping of personnel in case door safety release becomes inoperative.

Block Ice Plants

It would be preferable if the Refrigerating unit in the ice plants could be exchangeable as a complete unit in the same way as for the walk-in units, by only disconnecting possible water supply (from water economiser)

and power supply, thus lifting the evaporator out of the brine tank together with the condensing unit. Also it would be preferable if Freon could be maintained as the only refrigerant present in Cold Centres. As these suggestions may have other disadvantages it is requested that both the following alternative solutions for refrigeration equipment be offered.

- a) Armonia equipment to be assembled on site.
- b) F-12 or F-22 equipment delivered as a self-contained unit with condenser, compressor and evaporator, factory assembled and tested ready for installing with brine tank.

Ice cans should be for ice blocks of 25 Kg. each.

The tank and can arrangement should incorporate a thawing tank, agitators, simple hand operated block and tackle and a gravity slide to the cold store for ice. In Cold Centres, the common chilled storage will also be used for storing of ice. Furthermore, simple hose arrangement for filling the tanks with water, a hand operated ice crusher and handling tongs for ice blocks.

Chicken Dressing Facilities

The required capacity will in most places be very small to start with and it is assumed that a maximum capacity of 50 chickens per hour will suffice. Thus the equipment required, rather than reduce labour cost should facilitate slaughtering and dressing to be hygienic, and allow for chilling the chickens rapidly by means of ice. Equipment:

1. One killing rack and bleeding trough.
2. One scalding electrically heated and temperature controlled.
3. One single hand drum picker.
4. Flat top table and water rinsing facilities.
5. Chilling tanks for ice chilling.

Auxiliary Equipment for Cold Centres

Workshop: A workbench with vice and simple hand tools.
Storing facilities for spare parts and consumable auxiliary materials (oil, refrigerant, light bulbs, etc.).

Airconditioned Handling Area:

One portable platform scale 0 - 150 kg. with double beam - one beam to be used for taring containers.

Packing Table, Simple Desk.

One 2 H.P. airconditioner (Import of airconditioners are, in Tanzania, standardized to the following brands: General Electric, Fedders and Westinghouse).

1 two-wheel hand truck for small crates.

1 hand operated lift truck for pallets and containers maximum 1500 kg.

If Fruit and Vegetable room is included, one additional set of the same equipment is required, except for lift truck being substituted with one extra hand truck and two air-conditioners instead of one. Furthermore, a fan to utilise cold night air to cool down fruits and vegetables, thermostatically controlled to stop and start at a preset maximum

temperature, for allowing the air-conditioner to take over (between 50° and 65° C). Estimated capacity minimum 50 cu. m/min.

2 hand operated shutters for air intake and outlet, respectively.

Office Equipment:

One Desk and 1 Table. 4 Chairs
One Typewriter and one simple calculator.
Money box - portable
One filing cabinet
Telephone

Milk Plants

In some places the Co-operatives will organize collection and the Cold Centre will supply transportation from nearby collection centres, immediately pre-cool the milk, and later pasteurize and pack the milk in polyethylene bags. As the capacity of the milk plant suggested should be only 2000 litres of milk per day to be processed during 7 hours of operation, the plant should be as simple and inexpensive as possible but still meet reasonable requirements for the quality of the milk processed.

Suggested Equipment:

Milk weighing scale, milk to be poured from 40 - 50 litre tanks into the scale.

Bulk tank - Milk Cooler, cooled by ice water. Tank Capacity 1000 litres. Cooling Capacity 500 litres/hour from 30° to 4° C.

Vat Pasteurizer 300 litres/hour. Vat Capacity 500 litres approximately.

Tank Cooler for pasteurized milk 500 litres tank capacity, cooling capacity 500 litres/hour from 75° to 4° C.

Simple packing and sealing facilities to pack minimum 600 half litre polyethylene bags per hour.

Simple washing and sterilizing facilities for 40 - 50 litre cans.

Boiler, oil fired for all heating and sterilizing purposes.

All tanks and containers (except pasteurizer) are suggested to be aluminium rather than stainless steel.

Control and Testing Equipment, strainers, pumps, agitators and piping, etc. to make the plant complete.

Cleaning of the whole system may be chemical rather than steam, if cheaper.

The manufacturer may specify whatever equipment he believes will give the lowest overall processing cost for the milk, though anticipating unskilled labour, except for a specially trained Milk Technician. A separate building or room adjacent to the ice plant of the Cold Centre is visualized to house the milk plant.

Packed milk will be stored in the chilled room of the Cold Centre and be distributed wholesale by same.

Water Chiller:

In Cold Centres suggested to have milk plants the ice plant is also supposed to produce chilled water directly by applying ice blocks to a simple water chiller.

Chilled water for taking the top of the temperature off the hot pasteurized milk could be supplied by the water economiser (cooling tower) of the ice plant, possibly without increasing the size of the water economizer and rather allow for a short time increase in condensing temperature of the ice plant.

In places where the ice has to come from the Fish Receiving Stations, city water may be used for removing the pasteurization heat.

Special Milk Cooler (Moshi)

Required Capacity 10,000 litres milk/day to be cooled from 30° to 4°C in five hours.

The milk will be received in 40 - 50 litre cans and may have to be stored for up to 24 hours before it can be transported to Dar es Salaam or Arusha in 1000 litre tanks.

It is therefore suggested to install two insulated tank coolers each with a 5000 litres tank capacity.

It is further suggested to install a larger ice-plant 5 tons/24 hours in this Centre to cater for the milk coolers, utilizing the ice blocks in the ice cans as ice bank by whatever means the tenderer might suggest as cheapest (water heat exchanger in brine tank - separate water chiller using the brine, etc.).

Though gravity flow of milk should preferably be used, the tenderer may suggest using a pump to fill the shipping tanks, considering the large size of the coolers.

Arrangement for easy weighing, testing, control and cleaning should be included.

Construction material may be high grade aluminium for parts contacting the milk.

Goat Abattoir (Dodoma)

The capacity of this goat abattoir should be only 80 goats (10 - 12 Kg. carcass weight) during a 7 hour working day. As this is a small capacity and labour cost is low, the facilities should be the simplest possible to assure hygienic slaughter for Moslem requirements.

There should be a lairage - uncovered for easy inspection - and isolation of diseased animals.

A simple wooden casting box with gate allowing shackling from under the gate for casting of goats.

Overhead rails of round galvanized pipes for hanging for bleeding and dressing. Hoisting devices are not considered necessary for the light weight animals.

There should be division between dirty and clean operations so clean carcasses are moved in one direction and offal in another. A separate tripery should be included as well as separate room for cleaning skins. Skins to be air dried, suspended on frames (to be supplied locally) under roof cover.

Fork Processing Unit (Tabora)

There are in this region already 10 piggeries producing at low capacity 2000 pigs per year, which quickly could be brought up to 6000 per year. A Veterinary Centre in Tabora is safe-guarding proper production, through assistance from the German Democratic Republic, which also will supply the following equipment to a processing unit:

- 1 mincer AWT 100 - GDR
- 1 cutter KS 120 - GDR
- 1 mixing machine type 143A CSSR
- 1 filling machine GAK 80 with closing device - GDR
- 1 aluminium table 2 x 1 metre
- 5 portable smoking chambers
- 1 cooking boiler 500 litre
- 1 cooling basin
- 1 floor balance

To be operated by 4 to 6 people.

NCCO shall provide the building for this equipment and also a complete slaughter house with hardware, equipment and chilling and storing facilities. The capacity of the facilities will be based on a daily slaughter of 20 pigs of which 60% are planned to be processed into sausages and cooked meat, and 40% into fresh or frozen meat. Live weight of the pigs is about 115 kg. with a total slaughter yield of 93 kg.

Slaughter house requirements: a fenced pen 15 sq. m. from which the pigs enter a stunning pen by a sloped ramp. Overhead rails of galvanized pipes for sticking and bleeding after shackling (hand operated hoist).

Scalding tank with cradle (60° - 62°C)

Hand lifting to a scraping and gibberling table. Transfer to overhead rail by hand operated hoist. Rinsing facilities for carcasses and offal. Intestines together with waste to be collected in containers with lids for cleaning outside the slaughter room (triperly).

Furthermore, balance and hand tools for cleaning, sawing and cutting has to be provided for.

Transport of halves to chilling room by hand.

GDR will supply experienced butcher to supervise and train for slaughtering and processing.

Mobile Slaughter Unit for Game

Cropping of game meat for local consumption has for a long time been undertaken in Tanzania, but there has not been available any facilities for proper slaughter, storage, transport nor marketing of game meat. The Cold Chain Operation can, with its suggested facilities, take care

of these operations except for slaughter and chilling of the game meat in the field. It is therefore suggested that the Cold Chain Operation should have a mobile slaughter unit that can operate along the main roads in Tanzania to get close to the game cropping areas.

Cropping and shooting of the game and immediate transport to the unit will be undertaken by the Game Division of the Ministry of Agriculture, or by a separate company established by NAFCO for the same purpose.

The unit will slaughter and dress the animals and chill and store the meat until a vehicle from the transport system of W.C.C.O. picks up the meat for further distribution.

It is anticipated that the abattoir can operate at the same place, at least for a few weeks, thus it is justified that it may take up to one day to make it operative when it is moved to a new place.

As to chilling and transport of meat to a nearby Cold Centre, this could be undertaken by means of ice supplied from the Cold Centre, which would be at most a day's trucking away. The same containers shipped to the slaughter unit with ice could be used for chilling and transport of the meat to the Cold Centre.

Types of Animals to be Slaughtered:

Wildebeests	average slaughtered weight	100 kg.
Zebras	average slaughtered weight	120 kg.
Eland	average slaughtered weight	275 kg.
Impalas	average slaughtered weight	30 kg.

Other types within this weight range are Topi and Reedbuck. Furthermore, there are Gazelles with lower weight.

Elephants and Hippopotamus may still have to be slaughtered in the field as it is impossible to bring the full carcass to the slaughter unit where the meat could only be dressed and chilled.

Requirements for Slaughter Unit:

The abattoir should be able to slaughter up to 100 smaller animals (Gazelles and Impalas) or 25 larger animals (Zebras and Wildebeests) or a mixture of the two up to 3 tons of slaughtered weight per 7 hour day.

The facilities for hygienic slaughter may be on a rolling vehicle, in temporarily set up tents or buildings or a combination of these possibilities.

A power generator should be part of the installations to operate fans, light, possible power equipment like powered skinning devices and water pump with filter to clean water hygienically.

Clean and dirty operations should be separated. Special facilities for cleaning, salting and storing of skins should be included.

The chilling of the meat is suggested to be undertaken in 3 cu. m. standard insulated containers with ice bunker by inserting a portable fan in the containers while chilling quarters hung on rails and hooks. Hoist facilities, hand operated, are required to lift the heavier animals and besides a hand operated hoist arrangement to lift 3 cu. m. containers up to any truck.

It is not considered worthwhile to have by-products facilities.

The unit is to be considered a pilot scheme, which, if successful, should lead to the procurement of several more units.

Requirements for Transport Equipment

Major emphasis in designing transport equipment should be on versatility and low transportation costs.

The trucks for the long haul transport in between the Cold Centres and Fish Receiving Stations should thus have light weight but well insulated bodies. Foamed-in-place, polyurethane foam and light weight sheeting therefore will be mandatory to obtain as much useful volume and payload as possible, on the trucks. The same goes for insulated containers to be transported on trailers (with uninsulated box bodies) and also on rail and ship.

For long haul containers, an inside volume of 3 cu. m. is visualized to be maximum size (1 - 1 $\frac{1}{2}$ ton total weight) for easy handling with simple hand operated hoist equipment on the trailers and where ramp facilities are available hand operated lift trucks to move the containers.

Fish and other produce which might contaminate other food stuffs are anticipated to be transported either in separate insulated containers or trailers or in sealed aluminium containers in the insulated trucks.

For retail distribution two types of containers are planned: One type not bigger than it can be carried by two men, 100 kg. total weight in both insulated and uninsulated edition. Furthermore, small insulated containers for bicycle distribution of milk and fish. The former containers may also be used as vending boxes in shops and the latter ones as ice-boxes in private houses. Again foamed-in-place aluminium boxes or (inside) plastic liners, will be important to reduce tare weight.

For Zambia transit transport of frozen food it will be necessary to have fully insulated trucks with refrigeration units for frozen food.

Traffic regulations in Tanzania favour right hand drive vehicles because all traffic is to the left.

Most popular trucks which can be serviced in Tanzania are: (1) Bedford, (2) BMC, (3) Commer, (4) Fiat, (5) Ford, (6) Isuzu, (7) Leyland Albion, (8) Mercedes.

The sizes of the specified vehicles are within the limits of the Tanzanian Traffic Ordinance. However, as this ordinance is being revised the successful contractor will have to make sure that his deliveries will meet the regulations of the revised ordinance.

Alternative Proposal for Refrigerating Units for Frozen Food Transport from Dar es Salaam to Lusaka (Zambia)

As 4250 tons of frozen food per year is expected to be the volume of transit trade to Zambia, there may be possibilities for using a Liquid Nitrogen system instead of Mechanical Refrigeration. One truck is expected to be able to make one trip from Dar es Salaam to Lusaka in 48 hours including stops. As there, at least to start with, will not be any need for frozen transport from Zambia to Dar es Salaam, no liquid nitrogen supply would be needed in Zambia. Anticipating one truck (20 tons) would make one round trip to Zambia per week, this corresponds

to a need for 6 trucks with time out for repair and to accommodate peak loads. Tenderers who may wish to quote a liquid nitrogen system should include all capital costs to establish the system including liquid nitrogen storage and filling station in Dar es Salaam and investigate the running costs: Consumption and Confirmed Costs of Liquid Nitrogen delivered to Dar es Salaam. If the system looks economically feasible it may also be suggested for the small amount of Frozen Food transport in Tanzania.

TOTAL REQUIREMENTS FOR INDIVIDUAL LOCATIONS

Requirements for the Individual Cold Centres

Tanga

As Fruit and Vegetable section for Tanga Region will be in Mombo, there will, in Tanga town, only be a Cold Centre with 10 cu. m. frozen storage and 20 cu. m. chilled storage and no ice plant as a Fish Receiving Station is planned. There will, however, be chicken dressing facilities and milk plant using ice from Fish Receiving Station. At a later stage the Cold Centre might be developed to receive chilled beef for freezing and direct export but the necessary abattoir is not yet being implemented.

Presently Tanga Cold Centre will therefore primarily be an import distribution centre with prime possibilities for export being Fish which the Cold Centre will buy from the Fish Receiving Station and chicken.

Mombo

A Fruit and Vegetable collection Centre only for produce from Lushoto district. Some distribution to the district of fish and other perishables may be undertaken by means of insulated containers. The building may later be expanded to house a full Cold Centre. The space is suggested to be minimum 60 sq. m. totally including separate toilet, washing facilities and separate office, plus garage without workshop. Equipment will only be that for fruit and vegetable rooms and office facilities.

Moshi

Moshi shall have Fruit and Vegetable Section, 10 cu. m. Frozen storage and 20 cu. m. chilled storage. No chicken dressing facilities as such are already available in the region. However, to cater for Fishermen at the Nyumba Ya Mungu Dam and for a special large milk cooler the Centre should have a 5 ton/24 hours ice plant.

The Milk Cooler deriving its cooling capacity from the ice plant should be located in a separate room, with ample space for handling milk cans (40 cans of 50 litres) and to store 20 1000 litre tanks.

Arusha

Arusha is the Centre of a major development of Tourist hotels and will therefore require larger facilities for distribution, i.e. a 40 cu. m. frozen storage and 2 x 20 cu. m. of chilled storage to have some division of chilled products. Furthermore, chicken dressing facilities, ice plant 2.5 tons/24 hours and Fruit and Vegetable room. In spite of the increased cold room facilities there should still, for the main handling room, be anticipated a 50% expansion, as freezing and storing facilities for pork production and game meat may later be needed. Small exports may also take place from here via the new Kilimanjaro international airport.

Note: Import and Export denotes Import and Export from one Region to another unless otherwise specified.

Mwanza

As there already is a Fish Receiving Station being established in Mwanza, no ice plant should be included in the Cold Centre. Otherwise the Centre should have 10 cu. m. Frozen storage, 20 cu. m. chilled storage, chicken dressing facilities, and Fruit and Vegetable room.

Based on the Fish Receiving Station getting into operation by mid 1971 a truck route may be established early, as a trial operation utilizing existing cold storage facilities in Dar es Salaam.

Bukoba

Bukoba getting a Fish Receiving Station, will have the same facilities like Mombo primarily to cater for Bukoba cooking bananas and citrus fruits. Besides the "Mombo Facilities" there will be a milk plant in a separate room utilizing ice from the Fish Receiving Station and city water, which is comparatively cheap in Bukoba, to be used for taking the high temperature heat off the pasteurized milk. Packed milk will be stored in insulated containers with ice. Fish will be taken out of the Fish Receiving Station in insulated containers. All long haul transport from Bukoba will be via steamer to Mwanza (or export to Kisumu, Jinja, etc.) in containers to go further on rail or truck after refilling with ice in Mwanza.

Tabora

There is already a small milk plant in Tabora which, however, will need ice for milk collection. Tabora has a potential for producing 6000 pigs per year as soon as processing, storing and marketing facilities are available.

The facilities suggested are ice-plant to cater for local fishermen, no chicken dressing facilities, but fruit and vegetable room primarily for distribution of import, though mangoes in season are an export item.

The refrigeration facilities will consist of a chiller to chill 20 pig carcasses per day from 38°C. to 4°C. in a 20 cu. m. cold room, furthermore, a combined frozen storage and freezer room 20 cu. m. with a freezing capacity of 500 kg./24 hours and 20 cu. m. chiller with a 2 tons/24 hours chilling capacity for processed pork products and a 40 cu. m. chilled storage.

The building requirements for slaughtering and processing facilities will be a slaughter house and a meat processing room, the latter one to be air-conditioned. Chillers to be located between slaughter house and meat processing room and frozen and chilled storages between meat processing section and main handling room. There should be allowance for 50% expansion of cold rooms.

Dodoma

Dodoma export potential being tomatoes and goats, will require the standard Fruit and Vegetable facilities (Dodoma is otherwise short of fruits and vegetables) also ice for fishermen, milk and transport. For goats both the slaughtering and refrigeration facilities should be included, i.e. a simple slaughter house separate from cold centre to slaughter 80 goats per 7 hour day. A chiller 10 cu. m. to chill the carcasses (1.0 ton/24 hours) from 38°C. to 4°C. The carcasses are

suggested to hang in two layers in the room in double decked loas, and to be shipped in insulated containers with rails and ice bunker. Furthermore, chilled storage with rails and little shelving 20 cu. m. and a frozen storage - freezer, 20 cu. m. with 500 kg/24 hours freezing capacity of goat liver, hearts, special cuts, etc.

Finally a 2000 litre milk plant in a separate room. There should be allowance for 50% expansion of cold rooms.

Morogoro

Morogoro facilities will be identical to Mombasa for all types of Fruits and Vegetables. The operation might be a little different as the turnover will be larger and therefore more often transports. A Co-operative Society will themselves deliver to the Centre. Fish may come from Kilombero river in containers which are shipped from Dar es Salaam with ice.

Iringa

Iringa has a great potential in vegetables bound to develop for Zambia export and Dar es Salaam supply, otherwise there is no fish and there is a need for imports of other perishables. Facilities will be 2.5 tons/24 hours ice plant, 10 cu. m. frozen storage, 20 cu. m. chilled storage, Fruit and Vegetable section, no chicken dressing facilities but a 2000 litre milk plant.

Mbeya

An abattoir with chilling facilities is being built 12 km. outside Mbeya town by NAFCO with chiller and chilled storage facilities. However, it is now evident that Zambia will only import boneless frozen meat from Mbeya for its southern part, whereas carcasses will be acceptable to the northern part of Zambia as directed by their Director of Veterinary Services.

The Cold Centre will therefore be built adjacent to the abattoir to be able to supply freezer capacity and frozen storage to the abattoir. For this purpose should be installed a 20 cu. m. freezer with a capacity of freezing 2.5 tons boneless packed beef from plus 4°C to minus 20°C/24 hours. The freezer to be furnished with trolleys with shelves for trays for the meat during freezing. The frozen storage to be with shelves only and 40 cu. m. volume to store approximately 10 tons of packed beef. The freezing capacity may later have to be expanded. The lumps of meat to be frozen may be up to 25 Kg. each.

Furthermore, usual 20 cu. m. chilled storage, 2.5 tons/24 hours ice plant and 2000 litres milk plant and chicken dressing facilities.

A separate Fruit and Vegetable room will be built in Mbeya town of dimensions like Mombasa though not including an office and garage as it will be administered from the Centre at the abattoir, the latter to have a 50% allowance for Cold Room expansion.

Lindi

Lindi in Ntwaru Region should first of all be an importing Centre of practically all kinds of perishables even milk. A Fish Receiving Station in Mikindani is not expected to have any surplus of fish for other regions.

The Cold Centre will have ice to supply Hindi fishermen and for container transport via new shipping service to Dar es Salaam to start July 1971. Otherwise 10 cu. m. frozen food storage, 20 cu. m. chilled storage and Fruit and Vegetable receiving area but no chicken dressing facilities nor milk plant.

Dar es Salaam Cold Storage and Central Operations Facilities

The refrigeration equipment should be for Ammonia.

The total load should be distributed on at least two compressors - preferably identical - and both being part of a common system - so one compressor may service all facilities, during low load periods.

One of the compressors is to have automatic capacity regulation.

For condenser may be offered either sea-water cooled condensers (average water temperature 27°C.) or condenser with cooling tower or water economiser, (the high relative humidity in Dar es Salaam should be kept in mind - see site note). The whole plant should be able to operate automatically on all the rooms. The freezing tunnel may be operated semi-automatically, i.e. it can be left at night when first positioned. All evaporators should have a defrost system, which may be energized manually, but shall stop automatically.

The lay-out of compressors, condensers, pipings and control panel should be such as to allow for a 100% expansion of refrigeration equipment, without making any of the first installed equipment obsolete. The expansion possibilities should only take into account 3 - 4 more rooms and additional tunnel freezer.

All evaporators and eventual water economizers should be hot galvanized.

Though minus 30°C and minus 1°C are specified as lowest operating temperatures, the refrigeration capacity should be based on average temperatures of minus 25°C and plus 2°C to be obtained during 20 hours of full capacity compressor operation per 24 hours, or minus 30°C and minus 1°C at 24 hours full capacity operation, whichever requires the highest capacity.

Dar es Salaam Cold Storage - Cold Room Specification

Room No.	Type of Room	Commodities Stored	Gross Internal volume each cu. m.	Allowance on Volume	Air Temperature		Type of Trade
					Lowest	Highest	
1	Frozen Storage	Butter	300	+10% -0%	-30°C	-12°C	Transit Import
2	Frozen Storage	Fish	300	+5% -10%	-30°C	-12°C	Transit Import
3	Frozen Storage	Packed Vegetables, etc.	300	+0% -10%	-30°C	-12°C	Transit Import Local
4	Chilled Storage	Cheese	300	+20% -0%	-1°C	+12°C	Transit Import
5	Chilled Storage	Fruits	300	+20% -0%	-1°C	+12°C	Transit Import
6	Chilled Storage	Cheese or Fruit	300	+0% -20%	-1°C	+12°C	Transit Import + Local
7	Chilled Storage	Pharmaceuticals	100	+0% -20%	-1°C	+12°C	Transit Import
8	Frozen Storage	Meat (Beef quarters)	700	+5% -0%	-30°C	-18°C	Transit Import
9	Frozen Storage	Poultry Meat	700	+0% -10%	-30°C	-18°C	Local Export
10	Frozen Storage	Fish, Crustacean	700	+5% -5%	-30°C	-18°C	Local Export
11	Freezer	Fish	7 ton				Local

Total Frozen Storage should be min. 3000 cu. m. internal gross volume.
Total Chilled Storage should be min. 1000 cu. m. internal gross volume.

Air locks and handling area to suit road arrangements. Temperature in handling area to be 15° to 20°C.

A handling room of sq. m. for Fruits and Vegetables in transit. Temperature plus 15° to plus 20°C.

Requirements for air filters and door locks to be the same as for cold storages.

Spares

The Tenderer shall specify spares to meet three years of operation of the Cold Storage and Central Operations facilities.

Workshop Equipment for Central Maintenance

The Tenderer should include all components to make the workshop complete to perform the services specified under building requirements.

For spares, proper storing facilities should be specified to store both spares for the cold storage itself and spares for cold centres and transport equipment.

Office Equipment

Though it will be somewhat difficult to predict how much office equipment should be provided, the volume and type of business described in the management project may give some guidelines. The Tenderers' proposal must be given in a detailed specification of sizes, numbers, brands and types of desks, chairs, panels, cabinets, typewriters, calculators, money safe, etc, with prices for each major item.

The equipment should also include a switchboard with four external lines and 20 internal lines plus Telex facilities for Export.

For canteen should be specified tables and chairs for 40 people with simple cooking facilities and a 400 litre refrigerator, plates and cutlery for 50 people.

Fish Receiving Facilities

The requirements for the five fish receiving stations are already described under building requirements for these as they are all identical except for the Dar es Salaam station having increased ice-block capacities.

The cold storages for Fishing Village Units are also identical in requirements. In both cases, however, site conditions (ambient temperatures and humidities) will vary but it is required that all Refrigeration units should be identical and satisfy the highest mean day temperature of 35°C for village fishing units and Tanga conditions for fish receiving stations.

COMMISSIONING AND GUARANTEES

Start Up and Performance Tests

All facilities shall be commissioned by the Contractor in the following manner:

1. All Refrigeration equipment, except for Village Cold Storages, shall be run-in for 48 hours with faultless operation after which time a 24 hour performance test will be undertaken. The Purchaser's representative shall be informed before the run-in period starts.
2. The performance requirements to be tested are those stipulated in the specifications for temperature, power and water consumption, capacity requirements, etc. by the Contractor or the Purchaser whichever is most difficult to fulfil, and which shall be met during 20 hours full capacity operation time of compressors for a 24 hours period. Dar es Salaam Cold Storage will also be tested for obtaining lowest temperatures.
3. The test methods are to be agreed upon, but should be recognized methods.
4. In addition the Contractor shall submit capacity test results for all condensing units and other major pieces of equipment like boilers, pasteurizers, etc.
5. Two operating manuals for each location (Cold Centre, Fish Receiving Stations, etc.) and for each transport vehicle shall be submitted to HAFCO 3 months before start up of the respective facilities.
6. During the installation, run-in and test period the Contractor's personnel shall thoroughly instruct the operating personnel.
7. Three sets of service manuals for each major piece of equipment shall be submitted to HAFCO not later than 6 months, after signing of Contract.
8. Progress Reports shall be submitted not later than the seventh day of each month on all aspects of the project. This report shall be related to the agreed upon programme for the project and "high light" any over-run on the last day of the preceding month.
9. For Village Fishing Cold Stores only three units selected by the Purchaser in the vicinity of Cold Centres shall be subject to the above test.

Guarantees

Guarantees for performance and durability of equipment should be specified in detail by the Tenderer also as to economic consequences.

PROGRAMME FOR TULI-NYE PROJECT

An chart (overleaf) is shown the desired programme for delivery of facilities. The Tenderer may suggest another programme, if he cannot meet the suggested one or if he can improve it to meet the important aspects of the programme to have the following priorities:

1. To get the Bar es Saloon facilities operational as early as possible to meet needs for Zambia transit trade and import.
2. To open up the Cold Centres along the Zambia route.
3. To open up the Centres along the Arusha route.
4. To open up the Centres along the Central line plus Bukoba facilities.
5. To start up the other Coastal facilities plus Musoma.

To make the system profitable as soon as possible it is important that the different routes are opened up in as fast a sequence as possible; on the other hand this sequence should not be pushed to the extent of increasing cost by poor utilization of installation personnel and equipment.

TENTATIVE IMPLEMENTATION TIME TABLE FOR THE NATIONAL COOL CHAIN PROGRAM

Operation	1st Year												2nd Year					Comments				
	1			2			3			4			5			6						
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5		6			
Design work - sub-contracting Dar es Salaam Store																						
Site and construction work including offices																						
Equipment installation																						
Design work - sub-contracting - Morogoro, Iringa, Mbeya and Dar es Salaam Fish Receiving Station																						
Construction - Installation Morogoro, Iringa, Mbeya and Dar es Salaam Fish Receiving Station																						
Design work - sub-contracting: Moshi, Koshi and Arusha																						
Construction - Installation Moshi, Koshi and Arusha																						
Design and sub-contracting Tukuba (Centre and Fish Receiving Station), Dodoma, Tabora, Iwanza																						
Construction - Installation Tukuba, Dodoma, Tabora, Iwanza																						
Design and sub-contracting Tanga (Centre and F.R.S.) Lindi, Mikindani, Masora																						
Co.struction - Installation Tanga, Lindi, Mikindani, Masora																						
Transport Equipment: 2 x 20 ton freezer food articulated 2 x (9 + 12) ton combined + 25% of containers																						

1 1/2 tons vans delivery to coincide with commissioning of Cold Centres, one per Centre plus 2 for Dar es Salaam. Five Fishing Village Cold Storages to be delivered by the end of the first year, the rest in a continuous flow during the second year. Mobile slaughter unit to be delivered mid second year.

SPECIFICATIONS FOR TURN-KEY PROJECT

The principles employed in setting up the specifications are first to give sub-specifications for all equipment units to put emphasis on standardization. These sub-specifications should then, in turn, be applied to specifications for each location.

Each equipment specification is divided into two parts: (1) Purchaser's Specification on which the Tenderer will base his price quotation, (2) Tenderers additional technical specifications, on what he actually offers to supply.

Shipping Costs should include insurance, local handling and clearing charges, etc.

Tanzanian Duty and Sales Tax should not be included as all equipment can be imported free of duty and sales tax as such expenses can be refunded.

The Tenderer may offer open or semi-hermetic compressors as he judges to be most suitable and reliable, taking into account the complexity of repair and the availability of Central repair facilities.

SPECIFICATIONS

Unit Specifications for Equipment

Frozen Storage

	Minimum Inside Volume Cubic Metre					
	10		20		30	
	Price US. \$	Weight Kg.	Price US. \$	Weight Kg.	Price US. \$	Weight Kg.
Sectional Cold Room including Insulated Floor Sections and Door - minimum: K = 0.25 kcal/m ² /hr/°C. Anticipating one common wall with chill room (door wall)						
Refrigeration Unit for Freon 12/22 with air cooled Condenser and Evaporator including Motors, Controls, Automatic Defrosting system and arrangement for cooling one set holdover inserts for Insulated Trucks freezing compartment, in Cold air stream from evaporator every 24 hours. Lowest storage temperature minus 20°C.						
Installation Material including electrical equipment, safety alarm, etc.						
Accessories - wooden floor sections, shelves, etc.						
Packing						
Total Price/Shipping Weight						

Chilled Storages

	Minimum Inside Volume Cubic Metres					
	20		30		60	
	Price US. \$	Weight Kc.	Price US. \$	Weight Kc.	Price US. \$	Weight Kc.
Sectional Cold Room including Insulated Floor Section and Door. Minimum: $K = 0.5$ kcal/m ² /hr/°C.						
Refrigerating Unit for Freon 12 with air cooled Condenser and Evaporator including Motors, Controls and automatic Defrosting system. Lowest storage temperature minus 1°C.						
Installation Materials including electrical equipment, safety alarm, etc.						
Accessories: wooden floor sections, shelving, drain, etc.						
Cost of Packing						
Total Price/Shipping Weight						
Savings by having common wall between two chilled storages						

Note: 30 cu. m. Chilled Storage for ice blocks only.

20 cu. m. Chilled Storage for all commodities should include storage facilities for 1 ton of ice to enter the room from ice slide through a special hatch with removable insulated cover.

This storage will also be used for ice only with the same hatch in Fish Receiving Stations.

Tenderers Specifications - Sectional Cold Storages

	Frozen Storages			Chilled Storages		
	10 cu.m.	20 cu.m.	40 cu.m.	20 cu.m.	30 cu.m.	60 cu.m.
<u>Compressors:</u>						
<u>Brand</u>						
<u>Type</u>						
<u>Speed RPM</u>						
<u>HP Requirements</u>						
<u>kcal/hr₀ at -15/+25°C</u>						
<u>Motor HP and RPM</u>						
<u>Motor Brand</u>						
<u>Condensers:</u>						
<u>Brand</u>						
<u>Type</u>						
<u>Surface Area/Mat. Sq. m.</u>						
<u>Fan Motor HP/RPM</u>						
<u>Evaporator:</u>						
<u>Brand</u>						
<u>Type</u>						
<u>Surface Area/Mat.</u>						
<u>Fan Motor HP/RPM</u>						
<u>Coldroom:</u>						
<u>Dimensions Inside</u>						
<u>Actual Inside</u>						
<u>Vol. cu.m.</u>						
<u>Insulation thickness mm.</u>						
<u>Material and Thickness</u>						
<u>Outside Sheat</u>						
<u>Inside Sheat</u>						
<u>Kwall kcal/sq.m./hr./°C.</u>						
<u>Total kWhrs/24 hr at 25°C Ambient</u>						
<u>No. of Lights</u>						

1. Type of seal between sections:
2. Floor type and material:
3. Type of Safety Alarm:
4. Inside Storing Facilities - Quantity/Type/Material:
5. Type of Defrosting System:
6. Specify controls and other major components:

Chillers and Freezers (Contd.)

Specify, Inside Storing Facilities:

Type of Defrost System:

Controls and Other major components:

Chillers and Chilled Storage for Fishing Village Units

Inside Vol. 20 cu. m. min.	
Chilling Capacity Kg. Fish/24 hrs. from 25° to 0°C.	
500 Kg/24 hrs	1000Kg/24 hrs
Price US. \$	Weight Kg.
Price US. \$	Weight Kg.

Standard Sectional Cold Room as previously specified for $K_{max} = 0.5 \text{ kcal/m}^2/\text{hr}/^\circ\text{C}$.

Refrigeration Unit F-12, air cooled condensing units, automatic defrost, directly coupled with diesel engine mounted on unit including automatic temperature controls

Accessories: Wooden floor sections, shelving, drain, etc.

Spares to be located at each village storage

Packing

Total Price/Shipping Weight

Tenderers Specifications:

Compressors:

Brand

Type/Speed RPM

H. P. Requirements

kcal/hr. at $-15/25^\circ\text{C}$.

Engine Brand

Engine HP/RPM

Condensor:

Brand

Type

Surface Area sq. m.

Evaporator:

Brand

Type

Surface Area/Mat.

Fan RPM/Diameter

Total Fuel Consumption/24 hrs. at Stated Capacities and 25°C . Ambient

Inside Storing Facilities:

Type of Defrost System:

Controls and Other Major Components:

Spares to be located at each Village storage:

Estimated Labour Requirements for Installation of one Storage:

(1) Skilled Labour Hours:

(2) Unskilled Labour Hours:

Block Ice Plants

	2.5 ton/24 hrs.		5 ton/24 hrs.		10 ton/24 hrs.	
	Price US. \$	Weight Kg.	Price US. \$	Weight Kg.	Price US. \$	Weight Kg.
Refrigeration Unit R-12/R-22 with water cooled condensing unit (or with evaporative condenser) and evaporator to be immersed in Brine Tank including Motor and Controls, <u>all factory assembled.</u>					X	X
Brine and Thawing Tank with Cans (25 Kg.) and insulated cover.						
Water Economiser with pump and Fans including Motors if applicable						
Agitators with Motors						
Water Filling Arrangement, Hand operated block and tackle for handling ice-blocks, ice gravity slide to chilled storage						
Installation Materials, pipes, etc. including electrical parts and insulation material for tank and pipes						
Accessories: Hand operated ice crusher, ice tongs, special tools, etc.						
Packing						
Total Price/Shipping Weight						
<u>Alternative</u>						
Refrigeration unit NH ₃ with water cooled condenser and evaporator to be immersed in Brine Tank including motor and controls. Condensing unit to be assembled on site with evaporator						

Tenderers Specifications - Ice Plants

	Factory Assembled Re- frigerat. Unit HP/22		On Site Assembled Refrigerat. Unit HP,		
	1ton/24hr.	5ton/24 hr.	2ton/24 hr.	5ton/24hr.	10ton/24hr.
<u>Compressors:</u>					
Brand					
Type/ Refrigerant					
Speed RPM					
HP Require- ments					
kcal at minus 15/plus 25°C.					
Motor Size RPM					
Motor Brand					
<u>Condensers:</u>					
Brand					
Type					
Surface Area					
<u>Water Economi- sers: Brand</u>					
Type					
Capacity at 25°C/90% RH					
Fan Motor HP/RPM					
Water Pump HP					
Water Consump. Litre/hr.					
<u>Evaporator:</u>					
Brand					
Type					
Surface Area sq. m./Met.					
Agitator/Pump HP/RPM					
Tank Dimensions					
Can Dimensions					
No. of Cans					
Can Material/ Thickness					
For 1 ton of Ice: Total kWhr					
Total Litres of Water					

Ice Plant Operation Principle (Handling - Labour Requirements):

Specify controls and other major components:

Auxiliary Equipment for Cold Centres

	Brand	Capacity/ Dimensions	Principal Material	Price US, \$	Weight Kg.
Chicken Dressing Facilities, 40-50					
Chickens per hour: One Killing					
Rack and Bleeding Trough					
One Scalding Electrically Heated					
and temperature controlled					
One Flat Top Table					
Water Rinsing Facilities					
Two Chilling Tanks					
Cost of Packing					
Total Price/Shipping Weight					
Manpower Requirements for			kwhr. Consumption:		
50 Broilers/Hour:			Water Consumption:		
Standard Workshop Facilities:					
Workbench with vice					
Hand Tools: Attach Specification					
Shelves, etc.					
Packing					
Total Price/Shipping Weight					
Handling Area Equipment:					
1 Air conditioner 2 HP					
1 Portable double beam platform					
scale 0-150 Kg, one of the beams					
for taring					
1 Packing Table and Simple Desk					
1 two-wheel hand truck for					
crates					
1 hand operated lift truck for					
containers & Pallets max. 1500Kg.					
Packing					
Total Price/Shipping Weight					
Fruit and Vegetable Room:					
2 air conditioners 2 HP each					
1 portable double beam platform					
scale 0-150 Kg, one beam for					
taring					
1 Packing Table and Simple Desk					
2 two-wheel hand trucks for					
crates					
1 fan min. 50 m³/min. with ther-					
mostat for stop & start at preset					
outside temp. between 15 and 20° C.					
2 hand operated shutters for air					
intake and outlet, respectively					
Packing					
Total Price/Shipping Weight					

Auxiliary Equipment for Cold Centers

	Brand	Capacity/ Dimensions	Principal Material	Price US. \$	Weight Kg.
<u>Office Equipment:</u>					
1 Desk with Drawers					
1 Typewriter					
1 Simple Calculator					
1 Table and 4 Chairs and 1 Filing Cabinet					
1 portable money box					
Packing					
Total Price/Shipping Weight					

Milk Plant

	Price US. \$	Weight Kgs.
One Milk Weighing Scale Min. 50 Kgs. Capacity		
1 Ice-Water-Milk Cooler (1) 500 litres/hr. from 30° to 4°C.		
1 Pasteurizer 300 litres/hr.		
1 Cooler (2) for Pasteurised milk 500 litres/hr. from 75° to 4°C.		
1 set packing facilities min. 600 x ½ litre polyethylene bags/hr.		
1 boiler, oil fired for all heating purposes		
Control and Testing Equipment, Strainers, Pumps & Agitators		
1 Water Chilling arrangement to meet above needs, utilizing existing ice-plant and possibly water economiser		
Installation Material, Piping, Insulation, Electrical parts, etc.		
Other major components specify:		
Packing		
Total Price/Shipping Weight		

Tenderers Specifications

	Actual Capacity per hour	Type	Brand	Tank Capacity or HP	Material in Milk Contact	Other
Milk Scale						
Milk Cooler (1)						
Pasteurizer						
Milk Cooler (2)						
Packing Facilities						
Boiler						
1. Pump or Agitator						
2. Pump or Agitator						
3. Pump or Agitator						

Per 1000 Litre Milk, specify:

Total kwhr/Consumptions:

Total Fuel Consumption:

Total Water Consumption:

Total Consumption of Other Consumables, e.g. Chemicals, Bags, etc.:

Manpower Requirements:

Operation Principle:

Milk Cooling (Moshi)

	Price US. \$	Weight Kil.
2 x 5000 litre Bulk Tank milk cooler in aluminium, ice water as cooling medium insulation $k_{max} = 0.8 \text{ kcal/m}^2/\text{C/hr.}$ including cleaning arrangement - chemical cleaning		
1 Water Chilling arrangement to supply iced water to the above cooler to the amount of cooling 2000 litre milk/hour from 25° to 4°C.		
Necessary Pumps and Agitators including Motors		
Installation material, pipes, valves, insulation material, electrical parts, etc.		
Milk Weighing Scale, acidity testing set and 6 milk strainers and paper filters		
20 milk tanks for transport each 1000 litre capacity made from aluminium. Tanks to be fitted with skids for handling by hand lift trucks. To be cleaned at dairies with steam		
Other necessary accessories not included above, specify:		
Cost/Weight of Packing		
Total Price/Shipping Weight		

Tenderers Specifications:

Cooling Tank Dimensions Inside:

Insulation Thickness and Type:

Insulation k value $\text{kcal/m}^2/\text{C/hr.}$:

Aluminium Material Thickness Inside:

Outside:

Inside Type of Aluminium:

Horse Power, Agitators and Pumps:

Describe water chilling arrangement and capacity:

1) Weighing Scale, 2) Acidity Testing Equipment, 3) Strainers, specify:

Type, Brand, Capacity:

Transport Tank Dimensions:

Type and Thickness of Aluminium:

Operation Principle for the Milk Cooling Plant:

Per 1000 Litre Milk Please Indicate:

Total kWhr consumption including consumption of ice plant:

Total water consumption including consumption of water economiser:

Consumption of consumable materials: Chemicals, Filters, Oil, etc.:

Necessary Manpower to operate the milk cooling and handling:

Slaughter House Equipment For 80 Goats/7 hours

	Price US. \$	Weight Kg.
Casting pen, rails, hooks or gambrels, balance, blood and offal collection facilities, water rinsing and tripery facilities		
Boiler Plant including necessary piping and fittings for cleaning facilities and steriliser		
Blood Dryer and Meat Steriliser with trays		
Hand Tools and Other Facilities		
Installation Materials including electrical components		
Packing		
Total Price/Shipping Weight		

Tenderers Specifications: Brand, type and capacity of:

Slaughtering Facilities:

Boiler Plant:

Steriliser:

No. of hooks, gambrels:

Total Length of rails:

Specification of tools and other facilities:

Per 80 goats/7 hours specify:

Fuel Consumption:

Total kWhr consumption:

Required number of labourers:

Describe operating principles:

Slaughter House Equipment for 20 Pigs/7 hours

	Price US. \$	Weight Kc.
Slaughtering facilities: Simple stunning pen, overhead rails, hand operated hoists, scalding tank with cradle, water rinsing facilities, blood and offal collection containers, tripery facilities, weighing scale, etc.		
Boiler Plant to cover needs of both meat processing plant and slaughter house		
Hand tools and other facilities needed for both meat plant and slaughter house		
Installation material including electrical components needed for slaughter house		
Provisional figures for installation materials for meat plant, including room air-conditioner		
Packing		
Total Price/Shipping Weight		

Tenderers Specifications: Brand, type and capacity:

Slaughtering Facilities:

Boiler Plant:

No. of hooks, gambrels:

Total Length of rails:

No., size and material of offal containers, etc.:

Specification of tools and other facilities:

For 20 pigs/7 hours specify:

Oil Consumption:

Total kwhr. consumption:
(Should include estimate for meat processing plant)

Total number of labourers required:

Operating Principles:

Mobile Slaughter Unit

For Maximum 100 animals of 30 Kg. or 25 animals of 120 Kg. slaughtered weight.
Maximum sized animal 275 Kg. slaughtered weight (Eland).

	Price US. \$	Weight Kg.
Slaughter Equipment for abattoir including hand tools, tables, hooks, rails, containers, etc.		
Room facilities for slaughtering unit, i.e. vehicle bodies or tents, including facilities for skin dressing and storage and for personnel		
Vehicles for transport of slaughtering unit and personnel including power generator, pump and power and water installations including ceramic water filter.		
Packing		
Shipping Costs to Dar es Salaam		
Total Price/Shipping Weight		

Tenderers Specifications:

Brand, type and capacity of major pieces of slaughter equipment:

Sizes and types of room facilities:

Brand, types, HP, and Dimensions for vehicles, power generator and pumps:

Type, Capacity and effectiveness of water filter:

Manpower requirements to meet full capacity - specify number and type of personnel:

Operation Principle for the Unit:

Specifications for Cold Centres

The following specifications should be based on the general requirements for building and equipment, unit specifications for equipment and specific requirements for each Cold Centre.

The size of buildings are to be suggested by the tenderers based on the requirements for equipment and operation if not otherwise specified. As site conditions are not known provisional costs should be entered for:

Topographical survey
Site preparation
Building foundation
Water and Power connection

The reimbursement to be allocated the contractor for this will be subject to local tender for sub-contracting without addition of any fees other than those already specified by the Tenderer.

The installation costs for the buildings should include components such as water piping, toilet and washing facilities, water taps and hoses for cleaning of facilities and of containers and trucks, power lines for light and equipment and common power outlets for spot lights, air-conditioners, etc. but not electrical and water installation of otherwise specified equipment such as Refrigeration Equipment, Chicken Dressing Facilities, etc. Installation material for this equipment should be included in the previous unit specifications. The installation and erection costs for equipment referred to in the following specifications are thus only labour costs including travel allowances, per diem and supervision charges.

Tanga

	Price US. \$	
	Cold Centre without milk plant	Additional for milk plant Bldg.
Building and Construction:		
Provisional Costs:		
Topographical Survey		
Site Preparation		
Building Foundation		
Water and Power Connection		
Cost of Building (above foundation)		
Installation Costs - water, light and power, toilet, etc. including components and material		
Contractor's fees, specify:		
Other Costs related to Building and Construction, specify:		
Building Prices including installations		
Total Price all buildings		
Equipment:		Shipping Weight Kg.
2000 litres milk plant		
Chicken Dressing Facilities		
10 cu. m. Frosen Storage		
20 cu. m. Chilled Storage		
Workshop facilities		
Office facilities		
Main handling room facilities		
Shipping costs to Tanga		
Installation Costs for Equipment, i.e. only labour costs including allowances and supervision		
Spare Parts to be located in Tanga		
Other Costs to make Centre complete - specify:		
Total Price for Tanga Centre/Shipping Weight		

Monbo

	Price US. \$	
<u>Building and Construction:</u>		
<u>Provisional Costs</u>		
Costs of Building (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Cost's, specify:		
Total Price Building including installation		
<u>Equipment</u>		Shipping Weight Kg.
Fruit and Vegetable room facilities		
Office Facilities		
Shipping Costs to Monbo		
Installation Costs for Equipment		
Spare Parts to be Located in Monbo		
Other Costs to make Centre complete - specify:		
Total Price for Monbo Centre/Shipping Weight		

Moshi

	Price US \$	
	Cold Centre without milk cooling	Additional for Milk Cooling Building
<u>Buildings and Construction:</u>		
Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's Fees, specify:		
Other Costs to make Building complete, specify:		
Building Prices including installations		
Total Price all buildings		
<u>Equipment</u>		Shipping Weight K.
5 tons/24 hours ice plant		
10 cu. m. frozen storage		
20 cu. m. chilled storage		
Milk Cooling Plant - 10,000 litres/day		
Fruit and Vegetable room facilities		
Workshop facilities		
Main handling room facilities		
Office facilities		
Shipping Costs to Moshi		
Installation Costs for Equipment		
Spare Parts to be located in Moshi		
Other costs to make Centre complete - specify:		
Total Price for Moshi Centre/Shipping Weight		

Arusha

	Price US. \$	
<u>Buildings and Construction:</u> Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's Fees, specify:		
Other Costs to make Building complete, specify:		
Total Price Building including installations		
<u>Equipment</u>		Shipping Weight Kg.
Chicken Dressing facilities		
2.5 tons/24 hours ice plant		
40 cu. m. frozen storage		
Two 20 cu. m. chilled storage		
Fruit and Vegetable room facilities		
Main room handling facilities		
Workshop facilities		
Office facilities		
Shipping Costs to Arusha		
Installation Costs for Equipment		
Spare Parts to be located in Arusha		
Other Costs to make Centre complete - specify:		
Total Price for Arusha Centre/Shipping Weight		

Mwanza

	Price US. \$	
Building and Construction: Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Costs to make Building complete, specify:		
Total Price Building including installations		
Equipment		Shipping Weight Kgs.
Chicken Dressing facilities		
10 cu. m. frozen storage		
20 cu. m. chilled storage		
Fruit and vegetable room facilities		
Main handling room facilities		
Workshop facilities		
Office facilities		
Shipping Costs to Mwanza		
Installation Costs for Equipment		
Spare Parts to be located in Mwanza		
Other Costs to make Centre complete, specify:		
Total Price for Mwanza Centre/Shipping Weight		

Bukoba

	Price US. /	
	Cold Centre without Milk Plant	Additional for Milk Plant Bldg.
<u>Buildings and Construction:</u>		
Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Costs to make Building complete, specify:		
Building Prices including installations		
Total Price all buildings		
<u>Equipment</u>		Shipping Weight Kg.
2000 litres milk plant		
Fruit and Vegetable room facilities		
Office facilities		
Installation Costs for Equipment		
Shipping Costs to Bukoba		
Spare Parts to be located in Bukoba		
Other Costs to make Centre complete, specify:		
Total Price for Bukoba Centre/Shipping Weight		

Tabora

	Price US. \$	
	Cold Centre excluding Slaughter House and Heat Plant	Additional for Bldgs. for Slaughter House & Heat Plant
Buildings and Construction:		
Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Costs to make Building complete, specify:		
Building Prices including installations		
Total Price all buildings		
Equipment		Shipping Weight Kg.
2.5 tons/24 hours ice plant		
20 cu. m. chiller for carcasses 2 tons/24 hours		
20 cu. m. chiller for processed meat 2 tons/24 hours		
40 cu. m. chilled storage		
20 cu. m. freezer and frozen storage 500 kg./24 hours freezing capacity		
Slaughter house equipment 20 pigs/7 hours		
Fruit and Vegetable room facilities		
Main handling room facilities		
Workshop facilities		
Office facilities		
Installations Costs for Equipment		
Shipping Costs to Tabora		
Spare Parts to be located in Tabora		
Other Costs to make Centre complete - specify:		
Total Price for Tabora Centre/Shipping Weight		

Dodoma

	Price US. \$	
	Cold Centre excludin Goat Slaught- er Bldg. & Milk Plant	Additional for Bldgs. for Goat Slaughter & Milk Plant
<u>Buildings and Construction:</u>		
Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Costs to make building complete, specify:		
Building prices including installations		
Total Price all buildings		
<u>Equipment</u>		Shipping Weight Kg.
Slaughtering and Dressing equipment for 80 goats/day		
Chicken Dressing facilities		
2.5 tons/24 hours ice plant		
10 cu. m. chiller 1.0 ton/24 hours		
20 cu. m. chilled storage		
20 cu. m. freezer and frozen storage 0.5 tons/24 hours freezing capacity		
2000 litres milk plant		
Fruit and vegetable facilities		
Main handling room facilities		
Workshop facilities		
Office facilities		
Installation Costs for Equipment		
Shipping Costs to Dodoma		
Spare Parts to be located in Dodoma		
Other costs to make Centre complete - specify:		
Total Price for Dodoma Centre/Shipping Weight		

Morogoro

	Price US. \$	
<u>Building and Construction:</u>		
Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other costs to make building complete, specify:		
Total Price Building including installations		
<u>Equipment</u>		Shipping Weight Kg.
Fruit and Vegetable room facilities		
Office facilities		
Shipping Costs to Morogoro		
Installation Costs for Equipment		
Spare Parts to be located in Morogoro		
Other costs to make Centre complete - specify:		
Total Price for Morogoro Centre/Shipping Weight		

Iringa

	Price US. \$	
	Cold Centre excluding Milk Plant	Additional for Milk Plant Bldg.
<u>Building and Construction:</u>		
Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Costs to make Building complete, specify:		
Building Prices including installations		
Total Price all buildings		
<u>Equipment</u>		Shipping Weight Kg.
2000 litres milk plant		
2.5 tons/24 hours ice plant		
10 cu. m. frozen storage		
20 cu. m. chilled storage		
Fruit and Vegetable facilities		
Main handling room facilities		
Workshop facilities		
Office facilities		
Shipping Costs to Iringa		
Installation Costs for Equipment		
Spare Parts to be located in Iringa		
Other Costs to make Centre complete - specify:		
Total Price for Iringa Centre/Shipping Weight		

Mbeya

	Price US. \$		
	Cold Centre at Abattoir	Additional for Bldg. for Fruits and Vegetables Bldg. in Town	Milk Plant at Abattoir
Building and Construction:			
Provisional Costs			
Building Costs (above foundation)			
Installation Costs			
Contractor's fees, specify:			
Other costs to make Building complete, specify:			
Building Prices including installations			
Total Price all buildings			
Equipment			Shipping Weight Kg.
2000 litres milk plant			
2.5 tons/24 hours ice plant			
20 cu. m. freezer 2.5 tons/24 hours			
40 cu. m. frozen storage			
20 cu. m. chilled storage			
Chicken Dressing facilities			
Fruit and vegetable room facilities			
Main handling room facilities			
Workshop facilities			
Office facilities			
Shipping Costs to Mbeya			
Installation Costs for Equipment			
Spare Parts to be located in Mbeya			
Other Costs to make Centre complete, specify:			
Total Price for Mbeya Centre/Shipping Weight			

Lindi

	Price US. \$	
<u>Building and Construction:</u> Provisional Costs		
Building Costs (above foundation)		
Installation Costs		
Contractor's fees, specify:		
Other Costs to make Building complete, specify:		
Total Price Building including installations		
<u>Equipment</u>		Shipping Weight Kg.
2.5 tons/24 hours ice plant		
10 cu. m. frozen storage		
20 cu. m. chilled storage		
Fruit and Vegetable room facilities		
Main handling room facilities		
Workshop facilities		
Office facilities		
Shipping Costs to Lindi		
Installation Costs for Equipment		
Spare Parts to be located in Lindi		
Other Costs to make Centre complete, specify:		
Total Price for Lindi Centre/Shipping Weight		

Tenderers Specification of Buildings for Cold Centres

The tenderer is requested to fill in the chart below for individual building sizes and capacities. Furthermore, the tenderer is requested to supply one layout and elevation drawing for Dodona to be representative for other Cold Centres. For the other centres just line sketches for room division will suffice. Furthermore, the following minimum specifications should be given: (1) Major construction materials, (2) Building and construction principles, (3) Special arrangements to meet hygienic requirements. (4) General Specifications of installations.

Cold Centre Location	Size of Rooms - Internal L x W Metres						Total L x V Extra Rooms/Buildings	Area square Metres		No. of Outlets		Max. Power Supply KW.	Water Main Pipe Diameter Inches
	Main room incl. space for cold rooms, ice plant, etc.	Fruit & Vegetable room	Chicken Dressing	Garage and Workshop	Office & Delivery Room			Total area incl. toilet washing facilities	Total Area Under Roof	Electric	Water		
Tanga													
Morobo							X						
Moshi							X						
Arusha							X						
Mwanza							X						
Bukoba							X						
Tabora							X						
Dodona							X						
Morogoro							X						
Iringa							X						
Mbeya							X						
Lindi							X						

Spare Parts for Cold Centre Equipment

The Contractor shall specify needed spare parts for three years of operation in two groups:

- 1) Spare parts to be placed in each centre, i.e. only most commonly used spares at low cost which can be used by unskilled personnel such as special fuses, V-belts, etc. plus spares for individual facilities like Goat slaughter house.
- 2) Spare parts to be located at Central Maintenance shop in Dar es Salaam. These should include:
 - 2 x 2 HP air-conditioners
 - 1 complete refrigerating unit (including insulated panel) for each of 6 units of the same type
 - 1 motor including starter for each of 6 motors of the same type or in case of semi-hermetic components, one motor compressor.
 - 1 control unit (Thermostat, exp. valves, etc.) for each of 10 of the same type.

Otherwise the Tenderer shall include in his list of spares, the spare parts he considers necessary to cater for the equipment for a minimum of three years.

Specification for Dar es Salaam Cold Storage - Refrigeration Equipment

	Price US. \$	Weight Kil.
Compressors and related controls and motors		
Condensers including pumps and related controls		
Evaporators including fans, controls, motors and ducts except tunnel freezer		
Tunnel freezer evaporator including blowers, controls, thermometers, motors and facilities for placing the goods in the freezer		
Possible water economisers (cooling tower) including fans, pumps, controls and motors or sea water pump and filter		
Other major components: receivers, intermediate coolers, air purgers, thermometers, and other controls		
Installation materials, piping, valves, brackets, pipe insulation, except electrical materials		
Installation materials, electrical, including control board, wiring, etc. for all equipment		
Other major components not included above, specify:		
Packing		
Total Price/Shipping Weight		
<u>Tenderers Specifications:</u>		

	Compressors-Condensers			Remarks
	Type 1	Type 2	Type 3	
<u>Compressors</u>				
No. of Units				
Brand				
Type				
Speed RPM				
HP Requirements				
kcal/hr. at -15°/+25°C.				
Motor HP/RPM				
Motor Brand				
Motor Type				
<u>Condensor</u>				
Brand				
Type				
Tube surface sq. m.				
Pump cu. m./min.				
Pump Motor HP				
Pipe Material				
<u>Water Economiser if applicable, Capacity at 25 C. and 90% R.H.</u>				
No. of Fans				
Fan HP/RPM				
Pump HP/RPM				

Auxiliary Equipment

	Price US. \$	Weight Kg.
Remote Thermometer for reading of temperatures in each room plus freezer and ambient, from engine room including room selector, wiring and feelers		
2 powered fork lift trucks for stacking and transport, suitable for the larger rooms, maximum stacking weight 500 Kg.		
2 hand operated lift trucks to serve small rooms and lift containers. Maximum weight 1500 Kg.		
6 two wheel hand trucks for crates and small containers		
2 portable double beam platform scales 0-150 Kg.		
1 double beam platform scale for containers and pallets, 1500 Kg.		
Necessary machine room and cold storage tools		
Necessary furniture for handling rooms		
Other Equipment - Specify:		
Packing		
Total Price/Shipping Weight		

Tenderers Specification:

Remote Thermometer: Brand, Type, No. of Feelers, maximum number of feelers that can be connected, sensitivity:

Power Trucks: Brand, type, HP, maximum load and lifting height:

Platform scale 1500 Kg.: Brand, type, capacity, sensitivity:

Specification of Tools to be located in engine room:

Dar es Salaam Cold Storage and Central Operation Facilities - Total

	Price US, \$	
	Building for Cold Storage	Additional for Office, Workshop & Chicken Dressing Buildings
<u>Building and Construction:</u>		
Provisional Costs:		
Surveys		
Site Preparation		
Foundation Costs		
<u>Power and Water Connection</u>		
Building Costs above foundation		
Cost of Insulating Cold Rooms		
Installations Costs: water, light, power, toilet and washing facilities, etc. including components and materials not specified under equipment		
Contractor's fees, specify:		
Other costs relating to buildings, specify:		
Building Prices including insulation and general installations		
<u>Total Price all buildings</u>		
<u>Equipment</u>		Shipping Weight Kg.
Refrigeration Equipment		
Auxiliary Equipment		
Workshop and Stores Equipment for Central Maintenance		
Chicken Dressing Facilities		
Office Equipment for Central Operation		
Spares for all equipment above for three years		
Labour and Supervision Cost to install and commission all equipment		
Other Costs to make the Dar es Salaam facilities complete, specify:		
Cost of Shipping to Dar es Salaam		
<u>Total Price/Shipping Weight for Dar es Salaam Cold Storage and Central Operations Facilities</u>		

Note: Specify Cost for Sea Water piping per metre distance between Cold Storage wall and water front (not to be included above):

Tenderers Specification

Room No.	Dimensions L x W x H Metres	Volume cu. m. Inside	Evaporator			Storage facilities sq. m. shelving, etc.
			Pan HP RPM	Surface Area sq. m.	Type Brand	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

Room numbers should refer to those given in purchaser's room specification.

Insulation Material: Type: _____ Specific Weight: _____

Heat transmission coefficient kcal/m²/hr. K(t₁-t₂): _____

Thicknesses to Outside: Frozen storage: _____ Chilled Storage: _____

Thicknesses Between Rooms: _____

Describe type of vapour seal: _____

Describe type of doors (materials, thicknesses, latches): _____

Describe safety system against trapping of personnel in cold rooms: _____

Describe defrost system: _____

The Tenderer is further requested on a separate sheet to describe: operation principles that are specific to the offered plant (not general refrigeration principles) and indicate what are the major dimensions, types and lengths of installation pipes and their insulation. Also the major electrical components and controls should be described with indication of types, brands and capacities, etc. Furthermore, a diagnostic lay-out and elevation drawing is required to show arrangement of cold rooms, machine room, offices, workshop and chicken dressing facilities.

Tenderers shall supply separate specification sheets including prices of major components for (1) Workshop and Stores Equipment for Central Maintenance, (2) Office Equipment for Central Operation, (3) Spares for 3 years of Cold Storage for three years of operation.

Description of Building

The Tenderer should give the same information as for cold centres.

Information about Operational Costs for Dar es Salaam Cold Storage

Please specify:

1. Water and power consumption per 24 hours for operating all the cold rooms under the following conditions: At average 25°C. outside temperature and 80% R.H., and -25°C. in frozen storage and +2°C. in chilled storages:

Water cu. m./24 hours: (in case of Water Economiser)

Total power kWhrs./24 hours:

2. Same for operating at a reduced capacity as follows:

2 x 700 cu. m. rooms at -25°C.

2 x 300 cu. m. rooms at -25°C.

2 x 300 cu. m. rooms at +2°C.

1 x 100 cu. m. room at +2°C.

Or at approximately 2/3 capacity:

Water cu. m./24 hours:

Power kWhrs./24 hours:

3. Same for operating tunnel freezer to freeze 7 ton of chickens or fish from +4°C. to -25°C.:

Water cu. m.:

Power kWhrs./24 hours:

4. Same for tunnel freezer to freeze 3½ tons of chickens or fish:

Water cu. m.:

Power kWhrs./24 hours:

5. Estimated requirements for number and type of:

a) Personnel to operate refrigeration equipment:

b) Supervisors and labour to handle a total of 100 tons of goods per day in and/or out of the cold storage:

Specifications - Transport System

	Per Unit or Set	
	Price US. \$	Weight Kz.
1. Trucks - Diesel Pay Load Capacity min. 9 metric tons with insulated body suitable for pulling 12 t. trailer		
a. Max. sized Insulated Bodies, Aluminium Clad inside and outside divided into three compartments, $\frac{1}{3}$ being for frozen food (in the middle) with overall heat transfer coef. of max. $K(t_1-t_2) = 10 \text{ kcal/m}^2/\text{hr./}^\circ\text{C}$ and $\frac{2}{3}$ being for chilled food with max. $K = 0.6 \text{ kcal/m}^2/\text{hr./}^\circ\text{C}$. Insulation preferably in situ freon blown polyurethane foam. Chilled compartment to have one large door in the back, and the front compartment one smaller door on the side adjacent to frozen food compartment. In partition walls between the compartments, access doors to the frozen food compartment, which when open will also allow this compartment to be used for chilled food. Chilled compartments to be cooled by ice bunkers to be installed in each compartment and to hold ice, for 15 hours for heat transmission (5°C . to 25°C .) and fan load. For frozen food room there should be arrangements for hanging eutectic hold-over inserts (plates) to maintain -12°C . at 25°C . ambient and for 15 hours. Roof to be covered with sun shield. Price to include installation		
b. Set of Eutectic Inserts and air roter driven fans for chill room and other accessories and installations		
2. Articulated Truck or semi-trailer, min. Pay Load 20 metric tons		
a. Max. sized insulated bodies for frozen food only, i.e. one compartment $K \text{ max.} = 0.35 \text{ kcal/m}^2/\text{hr./}^\circ\text{C}$. and one door only. Design otherwise as above but without arrangement for hold-over plates but for mechanical refrigerating unit		
b. Mechanical Refrigerating unit (F-12) for above 20 ton truck for Frozen food to be maintained at -20°C . including power transmission, controls and installation		
3. Trailer min. 12 ton Pay Load		
a. Body to be suitable for carrying 1 - $1\frac{1}{2}$ ton containers and crates for fruits and vegetables - body in steel sheet		
b. Simple hand operated hoist arrangement for hoisting up containers. Max. 1500 Kz.		
4. Van min. Pay Load $1\frac{1}{2}$ ton		
a. Insulated bodies for vans. Aluminium inside and outside max. $K=0.7 \text{ kcal/m}^2/\text{hr./}^\circ\text{C}$. Roof carrier for empty crates etc. Block ice compartment for ice to be distributed		
5. Station Wagon for Central Operation in size and Capacity like Peugeot 404		

Tenderers Specification for Transport Equipment

	20 ton Artic.	9 ton truck	12 ton trailer	1½ ton van
<u>Trucks and Vans</u>				
<u>Brand and Type</u>				
<u>HP Rating</u>				
<u>Kerb weight Chassis Cab Kg.</u>				
<u>Body and Pay Load Allowance Kg.</u>				
<u>Max. axle load front Kg.</u>				
<u>Max. axle load rear Kg.</u>				
<u>Fuel Tank Capacity litres</u>				
<u>Nett Pay Load Kg.</u>				
<u>Approx. inside dimensions LxWxH (Body)</u>				
<u>Approx. outside dimensions LxWxH (Body)</u>				
<u>Insulation Thickness and specific weight (K=0.60)</u>				
<u>Insulation Thickness (K = 0.35)</u>				
<u>Aluminium or Steel Sheet Thickness and Type: 1) Outside</u>				
2) Inside				
<u>Brand and Type of Eutectic Plates, or Refrigeration Unit</u>				
<u>No. of Eutectic Plate Inserts, or kcal at minus 30° C./plus 25° C. for Refrigeration unit</u>				
<u>Dimensions of Eutectic plate inserts LxHxW and weight Kg., or weight of Refrigeration Unit</u>				
<u>Max. amount of ice for bunker, or compressor HP</u>				
<u>Est. ice consumption/hr. at 25° C. ambient and +5° C. inside</u>				
<u>No. of air rotors (wind driven), Fan HP, for refrigeration unit</u>				
<u>Running Costs under full load conditions (apply in trailer column the additional costs for trailer)</u>				
<u>Type of Fuel</u>				
<u>Fuel consumption per km.</u>				
<u>Costs of tyres and oil per km.</u>				
<u>Other est. maintenance costs/km. (Utilize cost figures from tenderers country)</u>				
<u>Extra fuel consumption per hour for mechanical refrigeration unit</u>				

Special features for Transport Equipment:

Brand and Type of Station Wagon:

Containers	Insulation Thickness & K-value	Mat. Type and thickness inside, outside	Inside LxWxH cm.	Unit Price US. \$	Weight Kg. (Tare)
Insulated container with 3 cu. m. inside volume - approx. 1 ton pay load incl. space for ice bunker (with arrangement for easy refilling) for 24 hours transport $k_{max} = 0.6$ kcal/m ² /hr./°C. at 25° ambient. With bottom skids for handling with lift trucks, eye bolts for hoisting. Aluminium inside and outside					
Insulated container with 100 litre inside volume for iced fish, iced chicken, dairy products, etc. $k_{max} = 0.8$ kcal/m ² /hr./°C. Inside; polystyrene or Aluminium liner, outside: Aluminium, ABS, or Glassfibre plastic with corners for guided stacking. Convenient handles for two-men-handling. Top lid - $k_{max} = 1.0$ kcal/m ² /hr./°C.					
Uninsulated container with same outer dimensions as above. Aluminium. Handles as above. Top lid					
75 litre inside volume insulated container. Polystyrene liner inside, aluminium, ABS or Glassfibre plastic, outside. $k_{max} = 0.8$ kcal/m ² /hr./°C. Top lid $k = 1.0$. With handles and arrangement for hanging on bicycle. To be used also as ice box for home use					

Note:

Container dimensions to be suited for optimum utilization of trailer and truck space.

Smaller containers may also be used for shipment of frozen food when stored inside larger container with ice bunker.

Specify: Ice-consumption per hour for each type of insulated container at 25°C. ambient - placed in shadow - and assuming only heat transmission load.

Total Price for Transport Equipment

	Price US. \$	Shipping Weight Kg.	Shipping Volume cu. m.
6 Diesel trucks 9 tons with one insulated frozen food ($\frac{1}{4}$) and two chilled food ($\frac{1}{4}$) compartments complete with hold-over equipment			
6 Diesel Articulated trucks 20 tons insulated for frozen food only, complete with refrigerating unit			
6 trailers 12 ton with uninsulated box body and hoist			
14, $1\frac{1}{2}$ ton vans with insulated bodies			
4 station wagons			
Spares for transport system including one spare refrigerating unit for truck			
50 insulated containers with ice bunker 3 cu. m. inside volume			
300 insulated containers 200 litre			
300 uninsulated containers 250 - 300 litres			
2000 insulated containers 75 litres			
Total Cost Packing			
Total Cost Shipping to Dar es Salaam			
Total Price/Shipping Weight/Volume			

Final numbers of trucks and containers are to be decided by the successful Management Project Tenderer. The above figures are considered to be on the low level.

Specification of Spares for Transport System:

Fish Receiving Station

	Price US. \$	
	Standard Fish Receiving Station	Dar es Salaam Fish Receiving Station
Building Construction:		
Provisional Costs:		
Topographical Survey, Site preparation, Building foundation, Water and Power Connection		
Cost of Building (above foundation) including built in furniture, sorting tables, auction benches, etc.		
Installation Cost, power and water		
Contractor's fees, specify:		
Other Costs not included, specify:		
Total Building Cost		
		Shipping Weight Kg.
Equipment (from Unit Specifications)		
5 tons/24 hours ice plant incl. accessories and installation materials		
20 cu. m. chilled storage for ice complete		
60 cu. m. chilled storage for iced fish complete		
Handling Facilities		
One double beam platform scale 0-150 Kg.		
1 Hand operated lift truck for containers maximum 1500 Kg.		
10 table trolleys for fish boxes		
4 two-wheel hand trucks for fish boxes		
Packing for Handling Facilities		
Standard Workshop Facilities		
2 x standard office facilities		
Spares to be located at each Fish Receiving Station		
Cost of Shipping to Dar es Salaam		
Cost of Installation - Labour and Supervision		
Other Costs not included above to make station complete, specify:		
Total Price for Standard Fish Receiving Station		

Fish Receiving Station (Contd.)

	Price US. \$	
	Addition	Reduction
Additional or reduced Prices for:		
<u>Mikindani</u>		
<u>Tanga</u>		
<u>Bukoba</u>		
<u>Musoma</u>		
<u>Dar es Salaam</u>		
1) Extra for 10 tons/24 hours ice plant		
2) Extra for 30 cu. m. ice store		
3) Extra Building Costs		
Total Extra US. \$ and Shipping Weight for Dar es Salaam Fish Receiving Station		

Tenderers Specifications for Fish Receiving Facilities

The Tenderer is required to give the same information about Building and Construction as for Cold Centres and to supply one elevation and lay-out drawing for a Fish Receiving Station with indication of room sizes.

Spare for Fisheries

The Tenderers should list spare parts in the same way as for Cold Centres, though anticipating that Fisheries would have their own separate Central Storage of spares, independent of the N.C.C.O.

In the list of spares should be included the following minimum numbers of refrigeration units:

- .1 Spare refrigeration unit for 20 cu. m. chilled storage (including insulated panel)
- 1 Spare refrigeration unit for 60 cu. m. chilled storage (including insulated panel)
- 2 Spare refrigeration units with Diesel engines for Village Fishing Units (including insulated panel).

Lists of spares to be presented as follows:

- a) Spares to be located at Fish Receiving Stations.
- b) Spares to be centrally located in Dar es Salaam including prices for major components and total price.

INFORMATION ABOUT TENDERERS BACKGROUND - In quoting for the Facilities of N.C.C.O.

If the tenderer is a consortium, the following information must be presented about all parties in the consortium. Likewise, if the tenderer is employing major sub-contractors such as civil engineers, building contractor, major components contractor, etc. the same information must be presented for each sub-contractor.

1. **Nature of Tenderers Business**

Major occupation, types of business, volume of business, financial background, etc.

2. In what aspects of tenderers previous or present activities are there similarities to establishing the facilities of N.C.C.O. and Fisheries?
3. What are the major areas of activity or production for which the tenderer will have to sub-contract or use sub-suppliers? Please indicate name, address and area of activity for such major sub-contractors or suppliers.
4. Please list a number of recent projects you have completed, that are similar in nature to N.C.C.O.'s facilities, and if NAFCO may address itself to the Purchaser to obtain information about his satisfaction, kindly indicate name and address.

Value and scope of each project should be indicated.

FORM OF TENDER

For Turn-Key Project for Facilities for A National Cold Chain
Operation and for Fish Receiving

To: The General Manager
National Agricultural and Food Corporation
P. O. Box 903
DAF ES SALAAM.

Having examined and completed where necessary the instructions to Tenderers, specifications, schedules, descriptions and drawings, concerning the complete establishment of all facilities in the above turn-key project, from initial surveys and design to commissioning, we, the undersigned, are willing to execute the complete turn-key project referred to, all in accordance with the said instructions, specifications, schedules, descriptions and drawings and complete the job within the periods and for the prices set out in this form of Tender.

Signature

In the Capacity of

duly authorised to sign tenders for and on behalf of:

.....

Address:

.....

.....

.....

Telephone:

Date:

Your Reference:

Schedule of Prices

	Buildings US. \$	Equipment US. \$
<u>National Cold Chain Operation - Facilities</u>		
Tanga Cold Centre		
Membo Cold Centre		
Moshi Cold Centre		
Arusha Cold Centre		
Mwanza Cold Centre		
Bukoba Cold Centre		
Tabora Cold Centre		
Dedema Cold Centre		
Morogoro Cold Centre		
Iringa Cold Centre		
Mbeya Cold Centre		
Lindi Cold Centre		
Total Price Cold Centres		
Dar es Salaam Cold Storage and Central Operational Facilities		
Spare Parts for Cold Centres to be placed in Dar es Salaam		
Transport Equipment		
Total Buildings and Equipment		
GRAND TOTAL ALL N.C.C.O. FACILITIES US. \$		
<u>Fisheries Facilities</u>		
Fish Receiving Station Dar es Salaam		
Fish Receiving Station Tanga		
Fish Receiving Station Mikindani		
Fish Receiving Station Bukoba		
Fish Receiving Station Musoma		
7 Village Fishing Unit storages at coast plus 14 at lakes and dams in all 21 with 1 ton/24 hours chilling capacity delivered Dar es Salaam		
Spare units and parts for Fisheries to be located in Dar es Salaam		
Total Buildings and Equipment		
GRAND TOTAL FISHERIES FACILITIES US. \$		

Total Savings if 10 Village Fishing Unit Storages are delivered with
500 kg./24 hours chilling capacity only:

Alternative

If Fisheries facilities and NCCO's facilities are executed together by the same contractor as programmed, the Tenderer's price will be as follows:

Total NCCO's Facilities: US. \$

Total Fisheries Facilities: US. \$

Total all Facilities:

Discount in executing all facilities as suggested by the same contractor %

Nett price complete turn-key Project:

US. \$

Note 1: All prices to be fully inclusive of all work needed to complete the turn-key project according to requirements and specifications spelt out in the enquiry document with the exception that all costs specified as provisional shall be subject to tender by sub-contractors.

Note 2: All prices shall include for completion of the project within the periods stated below.

Note 3: The total prices given above for Fisheries facilities and NCCO's facilities respectively should each be valid even if the Tenderer may only be offered to execute one of the groups of facilities, i.e. in case, for instance, that Fisheries facilities should be implemented at a later date.

Note 4: Any changes in the project before signing of contract that might lead to addition and/or exclusion of certain units will have as a consequence, price increases or reductions as specified in the detailed specifications as long as the changes do not amount to more than 10% of the total project value. If the two parts of the turn-key project are implemented together such increases or deductions will be reduced by the discount given in implementing the two projects together.

Programme

The Tenderer is required to fill in the number of months from the date of contract, in which the tenderer will undertake to reach the milestones indicated below. Priorities and preferable completion times for the different parts of the project, as desired by the Purchaser, are given in the Enquiry Document

	Periods in months from date of contract to commissioning of facility
Dar es Salaam Central Operations Facilities	
Dar es Salaam Cold Storage	
Dar es Salaam Fish Receiving Station	
Morogoro Cold Centre	
Ibeya Cold Centre	
Iringa Cold Centre	
Arusha Cold Centre	
Moshi Cold Centre	
Monbo Cold Centre	
Dodoma Cold Centre	
Tabora Cold Centre	
Mwanza Cold Centre	
Bukoba Fish Receiving Station	
Bukoba Cold Centre	
Tanga Fish Receiving Station	
Tanga Cold Centre	
Lindi Cold Centre	
Mikindani Fish Receiving Station	
Masoma Fish Receiving Station	
Delivery of station wagons	
Delivery of 2 Zambia trucks - 20 tons each	
Delivery of 2 Truck-Trailers (9+12) tons	
Delivery of 25% of containers	
Rest delivery of transport equipment	
Delivery of Mobile Slaughter Unit	

SUMMARY OF INFORMATION REQUESTED BY THE PURCHASER FROM THE TENDERERS

1. All attached specification sheets to be duly filled in.
2. Information about Tenderers background.
3. Information about possibilities for financial and technical assistance from your Government possibly including letter of intent.
4. Specification of Guarantees for Equipment.
5. Building and Construction descriptions.
6. Specification of spare parts:
 - a) To be located in Cold Centres and Fish Receiving Stations
 - b) To be located in Dar es Salaam for:
 - (i) Cold Centres
 - (ii) Fish Receiving Stations
 - (iii) Dar es Salaam Cold Storage
7. Elevation and lay-out drawings for:
 - a) Dodoma Facilities
 - b) A Fish Receiving Station
 - c) Dar es Salaam Cold Storage and Central Operations Facilities
8. Line sketches for lay-outs of each type of Cold Centre
9. Specification of tools and equipment for:
 - a) Cold Centre and Fish Receiving Station Workshops
 - b) Central Operation Facilities Workshop and Offices
 - c) Canteen Dar es Salaam
10. Description of operating principle for Dar es Salaam Cold Storage.
11. Proposal for Contract
12. Proposal for Local Manufacturing Project and Training of Technicians.

MANAGEMENT PROJECT

For

Initiating Operation and Training of Staff

For A National Cold Chain Operation

MANAGEMENT PROJECT FOR NATIONAL COLD CHAIN OPERATION

SCOPE OF BUSINESS TO BE OPERATED

The N.C.C.O. will, as previously mentioned, be a subsidiary company of NAFCO and will be in charge of operating all the facilities mentioned in the turn-key project, except for the Fish Receiving Stations, which will be operated independently by the Ministry of Agriculture, Food and Co-operatives (Natural Resources and Utilization Division) which is, however, also the parent Ministry of NAFCO.

The other major part of the business will be the wholesale operations: Purchasing and Distribution of perishables in the Cold Centre regions for sale to other Cold Centre regions and to Dar es Salaam.

For Dar es Salaam distribution it is suggested that an existing private company in co-operation with the National Cold Chain Operation might take care of the distribution in the city with its existing Cold Storage facilities. Thus NCCO will deliver to Dar es Salaam according to the demand of this company, which tentatively is called Dar es Salaam Cold Storage Distributors (DCD).

Fruits and Vegetables may possibly also be wholesale distributed in Dar es Salaam by DCD or sold wholesale on the auction floor of the Fruit and Vegetable market.

All beef for Dar es Salaam may in the future be slaughtered and distributed by Tanganyika Packers Ltd., Dar es Salaam. From TPL meat may also go via NCCO to places in under-supply like Lindi (Hitware Region) and to Zambia. Otherwise only small amounts of improved beef will be distributed between the regions as most locally consumed beef will be slaughtered in the location of consumption and not in any way be refrigerated. Presently there is only insignificant inter-regional trade in beef.

As to importation of perishables, this is presently in the hands of the State Trading Corporation which in the future may hand over this business to NCCO or at least utilize NCCO's facilities for storage and transport.

The export business in perishables may be divided between different organisations: NCCO, DCD and Tanganyika Packers Ltd. NCCO may first of all handle the export to Zambia, from the Southern regions.

Volume of Inter-Regional Business and Zambia Export

In the Table overleaf it is attempted to set out the present movement of perishables between the regions and to show some of the potentials. Though intensive investigations have been undertaken to establish future potentials it has not always been possible to establish reliable figures. The use of more general indications has therefore been necessary in many cases and those are only presented to show the low volume of present inter-regional distribution and some already more or less evident potentials, when the Cold Chain comes into operation.

However, the real increase in production of Fish and Farm produce and increase in inter-regional distribution that can be expected as a result of the promotional effect of the Cold Chain Operation cannot be estimated, i.e. how much more will farmers and fishermen produce when they get market outlets.

PRESENT AND POTENTIAL MOVEMENTS OF PERISHABLES BETWEEN REGIONS AND TO ZAMBIA

Cold Centre Location	Present Inter-Regional Import and Export (Perishables)					Evident Potentials for Inter-Regional Import and Export 1972-1974					Remarks
	Poultry, Pork, Goat E/I	Fish (Dried) E/I	Dairy Products E/I	Fruits & Vegetables E/I	Beef E/I	Poultry, Pork, Goat E/I	Fish (Iced) E/I	Dairy Products E/I	Fruits & Vegetables E/I	Consumption	
1. Dar es Salaam	Medium I	Large I	1800 I	Consumption 18,500	Large E 1000 I	V. Large I	V. Large I	2-3000 I	Consumption 30,000	Part of fruit and vegetable from the region itself	
2. Tanga	Small E	Small E	Small I	Medium E	-	Small E	Medium E	Small I	Medium E	Citrus and Mangoes	
3. Monbo	-	-	-	Small E	-	Small I	Small I	-	1500 E	All fruits and vegetables except citrus	
4. Mushi	100 E	Large E	1000 E	Large E	Medium I	200 E	V. Large E	2-3000 E	V. Large E Medium I	Banana, Kenya (export)	
5. Arusha	-	Small I	1000 E	Small E Small I	Medium I	Medium I	Medium I	-	625 E Large I	Export Onions	
6. Mwanza	-	600-800E	-	Medium E V. Large I	Small I	Small E	V. Large E	-	Medium E V. Large I	E-Citrus, I-Mukoba banana account for 500 t.	
7. Bukoba	-	-	-	V. Large E	-	Small I	Large E	-	1200 I V. Large E	Export Bananas	
8. Tabora	-	Small I	-	Medium I	-	Small I 500 E	Medium I	-	Large I Medium E	E - Mangoes, Pork	
9. Dodoma	-	Small I	-	Medium I Small E	1000 E	Small I 250 E	Medium I	-	Large I Medium E	E - Goats and Tomatoes Beef Kongwa	
10. Morogoro	-	Large I	-	Large E	-	Small I	Small E	-	2500 E	E-Fruit & Vegetable to DSM, from co-op, only	
11. Iringa	-	Small I	-	Small I Medium E	Small I	Small I	Medium I	-	Small I V. Large E	E-Zambia and DSM. Vegetables only	
12. Mbeya	-	Medium E	-	Large E	600 E	100 E	Large E	-	3000 E	Mostly exports to Zambia	
13. Lindi	-	Medium I	-	Large E	Large I	Medium I	Small E	Medium I	Large E V. Large I	E - oranges, limes	

E = Export. I = Import. All figures are tons/year. Small 10-50 tons/year. Medium 50-250 tons/year. Large 250-1000 tons/year. Very large 1000-2000 tons/year. (V. Large). In spaces with no indications the quantities are insignificant.

For the major wholesale market (Dar es Salaam) the supply of fruits and vegetables including starchy crops (cassava, yams, etc.) corresponds to 200 grams per person per day, with an average income above Shs. 5000/- per year for the town population (ten times higher than national average income). The reason for this low consumption is under-supply and therefore comparatively high prices.

It is expected that Fruits and Vegetables supply to Dar es Salaam will increase by 10 - 15 percent per year (including population growth of 7%) and the major part of this increase would have to come from other regions.

Fruits and Vegetables movement will primarily be from Mombasa and Morogoro to Dar es Salaam and up-country, from Mbeya to Zambia and from Iringa to Zambia, Dar es Salaam and up-country, though specific products may come from up-country places such as cooking bananas from Bukoba, onions and tomatoes from Arusha-Moshi, Tomatoes from Dodoma, and Mangoes from Tabora.

Also Fish prices in Dar es Salaam indicate severe under-supply. Prices are 2 - 3 times higher than other places in over-supply of Fish.

Though it therefore is expected that Dar es Salaam should be able to take very large quantities of Fish, the surplus generated when all the Fish Receiving facilities (and fishing gear and better boats) are implemented should allow for exports of iced Fish, first of all to Zambia, who presently import large amounts of dried fish from all over Tanzania. Exports from Bukoba and Musoma to Uganda and Kenya may also develop from dried fish to iced fish, utilizing the steamer service on Lake Victoria. All the ice-plants and fishing village cold stores are however first of all suggested to improve catch and distribution in the region itself.

Poultry, Pork, Goat and Sheep are presently only processed on a very small scale except for chickens in Dar es Salaam and Moshi. Though the chicken dressing facilities first of all are aimed at increasing local consumption some "export" will naturally follow. It is expected that production of Pork (Tabora), Goat (Dodoma) and Sheep (Mbeya) may start up in other places than those already planned.

Game Meat has a potential of several thousands of tons per year in Tanzania. The experimental mobile slaughter unit should therefore easily produce more than 500 tons/year and if successful lead to more units being introduced.

As to Dairy Products there is presently one large Dairy in Dar es Salaam and one in Arusha. Only Arusha is having a steadily growing surplus which to some extent is generated in Moshi, therefore milk cooling on a larger scale is suggested here to take the milk to Dar es Salaam or Arusha. All the other small milk plants suggested for the Cold Centres will only cater for local consumption. Larger milk plants are planned in Mwanza and Musoma. These two places may possibly later have surplus also.

Volume of Foreign Import and Export

Export

Overseas export will, as mentioned, to start with be taken care of by Dar es Salaam Cold Storage Distributors and/or by Tanganyika Packers Ltd., who may only use the Dar es Salaam Coldstorage to a limited extent. Tanganyika Packers are planning themselves to build larger freezing and storage facilities for this purpose.

Mwananchi Ocean Products, a NAFCO subsidiary will utilise the Cold Storage for freezing and storage of prawn fish for export.

Volume is 1200 tons/year.

Small exports may also at an early stage be undertaken from the new Kilimanjaro International Airport to be served by Arusha and Moshi Cold Centres.

Import

The imports of perishables presently confined to the State Trading Corporation are expected to reach the following amounts per year in 1972.

Frozen Foods:	From Kenya and Uganda	From Overseas
	250 tons/year	400 tons/year
Chilled Products:		
Dairy Products, Fruits, etc.	1000 tons/year	400 tons/year

Imports are not expected to rise above these figures. They may even fall due to increased and improved production in the country of chickens, pork, dairy products and fruits and vegetables. Imports from East Africa are primarily from Kenya from where NCCO may undertake transport itself and possibly thereby also export bananas, tomatoes and onion out of Moshi, Arusha to Nairobi.

Transit Trade to Zambia

Zambia expects to import via Dar es Salaam in 1971 - 1972 the following quantities per year.

Chilled Produce

1200 tons cheese

1000 tons fresh fruit

Total some 2200 tons/year of chilled produce.

Frozen Produce

600 tons butter

800 tons frozen fish

500 tons lambs and offal

500 tons frozen vegetables

2400 tons of beef and other meats frozen

Total 4800 tons per year of frozen food.

Imports from Zambia of perishables is expected to be negligible.

Initial Overall Potential for Distribution

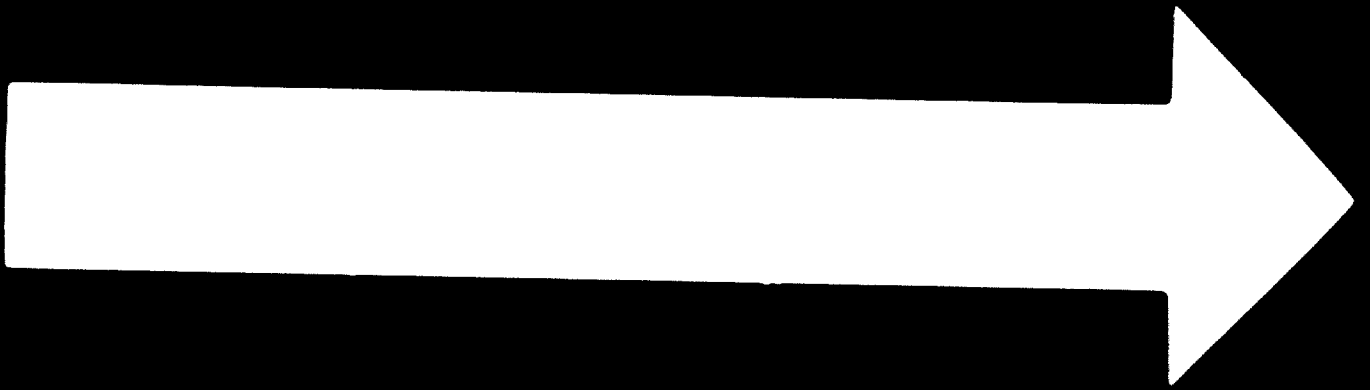
A cautious estimate based on the above figures and the information in the chart indicates that there should initially be a potential for distribution of refrigerated perishables from one region to another or to Zambia of the following magnitude:

	<u>Tons/year</u>
Poultry, Pork, Goat, Sheep and Game Meat	1-2000
Beef	1-2000
Iced Fish	3-4000
Milk	2-3000
Imports from abroad	2000
Exports to Zambia	1000
Transit Trade to Zambia	<u>6-7000</u>
Refrigerated Perishables	<u>16-21,000 tons/year</u>

For Fruits and Vegetables the potential could easily be including a 3000 tons export to Zambia.

10-15,000 tons/year

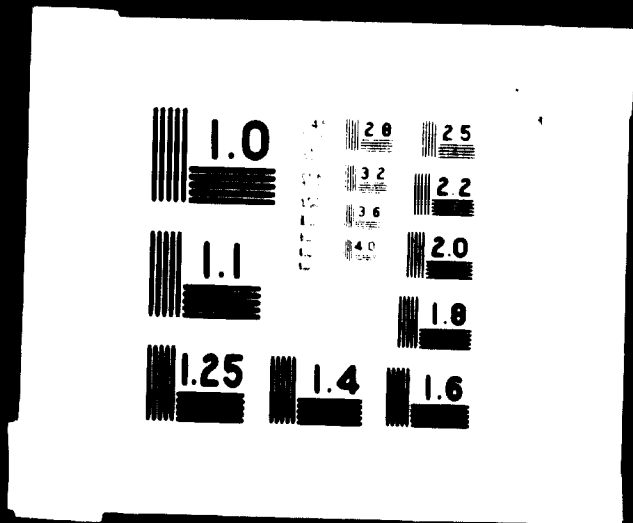
Thus a total distribution potential of 25-35,000 tons/year should at least be available during the first years of operation.



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PROPOSED MANAGEMENT OF COLD CHAIN OPERATION

The Cold Chain Operation requires special know-how both in Marketing, Stores and Transport operation, Mechanical Equipment and not the least, in Food Hygiene and cold preservation.

The problems of food hygiene and cold preservation are not only problems of cleanliness, though very important, but also knowledge about effects on different foods, of time, temperature, packing and other storage conditions (air circulation, mixed storage, etc.) as to food quality both from a health point of view as well as to taste and smell.

Many frozen and chilled foods have had bad acceptance by the public, because the quality of the foods has suffered due to lack of such knowledge. In particular in the introduction phase of these products, where the users have a skeptic attitude, it is most important to establish severe requirements for cold storage operation and perishable food handling.

From the attached proposal to an organization chart it will be seen that an operations inspector has been included as a high level staff member. He should be a food technologist or veterinarian with cold storage experience.

In the "line" functions, marketing and distribution, has been separated to put emphasis on:

1. Sales and purchase promotion to create interest both with users and producers for use of the cold chain.
2. Storage and transport operation that can meet the requirements laid down by the operations inspector, while satisfying marketing needs.

The cold centres are suggested to be staffed by supervisors who must, besides being commercially trained, have special training in hygiene, coldstorage operation and sales and purchasing of perishables, as they will be the significant outposts that can promote the business both ways. The staff of the centres should be small, only further including a driver-salesman, a clerk and two labourers for handling and cleaning. When chicken dressing or grading should be undertaken, specially trained, temporarily employed labour, should be called in. For milk plants, specially trained technicians should be employed and naturally trained butchers and skimmers for slaughter units.

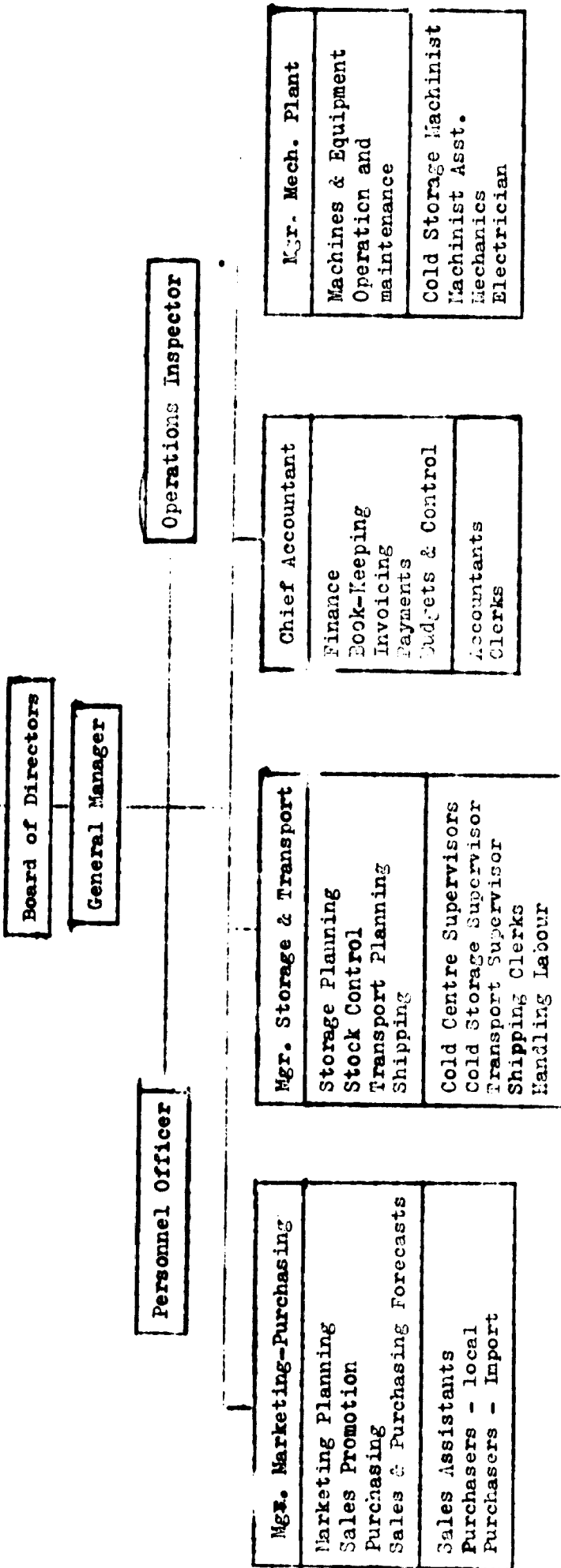
Retail Control

Though it is not the idea that retailing of perishables should be in the hands of the cold chain, it must to some extent direct and control retailing, as this is normally the weakest link in the whole chain. It is comparatively easy to educate the few people needed in wholesale storage and transport, but when it comes to retailers, the number of people involved becomes much larger, of mixed background education, and handling refrigerated perishables is usually a minor part of their job.

The cold chain operation must set up requirements prior to allowing a retailer to handle perishables, e.g. that he has the necessary cooling facilities, a sufficient number of customers to ensure a minimum turnover that his products do not get too old, etc. Also the retailers must be instructed in handling perishables and be controlled. The most suitable person to do this is the driver-salesman, who should be trained and selected accordingly and who can perform his control while selling and delivering.

NATIONAL COLD CHAIN OPERATION

EAFCO



MANAGEMENT PROJECT REQUIREMENTS

The Tenderers may suggest either of the following types of management, to work for the Board of Directors of NAFCO.

1. Managerial assistance in supplying experienced key-personnel and training of local staff.
2. A management proposal where the Contractor takes the responsibility for managing the operation and training under the directorship of NAFCO. This type would be preferred.

In both cases the proposals should preferably be combined with a technical assistance programme from the respective country.

The foreign staff suggested for the operation is as follows:

1. General Manager (4 years)
With experience in operating a farmer oriented wholesale organization including coldstorage and transport operation.
2. A Marketing Manager (3 years)
With experience in wholesale and purchasing of perishables including export.
3. Manager for storage and transport (2 years)
With experience in coldstorage and cold transport operation.
4. Chief Accountant with experience (2 years) from Food Processing industry and food wholesale.
5. Operations Inspector (2 years) - Food Technologist or Veterinarian
With experience in coldstorage operation and food hygiene applications.
6. Manager for Mechanical Plant (2 years)
With experience in operating and maintaining refrigeration machinery using ammonia as well as freons.
7. Marketing Assistant (2 years) experienced in planning wholesale marketing of perishables.
8. Coldstorage Machinist (2 years) experienced in operating and maintaining industrial refrigeration plants.
9. Chief Refrigeration Service Technician (2 years).
10. Chief Auto mechanic (2 years).
11. Master Butcher (2 years).
12. Milk Plant Technician (2 years)

All foreign personnel should have the appropriate education and preferably 10 years experience in their specific fields and besides have the qualities for training personnel.

An extensive training programme prior to start of operations should be established for counterpart staff. The major topics should be:

Food hygiene.

Behaviour and care of refrigerated foods.

Sales and purchase, grading and packing of perishables.

Operation of Cold Centres including management and technical operation.

The total counterpart personnel needed to run the operation should be specified in numbers and qualifications. It should be taken into account that the local staff should take over the operation after the above specified years of the foreign staff.

MANAGEMENT PROJECT SPECIFICATIONS

Expatriate Personnel

Salaries should include only 10% to pay for cost of housing; though salaries may not be tax free, the salaries indicated shall anticipate reimbursement of tax	Total Salary for specified years	Total Cost of travel and other allowances
General Manager 4 years		
Marketing Manager 3 years		
Storage & Transport Manager 3 years		
Chief Accountant 2 years		
Operations Inspector 2 years		
Manager, Mechanical Plant 2 years		
Marketing Assistant 2 years		
Cold Storage Machinist 2 years		
Chief Service Technician 2 years		
Chief Automechanic 2 years		
Master Butcher 2 years		
Milk Plant Technician 2 years		
Total Costs		

Management Fee

Tenderers proposal to cover overhead preferably connected with incentive scheme based on profitability of the whole operation, not taking into account the operation of Dar es Salaam Cold Storage Distributors.

Specification of Counterpart Personnel

	Total No.	Minimum Required Education
Assistant General Manager		
Marketing Assistants		
Accountants		
Typists		
Clerks		
Assistant Inspector		
Assistant Manager, Mechanical Plant		
Machinists		
Mechanics		
Electricians		
Service Technicians		
Assistant Storage and Transport Manager		
Storage and Transport Assistants		
Cold Centre Supervisors		
Cold Centre Driver/Salesman		
Cold Centre Clerks		
Cold Centre Labour		
Dar es Salaam Cold Storage Labour		
Truck Drivers		
Milk Technicians		
Butchers		
Other Personnel, specify:		
Total Number		

Personnel from Aid Programme

Specification of Personnel that might possibly be offered as free technical assistance to the Tanzanian Government, if possible attach copy of letter of intent from your Government.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

It is visualized that people from the Tenderers own organization may be given leave to work for an aid programme which in turn will supply the assistance to NAFCO.

Tenderer's Suggestions for Rates to be Applied to Products or Services To be Handled by the National Cold Chain Operation

Product and/or Service	Rate Units	Present Approximate rates in Tenderers Country	Rates Suggested for NCCO Tanzania
<u>Transport Rates: (long haul) Fruits and vegetables uninsulated truck</u>	US.¢ per Ton Km.		
Fruits and Vegetables insulated with ice bunker	US.¢ per Ton Km.		
Iced Fish - Insulated with ice bunker	US.¢ per Ton Km.		
Other perishables in insulated truck with ice bunker	US.¢ per Ton Km.		
Frozen Food in insulated truck with Eutectic plates	US.¢ per Ton Km.		
Frozen Food in Mechanical Refrigerated Truck	US.¢ per Ton Km.		
Local transport (Radius 10 mi.) Insulated	US.¢ per Ton Km.		
<u>Wholesale Charges:</u>			
Fruits and Vegetables			
Iced Fish			
Chilled Meat, Dairy Products			
Frozen Meat, unpacked			
Frozen packed products			
<u>Refrigeration and Storage Rates:</u>			
Storage of frozen food	US.¢ per Ton Day		
Storage of frozen food	US.¢ per Ton Month		
Storage of Chilled Products	US.¢ per Ton Day		
Storage of Fruits and Vegetables - Ventilated only	US.¢ per Ton Day		
Freezing of Meat Carcasses (-25°C.)	US.¢ per Ton		
Freezing of whole fish, Chicken, etc.	US.¢ per Ton		
Chilling of Meat, Fish, etc.	US.¢ per Ton		
Chilling of Milk from 30° to 4°C.	US.¢ per 1000 litres		
Wholesale price for ice-blocks 25 Kg. blocks	US.¢ per Ton		
<u>Processing:</u>			
Chilling, pasteurizing, packing ½ litre milk packs	US.¢ per 1000 Packs		
Slaughtering, dressing and icing of chicken (3 lb.)	US.¢ per 1000 Chickens		

Note:

The rates suggested for N.C.C.O., it is realized, can only be tentative, based on evaluation of economics of scale, difference in labour costs, etc. The Tenderer may qualify the basis for his evaluations.

MANAGEMENT PROGRAMME

The management operation and initial training programme is shown on Chart page 97.

It is anticipated that the expatriate General Manager should start his assignment immediately after signing of contract to be able to follow the project from its beginning and to recruit the rest of the personnel both expatriates and counterparts as early as possible.

While the management will be following and influencing the establishment of facilities and training of counterparts, they should go into detailed planning of the whole operation and into promotion activities both as to encourage production for inter-regional distribution and export as well as to sales of produce. The counterparts while being formally trained should take part in these activities and acquaint themselves with the potentials in the different parts of the country.

It is also visualized that the management will take an active part in initiating the proposed Mechanical Food Engineering Complex proposed to be the major local supplier of equipment to the Cold Chain Operation.

Tenderers' Comments to Management Programme or Alternative Suggestions:

MANAGEMENT PROGRAMME

	1 - YEAR	2 - YEAR	3 - YEAR	4 - YEAR
<u>Establishment of Facilities & Services</u>				
<u>Dar es Salaam Cold Storage</u>				
<u>Morogoro, Iringa, Mbeya</u>				
<u>Mombo, Moshi, Arusha</u>				
<u>Eukoba, Dodoma, Tabora, Mwanza</u>				
<u>Tanga, Lindi, Mikindani, Musoma</u>				
<u>Trial Operation, Iwanza</u>				
<u>Trial Operation, South - Zambia</u>				
<u>Trial Operation, North</u>				
<u>Start full scale operation on finished routes</u>				
<u>Expatriate Staff Service</u>				
<u>General Manager</u>				
<u>Marketing & Transport Manager</u>				
<u>Operations Inspector, Accountant, Manager, Mechanical Plant</u>				
<u>Marketing Assistant, Technician, Service Technician, and Mechanic</u>				
<u>Master Butcher and Milk Technician</u>				
<u>Training Counterpart Marketing and Cold Storage Personnel</u>				
<u>Training, Counterpart technical personnel</u>				
<u>Market Survey, and Operation Planning and Promotion</u>				

INFORMATION ABOUT TENDERERS BACKGROUND In Offering a Management Project

1. Nature of Tenderers Business

When started, types of business, volume, financial background, etc.

2. In what aspects of Tenderers present or previous activities are there comparison to the activities of the National Cold Chain Operation.
3. To what extent will the Tenderer be able to supply management people already trained in his own organization.
4. Does the Tenderer have any export organization that possibly could be interested in undertaking food cropping, processing and export marketing of Tanzanian perishables such as tropical fruits and vegetables, fish fillet freezing (lake fish), game meat canning and marketing, etc.
5. In what ways will the Tenderers organization otherwise be able to support the management team proposed for the Cold Chain Operation.
6. Other major points which the Tenderer feels are of significance.

FORM OF TENDER

For A Management Project for A National Cold Chain Operation.

To: The General Manager
National Agricultural and Food Corporation
P. O. Box 903
DAR ES SALAM.
Tanzania
East Africa.

Having examined and completed where necessary the instructions to Tenderers, specifications, schedules and descriptions concerning the above project for training and management of the National Cold Chain Operation, we the undersigned are willing to execute the complete project referred to, all in accordance with the said instructions, specifications, schedules and descriptions and within the periods and for the prices set out in this form of Tender.

Signature

In the capacity of

duly authorized to sign tenders for and on behalf of:

.....

Address:

.....

.....

.....

Telephone:

Date:

Your Reference:

Schedule of Prices

Supply of Expatriate Managers and Technicians according to specifications:

Total Salary for specified periods:

Total Cost of Travel and other Allowances:

Total Direct Costs

=====

Rates for Management Fees

- Notes:
1. All prices to be fully inclusive of all Expatriate Manpower costs needed to complete the requirements and specifications spelt out in the enquiry document.
 2. Supply of Expatriate personnel through free technical aid will have as consequence, that deductions are made in the above direct costs, in accordance with the specified costs for the personnel in question.

TENTATIVE PROPOSAL

for

**Local Manufacture and Training of Technicians in Building Up
The Facilities of H.C.C.O. and Fisheries Turn-Key Project**

TENTATIVE PROPOSAL FOR LOCAL MANUFACTURE

INTRODUCTION

It seems natural to utilize the occasion of the procurement of a large amount of uniform equipment, to create a new engineering and manufacturing industry in Tanzania.

The Tenderers on the turn-key project, possibly in co-operation with the Tenderers on the management project are therefore invited to put forward proposals for assisting the Tanzanian Government in establishing such an industry that could participate in the turn-key project and be of assistance to the management project.

Though the tenderers normally will be interested in delivering everything themselves, it is hoped that they will see it to be in their own interest to put forward such a proposal, as it could give the following advantages:

- a) Greater chance for being the successful tenderer
- b) The possibility for a future stable market for tenderers products.

A general proposal describing some of the possibilities behind this idea has been worked out by the Industrial Studies and Development Centre in Dar es Salaam and appears on the following pages

INDUSTRIAL STUDIES AND DEVELOPMENT CENTRE

A MECHANICAL FOOD ENGINEERING AND MANUFACTURING COMPANY FOR TANZANIA

INTRODUCTION

In Tanzania's Second Five Year Plan 1970-1974, it is suggested that 50 projects in Food and Beverages manufacturing could be implemented at a total investment of 250 million shillings. Though it is not visualized that this investment will fully materialize, import of equipment and installation know-how for implemented industries could easily run up to 100 million shillings.

A significant part of this import could be substituted by local fabrication and installation know-how. These industries employ a lot of comparatively simple hardware and sheet metal work.

The same goes for Refrigeration and Air Conditioning needs. With the planned Fish Receiving Stations and establishment of a Cold Chain Operation in mind these undertakings could be the basis for creating a local Mechanical Food Engineering Industry.

The State Trading Corporation has already a nucleus of a refrigeration engineering company which could form the basis for a larger company.

Food manufacturing plants that are planned for Tanzania and where a Tanzanian Engineering Company could possibly participate in deliveries would be:

Dairies, Breweries, Abattoirs, Ice-Cream Plants, Margarine and Ghee Plants, Canning Plants, Fish Flour and Concentrate, possibly also Beverage Plants.

Scope for Engineering and Manufacturing Company

The company is suggested to have the following activities:

- Import of Equipment.
- Plant Engineering and Design - Product Design.
- Fabrication of Sheet Metal Products and Simple Hardware.
- Service, installation and repair - spares stocking.
- Sales to the Tanzanian Market.

Import of Equipment

For many reasons it is evident that Tanzania will benefit very much from standardising equipment for these industries and for Refrigeration and Air Conditioning by limiting importation to a very few brands and types of equipment. Savings will be obtained through smaller stocks of standard equipment and spare parts, easier training of technicians, more efficient service and hopefully more assistance and service from manufacturers of selected equipment as the market would be more interesting.

The proposed company should thus by having some of the import rights for the selected equipment be able to get assistance to its start from foreign suppliers, who would see it to be in their interest to:

- (a) Supply engineering know-how along with equipment deliveries.

- (b) Send out refrigeration technicians for work and training in this country.
- (c) Undertake training of Tanzanians in their factories.

By selecting companies from possible aid giving countries, further expertise and training may be supplied as aid.

Plant Engineering and Design

The company should, to start with, develop know-how in Refrigerating and Air-Conditioning Engineering. The nucleus of STC comprising one expatriate Engineer, one local engineer, 3 trained service technicians and 2 under training plus 6 skilled craftsmen should form the basis. But expansion would be needed to meet product design requirements and the expanding market on refrigeration plants.

It is suggested that four extra Tanzanian engineers should be employed and two sent abroad to prospective suppliers of refrigeration and food engineering equipment to work as trainees for at least a year.

A couple of polytechnic graduates possibly with some practical experience in air-conditioning and refrigeration from India or Pakistan could be hired as intermediate technicians and some Tanzanian High School leavers with a technical college certificate should be sent to India or Pakistan for a two year study of refrigeration and air-conditioning.

For formal training of service men, it may be possible through aid programmes to get assistance for training at the Trade Centre or Technical College.

Though the emphasis is placed on refrigeration and air-conditioning, food engineering should by and by be developed to enable designing of simple plants like small abattoirs, small canning plants, milk plants, etc.

Fabrication of Sheet Metal Products and Simple Hardware

Anticipating the plants for Fisheries and a Cold Chain Operation will materialize, the products suitable for local fabrication would be walk-in coolers, uninsulated and insulated shipping containers, ice-boxes for home use, simple display cases for retailing and custom made products like tanks, pipework, air-conditioning duct-work, etc.

For Food Manufacturing plants in general a lot of items could be produced like piping and sheet metal parts for Band and Roller conveyor structures, meat hangers and rails, mixing tanks, silos, etc.

Product Designs

It is suggested that product design and know-how, in the beginning, should be based on licence from the foreign suppliers for products like walk-in coolers and display cases. In many cases foreign suppliers should be willing to supply part designs free of charge if they can deliver some essential parts, e.g. tank and cans for block-ice plants. By the time the trainees have finished their education abroad they should start design work.

Fabrication Facilities

Though sheet metal work should be the basis of the fabrication facilities, there should also be simple woodwork facilities, (e.g. for wooden cabinet structures) and not the least foaming equipment for freon blown polyurethane insulation, which is particularly suitable for Tanzania as it is not only the most superior form for container insulation but also the cheapest and even more so, because the raw material is imported as liquids with a volume of 3 to 5 percent of the final insulation.

As small ice boxes for household use and bike traders is expected to be an item sold in relatively high numbers it should also be feasible to introduce vacuum forming for inner liners of these boxes.

As to sheet working equipment, there may be available in Dar es Salaam a set of basic equipment in very good condition (approximately 5 years old) suitable for 12-15 workers. To meet a higher production need, pressbrake and power operated shears will be the most expensive additions, together with a spray paint plant and the polyurethane foaming and vacuum forming equipment.

As to service and repair equipment and erector gear, S.T.C. is quite well supplied. Not very much more will be needed to cover other fields.

It is estimated that total equipment costs would amount to some 5-600,000 shillings including STC equipment.

Management and Personnel

From suppliers or through foreign aid, it should be possible to get the additional management and technical know-how required.

To enable Tanzanians to run the business, much emphasis should be on starting practical training abroad as early as possible.

Conclusion

With the fast growing need for Refrigeration and Food Manufacturing equipment in mind, there should be a substantial amount of equipment manufacture and installation work that could be done in Tanzania to substitute import and to develop an engineering industry in Tanzania.

Considering savings on transport and cheaper labour there does not seem to be reasons why Tanzania should not be able to make a profitable business, on simple hardware, sheet metal work and installation work.

In order not to introduce too many kinds of equipment in the same areas, it is important that aid possibilities and suitability of equipment be correlated before decisions are made for major equipment purchases to cold storages. By concentrating on very few suppliers not only Tanzania will gain directly but the foreign suppliers and their countries may be much more positive in supporting and assisting a Mechanical Food Engineering Industry.

TENDERERS SPECIFICATIONS AND PROPOSALS

Objectives

Though the Tenderers specifications and proposals as requested on the following pages refers only to the facilities needed by N.C.C.O. and Fisheries, it is visualized that the same plus few additional facilities in the future should cater for other types of food plants as suggested above.

The aim of the following specifications is to establish first of all the volume of business that could arise from the turn-key project.

Secondly, to evaluate capital requirements for establishing manufacturing and installation facilities in Tanzania. Though some existing facilities like STU's refrigeration facilities and a local workshop may be required at lower cost, this should not be taken into account in setting up the capital requirements.

Thirdly, to establish approximately what margin of costs would be available for local production.

Fourthly, to investigate what contribution could be achieved through foreign aid.

The Tenderer should feel free to set up his proposal the way he feels most appropriate to enable NAFPO to make a feasibility study, for which the following specifications would be the minimum amount of information needed.

Specification for Local Manufacture and Installation Work

Work that could be undertaken locally for N.C.C.O. and Fisheries (do not include installation work related to Building Costs)

1. Local Manufacture

Kindly specify for each product or component that could be made locally:

- a) Type
- b) Number of Components
- c) Your sales price utilized in the turn-key project
- d) Cost of packing and shipping
- e) Your approximate estimate for cost of materials and number of skilled and unskilled labour hours to produce above components utilizing the prices in your country.

2. Installation Work and Local Assembly

Kindly specify from your costing on the turn-key project:

- a) Total number of local unskilled labour hours and corresponding cost
- b) Same for local skilled labour hours.
- c) Allowances, travel, etc. for local labour.
- d) Total number of skilled expatriate labour hours and cost.
- e) Number of supervisors, time of duration and cost of expatriate supervision.
- f) Total cost of expatriate allowances for travel, per diem, etc.

3. Other savings that could be obtained for you through the establishment of a local company, that could take over all local work.

4. Approximate total cost reduction in your turn-key project by transferring the above responsibilities to a local company in which you may participate.

TENDERERS PROPOSAL FOR ESTABLISHING A MECHANICAL FOOD ENGINEERING COMPANY

1. Personnel Required:

- a) Expatriate Personnel
Specify type and number
Costs/month for each type
Duration of service to meet turn-key project requirements
- b) Local Personnel
Type and number
Minimum required education and training
- c) Local Personnel to be sent for training in manufacturers plants
Type and number
Minimum required education
Duration of training abroad
Description of training offered and economic conditions

2. Equipment Required:

Specify major production machines and groups of equipment and tools needed - c.i.f. Dar es Salaam, including transport and office facilities. This need not be a binding quotation on the part of the Tenderer.

3. Building Requirements:

Specify areas required in sq. metres for:
Each workshop
Store rooms
Office space
Outside storage and parking place

4. Tenderers contribution:

- a) Specify type of personnel that could be supplied by tenderers or his sub-contractors own organizations.
- b) Types and costs of licences and know-how that would be required to start the proposed manufacturing.
- c) Proposal for financial participation by Tenderer.
- d) Proposal for programme for establishing facilities to coincide with the needs of the turn key project anticipating that some semi-skilled labour will be available locally.

POSSIBLE ASSISTANCE THROUGH GOVERNMENT AID PROGRAMME

If possible, enclose letter of intent from your Government.

Kindly specify:

1. Personnel that might be offered as technical assistance.
2. Aid to cover cost of supply of technical know-how, licences, etc.
3. Aid to cover cost of training Tanzanians in your country.
4. Financial aid as long term loan to establish facilities.

REQUIREMENTS FOR ELECTRICAL EQUIPMENT

1. SUPPLY ELECTRICAL EQUIPMENT SUITABLE FOR OPERATION ON TANGANYIKA ELECTRICAL SUPPLY COMPANY (TANESCO) LINES having following characteristics:

- a. 230/400 volt, 3 phase, 4 wire wye (star) connected with earthed (grounded) neutral, 50 cycle A.C.
- b. GOVERNING TANESCO MOTOR REGULATIONS (CLAUSE 5 (a) (1)):

(1)	PHASE	BRAKE HORSEPOWER	MAXIMUM STARTING CURRENT
	1	0-2	7 x full load
	3	0-3	7 x full load
	3	3-15	4 x full load
	3	15-150	2 x full load
	3	OVER 150	as directed by Company.

(2) SINGLE PHASE MOTORS permitted up to 2 BHP at 230 volts only.

(3) MOTORS EXCEEDING 2 BHP: 400 volt, 3 phase, 50 cycle.

2. GENERAL REQUIREMENTS:

a. SUPPLY ALL ELECTRICAL EQUIPMENT COMPLETE.

with horsepower matched manual or automatic motor starters, transformers, converters, switches, relays, interrupters, any other controls, accessories necessary for immediate system operation upon proper connection to electrical supply.

b. FURNISHED BY OTHERS: main disconnect switches, timers, power and control wiring to manufacturers control panels or housings.

(1) VENDOR supplys plans, diagrams, supervision for wiring of all equipment.

c. VENDOR RESPONSIBLE FOR PROPER OPERATION of systems at the completion of work of all trades.

d. MOTORS, CONTROLS:

(1) Recommended by manufacturers of equipment served.

(2) TROPICALIZED, use materials which stand up to high temperatures, humidity.

3. MOTORS, SINGLE PHASE AND POLYPHASE

a. OPERATING TOLERANCES:

- (1) VOLTAGE : \pm 10% of nominal
- (2) FREQUENCY: \pm 9% of nominal
- (3) COMBINED VOLTAGE, FREQUENCY: = 10%

b. TEMPERATURE AND SERVICE RATINGS:

- (1) DESIGN AMBIENT CONDITIONS, 40°C AT 3300 ft. (1000 metres) above sea level.
- (2) OPEN MOTORS: Operate at 40°C temperature rise for continuous duty.
- (3) CLOSED MOTORS: Operate at 55°C temperature rise for continuous duty.
- (4) CONTINUOUS OPERATION UNDER OVERLOAD without exceeding 90°C temperature rise:

(a)	<u>MOTOR HORSE POWER</u>	<u>MOTOR OVERLOAD FACTOR</u>
	OPEN 1/20	1.40 x full load
	" 1/12	1.40 x " "
	" 1/8	1.40 x " "
	" 1/6	1.35 x " "
	" 1/4	1.35 x " "
	" 1/3	1.35 x " "
	" 1/2	1.35 x " "
	" 3/4	1.35 x " "
	" 1 1/4	1.30 x " "
	" 2	1.30 x " "
	" 3 AND LARGER	1.15 x " "
	TOTALLY ENCLOSED, ALL SIZES 1.00 x " "	

a. MAXIMUM LOCKED MOTOR (STARTING) CURRENTS:

(1) SINGLE PHASE MOTORS, at 230 volts:

(a) AUTOMATICALLY CONTROLLED :

maximum 25 amperes \pm 15% tolerance.

(b) ANNUALLY CONTROLLED :

maximum 50 amperes

\pm 15% tolerance.

(2) POLYPHASE MOTORS at 230 volts:

- (a) CONFORM TO N.E.M.A. (UNITED STATES) OR B.S.2960 3979 metric) (See APPENDIX A of this specification)

d. MOTOR ENCLOSURES :

- (1) TOTALLY ENCLOSED in wet areas and areas exposed to weather.

(a) APPLIES to all slaughter hall equipment.

- (2) DRIP PROOF, (Impervious to dripping water) for sheltered, dry areas.

e. PROVIDE INHERENT (WITHIN MOTOR CASING) MOTOR PROTECTION DEVICES :

- (1) FOR ALL CONTINUOUS DUTY MOTORS UP TO 1 H.P.

(a) TEMPERATURE, CURRENT SENSITIVE DEVICES; disconnect motor from line.

- (2) RESET, RESTART :

(a) MANUAL FOR EQUIPMENT DANGEROUS TO OPERATOR i.e. saws, knives.

(b) AUTOMATIC for all systems components i.e. fans, blowers, pumps, compressors, conveyors.

4. MOTOR CONTROLLERS (STATIONARY):

a. REQUIRED FOR,

- (1) STATIONARY MOTORS over $\frac{1}{2}$ H.P.

b. HORSEPOWER (CURRENT) RATINGS :

- (1) NOT LESS than rating (locked rotor) of motor controlled.

- (2) FOR POLYPHASE: MOTORS CONFORM WITH N.E.M.A. or B.S.775 ratings requirements.

c. REQUIRED TYPES :

- (1) FOR OPEN SINGLE-PHASE MOTORS :

(a) UP TO 1 H.P.: manual toggle type switch.

(b) 1 TO 2 H.P. : Magnetic contactor type with start-stop pushbuttons, illuminated pilot light.

(2) FOR POLYPHASE AND ENCLOSED SINGLE PHASE MOTORS:

- (a) MAGNETIC CONTACTOR interrupting all conductors, start-stop pushbutton with illuminated pilot light.
- (b) ELECTRICALLY OPERATED AMPERE RATED CIRCUIT BREAKER SWITCHES, for very large squirrel cage, synchronous, wound-rotor induction motors. SWITCH RATED AT NO LESS THAN LOCKED ROTOR AMPERAGE.

(3) FOR INTERLOCKS, REMOTE CONTROLS:

Magnetic type starters.

- (a) REMOTE CONTROL MOTORS:
Circuit Breaker, Magnetic, across the line starter with push button station.
Start Stop buttons and illuminated pilot light.

d. CONTROLLER MOUNTED OVERLOAD PROTECTION :

(1) REQUIRED motors over 1 H.P. and motors up to 1 H.P. without inherent protection per 3 (e) :

(2) PROTECT ALL STARTING AND MAIN WINDINGS against,

- (a) OVERLOADS
- (b) STALLING
- (c) HIGH AMBIENT TEMPERATURES
- (d) LACK OF VENTILATION
- (e) SINGLE PHASING (Polyphase Motors)
- (f) UNBALANCED VOLTAGES
- (g) LOW-AND NO-VOLTAGE CONDITIONS

(3) PROTECT AGAINST LOCKED ROTOR CONDITIONS :
by quick acting overloads.

(4) PROTECTION DEVICES :

- (a) BOTH TEMPERATURE AND CURRENT SENSITIVE TYPE
- (b) WIRE IN SERIES with other protective devices.
- (c) CONNECTED TO EACH PHASE WINDING on polyphase motors.
- (d) FOR MANUAL (WITHOUT CONTACTORS) CONTROLLERS:
thermal bimetallic or melting-pot type switches directly interrupting current to motor.
- (e) FOR CONTACTOR (AND CIRCUIT BREAKER) CONTROLLERS :

Either thermal (bimetallic, melting pot or thermal-induction) relays interrupting control circuit to coil of magnetic contactor (or trip circuit breaker) or magnetic relays with magnetic coil and plunger acting with inverse-time relationship through adjustable dashpot controlling speed of plunger.

(5) RESET, RESTART :

- (a) MANUAL FOR EQUIPMENT DANGEROUS TO OPERATOR.
- (b) AUTOMATIC for all systems components.

e. CONTROLLER ENCLOSURES : fully sealed from dust, water, weather.

5. MOTOR APPLICATIONS

a. GENERAL REQUIREMENTS :

- (1) USE POLYPHASE MOTORS for all motors over $\frac{1}{2}$ H.P. in size.
- (2) POLYPHASE REDUCED VOLTAGE STARTERS : $\frac{1}{2}$ direct-on-line Star-Delta (Closed Circuit Transition) or auto transformer types.

b. MOTORS REQUIRED FOR SPECIFIC APPLICATIONS:

- (1) HOIST MOTORS : Constant-horsepower, polyphase, squirrel cage induction motors.
- (2) COMPRESSORS, PUMPS, EQUIPMENT WITH HIGH STARTING TORQUES :
 - (a) PREFERRED: polyphase squirrel cage motor (two speed where 50% capacity required)
 - (b) ACCEPTABLE $\frac{1}{2}$ H.P. and smaller only: single phase, capacitor-start or repulsion start, induction motors.
- (3) EQUIPMENT WITH HIGH STARTING TORQUE, VARIABLE SPEED : wound rotor polyphase induction (slip ring) motors.
- (4) HEAVY DUTY MEAT SAWS, SPLITTERS : two speed polyphase squirrel cage motors.
- (5) $\frac{1}{2}$ H.P. AND SMALLER EQUIPMENT started under no load, low starting inertia, fast acceleration, infrequent starts i.e. small fans, drills, grinders, small saws :
 - (a) ACCEPTABLE, Split-phase (single phase) motors.

NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION

Standard H.p. Speeds, Frequencies, Locked-rotor and Breakdown Torques and Locked-rotor Currents
Locked-rotor Torques, % of Full Load Torque

Rated Hp	Design A and B Synchronous Speeds-Rpm						Design C Syn.Speeds-Rpm		Design B Syn.Speeds-Rpm		Design C Syn.Speeds-Rpm		Locked Rotor Current 50 Cy											
	1800	1500	1200	900	720	600	514	450	1800	1200	900	3600		1800	1200	900	1500	1000	750					
3600																								
3000																								
1				150	150	115	110	105																
1 1/2			175	150	150	115	110	105																
2	275		175	150	150	115	110	105																
3	265		175	150	148	115	110	105																
5	250		175	150	135	115	110	105																
7 1/2	185		160	130	130	115	110	105																
10	175		150	125	120	115	110	105																
15	175		150	125	120	115	110	105																
20	165		140	125	120	115	110	105																
25	150		135	125	120	115	110	105																
30	150		135	125	120	115	110	105																
40	150		135	125	120	115	110	105																
50	125		135	125	120	115	110	105																
60	125		135	125	120	115	110	105																
75	110		135	125	120	115	110	105																
100	110		125	125	120	115	110	105																
125	100		125	125	120	115	110	105																
150	100		110	125	120	115	110	105																
200	100		125	125	120	115	110	105																

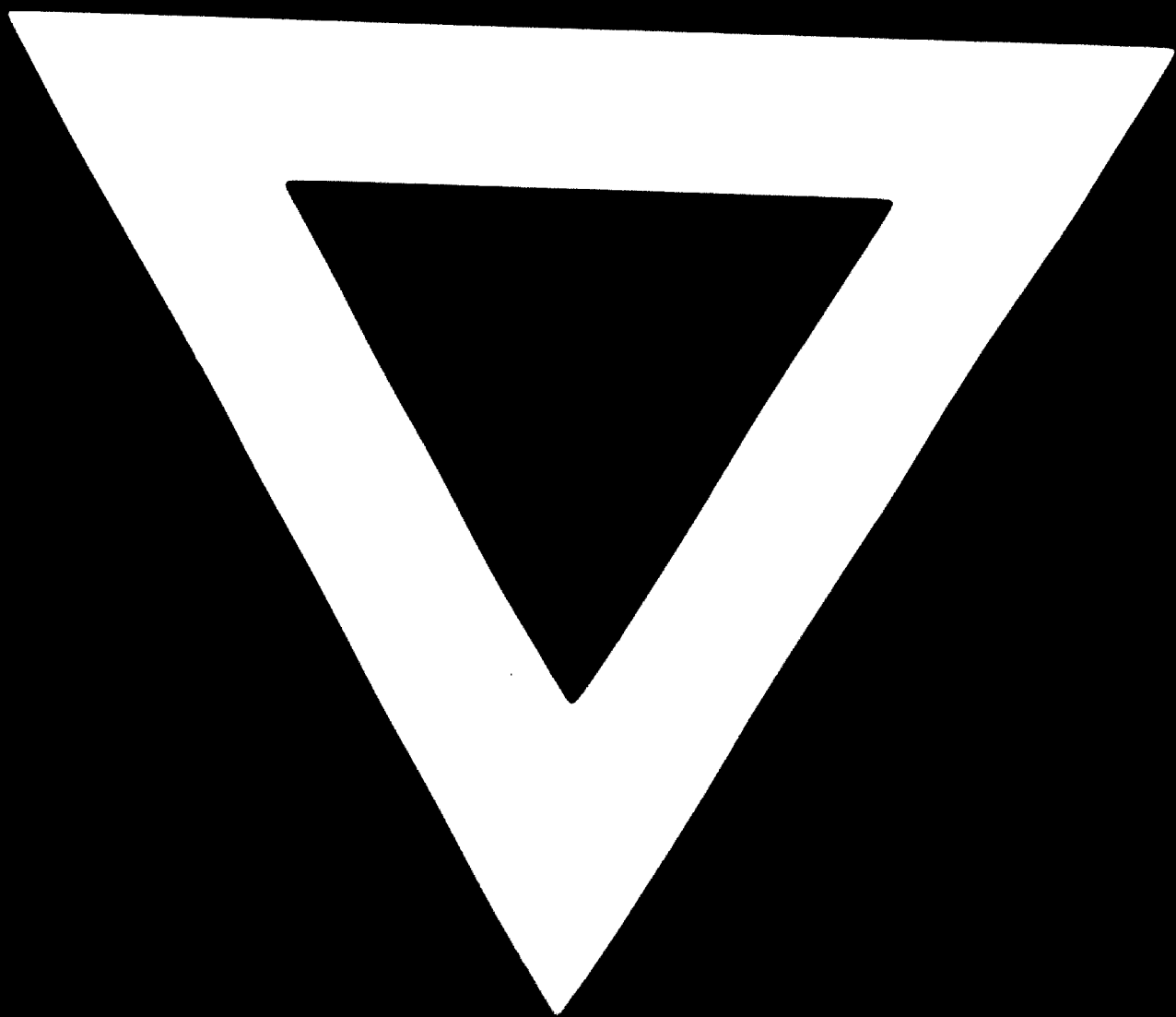
Speeds lower than 750 rpm-200%

Design A, values are in excess of those for Design B.

Locked rotor current, measured with rated voltage, and frequency, shall not exceed the following values for 400 volt Design B cage motors. Locked-rotor current at other voltages is inversely proportional to the voltage

CORRIGENDUM

- Page 20. Second line from top "50° and 65°C." should be "15° and 20°C."
- Page 24. First line, last paragraph "4250 tons" should be "4800 tons".
- Page 34. Fourth line from bottom "as" should be "or".
- Page 35. First item in table, third line "minimum" should be "maximum".
- Page 36. First item in table, third line "minimum" should be "maximum".
- Page 64. Sixth line from bottom - "~~Seri~~-hermetic components" should be "semi-hermetic compressor".



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