

Name of the Project/ Endowments, Chairs	Name of the Principal Investigator/Co- investigator	Department of Principal Investigator	Year of Award	Amount Sanctioned	Duration of the project	Name of the Funding Agency	Type (Government/ non- Government)
Design and Development of ARC Welding Robot	<u>Dr. P.M.Beulah</u> <u>Devamalar</u> <u>Dr.S.Mahadevan</u> <u>Dr.V.Jayaseelan</u> <u>Dr.K.C.Jayasankar</u>	<u>CSE/ECE</u> <u>EEE</u> <u>Mech</u>	2015	9.89	1 year	DRDO, CVRDE, (Under CARS project)	Government
MIS software for Inventory Management System	<u>Dr.S.PadmaPriya</u> <u>Mr.Thamba</u> <u>Meshach</u>	CSE	2015	0.15	6 Months	VA Industries <u>Choolaimedu</u> Chennai-94	Non Government

1. Design and Development of ARC welding robot

दूरभाष / Phone : 044 - 26364013
Fax / फैक्स : 044 - 26383661
तार/Grams : वहिकिलदेव



भारत सरकार, रक्षा मंत्रालय
अनुसंधान तथा विकास संगठन
संग्राम वाहन अनुसंधान तथा विकास स्थापन
आवड़ी, चेन्नई - ६०० ०५४



ISO 9001 : 2008
CERTIFIED ESTT

Govt. of India, Min of Defence
Defence Research & Dev. Orgn.
Combat Vehicles Res. & Dev. Estt.
Avadi, Chennai - 600 054

सभी पत्रदि निदेशक के पते से भेजे जाने चाहिए और कोई
अन्य अधिकारी के नाम से नहीं।

All Correspondence should be
addressed to DIRECTOR and not to
any Officer by Name

पत्र संख्या/Letter No. CVRDE/ 16CR0001/ APM/ 15-16/ LP

दिनांक / Date : 07 Aug 2015

To,

THE PRINCIPAL,
PRATHYUSHA INSTITUTE OF TECHNOLOGY AND MANAGEMENT,
POONAMALLE TIRUVALLUR ROAD,
ARANVOYAL KUPPAM,
CHENNAI - 600 025.

Kind Attn: Dr. P.M. BEULAH DEVAMALAR, PRINCIPAL

Dear Sir,

Sub:- DESIGN AND DEVELOPMENT OF ARC WELDING ROBOT

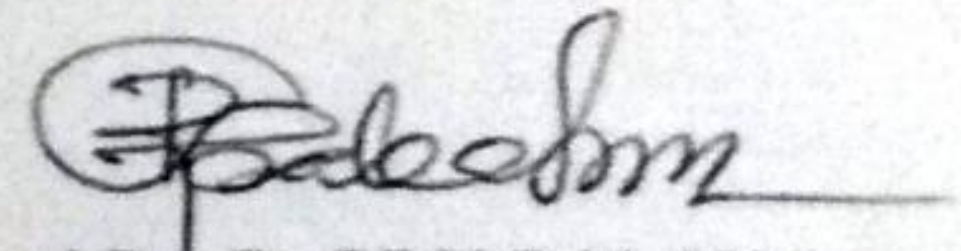
Ref:- a) Your Summary Offer No. R&D/ PITAM/ Mech/ ROBOT ARC/ 2015, Dt.19.03.2015
b) Your Letter dated 24.04.2015.

With reference to the above, it is intimated that your proposal for "Design and Development of Arc Welding Robot" has been accepted by the President of India in accordance with the CARS Annexure 2 for the value of Rs. 9,89,006/- (Rupees Nine Lakhs Eighty Nine Thousand and Six Only) as per the enclosed contract NO. CVRDE/16CR0001/APM/15-16/LP, Dt. 08.05.2015.

2. Please acknowledge receipt of this contract. In future, please quote this contract number and date for all your future correspondence for our reference. Kindly forward your invoice for arranging advance payment as per contract.

Thanking you.

Yours faithfully,


(Dr. R. SIVABALAN)
SCT 'E'
For DIRECTOR

Encls: as above

Copy to :-

1. HEAD (APM)
2. SAO (R&D)
3. SO BILLS
4. SO R&I
5. BUDGET - Cost debitable to Budget LP - General Revenue, Unit code :310000015-REV
Major Head - 2080, Minor Head - 110 , Head Code - 856/01



Contract for Acquisition of Research Services (CARS)

By signature of authority identified at (11) below, DRDO hereby contracts on the Research Service Provider identified at (3), the provision of the Research Services described at (6), within the time stated at (8), for payments at (9.2), and subject to other conditions overleaf, as follows:

1. Short title of Research Service to be provided: Design and Development of Arc welding Robot			Contract Number: CVRDE/16CR0001/ APM/15-16/LP Date: 08.05.2015	
in response to: V			Dates of CARS Amendments:	
2. RSQR Document Ref. No.: CVRDE/MMA/SPC/1415/179		Date of issue YY MM DD 2015 03 13		Issuing DRDO Lab/Estt/Project: CVRDE, Avadi, Chennai 600034
3. Name and address of Research Service Provider (RSP): Dr. P.M. Beulah - Devamalar, Principal Prathyusha Institute of Technology, Aranyoalkuppam			4. RSP's Offer Ref. Date:	
5. (a) This contract will require a formal amendment if the following key professionals are not available to RSP: NIL (b) RSP is authorized to engage these professionals as research consultants (individuals, firms, or companies): NIL				
6. Principal technical features of Research Service to be provided (Detailed in Attachment A) Enclosed - Annexure				
7. DRDO will make available the following DRDO-owned equipment to RSP (Detailed in Attachment B): Welding eqpt., Consumable, Electrode shop floor Assistance alongwith Armour plate 12/18 mm thick				
8. The technical performance of this contract shall be complete when RSP submits the Final Report before (date):				10+12 months
9.1 Expenditure on items below shall not exceed sums shown against each				Rs. in lakhs
a) Personnel				NIL
b) Equipment				7,70,499
c) Others				97000
(4) Service tax 14% Rs 1,21,457				Total: 9,89,006
9.2 Schedule of payments (Rs. in lakhs)				
a) Initial advance 30%			T0	2,96,702
b) at Performance Milestone I 20%			T1	1,97,831
c) at Performance Milestone II 20%			T2	1,97,831
d) at Performance Milestone III 15%			T3	1,48,351
e) On submission of Final Report (Refer also entry 8 above) 15%			TL	1,48,351
Total: >				9,89,006
© Payments will be made within 45 days of receipt by L/E/P of Contingent Bill				
10. DRDO will deem this contract, including amendments thereto, to have been consummated when signed below by the authority of the academic institution (e.g. Registrar) competent to enter into this contract: [Signature and seal] Name: Dr. P.M. Beulah Devamalar Designation: PRINCIPAL PRATHYUSHA INSTITUTE OF TECHNOLOGY AND MANAGEMENT ARANVOYALKUPPAM, THIRUVALLUR-602 025			11. Signature of L/E/P contract administrator: Name: DIRECTOR, CVRDE Designation: Address: Telephone: Email: Dr. P. SIVAKUMAR Outstanding Scientist Director	

- Specific Conditions of this contract: The following conditions apply (L/E/P to stipulate) in addition to General Conditions listed at II below:
1. Technical performance: The satisfactory execution of the technical features of this contract shall be established against Performance Milestones as follows:
 2. Delivery schedules: The interim reports and/or other outcome(s) of this contract shall be delivered as follows:
 3. Other specific conditions:

II. General Conditions of this CARS

1. Equipment:

1.1 All equipment of a capital nature purchased, by the Research Service Provider (RSP), to execute this contract are the property of DRDO (L/E/P). These shall be returned to L/E/P within 03 months of expiry of this contract, unless L/E/P specifies otherwise separately.

NOTE: Should there be a difference of opinion between the RSP and L/E/P on whether or not a piece of equipment is of 'capital nature', the decision of L/E/P shall be final and binding on the RSP.

1.2 Equipment included in the Summary Offer of Research Services [at Entry 9.1(b)] shall be procured by the RSP.

1.3 The RSP shall be responsible for the proper maintenance of the equipment and shall not alienate them, or use them without the prior permission of L/E/P for purposes other than those specified in this contract.

2. Financial provisions: By entering into this contract, the RSP agrees to make available to the L/E/Ps, or to any person or bodies designated by it, if requested by the L/E/Ps, all financial documentation and records on supplies and services purchased or acquired by the RSP for executing the contract.

2.1 Advances, work-in progress and schedule of payments:

(a) Advances or milestone payments are interim payments, which shall be deducted from the total sums due to the RSP.

(b) The L/E/P shall make payments for executing this contract on demands made through 'Contingent Bills' after certification by the pertinent financial authority of the RSP that the monies already released have been utilised for the purposes for which they were provided.

(c) Statements on expenditures incurred on items at 9.1 overleaf as certified by the internal auditors of the RSP shall be submitted within 30 days of crossing of each Performance Milestone identified in the schedule of payments at 9.2 overleaf.

(d) Except with the specific written pre-agreement of the L/E/P, the RSP shall not use for any purposes other than those specified in this contract, any material or services for which advances or milestone payments have been made.

2.2 Financial documentation and records:

(a) For work whose estimated time for completion is six months or less, the RSP shall submit only those reports as relate to the purchase of equipment by the RSP, within thirty (30) days of such purchase.

(b) For contracts whose estimated time for completion is more than six months, the RSP shall provide the L/E/P, not later than thirty (30) days after the end of each half-year, with a half-yearly financial report showing the actual expenditure incurred, against each of the entries at 'item 9.1' overleaf, for the execution of the contract up to the end of the previous half-year.

(c) The L/E/P, or other authority specified by DRDO, may inspect all books, bills, vouchers and other financial records at any time until the final settlement of accounts. The RSP shall supply the L/E/P with such documents as are necessary for final settlement of claims, without explicit request by the L/E/P, within three (3) months after the date of submission of the Final Report.

(d) The documents supporting claims shall be preserved by the RSP until one year after the contract accounts are finally settled.

3. Disclosure and use of information by the RSP: The RSP will ensure that the documents supplied by the L/E/P are not disclosed to any person other than a person authorised by the L/E/P. Any pattern, sample or information in documentary or other physical form remains the property of the L/E/P throughout the period of the contract and shall be returned to the L/E/P after execution of the contract, unless their disposal is otherwise provided for in the contract.

4. Delivery schedule:

4.1 The interim outcomes of the contract shall be delivered at the time or times and in the manner specified in I above.

4.2 The RSP shall inform the L/E/P promptly of any occurrence that is likely to cause delay in delivery of above contracted outcomes. The L/E/P shall determine, in the light of circumstances reported, the extent of change(s) required in the delivery schedule of the contract.

Note: The above covers only unexpected technical difficulties, gross delays in deliveries by suppliers of purchased equipment or consumables, illness or other justifiable cause of unavailability of research personnel and similar unforeseen circumstances.

4.3 An extension of the time limit for execution of the contract, or a postponement of delivery of outcomes shall require the explicit approval of the L/E/P, which approval shall be contractually valid only when this contract is formally amended by the L/E/P, as recorded on top right-hand corner overleaf.

5. Short-closure of contract: The contract may be short-closed at any time during the currency of its execution if the L/E/P feels that no useful purpose will be served by continuing its implementation. The short closure will be deemed to be effective from the day the short closure order is received by the RSP. Subsequent to this short-closure the RSP will submit a technical report on the work done till short-closure. The monies left unspent on the date of receipt of short-closure order by the RSP shall be returned to L/E/P. All equipment/stores acquired out of contract monies shall also be returned to L/E/P.

6. Reports: Reports giving details of the progress of the work shall be sent to the L/E/P at intervals as specified in I above. On completion of the contract, the RSP will submit a final report (Contractor Report). All reports shall be in a format conforming to Indian Standard IS:1064-1980, bound with Bibliographic Description sheet conforming to IS: 9400-1980.

7. Ownership of Intellectual Property (IP):

7.1 The ownership of intellectual property, whether or not legally protected, generated by contract research performed under this contract shall vest in DRDO. However, the RSP shall receive, upon demand by it, a royalty-free license from DRDO to use these intellectual properties for its own purposes, which purposes specifically exclude sale or licensing to third parties.

7.2 Notwithstanding the above, all documents and information detailing the technical performance of this contract (including pertinent laboratory notebooks, sketches, photographs, video tapes of experiments, electronic data acquisition records and other similar) shall be the property of DRDO, whether or not in the physical possession of DRDO.

8. Publications: Interim technical results and the outcome of the contract, intellectual or physical, are the property of DRDO. If the investigator intends publishing the technical outcome, he shall send a written request to L/E/P for permission to publish along with a copy of the manuscript. Within 60 (sixty) days of the receipt of such request, the L/E/P will inform the investigator(s) about its decision. If no communication is received from the L/E/P by the investigator/RSP within this period of 60 (sixty) days, the investigator/RSP shall be free to publish the material as proposed by him.

9. Publicity relating to this contract: The existence of the contracts or the status of their execution shall not be publicised by the RSP in the media or in its Periodic/Annual Report except with the written consent of L/E/P. The latter shall specify the text relating to this contract that may be made public.

10. Communications: All communications affecting the performance of the contract, or its terms and conditions, shall be contractually valid only when confirmed by formal amendments to this contract made by the original signatories to the contract, and recorded in the box at the top right-hand corner overleaf.

11. Compliance with law: Notwithstanding anything contained in this contract, the RSP shall be wholly responsible for complying with all laws in force in India.

12. Settlement of disputes: All disputes relating to this contract shall be settled mutually between the Vice-Chancellor/Director of the academic institution and Director of L/E/P placing this contract. Any remaining unresolved disputes shall be referred to final binding settlement by authorities mutually decided by the Secretary, Defence Research & Development, Ministry of Defence; and Secretary, HRD, Government of India, unless otherwise provided for in Specific Conditions at I (4) above.

13. Liquidated Damages: Liquidated Damages @ 0.5% per week not exceeding max. of 5% of the total value of the order will be imposed for the delayed delivery period.

1. Brief description and specification:

i. Construction

The robot has to be customized and modular type and it should be lighter in construction.

ii. Modes of operation

- ❖ **Teach-in Mode:** Welding path to be programmed in teach-in mode
- ❖ **Weld mode:** The advanced axis controller will manage the required path which ensures the constant feed and stand-off distances

iii. Control system

The robot has to be programmed to move the welding torch along the weld path to the given orientation. This control system shall be enable the open loop system. This control system ensures the flexible way of path programming, Also it shall include the following

- Each servo motor has its own controller. Provision for closed-loop control system for future development shall be catered.
- All axis controllers shall be connected to Master Axis Controller via RS485 line
- Master Axis Controller shall be connected to PC/ Laptop using USB cable
- A custom made software with GUI will be provided by the Axis controller manufacturer, for controlling all the axis of the drives.
- Master Axis controller shall be shut down the system, in case the communication with PC breaks

The Figure 1 shows the overall block diagram of "Arc welding robot" and Figure 2 shows the kinematics of cartesian robot configuration

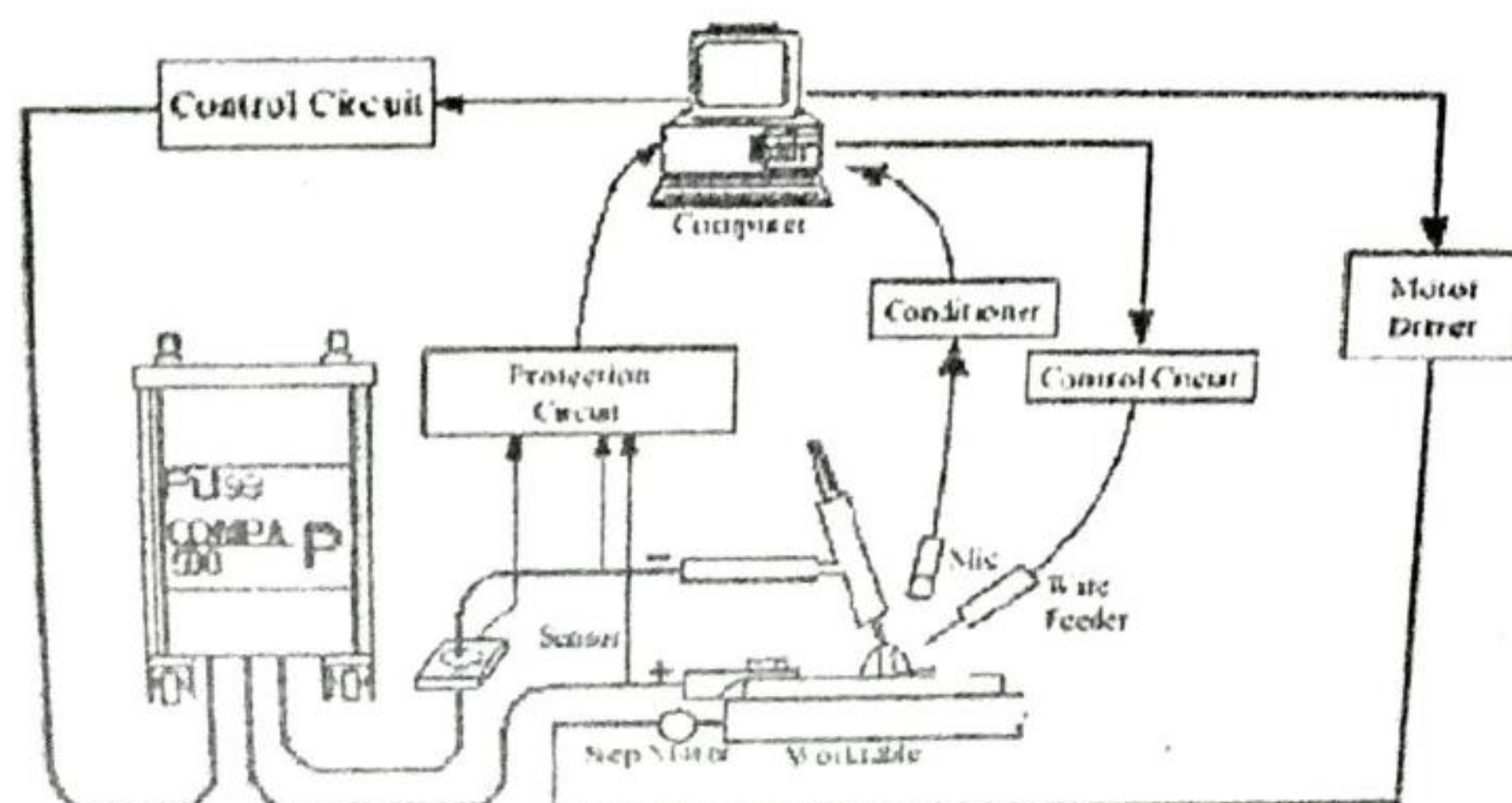


Fig.1 Block diagram of Arc welding robot configuration

Nature of the Report (CARS/CAPSI/Technical/Test etc.)

Supply Order No. CVRDE/16CR0001/APM/15-16/LP Date. 07.08.2016



DESIGN AND DEVELOPMENT OF ARC WELDING ROBOT

Project Closure Report

COMBAT VEHICLES
RESEARCH AND DEVELOPMENT ESTABLISHMENT
AVADI, CHENNAI - 600 054.

Sub : Submission of CARS project final report and claim for milestone payment
I to IV - reg.

Ref: CARS Contract No. CVRDE/16CR0001/APM/15-16/LP. dt:07/08/2015

1. The CARS project Titled "Design and development of Robotic Arc Welding" and its contract offer letter No. as stated ref granted to "Prathyusha Institute of Technology and Management (PITAM), Aranavoyal kuppam. (Contract enclosed as Appendix 'A')

2. The project consists of four milestones as mentioned in Table 1, out of which the expert committee vetted the layout, finalised the specifications and vetted the design document as mentioned in Milestone 1, SI No. 1-4. The MOM and annexure enclosed as Appendix 'B' and Annexure - 1 to Appendix 'B'.

Table 1. Milestones of CARS project as per stated reference.

Milestone	Stages description	PDC as per contract	Remarks
	Date of release of contract	07.08.2015	Advance received
Milestone - I	1. Layout design and approval 2. Finalise the specifications 3. Design of components 4. Design document of robot & review 5. Procurement of hardware	06.11.2015	Items procured hardware and control system integrated tested and installed at CVRDE on 12.07.2016
Milestone - II	1. Robot hardware construction 2. Integration with control system 3. Software program	06.04.2016	
Milestone- III	1. Testing and calibration 2. Installation procedure document 3. Software coding/Teach-in mode 4. program coding document	06.06.2016	
Milestone- IV	1.Demonstration of welding process using robot 2.Complete deliverables mentioned as per Appendix 'C' 3.Final report submission	06.08.2016	Demonstrated on 15.07.2016 and final reports submitted on 21.07.2016

3. All milestones are completed as single stretch because all stages are inter-linked activities. The reason for extension of individual milestone has been attached as Appendix 'C'. However, the overall milestone is met and successfully demonstrated on 15.07.2016 where PDC is 06.08.2016.

4. The milestone - I to milestone - III from procurement to hardware construction integration with control system, software program, testing and calibration of individual axis, teach in code program and program coding in various phases witnessed by undersigned CVRDE - ToT rep at institute premises.

5. The complete set of hardware (Robot unit) and program CD as per deliverables specified in stated ref contract's Appendix 'C' Sl. No. 1 & 2 delivered to CVRDE vide letter No. 001/ CARS/CVRDE dated 12.07.2016 by institute.

6. The final reports of one set hard copies issued to CARS expert review committee as per contract's Appendix 'C' Sl. No. 3 are submitted for their vetting (enclosed as Appendix 'D') and **accepted by expert committee.**

7. The milestone IV has been demonstrated on 15.07.2016 at CVRDE premises in front of Director along with expert committee members successfully.

8. The performance test of Arc welding robot has been conformed as per QA/QT vide document No. CV/ARJ/CARS/AWR/01 (enclosed as Appendix 'E') where the Acceptance test procedures mentioned in this document. The weld quality has been tested as per prerequisite of the document. (enclosed as Annexure - 2 to Appendix 'E'). It is more reliable to understand the soundness of weld as well.

9. The robot deliverables as inspection report has been issued in prescribed format (enclosed as Appendix 'F').

10. This report considered as a conformance report where the Arc Welding Robot performs satisfactorily. Further, the committee recommended to release all milestone payments (milestone – I to IV) at a time. The accession certificate also been issued for further reference at our end and the contract treated as closed.


Note: The Institute name is renamed as Prathyusha Engineering College (PEC) instead of Prathyusha Institute of Technology and Management (PITAM)

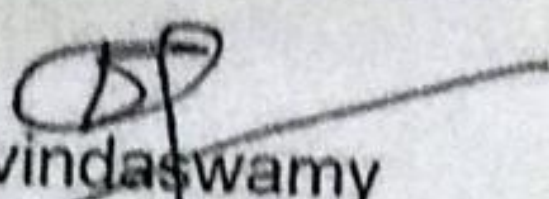
Enclosures:

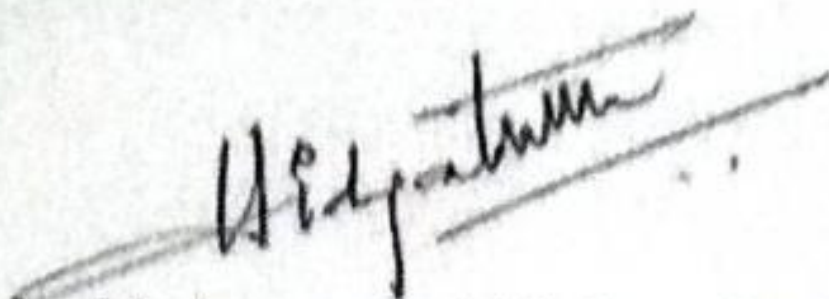
1. CARS contract - Appendix 'A'
2. CVRDE Expert committee design vetting minutes - Appendix 'B'
3. Design document approval - Annexure - 1 to Appendix 'B'
4. Individual Milestone extension justification - Appendix 'C'
5. Final reports - Appendix 'D'
6. QA /QT document – Appendix 'E'

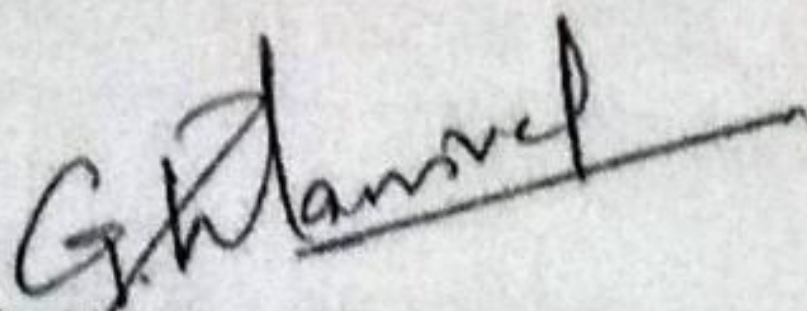
7. Acceptance Test Leaves (ATL) Annexure - 2 to Appendix 'E'
8. Inspection Report - Appendix 'F'

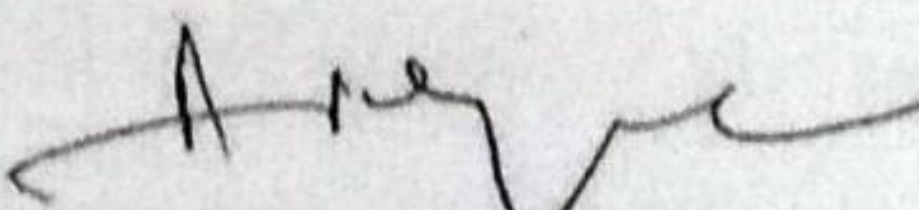
No: CV/ARJ-CMG/CARS/01
Date: 22nd 08.2016



C. Chenna Raidu
Scientist 'D' / ToT Division
User Member



D. Govindaswamy
Sc 'E' /member
R&QA Division

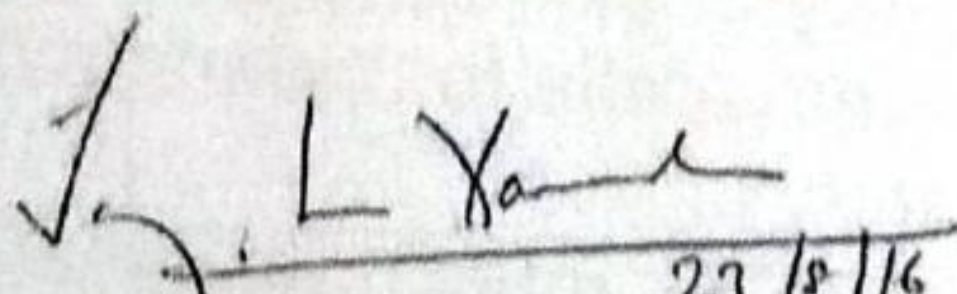

Mohammad Hidayathulla
Sc 'D' /member
Robotics Division

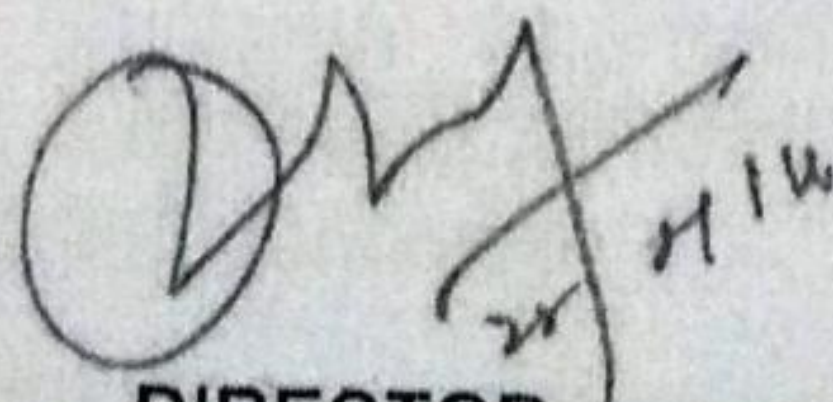

G. Palanivel
Sc 'F' /member
R&QA Division


Dr. A. Velayudham
Sc 'F' /member
Manufacturing Division


V. Balamurugan
Sc 'G' /member user gr.
ToT Division


(S. Ramesh)
Sc 'G' Addl. Dir (CEAD)
Member, CARS Approval committee


(Jayashree varadhan)
Sc 'H' /OS Addl. Dir (Electronics)
Chairman, CARS Approval committee


DIRECTOR

डॉ. पी. शिवकुमार / Dr. P. SIVAKUMAR
विशिष्ट वैज्ञानिक / Distinguished Scientist
निदेशक / Director

1) The activities of the Principal Investigator (PI)

Development of "Arc welding robot" as per Appendix 'A' and other Appendices enclosed as part of RSQR

- a) Layout design and obtaining approval of arc welding robot configuration .
- b) Detailed design on arc welding robot's parts to specifications as per Appendix 'A'
- c) Robot hardware construction with mandatory features
 - a. Rigit structure having the capacity to withstand the dynamic loads
 - b. Over ride sensors
 - c. Joy sticks for rapid movement control
 - d. Safety shut down in case of emergency
 - e. Thermal and shock load resistance
 - f. Safety guards / Telescopic protection over bed
 - g. Path planning by teach-in mode
- d) Installation of robot
- e) Demonstration of Arc welding robot with GMAW / FCAW on sample piece
- f) Operates in different modes as per Appendix 'A'

2) The activities relative to CVRDE

- a) CVRDE will be provides the welding equipments along with torch, consumable electrodes and shop floor support for demonstration of "Arc welding robot" at CVRDE.
- b) Armour plate of 12mm/18mm thick for sample welding at CVRDE

3) General Terms and Conditions

- a) Quarterly review of the progress of the project will be made by CVRDE .
- b) Presentation to CVRDE expert committee after the completion of the project

2. Specification of robot

Type of robot	-	Cartesian
Number of axis	-	Four (Two major P-P and Two minor R-R)
Pay load	-	Min 10 kg
Min feed	-	30mm/min
Maximum rapid	-	9000mm/min
Reach and Stroke	-	2000mm and 120mm
Tool orientation	-	perpendicular (down hand)
Drive	-	Electrical
Repeatability	-	$\pm 1.0\text{mm}$
Precision and Accuracy	-	$\pm 1.0\text{mm}$
Operating environment	-	Hazardous (GMAW/FCAW environment)

Figure 2. Shows the typical kinematics of Cartesian robot configuration, where Principle Investigator (PI) can modify suitably to obtain the objective.

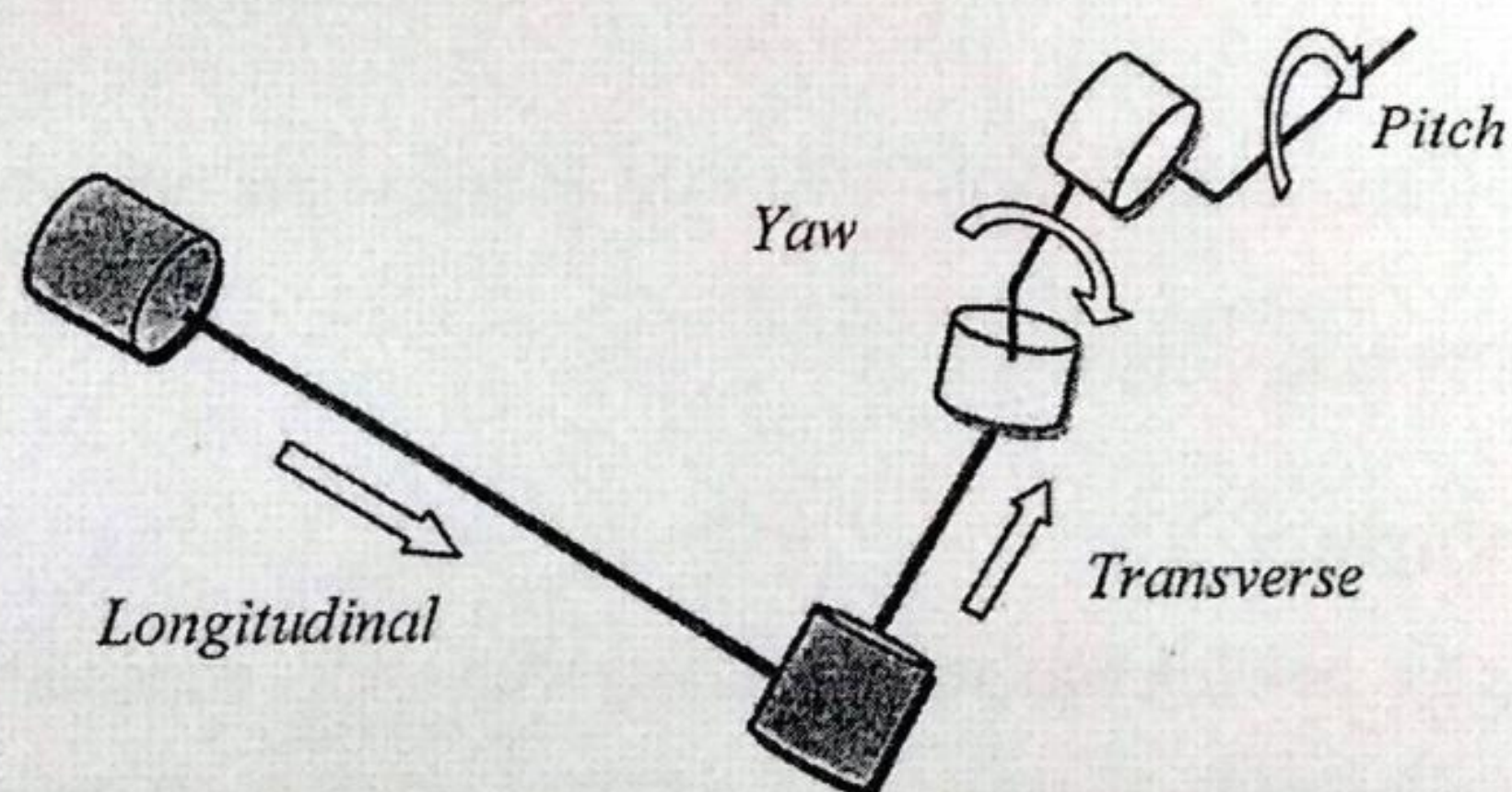


Fig. 2 Schematic sketch of Cartesian Robot

Deliverables

The Research Service Provider or Principal Investigator (PI) shall handover the following to CVRDE at the end of project as follows.

1. The Arc welding robot - 1No

Consisting of Rigid structures with backlash free axis movements (Cartesian type), Control system along with monitor and portable racks, Safety shutdown switch, Safety limit switches & override controllers, Welding torch holder and weld feeder rod mounting unit.

- a. External joy sticks
- b. Calibration or setting probe
- c. Magnetic base for mounting the robot

2. Software

- a. Lab view program or Software developed for robot operation or any algorithm used – 1 CD

3. Reports and Documents

- a. Design document
- b. Technical description and specification for system and sub-system
- c. System wise assembly drawings, component drawings, item list and standard part description
- d. Assy. & Integration document with installation guide
- e. Test procedures and Reports
- f. Software source codes
- g. Training document

Milestones

Estimated time frame is one year from the date sanction

Milestone	Timeline	Stages / Milestones
	T0 – Start of project	Date of release of contract
Milestone - I	Timeline : T1 = (T0+3) months T1 = 3 months At the end of } = 3 months milestone -I	1. Layout design and approval 2. Finalise the specifications 3. Design of components 4. Design document of robot & review 5. Procurement of hardware
Milestone - II	Timeline : T2 = (T1+5) months T2 = 3+5 months At the end of } = 8 months milestone -II	1. Robot hardware construction 2. Integration with control system 3. Software program
Milestone - III	Timeline : T3 = (T2+2) months T3 = 8+2 months At the end of } = 10 months milestone -III	1. Testing and calibration 2. Installation procedure document 3. Software coding/Teach-in mode program coding document
Milestone- IV	Timeline : T4 = (T3+2) months T4 = 10+2 months At the end of } = 12 months milestone -IV	1. Demonstration of welding process using robot 2. Complete deliverables mentioned as per Appendix 'C' 3. Final report submission

Welding is a crucial manufacturing process and widely used in industries to fabricate various products including ships, automobiles, trains and bridges. Welding has inherent quality issues which can be addressed by robotic welding.

2. Scope of this document

Quality welding is the prime important requirement for fabrication of AFV Hull & Turret structures without compromising the production and inspection cost.

3. Details of PDR approval

The Preliminary Design Review (PDR) of arc welding robot configuration to be get approved from specially constituted expert committee of CVRDE in which one member should be from R&QA

4. List of Drawings

System wise assembly drawings, component drawings, item list and standard parts description are to be submitted

5. List of Standards

- | | |
|--------------------|---|
| a. ISO - 15613 | - Specification and qualification of welding procedures for metallic materials |
| b. AWS D 16.2:2007 | - Specification and qualification of welding procedures for metallic materials |
| c. ASTM - A370 | - Standard Test Methods and definitions for Mechanical Testing of steel products. |
| d. AWS B1.11: 2000 | - Guide for Visual Inspection of Welds |
| e. ASTM-E-165 | - Standard practice for Liquid Penetrant Examination for General Industry |
| f. ASTM-E-1032-12 | - Standard test method for Radiographic Examination of Weldments (X-ray test) |

6. Applicable documents

Attached as Appendix 'C' point (3)

7. System requirements

Attached as Appendix 'C' point (2)

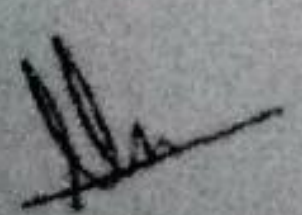
13/2/15
के. पार्थिवन / K. PARTHIBAN
वैज्ञानिक "एफ" / Scientist "F"
आर एवं क्वा र विभाग / R&QA Division

वी बालमुरुगन
V. BALAMURUGAN
Scientist 'G'

Special Terms and Conditions

- 1) The software and hardware are property of CVRDE, Ministry of Defence, Govt. of India And no part of this should be disclosed or used for any other purpose without a written consent from Director, CVRDE.
- 2) A joint review meeting shall be conducted at CVRDE in the presence of Head of Department / Director, CVRDE on mutually agreed dates
- 3) Director, CVRDE is the authority to make any changes in specification, terms and condition.
- 4) The four stage payment will be made on recommendation of committee for each task constituted by Director, CVRDE.

a. Advance (M0)	-	30% of total cost
b. On completion of Milestone - I	-	20% of total cost
c. On completion of Milestone - II	-	20% of total cost
d. On completion of Milestone- III	-	15% of total cost
e. On completion of Milestone- IV	-	15% of total cost
- 5) It is requested that Principal Investigator (PI), may forward the final reports with hardware as per deliverables mentioned in appendix 'C' to CVRDE within one year of time period after signing of contract along with final deliverables and reports.
- 6) The Income tax as applicable shall be ^{deductible}~~detected~~ from Principal Investigator (PI) accompanying the bills against the contract. The current rate of Income tax is 10%.


 वी बालमुरुगन
 V. BALAMURUGAN
 Scientist 'G'

8. Specifications

Specification enclosed as Appendix 'A'
Scope of Work enclosed as Appendix 'B'

9. List of deliverables

Attached as Appendix 'C' and time frame in Appendix 'D'

10. Sequence of tests

Attached as Appendix 'H' Part 2(i)

11. Test Procedures

a) **Robot test procedures** by AWS D 16.2:2007 Guide for components of Robotic and Automatic Arc Welding Installation

b) **Weld test procedures** by the following

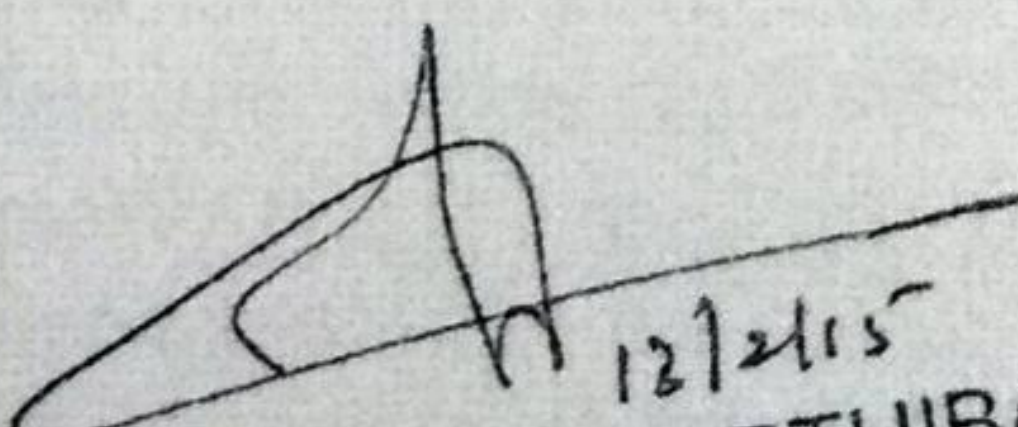
- | | | |
|----|-----------------|---|
| a. | ASTM -A 370 | - Standard Test Method and definitions for Mechanical Testing of Steel products (Only Tensile & Hardness testing) |
| d. | AWS B1.11: 2000 | - Guide for Visual Inspection of Welds |
| e. | ASTM-E-165 | - Standard practice for Liquid Penetrant Examination for General Industry |
| f. | ASTM-E-1032-12 | - Standard test method for Radiographic Examination of Weldments (X-ray test) |

12. Acceptance Test Procedures (ATP)

Attached as Appendix 'H'

13. QA/QT conformance report

The system should be in the conformance with system requirements and comply with milestones enclosed in Appendix 'D'


12/2/15
के. पार्थिवन / K. PARTHIBAN
वैज्ञानिक "एफ" / Scientist "F"
आर एवं क्वा ए विभाग / R&QA Division

Acceptance Test Procedures

The Principal Investigator (PI) and team should develop a hardware configuration of arc welding robot as part 1. And to be demonstrated with the welding process use of either by Gas Metal Arc Welding (GMAW) / Flux Cored Arc Welding (FCAW) as part 2.

Part 1 : Welding robot and it's configuration**i. Configuration of "Arc welding robot" – Phase - 1**


- a. Layout design approval from CVRDE expert team
- b. Design document report review by CVRDE expert team and submission of report
- c. "Arc welding robot" hardware items procurement and Item list submission

Note: Phase – 1 completion indicates that completion of milestone -I

ii. Hardware consisting of "Arc welding robot" - Phase - 2

- a. After hardware construction of "Arc welding robot", the following specification has been checked in dry run condition (without welding equipment). The value given below has been accepted with the accuracy of $\pm 10\%$ of deviation to the points

S No. d,e,f, i & j



a. Type of robot	-	Cartesian
b. Number of axis	-	Four (Two major P-P and Two minor R-R)
c. Pay load	-	Min 10 kg
d. Min feed	-	30mm/min
e. Maximum rapid	-	9000mm/min
f. Reach and Stroke	-	2000mm and 120mm
g. Tool orientation	-	perpendicular (down hand)
h. Drive	-	Electrical
i. Repeatability	-	$\pm 1.0\text{mm}$
j. Precision and Accuracy	-	$\pm 1.0\text{mm}$

Note: Phase – 2 completion indicates that completion of milestone -II

iii. Develop a algorithm / Program using Lab view or any other coding program for operating robot

- a. Submission of Installation procedure document
- b. Submission of Software coding/Teach-in mode program coding document

Note: Phase – 2 completion indicates that completion of milestone -III

वी बालमुर्गन
V. BALAMURUGAN
Scientist 'G'

13/12/15
के. पार्थिवन / K. PARTHIBAN
शैक्षणिक, "F" Scientist "F"
रिसर्च व विकास / R&D Division

**Minutes of CARS milestone review meeting held at cvrde on 19-01-2016 at 1330 hrs
for Design and development of Arc Welding Robot**

The milestone I review meeting of CARS project titled "Design and development of Robotic Arc Welding" CARS order No. CVRDE/16CR0001/APM/15-16/LP. dt:07/08/2015 granted to Prathyusha Institute of Technology and Management (PITAM), Aranavoyal kuppam was held in conference hall-I CVRDE, Avadi on 19.01.2016 at 1530hrs. The project consists of four milestones of which first milestone have been reviewed by the CVRDE expert review committee. The status and discussion of each activity presented as follows.

The Participants are as follows

CVRDE, Avadi			PITAM, Aranavoyal Kuppam
01	Smt. Jayashree varadhan, Sc 'H' /OS - Chairman	01	Dr. Mahadevan, Sr. Prof. (R&D) Principal Investigator
02	Shri. Ramesh, Sc 'G' CARS Approval committe	02	Dr. Jai Shankar, Asst. Prof.
CARS Expert review committee:		03	Dr. Jayaseelan, Asst. Prof.
01	Dr. Velayaudham, Sc 'F'		
02	Shri.G. Palanivel, Sc 'E'		
03	Shri.D. Govindaswamy, Sc 'E'.		
04	Mohammad Hidhyathula, Sc 'D'		
User group			
01	Shri. V. Balamurugan, Sc 'G' Addl (Arjun)		
02	Shri. C.Chenna Raidu, Sc 'D' member secy.		
Total Participants: 11			

On behalf of Chairman Shri. S.Ramesh welcomed the members of review committee and team of professors PITAM, Arnavoyel Kuppam.

The Principal Investigator (PI) – II, PITAM briefed the subject project and gave the detailed presentation on milestone - I activities as follows. where, the first Milestone consists of Layout design, Finalisation of specifications, Design of individual components and its Bill of Materials and procurements of those items after vetting design document. and also the PI addressed that the delay of milestone mainly due to design phase requires more time to visualize the whole phases of product development also the college keep shut more than a month in natural calamities.

The extend of presentation the detailed discussion had with CVRDE expert committee. the following action points are requires to be worked out by PITAM as follows.

1. Torque requirement for motor to be studied
2. Direct coupling may not be adequate to meet the torque requirements
3. Servo system details pertains to feedback (Position and Velocity) to be clarified
4. Details of sensors and other elements of control system not presented

Part 2 : Welding demonstration using robot

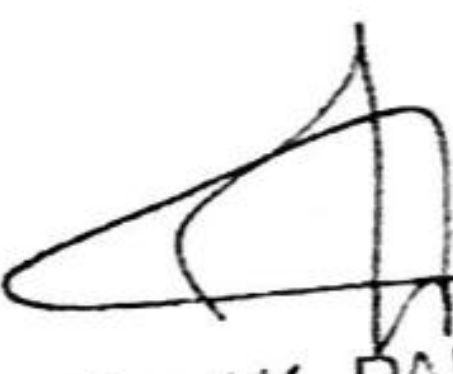
i. Welding of butt joint

Exp No	Experimental description	Remarks
01	'V' groove butt welding of 250X100X18mm size armour plate welded in longitudinal direction	1. Visual Inspection of welds as per AWS B1.11:2000 2. Tensile specimen to be prepared as per ASTM-A370
02	'V' groove butt welding of 18mm thick armour plate of 100mm length and 50mm gap as stitch weld to the length 450mm plate.	1. Liquid Penetrant Examination as per ASTM-E-165 2. Radiographic testing (X-Ray test) as per ASTM-E-1032-12

Note: sample quality to be checked by CVRDE using any one or both method mentioned in the table

- ii. Along with "Arc welding robot", the final report consists of design and development, calibration, installation procedures are to be submitted.

Note: Part (i & ii) completion indicates that completion of milestone -IV and the CARS project treated as closed.


PRINCIPAL
PRATHYUSHA INSTITUTE OF
TECHNOLOGY AND MANAGEMENT
ARAVOYALKUPPAM, THIRUVALLUR-602 025
के. पार्थिवन / K. PARTHI
वैज्ञानिक "एफ" / Scientist
आर एवं क्वा ए विभाग / R&QA Division

Certified
will be
fully met / acceptable
variation
all to R&QA App. 'A' to H
without any

PRINCIPAL
PRATHYUSHA INSTITUTE OF
TECHNOLOGY AND MANAGEMENT
ARAVOYALKUPPAM, THIRUVALLUR-602 025

वी बालमुरुगन
V. BALAMURUGAN

ION
ARJUN Division

Sub: Approval of design document of arc welding robot as part of milestones - I on CARS project.

Ref.: 1. Director's approval vide noting No. CVRDE/7.1/PM/CARS-CAPSI-TASK/ Review/04. Dt. 29/09/2014
2. CARS Contract No. CVRDE/16CR0001/APM/15-16/LP, Dt. 08.05.2015

Design and development of portable modular type "Arc Welding Robot" for fabrication of armour structures and critical assemblies had been undertaken through CARS project, and the contract placed on "Prathyusha Institute of Technology and Management, Aranvoyal kuppam" vide contract ref (2).

2. Accordingly, the milestone-I review meeting was held at conference hall-I CVRDE, Avadi on 19.01.2016 at 1530hrs. The project consists of four milestones of which first milestone have been reviewed by the CVRDE expert review committee. In continuation that the PI of PITAM, Aranvoyalkuppum agreed to carried out the necessary improvements which was suggested by expert committee, accordingly the revised design document submitted for review committee approval.

Hence, it is requested to accord approval of the submitted document for further proceed on this project.

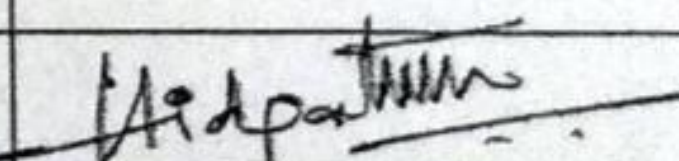
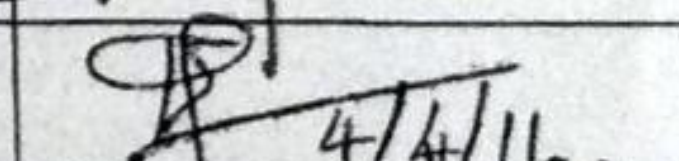
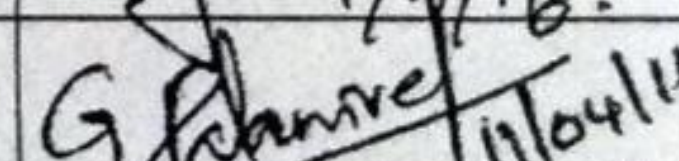

No. CVRDE/7.1/PM/CARS-CAPSI-TASK/ Review/04

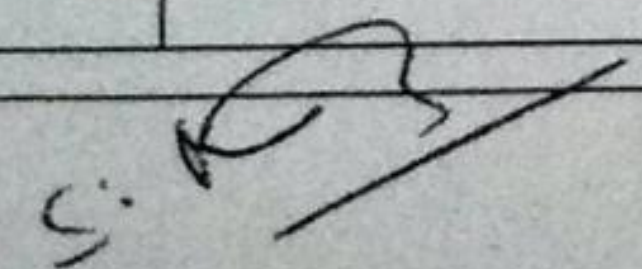
Date : 29.03.2016

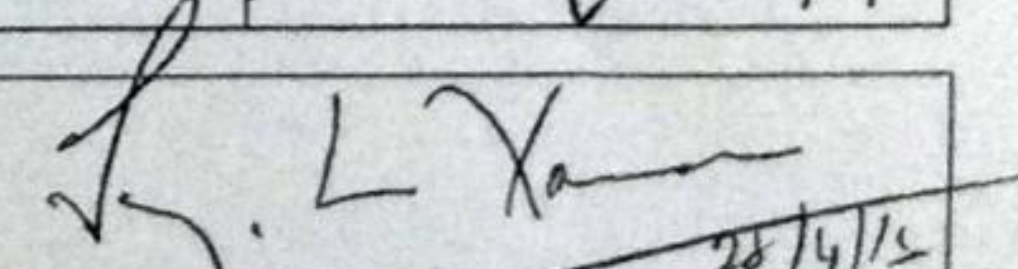
Encl : 1. Revised & Updated Minutes of Meeting.
2. Design document of Arc Welding Robot.

To

CVRDE Expert review committee

Sl No	Member	Design/position	Division	Signature
01	Mohammad Hidayathulla, S	Sc 'D'/member	Robotics	
02	Govindaswamy D	Sc 'E'/member	R&QA	
03	Palanivel G,	Sc 'E'/member	R&QA	
04	Dr. A. Velayudham	Sc 'F' Member	Mfg.	


(S. Ramesh)
Sc 'G' /Addl Dir (CEAD)
Member



(Jayashree Varadhan)
OS/Sc 'H'/Addl Dir.(Mgmt)
Chairman

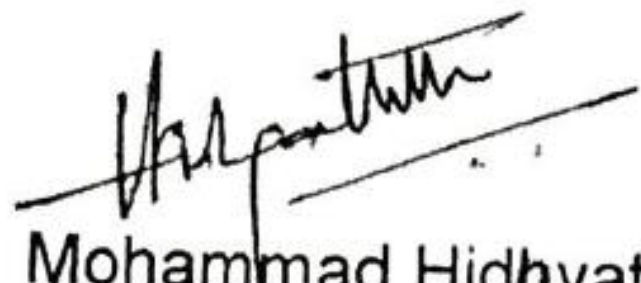
5. Heat impact or weld spatter protection status to be clarified
6. Production feasibility of the robot
7. Scaling and additional features to be catered
8. Kinematics of robot w.r.t work envelope to be detailed
9. Literature survey not addressed


The PI agreed upon the above and reevaluate the same and further design document will be submitted within a course of month.

Recommendations of the CARS approval and review committees described the scope of improvement in the project.


The specified robot can be further cater for future improvements in the area of multi nozzle utility, weld seam tracking , online inspection and real time welding.

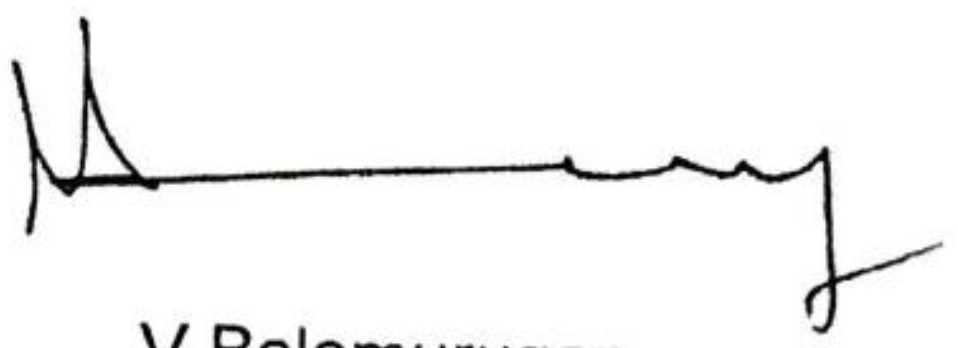

D. Govindaswamy
Sc 'E' /member
R&QA Division
4/4/16



Mohammad Hidayathulla S
Sc 'D' /member
Robotics Division



C. Chenna Raidu
Sc 'D' /member user gr.
Arjun Division

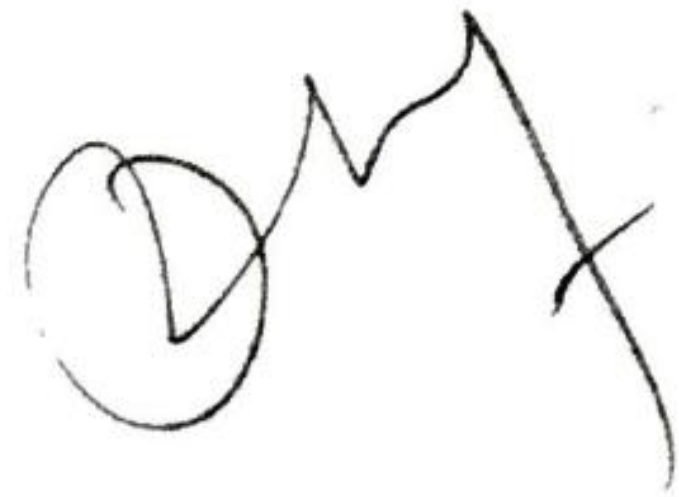

G. Palanivel
Sc 'E' /member
R&QA Division
11/04/16


Dr. A. Velayudham
Sc 'F' /member
Manufacturing Division
20/4/16


V. Balamurugan
Sc 'G' /member user gr.
Arjun Division


(S. Ramesh)
Sc 'G' Addl. Dir (CEAD)
Member, CARS Approval committee
21/4/16


(Jayashree varadhan)
Sc 'H' /OS Addl. Dir (Mgmt.)
Chairman, CARS Approval committee
21/4/16



DIRECTOR
डॉ. पी. शिवकुमार / Dr. P. SIVAKUMAR
विशिष्ट वैज्ञानिक / Distinguished Scientist
निदेशक / Director
21/04/2016

To

The DIRECTOR,

CVRDE,

Avadi, Chennai 600054.

Kind Attn: Shri Balamurugan, Sct. G, Additional Director, MBT-Arjun.

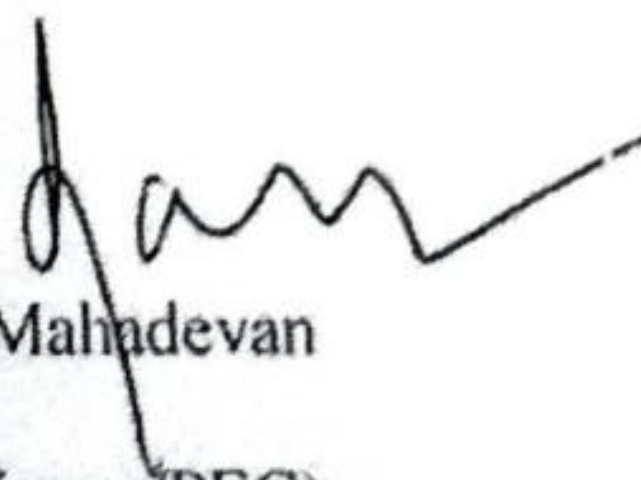
Sir,

Sub: Design and Development of ARC welding robot.,

Ref: Your S.O No CVRDE/16CR0001/APM/15-16/LP.dt:07/08/2015

Due to long lead time required for procurement of electrical and electronics components through import source considerable delay has taken place though design document cleared by CVRDE. Hence the PDC assigned by CVRDE for various milestones could not be maintained and got delayed. However delivery of complete robot arrangement and proving trial will be conducted on or before 10 th July at your premises as per specification stipulated in your quality requirements and entire stage payment can be claimed by us as one time and well within the final PDC 6th August.

With kind regards



Dr.S.Mahadevan

(Senior Professor/PEC)

Copy To

Dr. Sivabalan, Sct. F

CVRDE, Avadi.



APPX 'D'
[Page-1]

PRATHYUSHA ENGINEERING COLLEGE

Approved by AICTE & Affiliated to Anna University, Accredited by National Board of Accreditation (NBA), ISO 9001 : 2008 Certified Institution
NAAC accredited A Grade Institution

No- 001/CARS/CVRDE

24.07.2016

DELIVERY CHALLAN No.2

To,

The DIRECTOR,
CVRDE, AVADI.

Sub: Issue of documents/ Reports/ CARS Project- Deliverable.

Ref: CVRDE / 16 CR0001/ APM / 15-16, Dated (07.8.2015).

Vide delivery challan no 001/CARS/CVRDE/dated- 12.07.2016 the following items & sub assembly have been delivered to you on 12.07.2016.

1. Arc Welding ROBOT Assembly as per items at enclosure A & B
2. 1(one number) CD (PLC Program)

Further to above, the following documents at serial number (1 to 10) in duplicate are submitted her with (reference enclosure), with above deliverables entire items stipulated the order have been completed in full.

- | | | |
|----|--|------|
| 1 | Design document | 1 No |
| 2 | Technical descriptions and specification for system and subsystem | 1 No |
| 3 | System wise assembly drawings, Component drawing , item list and standard part description | 1 No |
| 4 | Assemble integration details Installation guide | 1 No |
| 5 | Test procedure and Reports | 1 No |
| 6 | Software source code, Software program | 1 No |
| 7 | Training document | 1 No |
| 8 | Installation procedure document | 1 No |
| 9 | Teach in mode program | 1 No |
| 10 | User manual | 1 No |

With kind regards

CVRDE	
TIME	SIGN OF S/ASSISTANT
IN	1500
OUT	23/7/16
DATE	
REG. No. 582	

Yours sincerely,
(Dr.S.Mahadevan)
Principal Investigator

CARS Contract No. CVRDE/16CR0001/APM/15-16/LP. dt.07/08/2015
QA / QT document No. CV/ARJ/CARS/AWR//01 dated : 13.02.2015

Acceptance Test Leaf

i. Appendix 'G' Part 1 : Welding robot and it's configuration Configuration of "Arc welding robot" - Phase - 1			
Sl No	Description	Status	Remarks
01	a) Layout design approval from CVRDE expert team	Expert committee vetted and cleared	Design doc approval as per Appendix 'A'
02	b) Design document report review by CVRDE expert team and submission of report		
03	c) "Arc welding robot" hardware items procurement and Item list submission	Cleared	As per list vide letter No. 001/CARS/CVRDE dt. 12.07.2016

Appendix 'G' Part 1: Hardware consisting of "Arc welding robot" - Phase - 2				
Sl No	Description	Required parameter	Output/ Measured	Status
a	Type of robot	Cartesian	Cartesian	Cleared
b	Number of axis	Four	Four	Cleared
c	Pay load	Min 10 kg	40 Kg	Cleared
d	Min feed	30mm/min	30mm/min	Cleared
e	Maximum rapid	9000mm/min	9000mm/min	Cleared
f	Reach and Stroke	2000mm and 120mm	2000 mm and 120mm	Cleared
g	Tool orientation	perpendicular (down hand)	perpendicular (down hand)	Cleared
h	Drive	Electrical	Electrical	Cleared
j	Repeatability	$\pm 1.0\text{mm}$	$\pm 0.01\text{mm}$	Cleared
k	Precision and Accuracy	$\pm 1.0\text{mm}$	$\pm 0.01\text{mm}$	Cleared

Appendix 'G' Part 1 : Develop a algorithm / Program using Lab view or any other coding program for operating robot

Sl No	Description	Status	Remarks
01	Submission of Installation procedure document	Cleared	As per list vide letter No. 001/CARS/CVRDE dt. 12.07.2016
02	Submission of Software coding/Teach-in		
03	Mode program coding document		

Appendix 'G' Part 2 : Welding demonstration using robot

Welding of butt joint

Sl No	Description	Required parameter	Output/ Measured	Remarks
01	'V' groove butt welding of 250X100X18mm size armour plate welded in longitudinal direction	Visual Inspection of welds as per AWS B1.11:2000	Cleared	Test Report attached
		Tensile specimen to be prepared as per ASTM-A370	Cleared	Test Report attached
02	'V' groove butt welding of 18mm thick armour plate of 100mm length and 50mm gap as stitch weld to the length 450mm plate.	Liquid Penetrant Examination as per ASTM-E-165	Cleared	Test Report attached
		Radiographic testing (X-Ray test) as per ASTM-E-1032-12	Cleared	Test Report attached

G. Palanivel
23/08/16
G. PALANIVEL
SCIENTIST 'F'
R & QA DIVISION



PRATHYUSHA ENGINEERING COLLEGE

Approved by AICTE & Affiliated to Anna University, Accredited by National Board of Accreditation (NBA), ISO 9001 : 2008 Certified Institution
NAAC accredited A Grade Institution

To

The Director,

CVRDE,

Avadi.

Sir,

Subject: Testing of sample

The sample test specimen forwarded by Director CVRDE has been tested for its mechanical properties.

The recorded values on the test sample specimen are as follows

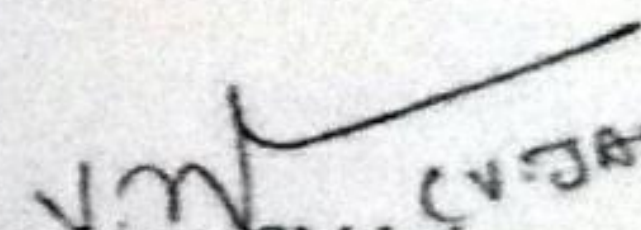
Data

Input Material:	Welded Armour plate sample
Base Metal:	Armour steel
Electrode:	ASS

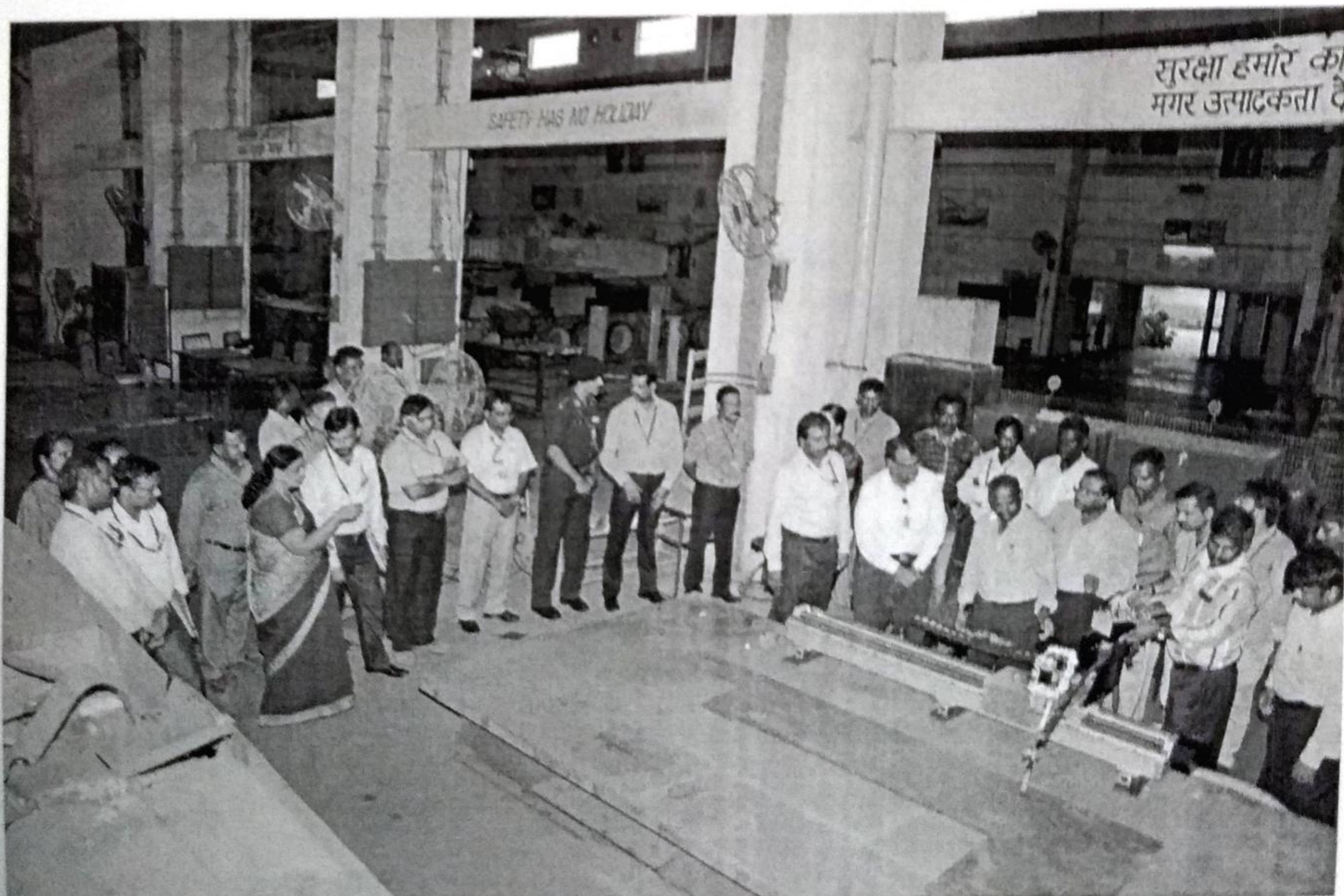
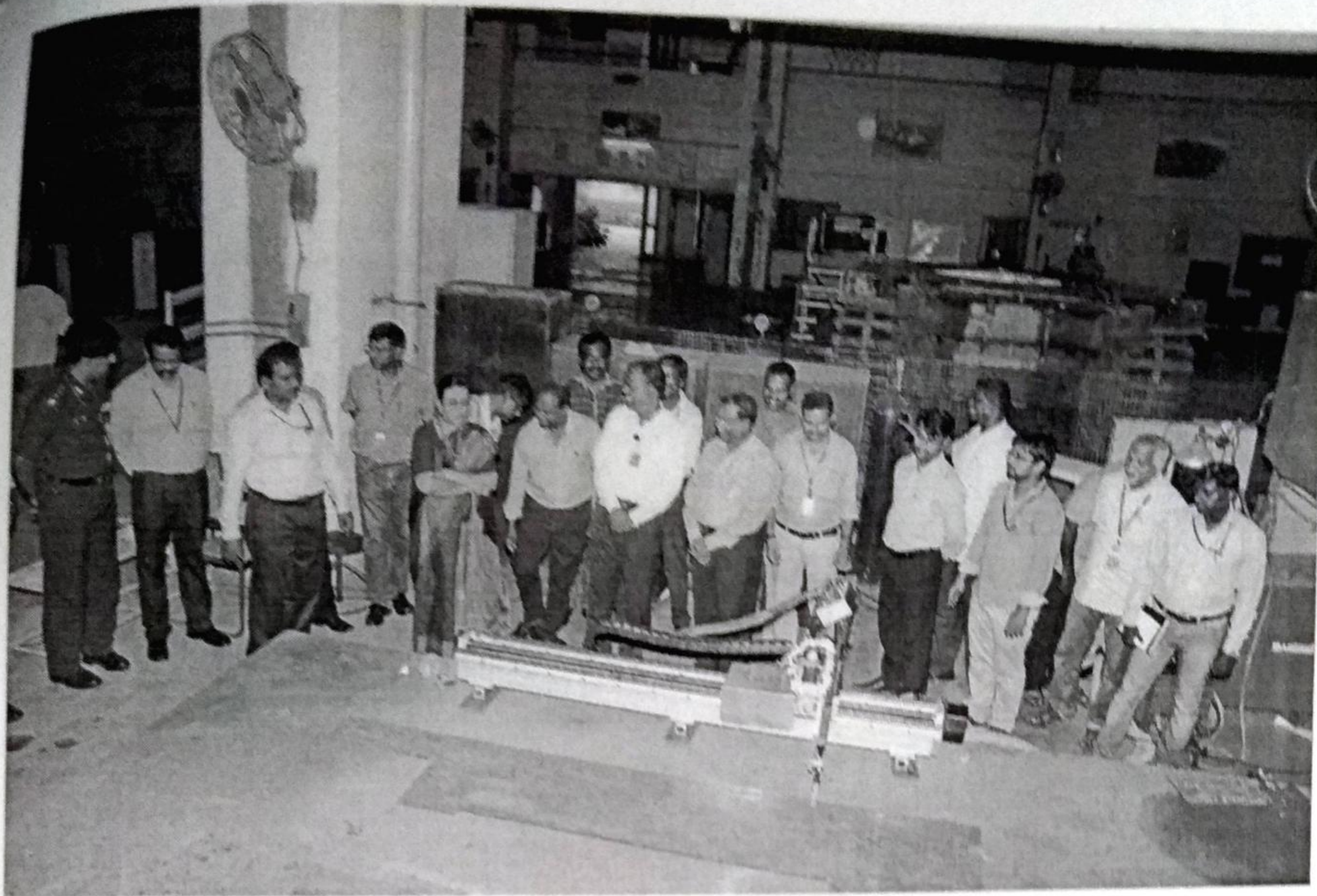
Test Result

S.No	Y.S(Mpa)	UTS(MPa)	% Elongation
1	640	720	15

Submitted for your perusal please.


In charge SM Lab

(Department of Mechanical)





PRATHYUSHA ENGINEERING COLLEGE

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NAAC accredited A Grade Institution

No: 001/CARS/CVRDE

DELIVERY CHALLAN

Date: 12/7/16

To

The Director,
CVRDE,
Avadi.

1700-12/7/16
566

Sub: Supply of Design and Development of Arc Welding Robot

Ref: Your contract No CVRDE/16CR0001/APM/15-16/LP.dt:07/08/2015

With reference to your contract above, the PEC is delivering the fully assembled "Arc Welding Robot" in two main assemblies as given below

1. Mechanical Hardwar construction with fully assembly condition as per Appendix 'A'
2. Electrical and Electronics with fully assembly condition as per Appendix 'B'

The above two major subject assemblies are designed and manufactured at our premises as per the requirements in your contract and witnessed by Shri Chennai Raidu Set 'D' at all the stages of progress.

The list of items as per table 1 and table2 pertaining to mechanical hardware (part) and electrical electronic items have been assembled and certified by Shri Chennai Raidu Set 'D'.

Enclosure: 1. Appendix 'A' and Appendix 'B' .

2. CD 1 No (PLC Program)

REG No. 59
12/7/16

Principal,

PRATHYUSHA ENGINEERING COLLEGE
ARANVOYALKUPPAM,
TIRUVALLUR - 602 025.

Principal

12.7.16

College Campus : Poonamallee - Tiruvallur Road, Aranvoyal Kuppam, Chennai - 602 025. Tamilnadu. Tel : 044-3767 3767, Fax : 91-44-3767 3703

Email : admin@prathyusha.edu.in / principal@prathyusha.edu.in • Website : www.prathyusha.edu.in



PRATHYUSHA ENGINEERING COLLEGE

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NAAC accredited A Grade Institution

12/12/14
566

Appendix 'A'

ARC WELDING ROBOT

CVRDE/ CARS Contract No: CVRDE/16CR0001/APM/15-16/LP.dt:07/08/2015

PART LIST

Table 1: List of Major Mechanical Items:

S. No	MATERIAL	Make / Model No	Description	Qty
X AXIS				
1.	TUBE, BASE	-	Size: 100/30 sq mm. Length 2.2 m	2
2.	RAIL	HIWIN	Size: Dia 25 mm Length: 2.2m	2
3.	LINEAR GUIDE WAY	HIWIN - EGH 25SA		4
4	BALL SCREW ASSEMBLY	HIWIN	Dia: 32mm Pitch: 10 mm Length: 2.2 m	1
Y AXIS				
5.	ALUMINIUM BASE PLATE	Special Aluminum	Thickness : 19mm	1
6.	RAIL	-	Size: 20 Sq mm. Length: 315 mm	2
7.	LINEAR GUIDE WAY	HIWIN - EGH 20 SA		4
8.	BALL SCREW ASSEMBLY	HIWIN	Dia: 16 mm Length: 315 mm Pitch: 5 mm	1
9.	ROTARY GEAR BOX	AWS	-	1
10.	ANGULAR GEAR BOX	AWS		1
11.	TORCH HOLDER			1
12.	MAGNETIC BASE			3



PRATHYUSHA ENGINEERING COLLEGE

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NAAC accredited A Grade Institution

120- 12/7/16

566

Appendix 'B'

Table 2. List of Electrical & Electronics items

S. No	MATERIAL	Make / Model No	Description	Qty
1.	PLC	Mitsubishi / Q00UJ	CPU, PS with 5 i/o slot, processing speed : 120ns	1
2.	4 Axis Motion Controllers.	MITSUBISHI / QD77MS4	4 axis motion module – acc/de acc time : 1 to 8388608 ms.	1
3.	Digital Input Card	Mitsubishi / QX40	16DI, 24V DC, (positive common type)	1
4.	Digital Output Card	Mitsubishi / QY40P	16 DO, Transistor output module. 12/24V DC,	1
5.	HMI	Mitsubishi/ GS 2107 WTBD	7 “ Touch screen	1
6.	SERVO X, Y AXIS	MR-J4W2 77B	750W amplifier SSCNET type	1
7.	SERVO MOTOR X,Y	Mitsubishi / HG KR 73(B)	750W Servo Motor, (Rated torque : 2.4Nm) Rated speed: 3000rpm, Rated curr: 4.8A	2
8.	SERVO Z, Z'(Rotational and Angular axis)	Mitsubishi / MR-J4W2 44B	400A Amplifier – SSCNET type.	1
9.	Servo motor Z, Z' (Rotational and Angular axis)	Mitsubishi / HG KR 43(B)	400W Servo Motor, (Rated torque : 1.3Nm) Rated speed: 3000rpm, Rated curr: 2.6A	2
10.	ENCODER CABLE	Mitsubishi / MR-J3ENCBL5M-A2-L	5m Encoder cable.	4
11.	CONNECTOR	Mitsubishi / MR-PWS2CBL03M-A2-L	Power Connector	4

Prathyusha Engineering College

College Campus : Poonamallee - Tiruvallur Road, Aranvoyal Kuppam, Chennai - 602 025. Tamilnadu. Tel : 044-3767 3767, Fax: 91-44-3767 3703

Email : admin@prathyusha.edu.in / principal@prathyusha.edu.in • Website : www.prathyusha.edu.in



DATE	12/07/2018
TIME	10:30 AM
PLACE	AVADI
BY	[Signature]

PRATHYUSHA ENGINEERING COLLEGE

Approved by AICTE & Affiliated to Anna University, Accredited by National Board of Accreditation (NBA), ISO 9001 : 2008 Certified Institution
NAAC accredited A Grade Institution

12.	BATTERY	Mitsubishi / MR-BAT-6V15ET	Back up for amp	2
13.	SSCNET	Mitsubishi / MRJ3BUS03M	SSCNET cable for amp	2
14.	CONNECTOR	Mitsubishi / A6CONIE	Connector	2
15.	ETHERNET CABLE			2
16.	3 P 6A MCB		Mitsubishi / Schneider	2
17.	2 P 6A MCB		Mitsubishi / Schneider	4
18.	PANEL ENCLOSURE AND REMOTE PANEL		Fabricated	1
19.	SOCKET 230V 5A		Legend	1
20.	RELAY WITH FUSE CHANNEL		Omran	1
21.	SMPS 100W, 4.2 AMPS		ABLIREM24042	1
22.	4P RCS		Mitsubishi / Schneider	1
23.	FAN & FILTER (4")			2
24.	PROXIMITY SENSOR		Omran	8
25.	CONTROL TRANSFORMER		AWS	1
26.	ELECTRICAL ACCESSORIES			1

S. No	Description	Qty
1.	Scope of supply - Major Mechanical Items & Electrical, Electronics items including programming and commissioning activities	01 Set

Certify that items pertaining to ARC WELDING ROBOT (Mechanical, electronics and electrical items as per list above) have been fully assembled in the premises of Prathyusha Engineering College, Mechanical Engineering department Lab in the presence of the following members.

Prathyusha Engineering College

CVRDE, Avadi

1 Dr.S.Mahadevan, Senior Professor, Department of Mechanical Engineering

Shri Chenna Raidu, Sect 'D'

2 Dr.V Jayaseelan, Associate Professor, Department of Mechanical Engineering

[Signature]

College Campus : Poonamallee - Tiruvallur Road, Aranvoyal Kuppam, Chennai - 602 025, Tamilnadu. Tel : 044-3767 3767, Fax : 91-44-3767 3703

Email : admin@prathyusha.edu.in / principal@prathyusha.edu.in • Website : www.prathyusha.edu.in

DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION
COMBAT VEHICLES RESEARCH AND DEVELOPMENT ESTABLISHMENT
CARS PROJECT SCHEME 2015-2016
UTILIZATION CERTIFICATE


1. Name of the guide and address:

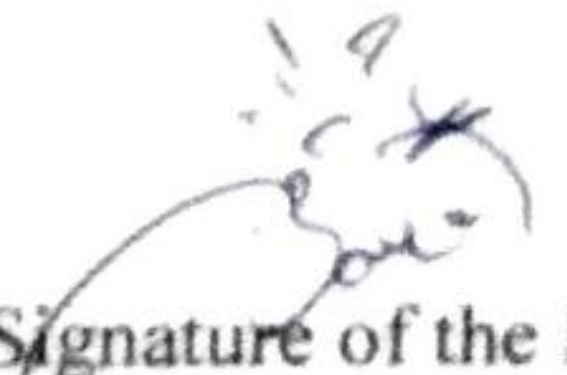
Dr. P.M.Beulah Devamalar,
Dr.S.Mahadevan,
Dr.V.Jayaseelan,
Dr. K.C. Jayasankar
Prathyusha Engineering College
Aranvoyal Kuppam
Tiruvallur-602025

2. Title of the project : Design and Development of ARC Welding Robot

3. Project code : CVRDE/16CR0001/APM/15-16/LP, Dt 08.05.2015

It is certified that a sum of Rs 9.89 Lakhs (Rupees Nine lakhs eighty nine thousand Only) sanctioned by the council for carrying out above mentioned CARS project has been utilized for the purpose for which it was sanctioned and sum Rs Zero (Nil) remaining unutilized is refunded.


Signature of the Guide


Signature of the HOD

2. MIS software for inventory Management system



V. A. Industries

No. 4B/1, Kandhappan Colony, Choolaimedu, Chennai - 600 094.
(Meenakshi Ammal Kalyana Mandapam Backside)
☎ 23614700 Cell : 98412 14921, 98417 13091

Mfrs. of Tubular Structures, Rolling Shutters, Steel Windows, Grills, Gates and All Fabrication Works

V. Arumugam

, Date :

Date: 11.4.2016

LETTER OF APPRECIATION

This is to appreciate the exemplary, prompt and commendable technical contribution in the development of MIS software for "Inventory management System " by **Mr.Jothi Kirubakaran** of Final Year Computer Science and Engineering, Prathyusha Engineering College under the able guidance and efficient helm of **Dr.S.PadmaPriya**, Professor, and **Mr.W.Thamba Meshach**, Associate Professor, Computer Science and Engineering. The project development was done for duration from November 2015 – March 2016.

We wish the organization all success in future endeavors.

Yours Sincerely,

For V.A. INDUSTRIES

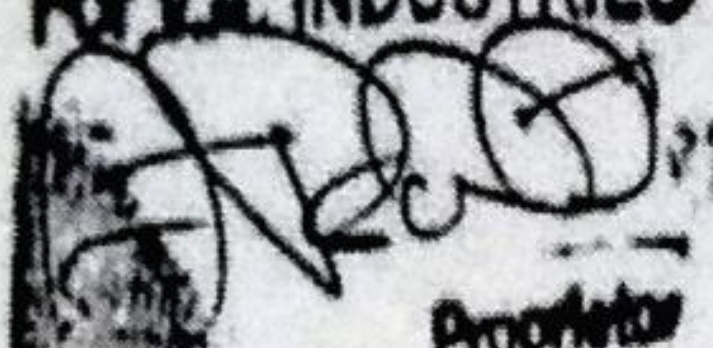
Proprietor

Bill Payment

	Name	Time spent (month)	Total Cost
Project Coordinator	Dr.S.PadmaPriya	November 2015 to March 2016	Rs 15000
			Rs.15000

The amount of Rs 8000/- was paid towards project to the student Mr.JothiKirubakaran

FOR THE CLIENT

For V.A. INDUSTRIES

Proprietor

Signature

FOR THE CONSULTANT
PROJECT COORDINATOR
DR.S.PADMAPRIYA
Professor, CSE Dept.
Prathyusha Engineering College


Signature

Project Report

Project Title: Inventory Management system

Project Coordinator:
DR.S.PADMAPRIYA

CO-Project Coordinator: Mr.W.Thamba Meshach

Anticipated Project Start Date: 15-11-2015

Client :V.A.INDUSTRIES, CHOO LAIMEDU ,
CHENNAI-94

Date Prepared: 09-11-2015

Estimated Completion Date: 31-03-2016

Team Members:

1. Dr.S.PadmaPriya
2. Mr.W.Thamba Meshach
3. Mr.Jothi Kirubakaran

INTRODUCTION:

The project entitled Inventory management system is to maintain the stock in the warehouse.

PROJECT:

Inventory management system is a software application maintains the records related to goods in, goods out and stock.

OBJECTIVE:

The main objective of the application is to automate the existing system of manually maintain the records of the goods in, goods out and stock.

SCOPE:

This application can be used by any warehouse to maintain the stock record.

PROBLEM DEFINITION:

The transactions related to Goods In, Good Out and returns are maintained manually at present along with maintaining the accounts of the customers and the suppliers.

All these are to be automated and an application is required to relate all of them relatively and logically so that the current system can be replaced and accepted without major changes and problems.

The application should provide quick access to the records maintained and must reveal the important reviews about the business so that the growth can be easily compared and should provide with the various reports showing the related details so that the important decisions could be taken easily.

Project Features:

The project covers the following Features.

Manufacturing/Contract/Job work Features

- o Material Inward Entry
- o Party Order / Job work / Contract Order Entry
- o Order wise Item Selection in Sales Bill
- o Finished Item Master
- o Datewise Raw Material Usage Entry
- o Datewise Finished Product Outward
- o Orderwise Raw material usage
- o Orderwise Finished Product Entry
- o Payment Entry

Reports

- o Supplier/Itemwise Date to Date Purchase Reports
- o Credit/Cash based Purchase Bill Reports
- o Customer/Itemwise Date to Date Sales Reports
- o Purchase/Sales Return Reports
- o Orderwise Sales Reports
- o Credit/Cash based Sales Reports
- o Datewise Total Sales Report
- o Date to Date material Movement Chart
- o Current Stock Report
- o Customer/Itemwise Date to Date DC Reports
- o Pending DC Reports
- o Raw material Usage Reports
- o Finished Product inward Reports
- o Orderwise raw material usage Reports
- o Datewise Sales Executive Reports
- o Datewise Payment/Receipt Report

HARDWARE REQUIREMENTS

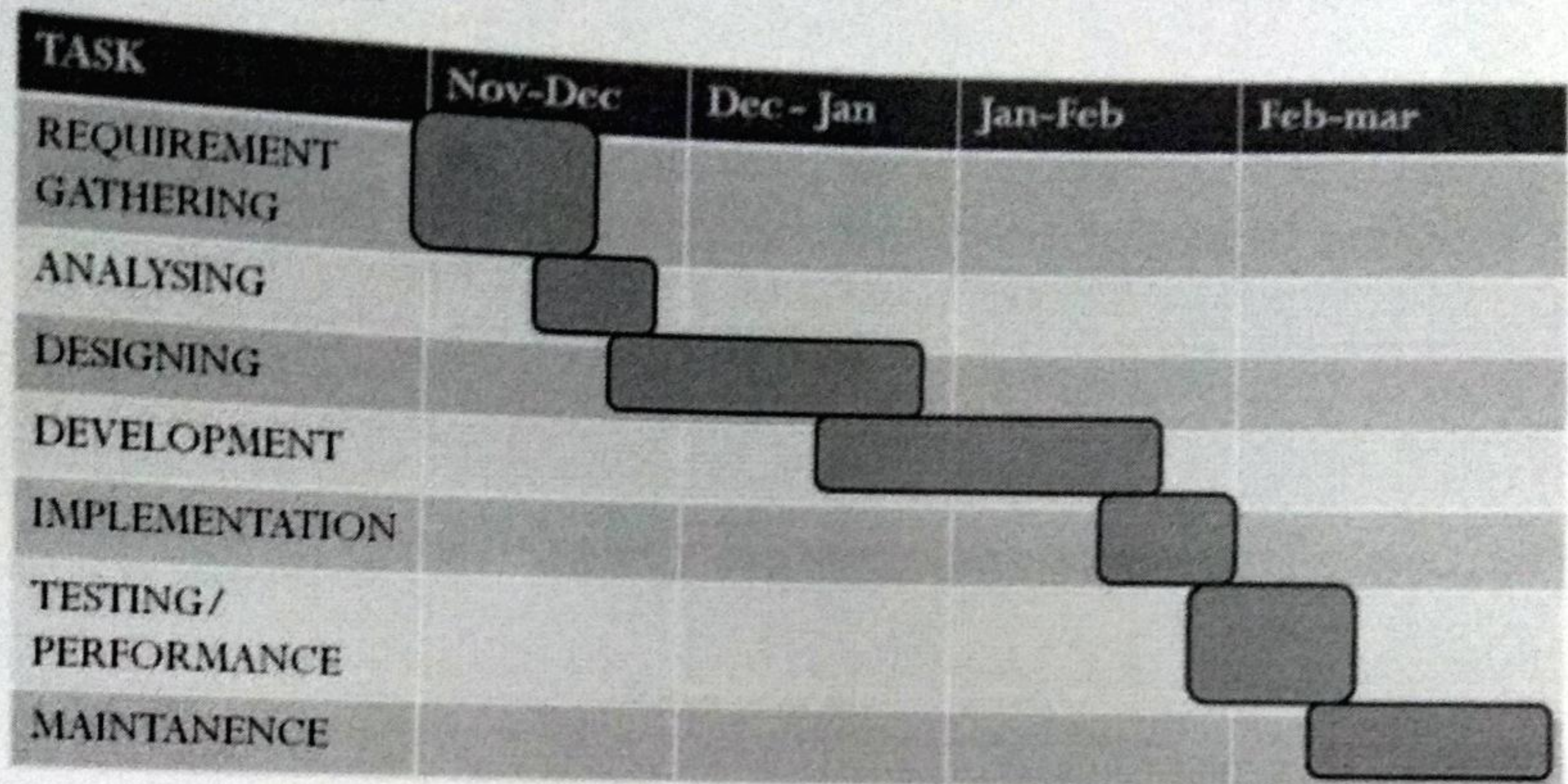
Processor	:	Intel Core i3
RAM	:	2 GB RAM
Hard Disk Drive	:	80 GB

SOFTWARE REQUIREMENTS

Client Side Requirement	:	Visual Studio 6
Backend	:	MySQL 5
Operating System	:	Supports all operating

Timeline:

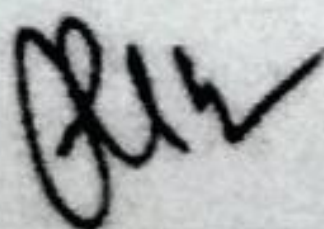
Gantt chart – Timeline



Detail of the Project Budget:

S.No	Item	Amount in Rupees
1	Data Collection	4000
2	Database design Cost	6000
3	Development cost	13000
4	Training cost	2000
5	Maintenance	35000
Total		30000

PROJECT COORDINATOR
DR.S.PADMAPRIYA
Professor, CSE Dept.
Prathyusha Engineering College



Signature

Payroll



ESTD. 2001

INVENTORY MANAGEMENT SYSTEM

CONSULTANCY PROJECT REPORT

Submitted by

Under the Guidance of

Dr.S.PadmaPriya

&

Mr.W.Thamba Meshach

By

Ms.Jothi Kirubakaran

To

V A Industries

Choolaimedu, Chennai-600094

SCOPE OF THE PROJECT	
<u>Project Title:</u> Inventory Management system	<u>Project Coordinator:</u> DR.S.PADMAPRIYA
<u>CO-Project Coordinator:</u> Mr.W.Thamba Meshach	<u>Anticipated Project Start Date:</u> 15-11-2015
<u>Client :</u> V.A.INDUSTRIES, CHOOLAIMEDU , CHENNAI-94	<u>Date Prepared:</u> 09-11-2015
	<u>Estimated Completion Date:</u> 31-03-2016
<u>Team Members:</u> <ol style="list-style-type: none"> 1. Dr.S.PadmaPriya 2. Mr.W.Thamba Meshach 3. Mr.Jothi Kirubakaran 	

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- o Datewise Payment/Receipt Report

HARDWARE REQUIREMENTS

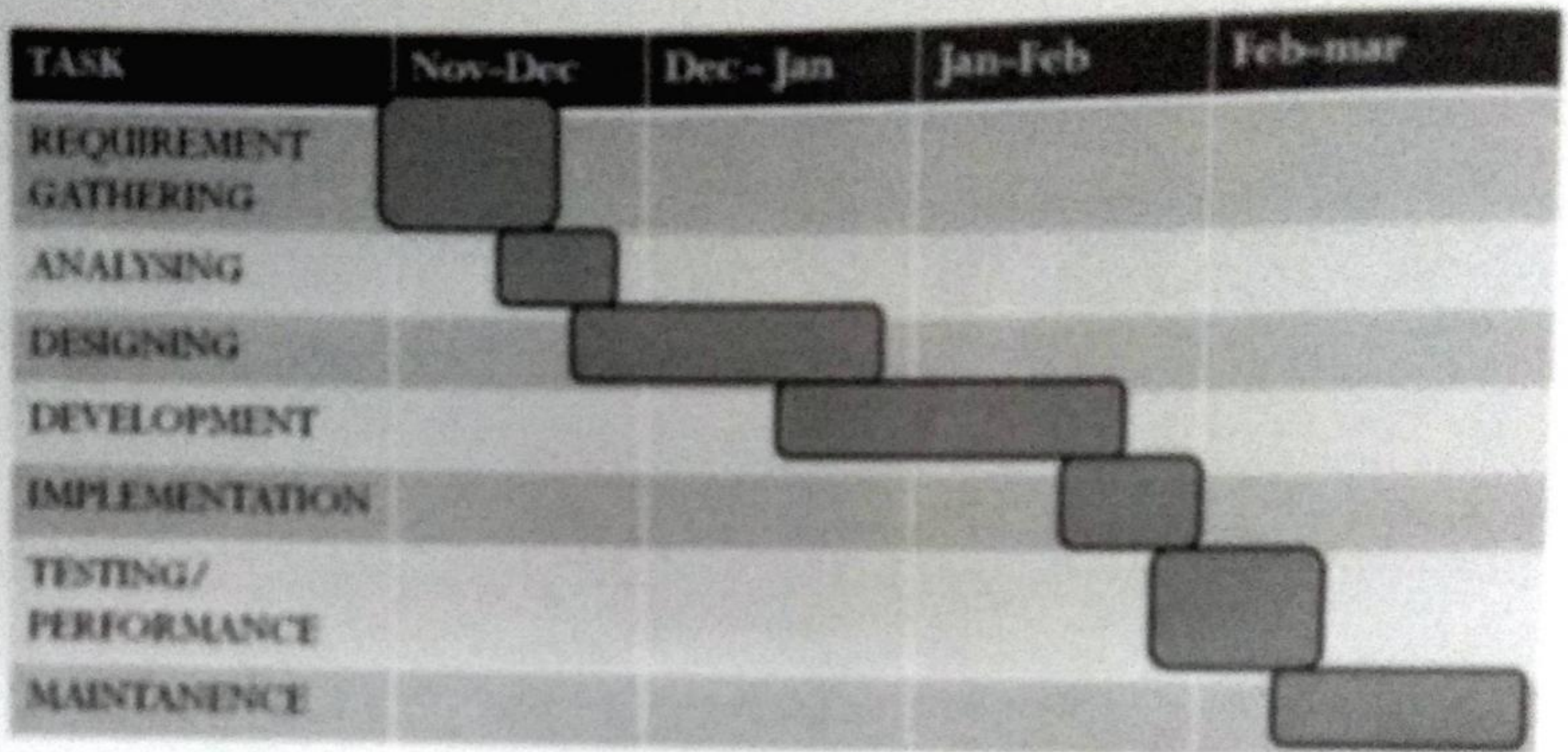
Processor	:	Intel Core i3
RAM	:	2 GB RAM
Hard Disk Drive	:	80 GB

SOFTWARE REQUIREMENTS

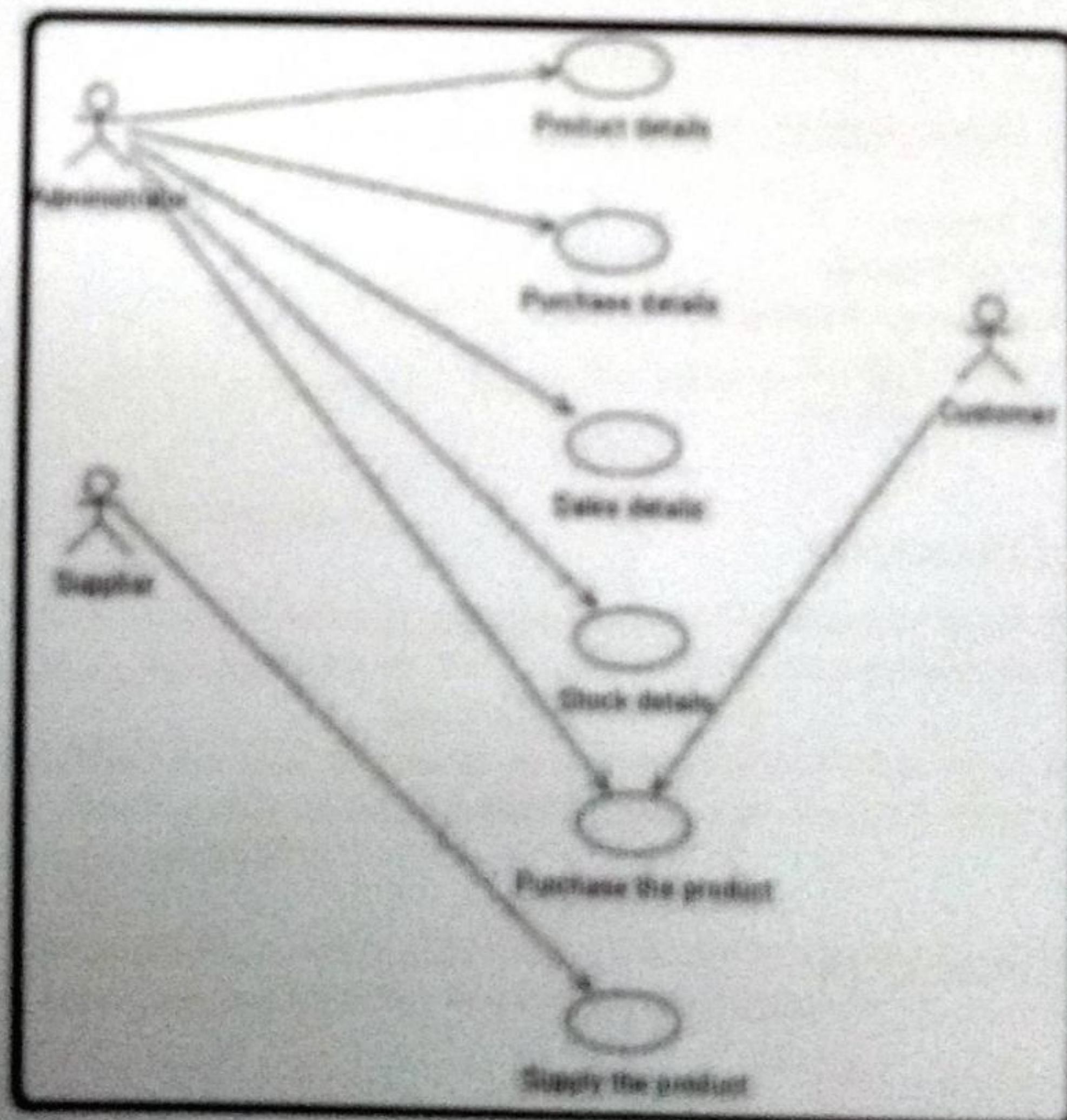
Client Side Requirement	:	Visual Studio 6
Backend	:	MySQL 5
Operating System	:	Supports all operating

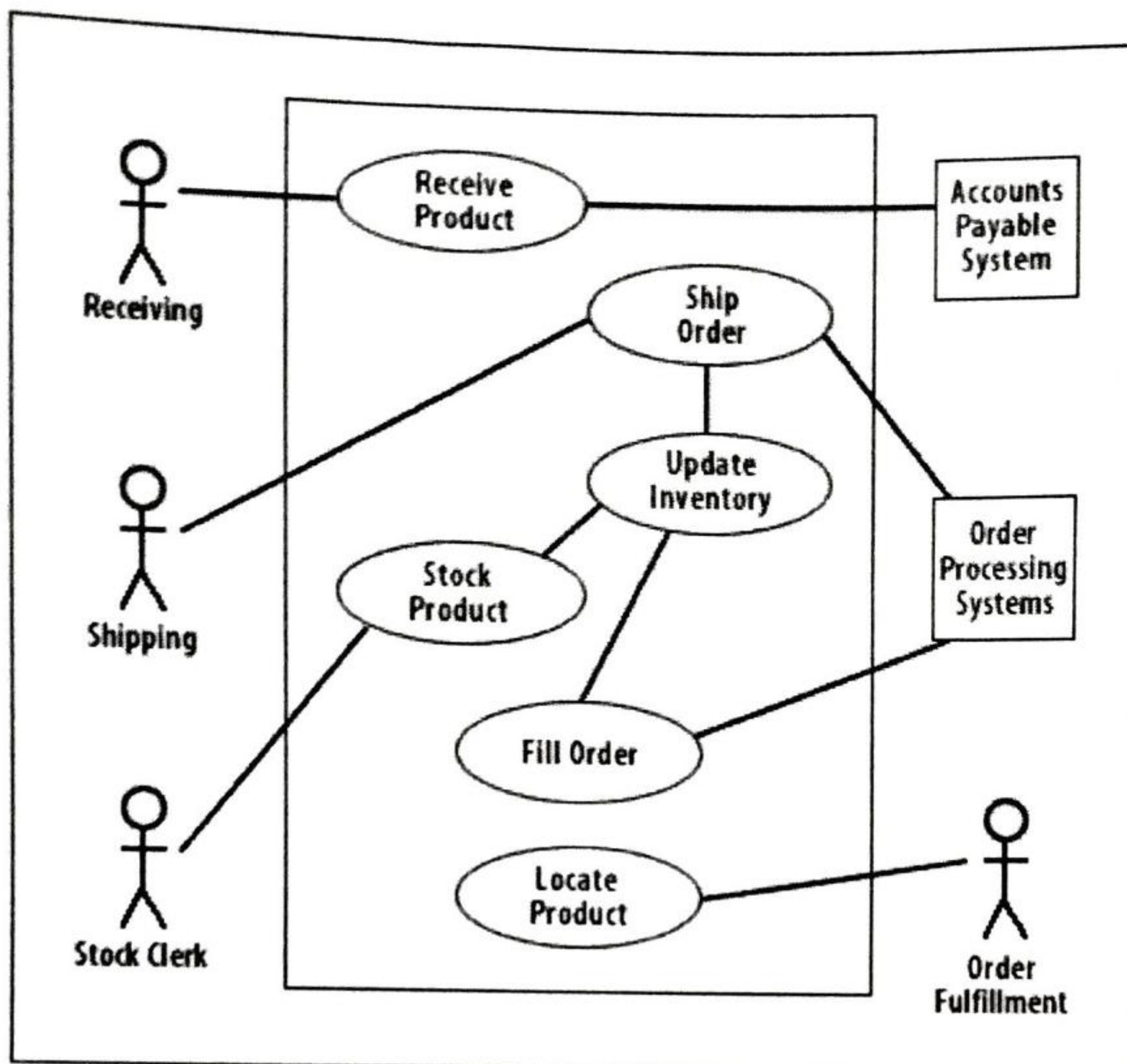
Timeline:

Gantt chart - Timeline



Use case diagram





Sample Screen

SALES BILL

Bill Type: Credit Sales No: Sales Date: 04/04/2004

Customer Name: ERODE PAINTS TIN: DC Details: DC Nos: DC Date:

Item From: By Own PO Nos: PO Date: Packing Details: Transport/Courier:

Payment Terms: L.R./R.M No: Freight: To Pay

SlNo	Item Code	Item Name	Quantity	Unit	Price	Per	Pr.Dis %	Amount
1	BL	BALANCE	30	BAGS	810.00	BAGS	0.00	24300.00
2	BL	BALANCE	2	BAGS	3700.00	BAGS	0.00	7400.00

Sales Person: Destination: Delivery Terms: 2004

Sub Total Rs 31700.00
 Discount 0.00 % 0.00
 Freight Charges 0.00
 Add 0.00
 Rounded Off 0.00

Save Continue Bill Print Delete Exit

BILL Amt Rs 31700.00