QUEST
Since 1986

CELEBRATING 25 YEARS 1986 - 2012

COMPANY PROFILE

QUEST
ASSOCIATES

Since 1986

QUEST
Inspection Services Pvt Ltd.

Recognized Third Party Inspection agency and Inspection Authority under SMPV (U) Rules, 1981, by the CCE, Nagpur

Policy :

It is the policy of QUEST, Pune that only appropriately qualified, trained and experienced Inspection Engineers and Surveyors are deputed for each assignment, to carry out inspection work as per the Scope of Inspection and an agreed / approved Quality Plan. A prompt, satisfactory and accountable service is assured.

Services Provided :

- Inspection and Consultancy for process plant equipments
- Welding pre qualification : Training and Certification as per ASME and EN specifications
- Inspection of Reaction Vessels with Agitator Assembly
- Inspection of Heat Exchangers and Pressure Vessels : SS, MS, Cu, Ni etc.
- Inspection Rotary Autoclave for Rubber Reclaim Machinery.
- Inspection of Dairy and Brewery Equipment
- Inspection of Air Compressors and Gas Compressors
- Inspection of Centrifugal Pumps to API 610 & IS 5120
- Inspection of Fans, Blowers and Steel Plant Equipments.

Quest Associates,
1 & 2, Sagar Complex, Tower B,
Mumbai-Pune Road, Kasarwadi, Pune. 411034.
Tele No. 020-30621658
kvmquest@gmail.com
quest.insp@gmail.com

QUEST Inspection Services Pvt Ltd.
Regd. Office : 3, Nakshatra, Hanuman Nagar,
off Senapati Bapat Road, **Pune 411 016**
☎ 020 2565 7194 Cell Phone 0 98225 90326
E-mail :- questinspection@yahoo.co.in

Resident Address "PASAYDAN" RH 61,
Mayureshwar Sai Nisarg Park Co-op. housing society ltd,
Pimple Soudagar, Pune-411 027,

COMPANY OVERVIEW

QUEST Associates & **Quest** Inspection Services Pvt. Ltd. a quality surveillance and inspection services firm, embarked on its journey more than 25 years ago in July 1986 at Pune. Our initial struggle was to impress upon our esteemed prospective clients, the importance and need for outsourcing Second Party and Third Party Inspection work to a new, indigenous firm, as a beneficial support to their existing Quality Control Department, by a team of Inspection Engineers, Mr.Rammohan S. Nagarkar & Mr.Krishna V. Mane approved by Lloyds & NPCIL, experienced and knowledgeable in specific fields, led by an ex-Lloyd's Surveyor. Qualified with additional qualification in NDT & welding inspection like CSWIP, 3.1 & NACE Certification An equally important aspect was that we offered locational advantage and economical services. Our credo has been "a prompt and satisfactory inspection service, without prejudice, fear or favour". We have tried to put that in practice throughout. Customer satisfaction has been our main focus.

We established "QUEST Inspection Services Pvt. Ltd." in January 1989, which firm obtained approval of the Chief Controller of Explosives, Govt. of India, Nagpur, as an Inspecting Authority for unfired pressure vessels.

A Quality surveillance and Third Party Inspection Services firm serving Industry Since 1986,

- Complete support with technical guidance by our founder Mr. Rammohan Nagarkar ex Lloyds surveyor,
- Approved by the chief controller of explosives, Govt. of India (Known as PESO) as an Inspection authority for unfired pressure vessels under the preview of the static & Mobile pressure vessels (U) Rules 1981,
- Our Major Clients : Atlas Copco India Ltd., Alfa Laval India Ltd., Citadel Impex, Hindustan Polyamide & Fiber Ltd., GRP Ltd., ISGEC, L & T, Reliance, Techniup SAIL, Thermax, United Breweries, United Spirit etc.
- Our Overseas Clients :- Sudeco U.K., Velosy, Kuwait, Praj Sierra Leone, Eniemo and Forbes Taidu, Moritues, Samson Reclaim Rubbers Ltd Shri Lanka etc
- We are approved by Linde, Munich, Germany and recently executed the gas compressor project (GTO) for Linde, Munich Germany for TATA KPO Orissa Project, for Altas Copco,
- For Atlas Copco India Ltd, We are the major Third Party Inspection

agency for their Air and Gas Compressor (H type, Z type, GT type, SC type, GTO type, Single & Multistage)

Unfired Pressure Vessels under the purview of the Static & Mobile Pressure Vessel (U) Rules 1981 (including subsequent Amendments & Circulars issued by the Explosives Department, Nagpur) comprise of compressed gas vessels. A number of such vessels were inspected at all stages of construction and testing to satisfaction, before being certified by us.

Over the years, we have been able to provide our services in line with our credo, and with technical integrity of our personnel, to the satisfaction of our Clients, in many parts of India, and have earned a reputation as one of the best Indian Inspection Services Firm, comparable to any international inspection agency. The credit for this goes of course to our Clients, who placed their confidence in us, by hiring our services for the inspection of variety of simple and complex equipments [used by Chemical Process, Petrochemical and other heavy engineering industries], during construction, testing, trials and sometimes even during commissioning. We have also undertaken field Inspection on behalf of International Inspection & Certification Agencies such as Lloyd's Register, Velosi Kuwait & RW-TUV India, when appointed.

Inspection of Air & Gas Compressors (H type, Z type, GT type, SC type, GTO type, Single & Multistage) for Atlas Copco India Ltd. For their clients – BOC, Linde, INOX, SAIL, VSP, MND, MECON, Reliance, RCF, Prax-Air, Air Liquid, JSW etc.

Inspection of the equipments that happen to be our forte are : Pumps (Water & Process), Air & Gas Compressors, Material Handling Equipments (including Cranes) of all types, Dairy Equipment, Brewery Equipment, Structural's of all types, including support structures for Water Tube Boilers and imported Air Compressors, Simple and Complex Pressure Vessels, Agitators and Heat Exchangers, Bio Process Engg equipment, and simple electrical equipment like LT Motors & Control Panels. Inspection of MS & SS Tubular in Tube Mills in India and China was also undertaken by us.

We undertake stage & final Inspection of Forgings & fittings, as well as Castings of Carbon Steel, Low Alloy Steel and High Alloy material, including that of Heat Resistant & Low Temperature grades at Forges and Foundries. Relevant Quality Plans have been established and implemented at the Forges & Foundries.

We undertake Inspection of Fusion Welded equipment built with Mild

& Low Alloy steels, Stainless Steels, High Alloys etc. materials, to BIS, BS, DIN and ANSI standards, as per National and International Codes of Construction, Client approved Quality Plans and Fabrication Drawings, and to Client/User's additional and special requirements, duly conducted to the entire satisfaction of the Client.

Our scope of inspection covers, fabrication design review, stage and final inspection and tests, including witnessing testing of materials and equipment, during Welding and Non Destructive Examination. We also undertake Site Inspection assignments during assembly and construction of Large pressure vessels, Columns, Storage Tanks and related piping at Clients' Sites.

We routinely conduct training of our own Engineers for inspection of the jobs in hand, including training, qualification and Certification in NDT disciplines, prior to taking up the inspection work. We also undertake training of Vendors' staff, as part of Vendor Development exercise, on behalf of, at the request of our Clients. The training comprises not only of explaining behavior of commonly used materials to International Material Standards, their unique physical, chemical and metallurgical properties, but also the appropriate interpretation and implementation of the requirements of the adopted Code/s of Construction.

Independent Review of Welding Procedure Specifications, witnessing Welding Procedure & Welder Performance Qualification Tests as per ASME, AWS and BS/EN/ISO Codes, and Certification of the approved WPSs, PQRs and WPQRs is also undertaken by us at the request of Welding Fabricators.

A measure of our Clients' satisfaction is their placing repeat Orders on us. We hope our Clients will continue to place their trust in our services for years to come.

….. RS Nagarkar

A BRIEF INTRODUCTION

QUEST Associates is an Inspection Organization based in Pune, India. We undertake Second party and Third party Stage & Final inspection of materials and equipment used in heavy engineering industries to National and International Standards and Codes of Construction, and our Clients' Requirements, at their approved Vendors' Works at Pune, Mumbai, Thane, and other districts of South Maharashtra, as well as at Baroda, Hyderabad, Chennai, Belgaum, Bangalore & Delhi region, and at Clients' Erection Sites

Our company's founder is Mr. R. S. Nagarkar, an ex-Lloyds Surveyor, who currently supports us in his role as a consultant.

In 2008, QUEST, Pune was reorganized in two different identities with separate Heads and profit centres.

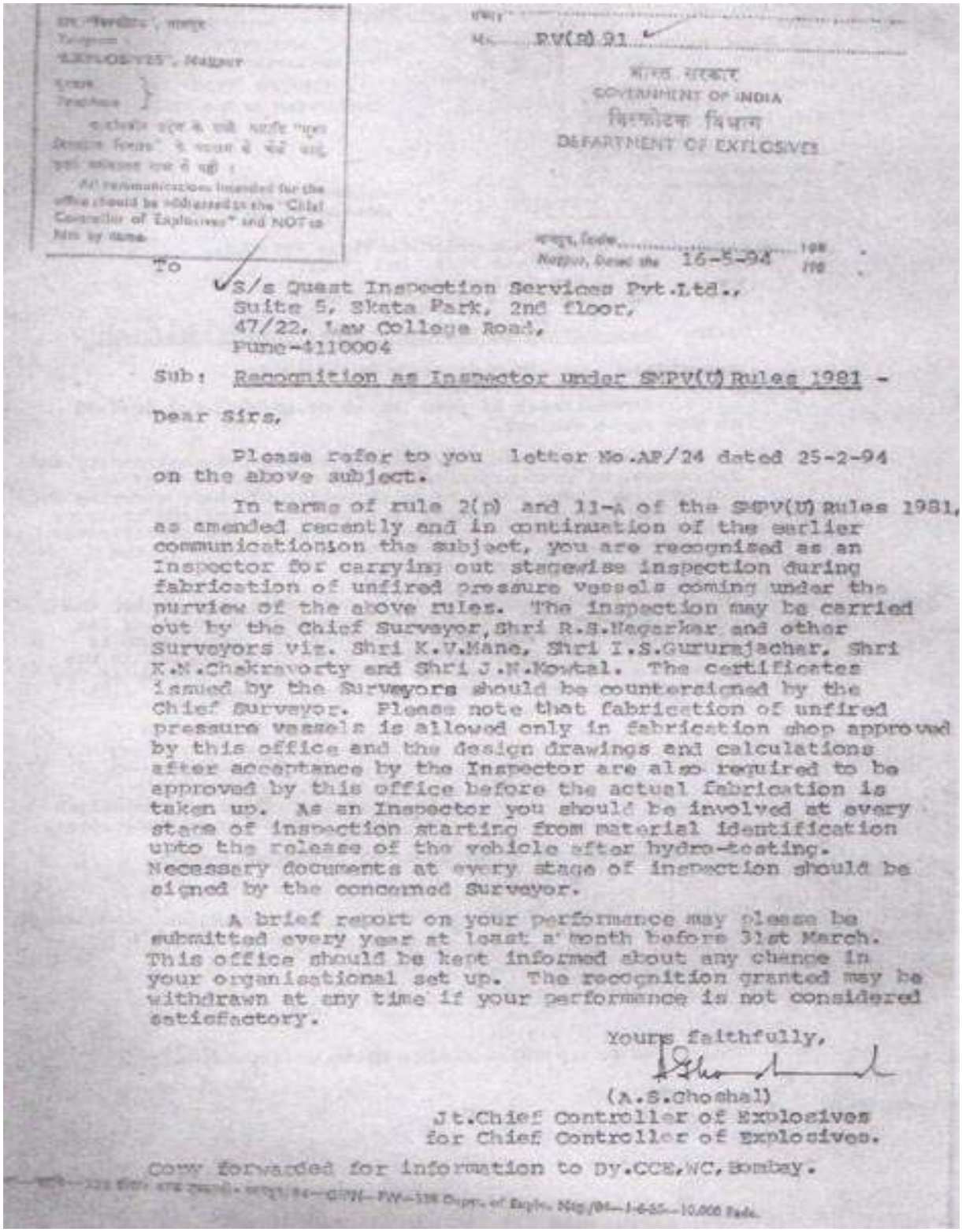
Mr. KV Mane took over as the Principal Surveyor & Administrator of **QUEST Associates**, a proprietory Firm. He is also in-charge of all the Field Work of both Firms under the umbrella of QUEST, Pune.

The sister concern **QUEST Inspection Services Pvt. Ltd. (QISPL)** is headed by Mr. Pushkar Pandit, Director Administration & Finance. The Chief Controller of Explosives, Govt. of India, Nagpur has approved QUEST Inspection Services Pvt. Ltd. as an Inspecting & Certifying Authority for Compressed Gas Vessels, coming under the purview of SMPV(U) Rules 1981.

Mr. RS Nagarkar acts as the Chief Surveyor and Consultant of both the Firms, and is due to retire shortly.

It is the policy of QUEST, Pune that only appropriately qualified, trained and experienced Inspection Engineers and Surveyors are deputed for each assignment, to carry out inspection work as per the Scope of Inspection and an agreed/approved Quality Plan. A prompt, satisfactory and accountable service is assured.

CCOE APPROVED LETTER



"EXPLOSIVES", Nagpur

All communications intended for the office should be addressed to the "Chief Controller of Explosives" and NOT to him by name.

No. RV(n) 91

भारत सरकार
GOVERNMENT OF INDIA
विस्फोटक विभाग
DEPARTMENT OF EXPLOSIVES

Nagpur, Dated the 16-5-94 19

To

M/s Quest Inspection Services Pvt.Ltd.,
Suite 5, Skata Park, 2nd floor,
47/22, Law College Road,
Pune-411004

Sub: Recognition as Inspector under SMPV(U) Rules 1981 -

Dear Sirs,

Please refer to you letter No.AF/24 dated 25-2-94 on the above subject.

In terms of rule 2(n) and 11-A of the SMPV(U) Rules 1981, as amended recently and in continuation of the earlier communicationion the subject, you are recognised as an Inspector for carrying out stagewise inspection during fabrication of unfired pressure vessels coming under the purview of the above rules. The inspection may be carried out by the Chief Surveyor, Shri R.S.Nagarkar and other Surveyors viz. Shri K.V.Mane, Shri I.S.Gururajachar, Shri K.N.Chakravorty and Shri J.N.Kowtal. The certificates issued by the Surveyors should be countersigned by the Chief Surveyor. Please note that fabrication of unfired pressure vessels is allowed only in fabrication shop approved by this office and the design drawings and calculations after acceptance by the Inspector are also required to be approved by this office before the actual fabrication is taken up. As an Inspector you should be involved at every stage of inspection starting from material identification upto the release of the vehicle after hydro-testing. Necessary documents at every stage of inspection should be signed by the concerned Surveyor.

A brief report on your performance may please be submitted every year at least a month before 31st March. This office should be kept informed about any change in your organisational set up. The recognition granted may be withdrawn at any time if your performance is not considered satisfactory.

Yours faithfully,

(A.S.Choshal)
Jt.Chief Controller of Explosives
for Chief Controller of Explosives.

Copy forwarded for information to Dy.CCE,WC,Bombay.

तार "विस्फोटक", नागपुर
Telegram
"EXPLOSIVES", Nagpur
दूरभाष
Telephone

कार्यालयीन उद्देश से सभी पत्रादि "मुख्य विस्फोटक नियंत्रक" के पदनाम से भेजे जाएं, उनके व्यक्तिगत नाम से नहीं।
All communications intended for the office should be addressed to the "Chief Controller of Explosives" and NOT to him by name.

संख्या
No. PV(P)91

भारत सरकार
GOVERNMENT OF INDIA
विस्फोटक विभाग
DEPARTMENT OF EXPLOSIVES

नागपुर, दि.
Nagpur, Dated the 23-11-1989

To

S/s Quest Inspection Services Pvt.Ltd.,
Suite 5, Ekata Park, 2nd floor,
Law College Road, Pune-411004

Sub: Recognition as inspecting authority under SMPV(U) Rules 81

Dear Sirs,

Please refer to your letter No.AP-24 dated 19-10-89 and recent discussions with your representatives in this office.

S/s Quest Inspection Services Pvt.Ltd., Pune-4 is recognised as an inspecting authority for carrying out stagewise inspection during fabrication of unfired pressure vessels coming under the purview of the SMPV(U) Rules, 1981. The inspections may be carried out by your Surveyors Shri R.S.Nagarkar, R.K.Nair and G.C.Sahasrabuddhe strictly following the requirements of the relevant fabrication Code and the SMPV(U) Rules 1981. The certificates issued by the Surveyors should be countersigned by Shri Nagarkar, Director. Please note that fabrication of unfired pressure vessels is allowed only in fabrication shops approved by this office. The design drawings and calculations, after acceptance by the inspecting authority, are also required to be approved by this office before the actual fabrication is taken up.

The approval granted above would be valid for the period ending 31-12-1990. You should submit a brief report on your performance during the period at least a month before the date of expiry of the recognition. The recognition granted may be withdrawn at any time if your performance is not considered satisfactory.

Yours faithfully,

(A.S.Ghoshal)
Dy.Chief Controller of Explosives
for Chief Controller of Explosives.

Copy forwarded for information to:-

1. The Dy.CCE,WC,Bombay.
2. The Dy.CCE,EC,Calcutta.
3. The Dy.CCE,NC,Agra.
4. The Dy.CCE,SC,Madras.

Dept. of Explo. Nat./84—1-6-85—10,000 Pads.

Telegram :
"EXPLOSIVES", Nagpur
Telephone :

All communications should be addressed to the "Chief Controller of Explosives" and NOT to him by name.

No. PV(R) 91

भारत सरकार
GOVERNMENT OF INDIA
विस्फोटक विभाग
DEPARTMENT OF EXPLOSIVES

Nagpur, Dated the 12-10-93 19

To

M/s Quest Inspection Services Pvt.Ltd.,
Suite 5, Ekata Park, 2nd floor,
47/22 Law College Road,
Pune-411004.

Sub: Recognition as Inspector under SMPV(U) Rules 1981 -

Dear Sirs,

Please refer to your letter No.AF/24 dated 20-7-93 on the above subject.

S/shri K.V.Mane, I.S.Gururajachar, E.N.Chakravorty and J.N.Kotwal of your organisation are accepted as Engineer Surveyors. There would be no objection to their carrying out stagewise inspection during fabrication of unfired pressure vessels and issuing certificates thereon. The certificates issued by them should however, be countersigned by the Chief Surveyor, Shri R.S.Nagarkar.

In this connection, it is intimated that as per the recent amendment of the SMPV(U) Rules 1981, a scrutiny fee of Rs.1000/-(one thousand) is payable for recognition as Inspector. You are requested to forward the amount in the form of a bank draft payable to the Chief Controller of Explosives at Nagpur, at an early date.

Yours faithfully,

(A.S.Ghoshal)
Jt.Chief Controller of Explosives
for Chief Controller of Explosives.

Copy forwarded for information to Dy.CCE,WC,Bombay.

GOVERNMENT OF INDIA
MINISTRY OF COMMERCE & INDUSTRY
PETROLEUM AND EXPLOSIVES SAFETY ORGANISATION (PESO)
Head Office, Nagpur.

Tel : 2510248,
Fax : (712) - 2510577
Email : explosives@explosives.gov.in

5th Floor, A-Block, CGO Complex,
Seminary Hills,
Nagpur (M.S.) - 440006

No : PV(R)91 (CPS56028) **Date : 14/1/2016**

To,

M/s. QUEST Inspection Services P. Ltd.,
3, Nakshatra, Hanuman Nagar Off Sanapati Bapat Marg,
Pune 411016,
Pune - 411016,
District :PUNE
State :Maharashtra

Sub : Recognition as Inspector and Competent Person under SMPV(U) Rules 1981 - Regarding.

Sir ,

Please refer to your online submission details vide No. PV(R)91 (CPS56028) , dated 14/01/2016.

1. In terms of Rule 2(p) and 11A of SMPV(U) Rules 1981, the recognition granted to your organisation vide PV(R)91 (CPS56028) dated 14/01/2016, is here by extended for a period of 1 years from the date of issue of this letter comprising of the persons indicated below as Inspector and Competent Person for carrying out stage-wise inspection during fabrication/repair of unfired pressure vessel and certification thereof under Rule 12(2) of the said Rules.

Recognised under SMPV(U) Rules 1981	Name of Recognised Competent Person
Rule 12(2) (other than horton Spheres)	Shri Rammohan S. Nagarkar (PV(R)91/CPS56028-1)
Rule 12(2) (other than horton Spheres)	Shri Krishna Vithoba Mane (PV(R)91/CPS56028-2)

2. Please note that the vessel fabricated under your stage inspection should not be certified by you as a competent person under Rule 33 & 43 of SMPV(U) Rules, 1981.

3. The Certificate of Control (stagewise inspection certificate) shall be countersigned by Shri Rammohan S. Nagarkar

The above recognition is also subjected to the following condition.

4. All tests, examinations and inspections shall be carried out in a manner consistent with the intent or the purpose of SMPV(U) Rules 1981.

5. The certificates under the SMPV(U) Rules, 1981 shall be generated online with the help of your User ID, from this organisation's website. **Duly signed copies of such Certificates shall also be enclosed with the application for Approval/Grant/Amendment of the licenses, as the case may be.** Manually made certificate will not be entertained.

6. You shall maintain records & submit annual return in prescribed format (copy enclosed) in respect of certificate issued by you, indicating Chief Controller of Explosives/Jt. Chief Controller of Explosives's approval reference no. in respect of proposed licensed premises; Certificate number; Name & address of the applicant company/client; complete address of the site/premises; Name of contact person of the company/client; etc..

7. You shall not subcontract testing and examinations work to any other person/agency.

You are advised to include 2-3 more qualified employee for Competent Person/Inspector under SMPV(U) Rules, 1981.

The recognition granted above may be revoked at any time in case of any violations of any condition of this recognition letter or if your performance is not considered satisfactory or found involved in any unethical and unprofessional conduct or not found physically fit and mentally sound for carrying out tests and examinations.

Your photograph(s) is/are enclosed for reference.

Any Change in organisation including manpower, a brief report on your performance of each competent person should be submitted to this office every year ending 31st March.

The subject recognition is otherwise valid upto 31/12/2016. The extensions of the Validity will be considered on submission of the following documents.
i. Performance Report
ii. Medical fitness certificate in respect of each competent person of your organisation.
iii. Any change in Technical/Competent Person.

Yours faithfully,

(V B Borgaonkar)
Deputy Chief Controller of Explosives
for **Chief Controller of Explosives**

Copy forwarded for information to the :-

The Jt. Chief Controller of Explosives, 1. West Circle, Mumbai 2. South Circle, Chennai 3. East Circle, Kolkata 4. Central Circle, Agra 5. North Circle, Faridabad

for Chief Controller of Explosives

Enclosure

No : PV(R)91 (CPS56028)

1.	 **Rammohan S. Nagarkar**	Counter Signatory Name : Rammohan S. Nagarkar
2.	 **Krishna Vithoba Mane**	Competent Person Name : Krishna Vithoba Mane

for Chief Controller of Explosive, Head Office, Nagpur.

Lloyd's Register

Agreement between
Lloyd's Register Asia and Quest Associates

SCHEDULE - II as on 12 December 2013

1. Qualification of Quest Associates's Inspectors (listed below) will be reviewed by LR with respect to their usage in LR's work. Any changes in inspectors have to be first approved by LR.

2. LR reserves the right to monitor the performance of the inspectors at any time, and if, in the opinion of LR, the required professional standard is not maintained, LR may withdraw approval of the inspectors and "Quest Associates" will be notified accordingly.

3. Further where it is reported that conduct of the inspector covered by this agreement is contrary to the aims and objectives of LR, this will be investigated, and if in the opinion of LR the complaints is well founded, this agreement may be withdrawn and "Quest Associates" notified accordingly. LR is not required to give reasons for withdrawal of this agreement.

Names of Inspectors

1. Mr. K.V. Mane
2. Mr. B. Vijayraj
3. Mr.A. Rajesh

SIGNED for and on behalf of
LLOYD'S REGISTER ASIA

V.Neeraj
Area Operations Manager,
South West Asia

SIGNED for and on behalf of
Quest Associates

K.V. Mane, Principal Surveyor

Working together for a safer world

BHARATIYA NABHIKIYA VIDYUT NIGAM LIMITED
(A Government of India Enterprise)
Kalpakkam – 603 102

भाविनि BHAVINI

M.PALANIAPPAN,
Sr.GM (QA-Proc).,

Ph: + 91 (044) 27480956, 27480180.
Tele fax:+ 91 (044) **27480180,** Fax: 27480116.
Email: mpp@igcar.gov.in

REF: BHAVINI/QA/MP/2008/ 1735 **DATE: 10/09/08**

Shri.Mahesh Limaye
Dy.General Manager NPE
M/s.Larsen & Toubro Ltd,
Powai Works, Saki Vihar Road
P.O.Box No.8901,
Mumbai – 400 072'
(Fax: 022 – 6705 1611)

Sub: Approval of QC personnel for Steam Generator – Reg.
Ref: Your letter No. SGA/HNS/1213 dated 09/09/08.

This has reference to your letter under reference above seeking approval of Mr. Krishnath Vithoba Mane of M/s. Quest Associates, for carrying out inspection activities of Handling Structure, Evener Beams, manufactured at M/s. Precifab Engineers Pvt. Ltd., Kolhapur, for Steam Generator of PFBR Project. On review of the credentials of the personnel and based your recommendation, Mr. Krishnath Vithoba Mane of M/s. Quest Associates is approved for carrying out inspection activities at M/s. Precifab Engineers Pvt. Ltd., Kolhapur.

This approval is only for the particular activity mentioned above. However, his performance will be reviewed from time to time by BHAVINI QA and subsequent continuation of his service will depend on his satisfactory performance.

Thanking you,

Yours faithfully,

(M.PALANIAPPAN) 10/09/08

Cc.

AD (Proc)

Shri.A.K.De
Head QA, NPCIL QA
M/S.Larsen & Toubro Ltd.,
Fax: 022-67051611

COMPANY TRACK RECORD

Annexure A : We are continuality performing 3rd and 2nd party expending for gas, oil, and refinery project, the details list as below,

Sr.No	Client	Project Name	Model No.	Qty	Year
1	RIL	ROGC	GT050T1D1	1	2014
2	MCFL	MCFL	5 Stage	1	2014
3	JSW (ISPAT)	H Booster	N2 Booster	1	2014
4	Praix Air	N2 Booster	N2 Booster	1	2014
5	JSW	Booster	SC-32	2	2014
6	RIL	FGC	GT026T1D1	1	2015
7	RIL	PSA TAIL GAS	GT063T5T1	1	2015
8	Air Product	Air Product	SC10N2	3	2015
9	Punj Looyds	Air Blower	HA8	3	2015
10	BPCL Kochi	BPCL Kochi	H26A32L1	1	2015
11			H26011L0		
12	Reliance	PSA TAIL GAS	GT063T5T1	1	2016
13	Reliance	Vent Gas	SC10N2L1	5	2016
14	Linde	MAC For Linde Inox (SLR)	M45A32L1	1	2016
15	Linde	MAC For Linde Inox (Souning)	M45A32L1	1	2016
16	Linde	Linde Ropganj, Bangladesh	H40A421	1	2016
17	Socor	Socar, Azerbaijan	T063T1D1	1	2016
18	Linde Bintula	Linde Bintula, Malesia	H35	1	2016
19	Haipong	Atlas Copco Energas, Germany	45492725	3	2015
20	Duisburg	Atlas Copco Energas, Germany	45523742	5	2016
21	Duisburg	Atlas Copco Energas, Germany	-	1	2016
22	Duisburg	Atlas Copco Energas, Germany	45522329	1	2016
23	Rapid PO Malasia	Atlas Copco Energas, Germany	45526033	6	2016

Annexure B .From July 1986 to March 2012

A. **Inspection of Reaction Vessels with Agitator Assembly: to ASME Code Section VIII Divn.1 (Current Editions).**

Clients	**Vendors**
Indian Gum Industries, Ahmadabad;	Ghanashyam Steel Works, Baroda
Loctite India Ltd., Pune	Dalco Engineers, Pune
Hindustan Ciba Geigy Limited, Goa	Dalco Engineers, Pune
Khatau Junker Ltd. (Vats & Dyes)	Phils Engineering, Mumbai
Apcotex Lattices Limited, Taloja Mumbai	Indus Engineering Works,
Dufon Laboratories, Tarapore	Heat Fabs, Pune
Merind India Limited, Mumbai	Praj Industries / Alfa Laval, Pune
Alkyl Amines, Vashi & Kurkumbh	Polyquip Pvt. Ltd., Dombivali
Hindustan Polyamides & Fibres Ltd.	Spellbound,Rathi,Techmech, Thermotech
Madhu silica,Bhavnagar	Alfa laval,Pune,

B. **Inspection of Heat Exchangers and Pressure Vessels: SS, MS, Cu Ni etc. Codes ASME Section VIII Divn.1, AD Merkblatter, TEMA Std.**

Clients	**Vendors**
Bayer India Limited, Thane	AnandEngineers, Andheri,Mumbai
Quality Engineering, Thane	Metko Industries, Kalwe
Geecy Engineering, Thane	Dai-Ichi Karkaria, Pune
Dalco Engineering, Pune	Herdillia Unimers Ltd., Vashi
Consolidated Chemequip, Dombivali	Lurgi India Ltd.,Delhi
Project Technologists, Itola Baroda	Linde Process Technologies,
Radiant Engineers, Pune	Kirloskar Pneumatic Co., Saswad
BPCL Aromatic Plant/KTI Ltd.,Delhi	Larsen & Toubro Ltd.,Powai
GR Engineering, Tarapur	Reliance Heat Transfer, Mumbai
MRPL Mangalore/KTI, Delhi	TEMA Exchangers, Umbergaon
Alkyl Amines, Vashi & Kurkumbh	SV Tank & Vessels, Turbhe
Quality Engineering, Thane	Thermotech Engineers, Pune
Spellbound Engineers, Chakan	Cosmos Engineers, Pune
Fabtech Engineers, Pune	Steelvision Ind., Chakan
Polychem Limited, Nira	Walchandnagar Industries Ltd.

C. **Inspection of Rotary Autoclaves for Rubber Reclaim Machinery.**

Clients	**Vendors**
Gujarat Rubber Reclaim, Mumbai	Standard Plates&Vessels, Kolhapur
	Precifab Engineers, Kolhapur
	Petrochem Engineers, Ambernath
Avien Rubber Industries,Pune	Phils Engineering, Mumbai
Bharat Rubber Regen.Co., Calcutta	Centaur Engineers,Ambernath

D. **Inspection of Dairy and Brewery Equipment (predominantly Stainless Steel Sheet Metal Fabrication to proprietary standards and to 3A sanitary finish standards).**

Clients	**Vendors**
Alfa Laval (I) Limited, Pune	StandardPlates&Vessels,Kolhapur
	Precifab Engineers, Kolhapur
Hindustan Ciba Geigy Ltd.,Goa	Mojj Engineering, Pune
Larsen & Toubro Ltd., Mumbai	Filtron Engineers, Pune
	Fischer Industries, Solapur
	Jektron Engineers, Pune
Jain Chiquita Ltd.,Jalgaon	LKM India Limited, Sarole,Pune
Synergy Agro, Ahmedabad	Walmik/Milkmax/Ram
G.Deo,Pune	
Merind Limited, Mumbai	Alfa Laval (I) Limited, Pune
Vadilal Industries, Ahmedabad	Walmik Engineers, Pune
SAB Miller/Skol Brew.	Praj Ind. Ltd., Alfa Laval (I) Ltd.
UB Breweries,	Ziemann (I) P.Ltd.
Balaji Breweries	Synergy Engineers.
IDMC Ltd. Anand, Gujrat	Vendors located in Pune & Mumbai
PHEs:-	
KTI Ltd.,New Delhi	Indswep Energy Systems,Pune
	Praj Industries Ltd.,Pune
Triune Projects, New Delhi	Alfa Laval (I) Ltd.,Satara
L&T Ltd.Gr.II Projects,Powai	Fischer India,Solapur

E. **Inspection of Air Compressors and Gas Compressors** :

Clients	**Vendors**
ONGC / Triune Projects, Delhi	Atlas Copco (India) Ltd.,Pune

IPCL Gandhar/India Tube Mills	Kirloskar Pneumatic Co.,Saswad
ONGC / JCE Engg.Mgmt.,Delhi	Kirloskar Pneumatic Company,Pune
Bhoruka Gas/Linde Process Tech.	Alfa Laval (Stal Refgn AB),Pune
Iffco,Phulpur,Guna & Kalol/ITMML	Ingersoll Rand, Naroda,Ahmedabad
Deepak Fertilisers, Taloja/ITMML	Ingersoll Rand, Naroda, Ahmedabad
Essar Steel Limited, Hazira	Kirloskar Pneumatic Company, Pune
Atlas Copco India Ltd, Pune	
Radiant,Chintamani,Saksham,Pune	

F. **Inspection of Centrifugal Pumps to API 610 & IS 5120**:

Clients	**Vendors**
Larsen & Toubro Ltd.,Powai (various Projects)	Kirloskar Brothers, Kirloskarwadi
ISGEC/IJT, Noida	Sulzer Pumps,Thane,
Thermax ltd	Mather & platt/WILO
	KSB Pumps Limited,Pune
	Kishor Pumps, Pune
	Fristam Pumps,Pune
	LKM India Ltd., Sarole, Pune
Triune Projects, New Delhi (various Projects)	Kirloskar Brothers,Kirloskarwadi
	Khimline Pumps, Thane
	Akay Industries, Hubli
KTI Limited, New Delhi	Kirloskar Brothers,Kirloskarwadi
DLF Industries Ltd.,New Delhi	Mather & Platt, Chinchwad,Pune
	KSB Pumps, Chinchwad, Pune
Thermax Power, B&H Division	Akay Industries, Hubli
	Stork Pumps, Ahmedabad
	Kirloskar Brothers, Kirloskarwadi
JCE Engg.& Mgmt.Services,Delhi	Kirloskar Bros, Kirloskarwadi
KBL Export Division (Abu Dhabi Fund - Export to Egypt)	Kirloskar Brothers, Kirloskarwadi
VA Tech Wabag, Chennai	Kirloskar Brothers, Kirloskarwadi
	KSB Pumps, Pune; Kishor Pumps Pune.

G. **Inspection of Fans and Blowers**:

Clients	**Vendors**
L&T Niro Limited, Baroda	Airotek, Pune
	Batliboi Ltd., Udhna Surat
Larsen & Toubro Limited, Mumbai	Thermax Limited, Fans Divn.,Pune
(various projects)	Universal Fans, Pune
Essar Steel Limited, Hazira	Universal Fans, Pune & Jejuri
	Kulkarni Engg., Sangli
Global Enviro, Pune	Kulkarni Engg., Sangli
Triune Projects Pvt.Ltd., Delhi	Radalt Electricals, Jejuri
Alfa Laval (India) Limited	Asea Brown Boveri, Calcutta
ISGEC, Noida	Batliboi Ltd.'s, Pune Vendors

H. **Inspection of Steel Plant Equipment**:

Clients	**Vendors**
Mukand Ltd.Kalwe (Vizag Steel)	National Heavy Engg.,Talegaon
Essar Steel Limited,Hazira	Krupp Industries, and various
other sub vendors of Client.	

I. **Inspection of Material Handling Equipment : Cranes, Stacker Reclaimers, Conveyors, etc.**

Clients	**Vendors**
Larsen & Toubro, Gr.II Projects	National Heavy Engg., Talegaon
	Eddy Cranes Ltd., Pune
	Sood Technicians, Aurangabad
	Diamond Engrs., Chennai
Thermax Ltd., Cogen Divn., Power Divn, WTD, Divn, TBW, B&H Divn	Electromech Engineers, Pune
Kinetics Technology (KTI, Delhi)	Acme Engrs., Ghatkopar, Mumbai
	Eddy Cranes, Pune
	Indiana Conveyors, Jejuri
Neer Shree Cements, Kota	WMI Cranes, Bhandup, Mumbai
Essar Steel Limited, Hazira	Indiana Conveyors, Jejuri
Mukand Limited, Kalwe	Various sub vendors at Ambernath and Badlapur (various projects)

J. **Inspection of Boilers and Boiler Components** :

Clients	**Vendors**
L&T Gr.II GTFB (ACW CCP Project) Pune	Thermax Babcock Wilcox Ltd.
L&T Gr.II GTFB (UMIL-CCP Project)	Thermax Limited, Chinchwad
L&T Gr.II (Dairy Projects)	Thermax Ltd., Chinchwad, Pune
DLF Industries Ltd., Faridabad	Mirco Dynamics, Pune Cogen Industries, Pune Prabhakar Engineers, Pune Heat Fabs, Pune
Thermax Limited, Chinchwad	IBR approved sub vendors

K. **Inspection of Boiler Structural and other Structural**:

Clients	**Vendors**
Gujarat Heavy Chem.Ltd.,Sutarpada	TBW sub vendors, Pune
L&T Gr.II GTFB [ACW & UMIL CCP Proj]	Thermax Babcock subvendors
ISGEC John Thompson, Noida, UP	ISGEC subvendors, Pune
Thermax Power, B&H	Vendor at Pune & A'nagar

L. **Inspection of Cement Plant Machinery and ESP Equipment** :

Clients	**Vendors**
Neer Shree Cements, Kota	ThyssenKrupp Industries and Sub vendors Thermax Enviro and subvendors
L&T Gr.II Projects Cement Divn.	NHEC, Rakhoh Ent, Varun Engrs. Mahindra Engrs, Nenser Corpn., Technomech Engineers., Pune
Indo Rama Cements, Vashi, Mumbai	Walchandnagar Ind. Ltd., Thermax Enviro & subvendors

M. **Inspection of Castings to ASTM and Indian Standards** :

	Clients	**Vendors**
i.	<u>Steel (Sand) Castings to Indian Standards</u>	
	Mukand Limited, Kalwe [various projects]	Kolhapur Steel Ltd., Kolhapur
ii.	<u>High Alloy HK 40 (Sand) Castings</u>	
	Thermax Ltd., Pune	Uni Abex Alloy Products, Thane

N. **Inspection of Glendon Coil Assemblies : Centricast tube segments of**

HF/HK/HP Alloys for PIG IRON PLANT, to Tata Korf Design.

Clients	**Vendors**
Midwest Iron & Steel,Srikakulam	Uni Abex Alloy Products,Thane
Unimetal Ispat Limited,Hyderabad	Nitin Castings Ltd.,Thane
Lanco Ferro, Srikalahasthi	Dwarkesh Engg.Works,Calcutta
Kirloskar Ferrous,Hospet	Shivaji Works,Solapur
	Dwarkesh Engg.Works,Calcutta

O. **Inspection of Demineralised Water Plant Equipment** :

Clients	**Vendors**
Bayer India Ltd.,Thane	Aquatech Engrs.,Worli/ Rabale
KTI Limited, Delhi	Ion Exchange,Pune & subvendors
Triune Projects (IPCL)	Ion Exchange,Vashi& subvendors
L&T Ltd., Gr.II (Dairy)	Ion Exchange,Pune & subvendors
GSFC, Baroda [Ion Exchange]	Sparkon Engrs.Chakan
VA Tech Wabag, Chennai	Fabtech Engineers,Chakan,

P. **Inspection of Chemical Dosing Systems** :

Clients	**Vendors**
L&T Gr.II Projects, Powai	Enpro Engineers, Pune
L&T Gr.II (HARP Divn.) Baroda	VK Pumps, Nasik
L&T Gr.II (GTFB) Baroda	Enpro Engineers, Pune
KTI, New Delhi	Ion Exchange's subvendor
Thermax Ltd.,Cogen Divn.	VHP Engineers,Pune
DLF Industries Ltd.,Faridabad	Enpro Engineers,Pune

Q. **Inspection of Steel** :

Clients	**Vendors**
L&T Gr.II.Projects,Mumbai	Ispat Profiles,Sanaswadi,Pune
Essar Steel Ltd.,Hazira	Ispat Profiles,Sanaswadi,Pune
Kalyani Seamless,Baramati	Ispat Profiles,Sanaswadi,Pune
Mitsui Corporation,Mumbai	Jindal Steels, Vasind, Mumbai

R. **Inspection of Seamless Pipes and Tubes** :

Clients	**Vendors**
L&T Gr.II Projects (GTFB),Powai	Indian Seamless,Ahmednagar
	Kalyani Seamless, Baramati

L&T Gr.II (HARP), Baroda	Maharashtra Seamless Ltd.
KTI, New Delhi	Maharashtra Seamless,Nagothane
Saipem Triune ,New Delhi	Maharashtra Seamless,Sinnar.
Polychem Limited,Mumbai	Choksi Tubes,Ahmedabad
India Tube Mills,Mumbai	Gujarat Steel Tubes,Ahmedabad
	Ratnamani Tubes,Ahmedabad
	Radiant Engineers, Pune & Coin Bharat. Mumbai. Various Tube Mills in China & India

S. **Inspection of Valves, Steam Traps, Strainers, Filters, etc.**:

Clients	**Vendors**
L&T Gr.II (HARP Divn.) Baroda	BDK Valves, Hubli
L&T Gr.II Projects, Powai	BDK Valves, Hubli
	LKM India, Sarole, Pune
	Spirax Marshall, Pune
	Pennant Engg., Pune
	Intervalves, Pune
Triune Projects, Delhi	Fouress Engg, Thane
	BDK Valves, Hubli
	Niton Valves, Mumbai
India Tube Mills, Mumbai	Sakhi Engineers, Thane
	BDK Valves, Hubli
	Goodflow Valves, Mumbai
Thermax Ltd.,Cogen Division,Pune	Fouress Engg., Thane
	Shalimar Engg., Mumbai
DLF Industries,Faridabad	Crescent Valves, Mumbai
	Hitech Valves,Vasai
	Pennant Engg., Pune
	Intervalves,Pune
Reliance Industries Ltd.,Mumbai	Pennant Engg., Pune
	Intervalves, Pune
	Spirax Marshall, Pune
Atlas Copco India Ltd.,Pune	Kirloskar Filters,Pune
Essar Steel Limited,Hazira	Unique Valves, Pune
KBL Export Divn, Pune	Xomox (Invest) Valves, Belgaum
	Strong Steel Valves, Thane
	Crescent Valves, Mumbai
Alfa Laval (I) Ltd., Pune	Samson Control Valves, Thane

T. **Inspection of Forgings and Fittings** :

Clients	**Vendors**
L&T Gr.II Projects, Powai	Bharat Forge Limited,Pune
	Rajkumar Forge Ltd.,Chakan
Essar Steel Ltd.,Hazira	Rajkumar Forge Ltd.,Chakan
	Western India Forge,Pune
	Kran Rader, Pune
Andrew Yule & Co., Calcutta	Bharat Forge Limited, Pune
India Tube Mills/IPCL Gandhar	Echjay Industries, Rajkot
Thermax Ltd., Pune	Alliance Fittings & Forgings, Pune
Triune Projects Pvt.Ltd., New Delhi	Vishal Engineering, Bhayander

U. **Inspection of Fasteners** :

Clients	**Vendors**
L&T Gr.II (HARP) Baroda	Eby Fasteners, Mumbai
Dufon Laboratories, Mumbai	Crown Engineers, Dombivali
S.V.Tank & Vessel,Turbhe.	Crown Engineers,Dombivali.
India Tube Mills, Mumbai	Pacific Fasteners,Murbad
Larsen & Toubro Ltd.	Seni Engineers , Vikhroli

V. **Inspection of Unfired Pressure Vessels to SMPV (U) Rules, 1981, coming under the purview of CCOE Nagpur :-**

Clients	**Vendors**
Various LPG Transporters	SV Tank & Vessels, Turbhe
	and Installations [approx. 300 Nos.]
	Sintech Equipments,(16Nos)
	Heatfabs,Bhosari (15 Nos.)
	Fabtch Engrs.,Pimpri (5 Nos.)
	Sparkon Engrs.,Chakan (5 Nos.)
Telco / Globe Gas Company	4 Nos. 350 M3 Propane Tanks
	at Fabtech Engrs.,Chakan and
	1 No.350 M3 Propane Tank at
	SV Tanks & Vessels, Mumbai
Nippon Denro Ispat Limited	2 Nos. 173 M3 Propane Tanks
	at SV Tanks & Vessels,Turbhe
Bhushan Steels & Strips Ltd.	2 Nos. 288M3 Propane Tanks
	at SV Tanks & Vessels,Turbhe
Finolex Essex Ind.Ltd.Ratnagiri	2 Nos. 100M3 Propane Tanks
	at SV Tanks & Vessels,Turbhe

W. **Inspection of Diesel Engines, Diesel Generating Sets**:

Clients	**Vendor**
L&T Gr.II Projects	Cummins India Limited, Pune
	Greaves Limited, Pune
Neer Shree Cements	Greaves Limited,Pune

X. **Inspection of Gear Boxes**:

Clients	**Vendor**
Essar Steel Limited, Hazira	Kirloskar Pneumatic Co.Pune
L&T Gr.II Projects	Kirloskar Pneumatic Co.Pune
	Greaves Ltd.(David Brown),Pune

Y. **Inspection at Project SITES**:

Clients	**Project**
Deepak Fertilisers, Mumbai	Ammonia St. Tank, Taloja 1989-91
Davy Powergas,Mumbai	Gujarat Godrej, Ankleshwar'91
Essar Steel,Hazira/Thermax Ltd.	Sponge Iron Plant Module I & II
NOCIL, Ghansoli	Annual shutdown 1992
MRPL: for UHDE,DPGIL and KTI	MRPL Phase I:1995-96
Deepak Nitrite: for Xytel India	Deepak Nitrite Taloja Plant '96
SPIC Manali:for UHDE India	Manali Site 1996
IPCL :for India Tube Mills, Mumbai	Ethylene St.Tanks: Gandhar
Kirloskar Ferrous India Ltd. Hospet	Pig Iron Plant 1995-96
KPGIL/Praxair	Torangallu Site 1996-97
L&T Power, Baroda	GCW Kovaya 1998
TBW Limited, Pune	IOCL Barauni Site

Z. **Inspection of Centrifugal Purifiers**:

Clients	**Vendor**
L&T Gr.II (Projects),GTFB,Powai	Alfa Laval(I) Ltd.,Pune.
DLF Industries, Faridabad	Pennwalt Ind. Vashi, Navi Mumbai

AA. **Inspection of Electrical Motors (LT)**

Clients	**Vendor**
VA Tech Wabag, Chennai	Crompton Greaves Ltd. Ahmednagar
L&T Gr.II Projects	Crompton Greaves Ltd, Ahmednagar
Kirloskar Brothers (Export Divn.) (Abu Dhabi Fund - Export to Egypt)	KEC, Hubli & Bangalore

BB. **Inspection of Distilleries & Breweries Projects,**

Clients	**Vendor**

United Breweries, Bangalore	Praj Industries Ltd. Alfa Laval India Ltd.
SAB Miller India Ltd.	Praj Industries Ltd. Ziemann India Ltd.
Krones India Ltd.	Vendors located in Pune & Mumbai
Carlsberg India Ltd.	Krones India Ltd. IDMC Limited

CC. **Inspection of Water Treatment Equipment**

Clients	**Vendor**
Triveni Engg. Ltd. Delhi	Vendors located in Pune & Mumbai VA Tech, Wabag

DD. **Inspection for Overseas Clients , Equipments ordered & Vendors**

1.**Velosi Engineering, Kuwait**
- CI & CS Manhole Castings — Jayaswal Neco Ind. Ltd Nagpur
- PLC Control Systems — Honeywell. Hadapsar.

2.**Samson Reclaim Rubbers Ltd, Sri Lanka** — Rubber Reclaim Autoclave

3. **Malaysian Order** for Edible Oil Refinery Project : All SS 316 Oil Storage Tanks, Heat Exchangers & Columns — Techmech Engineers, Thane

4. **M/s Forbes Taidue & M/s Niemo**, both of **Mauritius** : Sugar Ind. Eqpt. Crystallizers, Juice Heaters, Conveyors, Impact Rollers, Fibrizers, Evaporators, and PAN Bodies. — M/s Citadel Impex Pvt. Ltd. M/s Nenser Corporation, Pune; and Kolhapur Vendors : SNSP Engg., Precifab Engg., Parekh Udyog, Prith-pal Ind., Navi Mumbai, Kolhapur Auto.

EE. **Inspection of Current Projects**

1.**Thermax SPX-** : Eqpt. : Preheater assemblies:
Vendors :Visoka Engineering Pvt. Ltd., & Precision Eqpt, Pvt. Ltd. Chennai

2.**Concept Engg. Proj. Pvt. Ltd**. -Tubulars, Valves & Pipe Fittings — C. Doctor (I) Pvt. Ltd., Vatva, Ahmedabad

3. **Johnson Matthey Chem. (I)Pvt. Ltd**.
- PHEs — Alfa Laval I. Ltd. Satara,
- Heat Exchangers & Columns — CCMC, Dombivali

4.**Thermax Ltd Power Division** : Accessories for 125 MW Boilers
a.Project : Reliance Infra, Dhusar, Rajasthan.
Eqpt. : Blr Feed Pumps, Centrifugal Water Pumps, Control Valves, SRVs and Boiler Structurals :
Vendors: KSB Pumps, Pimpri; Limson Engg.; Ravi Ind.; RV Ent.; Jai Ambe; Bend & Fab; Vakkannad Engg.

b.Project: Dangoti Zambia : Eqpt. : Pressure Vessels, Air Receivers & CF

Pumps Vendors : Minaxi Energy Ltd., Coimbatore and Mahesh Ind., Sanaswadi

5. Isgec Heavy Engineer Limited, Noida,

6. **Atlas Copco (I) Ltd**.: HP Compressor Base Frame & Intercooler Assemblies, Projects : Bharat Chemical & Petrochemical Ltd.; INOX, Pondicherry; INOx MAC-I, II, III, IV; INOX BAC-I, II, III, IV; British Oxygen; TAKE OFF Project, South Africa; L & T hazira; GSFC, Baroda; Rashtriya Ispat Nigam, Vishakhapatnam; Al Dahej, Saudi Arabia. Vendors : Radiant Engg.& Fabritech Engg., Bhosari; Saksham Ind. & JJ Ent., Chakan; TR Ent. Talavade; Chintamani, Hadapsar; United Engg., Nashik; GEI Bhopal; Karnataka Engg. Banglore;

Quest Quality Assurance Plans

QUEST QAP No. 1
QAP for ROTARY AUTOCLAVE with Limpet Coils
Rubber Reclaim Autoclave

ORDER DETAILS

PROJECT	Various for GRRP Rubber Reclaim Plants
PURCHASER	Gujarat Rubber Reclaim Pvt. Ltd., Mumbai
PURCHASE ORDER NO. &	
MANUFACTURER	**Approved vendors of GRRP,**
QUALITY PLAN PREPARED	Mr. RS Nagarkar, & K.V.Mane ,
QUALITY PLAN APPROVED	GRRP,Munbai

DESIGN FEATURES

DESIGN CODE	ASME CODE Section VIII Div. 1, Edition 2004
EQUIPMET NAME	Horizontal ROTARY AUTOCLAVE: Motor Driven
EQPT. SIZE	1500mm ID x 4000mm Tan to Tan Line x 20mm thick Shell/22mm thick dished end
MAT'LS OF CONSTRUCTION	
DESIGN PRESSURE	SHELL : 22 Kg/cm2 LIMPET COILS : 7.0 Kg/cm2
DESIGN TEMPERATURE	SHELL : 280 Deg C LIMPET COILS : 280 Deg C
CORROSION ALLOWANCE	SHELL : 1.5 mm LIMPET COILS : 1.5 mm
RADIOGRAPHY	SHELL MAIN SEAMS : 100% DEs : SEAMLESS
POST WELD HEAT	YES; @ 600 Deg C : Soaking for One Hour
HYDROSTATIC TEST	SHELL : 33 Kg/cm2;LIMPET COILS : 9 Kg/cm2 (7.7 Pn.)
Low Pressure Air Leak Test	RF PADS : 1.5 Kg/cm2 LIMPET COILS : 2.5 Kg/cm2
ANY OTHER TESTS	RUNNING TRIALS @ NO-LOAD, and FULL LOAD (@
DRAWING NOS./ REV. NO.	
THIRD PARTY INSPECTION	Quest Associates, Pune 411 027
WELDING PROCESSES & CONSUMABLES	SMAW and GTAW+SMAW : Using AWS E-7018 Electrodes

MAJOR MATERIAL SPECIFICATIONS

Cylindrical Shell Plates	ASME SA 516 Grade 70 : 25mm thick
Torispherical Dished End Plates	ASME SA 516 Grade 70 : 28mm thick
Top & Bottom Door Assembly	Cast Neck Ring : IS:1030 Gr. 26-52; Neck: 25mm SA 516
LIMPET COIL HALF PIPES	IS: 1239 Class C (Heavy) 4" NB x 4.80mm thick ERW
NOZZLE PIPES / NECKS	ASME SA 106 Grade B
STRUCTURAL/NON PR. PARTS	IS : 2062 Grade B.
FASTENERS	Studs: ASME SA 193 Gr.B7 & Nuts: ASME SA 194 Gr.

MANUFACTURING POLICY

1.	All efforts shall be directed to ensure that material abuse is avoided; and material properties are in
2.	In Design and Fabrication : sharp corners, abrupt changes of sections, and such other physical as
3.	"NO EXPERIMENTS" shall be made on the actual job. Where necessary, Mock-up Tests and
4.	Welding Procedures and Welders shall be pre-qualified, by training, testing and qualifying
	ASME Code Section IX, prior to employment on the actual job.

MFG POLICY [Contd/-]

5.	The equipment shall be constructed in accordance with the requirements of, a) The Design code, together with b) The Approved Fabrication Drawings c) The Purchase Order and, d) The Approved
6.	Revisions to the Approved Fabrication Drawings may be based only upon, : a) Change in manufacturing procedure with prior agreement of the Purchased. b) Overriding Purchaser's requirement in so far as they do not contravene the Design
7.	All deviations shall be promptly recorded, deliberated upon by Manufacturer's Design and Quality Control Departments, and appropriate disposition actions submitted to Purchaser.
8.	Corrections, Corrective Actions, and other disposition actions vis-à-vis Deviations and Non- Conformities, within purview of the Code, as proposed by Vendor QC, may be allowed by
9.	Unusual Repairs may be undertaken in accordance with a Special Repairs Procedure with prior approval of Purchaser and Third Party Inspection Agency. Necessary precautions as well as applicable NDT & PWHT as required by Design Code, shall be incorporated

QUALITY ASSURANCE & CONTROL

A. DESIGN CONTROL ON SHOP-FLOOR

1.	Ensure that only the latest revisions of Approved Fabrication Drawings are used on shop-
2.	Maintain a separate Register (Job-wise) for recording as-built changes and deviations, if any, for
3.	Obtain approval of TPI and Purchaser on As-Built drawings at intermediate stages and

B. MATERIAL CONTROL

1.	Scrutinise Manufacturer's / Mill Test Certificates for compliance with Specification &
2.	Verify authenticity and co-relation of identification marking with Mill / Mfr's TC.
3.	- Where permitted by Design Code and the Purchaser, draw appropriate number of samples for required check tests from partially identifiable materials. Check Tests shall be witnessed by TPI.
4.	Ensure that only materials complying with requirements of the approved Fabrication Drg. / Bill of Materials are procured. Deviations found, if any, shall merit rejection; minor deviations, if any, may be put up to consideration of Purchaser and TPI for acceptance
5.	Identification markings on accepted materials shall be transferred on allocated portions and left-

C. WELDING CONTROL

1.	Prepare applicable WPSs (proposed Welding Procedure Specifications),as relevant to each type of
2.	Conduct Receipt Inspection of Welding Consumables procured, and maintain batch test
3.	Conduct Welding Procedure and Welder Performance Qualification Tests in presence of TPI, and prepare documentation thereof as per ASME Code Section IX. Submit the documented
4.	Ensure that qualified Welding Procedures and Welders (duly qualified in relevant positions), are
5.	Scrutinise and verify completeness of the proposed Special Repairs Procedure including, where
6.	Ensure step by step implementation of the approved Special Repairs Procedure, including stage
7.	Identify each weld-seam with Job No., Seam No. and a hard stamp by the welder.

D. NON-DESTRUCTIVE TESTING CONTROL

1.	Written NDT procedures / techniques shall be submitted for scrutiny and prior approval of
2.	The procedures shall meet Code stipulations and include details of the equipment used, its
	capacity, strength and sensitivity, and the NDT Operator's name and ASNT / ISNT
3.	NDT Technique adopted for each weld configuration / item under examination shall be as stipulated in the relevant NDT procedure.

E. FABRICATION INSPECTION CONTROL : CHECK LIST

Legend : P = Perform W = Witness E = Evaluation V = Verify H = Hold

S.No	Activity	Characteristics Checked	Ext of Check	Acceptance Standard	Hold Fabr	Points Quest	Client GRRP
1.	Approval of Drawings & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code Sec. VIII Div 1: 2001 & P.O.	P	V/A	A
2.	Welding Prequalifications WPS,PQR, WPQ	Qualify afresh, using optimum heat	100%	ASME Code Section IX	P	W	V
3.	Verifn of Weld-ing Consumables	Batch Test Certs of Consumables	100%	ASME Code Section II Part C	P	V	V
4.	**Material Identification**. ---Stamp Transfer -Witness Pouring UT& HT of MH Castings **NDT of Mat'ls:** **Plates…….** **Forgings……** **Castings……** **Castings.....**	Identification & corelation with Mill / Mnfr's TC Dim'l andVisual Inspection **UT Check** as per ASTM A435 ASTM A 388	100 % 100 % 30mm thk	Drawing and Bill of Materials; ASME Sec II Part A: Refer To QCPs # 1,2,3. Scanning 100% A 435 Clause 6 ASTM A578Level	P P P P	H H H/W H/W	V V V V
5.	Inspection of Sub-Ordered Materials at @Vendors' Premises.	Inspection as per Material Speci-fications, Order	Cast Forged Plat	IS : 1030 Gr. 26/52 ASME SA 105 ASME SA 516 Gr70 ASME SA 106 Gr B ASME-VIII-1	P	W	V
6.	Inspection of Dished Ends	Visual and Dimensional Check. Refer ASME VIII-1 Clauses UG	100%	Ovality, min thick, Height, OD, Circf. & Profile check by Template. (as per Approved drawing) As per ASME.VIII Div1 Appendix 8	P	W	V
7.	Shell long seam set-ups	Pre-pinching, Ovality, Circf. Weld	100%	No flat spots; Set-up as per drawing & Ovality < 1%	P	W	V
8.	Back-chip PT of long seams	Back-chip & PT to sound metal	100%	PT acceptance as per ASME.VIII–1 App 8	P	W	V
9.	Final Inspection after finish weld-ing & Re-rolling	Weld finish; Ovality check.	100%	No undercuts/ under-fill or spatter; After re-roll Qualify 3	P	H	V

S.No	Activity	Characteristic Checked	Ext of Check	Acceptance Standard	Hold Fabr	Points Quest	Client GRRP
10.	Radiography of Long Seams	Weld soundness Shell / DE	100%	ASME Code SecVIII-1 UW-51	P	E	V
11.	Typ. Set-up of Circumf. Seams Shell to Shell, DE to Shell	Weld geometry, Dimensions, Orientation & Alignment	100%	Verify RT of LSs completed; ASME VIII-1 and Drawing; Aligned	P	H	V
12.	Circum. seam backchip DP test	Back-chip & PT to sound metal	100%	PT acceptance as per ASME.VIII–1 App 8	P	H	V
13.	Final Inspection of finish welding -and that of the cylindrical Shell	Check weld finish,Alignment & shell length after	100%	No undercuts/ under-fill/spatter/arc strikes Alignment 1mm/Mtr **:** max 4mm.	P	H	V
14.	Radiography of Circ-seams	Weld soundness -Defect free	100%	ASME Code Sec. VIII Div.1 UW-51	P	E	V
15.	Marking of Man ways & In/Outlet nozzles on Shell	Dimensions and Orientation	100%	Drawing, Nozzle Schedule, BoM.	P	H	V
16.	Inspection of 4" NB ERW pipes : Half pipes for Limpet Coil	Section-bent half pipe segments : Check on	100%	As per helical layout drawn on shell; No kinks or wrinkles; Check	P	H	V
17.	Mock-up Test : Welding of half pipes of Limpet Coil to plates	Proper fitup of half pipes on a plate; Mock-up welding	100%	Uniform root gap & root face; consistent full penetration weld	P	H	V
18.	Set-up of Limpet Coils: half pipes and closure plates on shell.	Single-V joints at pipe to shell, pipe to pipe & closure plt	100%	Uniform root-gaps & root face; Fit-up as per layout; sequen- tial	P	H	V
19.	Final visual & Dimensional examination on completion	Visual inspection Dim'l check: shell length &	100%	No surface blemish : undercut, arc strike, spatter or	P	H	V
20.	Low-Pressure Pneumatic Test on limpet welds; Vessel Rotated.	Leak Detection by soap bubbles. Use calibrated	100%	-Pn. Leak test @ 2.5 Kg/cm2 – No Leaks -Thru' thick. leaks to Repair & Retest.	P	H	V
21.	Cut Manway openings for access in Vessel	Cut open only after the limpet coils	100%	Drawings & Layout: Limpet Coils circum -vent manways	P	V	V
22.	Setup of Forged 90 thk End Rings on Dished Ends	Concentricity, Centre distances Weld-edge	100%	Dimensions of shaft Brg centres; Square- ness of	P	H	V
23.	Welding of End Rings on DEs: Sequentially.	To maintain con centricity, fit the shaft in	100%	Concentricity of central shaft; square- ness of end	P	V	V
24.	Final Inspection of above welds	Weld finish and Weld sizes	100%	No undercuts/ under-fill or spatter.	P	H	V
25.	Top & Bottom Manway Rings: CS Castings to IS 1030Gr.26-52	Identification at Foundry as per **QCP #1:** Stamp keyblocks	100%	Verify Foundry TC . Stamp test blocks after	P	H	V
S. No	Activity	Characteristic Checked	Ext of Check	Acceptance Standard	Hold Fabr	Points Quest	Client GRRP

26.	Acceptance of Castings upon satisf. Check tests	Tensile, Bend & Hardness Tests; UT of castings PT of	100%	Test Results as per IS: 1030:Gr.26-52 UT A609 Clause 18 Weldedge-No defect	P	H	V
27.	M/W Rolled Necks L. seam welding & RT	LS fitup & weld-ing as per Cl. 7to	100%	Neck Long Seam RT 100% Acc. std. ASMEVIII-1UW-	P	H	V
28	Attachment of necks to M/Way Castings	Circ seam fitup& welding as per		Circ Seam weld finish - RT 100% ASMEVIII-1UW-	P	H	V
29.	Marking of Re-maining Nozzles on shell & DEs:	Dimensions and Orientation	100%	Drawing, Nozzle Schedule, BoM.	P	H	V
29.	Nozzles to SORF flanges : sub-assembly set-up	Dimensions, Squareness & weld	100%	Identifn markings, Rating & Sizes as per Spec & Drawing	P	H	V
30.	Air Leak test of nozzle to SORF flange welds	Leak Test using Soap solution.	100%	Pn. Test Pressure 1.5 Kg/cm2 : No leaks Use Calibr. Pr. G/gs	P	H	V
31.	Setup of Nozzles / Manway neck on shell & DE	Visual, Dim'l, & Weld Geometry RF Pad fitment	100%	Drawing Details : Weld set-on / set-in Root gap/squareness	P	H	V
32.	Nozzle to shell / DE back-chip PT	Back-chip & PT to sound metal	100%	PT acceptance as per ASME VIII–1 App 8	P	H	V
33.	Final Inspection of above welds	Weld finish and Weld sizes	100%	No undercuts/ under-fill/arc strike/spatter.	P	H	V
34.	Saddle-Supports Assembly: Bearing Pads	- Inspection of 3rd Dished End &	100%	3rd Dished End Tori-spherical: 28mm thk	P	H	V
35.	Material Idfn of Stub & Pipe-shaft; Inspection	Forged/BarStock for stub shd be normalised &	100%	Witness all tests; check dimensions of shaft after	P	H	V
36.	Final inspn of saddle structural support and level	Final Visual insp & weld sizes Dim'l check of	100%	No undercut, spatter, arc strike, under-fill; No deformation, tilt	P	H	V
S. No	Activity	Characteristic Checked	Ext of Check	Acceptance Standard	Hold Fabr	Poi ntQ	Client GRR
37.	Final Overall Dimensional & Visual Check;	Dim'l check & check for comple	100%	Check completion of work. Note as-built dimensions. Convey	P	H	V
38.	Final visual exa-mination of all the weldments on	Final Visual and Dimensional check of welds;	100%	No surface blemish : undercut, arc strike, spatter or under-fill;	P	H	V
39.	Post Weld Heat Treatment (SR) of Vessel with	Calibration of Furnace controls &	100%	Verify whether Vessel loading & thermocouple place -	P	H	V
40.	Concentricity & Dim'l check after PWHT	Concentricity as per Customer's requirement.	100%	Convey final dim'l readings to Purcha-for his acceptance.	P	H	V
41.	Stirrer/Agitator Machined Parts incl. hollow &	-Dimensional, Visual Inspn. -Witness fitting	100% as per	-As per appd. Drgs. within tolerances; -Interference fitment	P	H	V
42.	Stirrer shaft after m/cg as mounted on Lathe, and prior	Run-out of shaft checked as mounted on	100%	Run-out -@ stuffing box areas +/- 0.1mm -Upto 1 Mtr away	P	H	V

43.	Rotor Assembly In Vessel with Stirrer arms and	Static Balancing Swing Diameter, Angle size and	100%	. Statically Balanced . Swing Diameter +/-2mm	P	H	V
44.	Fitment of Saddle Supports on Dished Ends:-	Fit pronged plate members vertical and then	100%	Required Height, Centre distances and Diagonals of bolt	P	H	V
45.	Final Inspection of Autoclave Assembly with	Visual & Overall Dim'l Inspn of	100%	Verify completion of welding work and correctness of	P	H	V
46.	Running Trials: Pl. refer to GRRP QCP# 4	No-Load Trial Direction of Ro-tation:	100%	No Load Trial : Smooth run. Check swing diameter and	P	W	W
47.	Final Hydro- static pressure test of Rotary	Test Pressure : 34.32 Kg/cm2 at top., with	100%	Calibrated Pressure Gauges Range 1.5 to 4 times test pressure	P	W	W/ V
48.	Final Hydrostatic /Pneumatic pressure test of	Test Pressures : 9.1 Kgcm2(Hyd) / 7.7	100%	Calibrated Pressure G/gs Range 0~14 Kg/cm2 Holding	P	W	W/ V
49.	Bottom MH Door on Trolley	Free movement To & Fro and Up & Down	100%	Operations to be shown to GRRP & Quest at the Shop.	P	W	W
50.	Painting of MS parts	2 coats of Zinc CrO3 Red Oxide	100%	Wire brush & paint DFT 60 microns	P	V / W	W/ V
51.	Identification Marking	Hard Punching per Data sheet	100%	On a permanently welded SS plate	P	V	V
52.	Certification and Documentation	Review Folders and sign	100%	Manufacturer's Document Folder	P	V	V

OCP.NO. 1 : PROCEDURE FOR INSPECTION OF MANWAY CASTINGS

1. The Manway Castings: 2 Nos. shall be procured in duly fettled condition from a reputed Foundry with established Quality System. Scope of inspection for Third Party Inspection Agency (TPI) based on the following requirements shall be stipulated in Sub-Orders placed on Foundry.
2. Castings shall be to IS: 1030 Gr. 26-52, covered by Foundry Certificate, to that effect. Additionally, integral test bars shall be provided, for product quality check testing. Alternately, if separately cast test blocks (key- block type) are proposed, then pouring shall be witnessed. Metal tags (with identification marks punched) shall be inserted in test-blocks at the time of pouring. 2 Nos. Extra test-blocks shall be required for product check tests. Tests shall be witnessed by designated Third Party Inspection (TPI) agency.
3. As an essential requirement , the Castings shall be of normalised quality (Soaking time 1min/mm. Extra test blocks, normalised with the casting/s in furnaces with calibrated thermocouples and Master Controller, shall be checked for Tensile, Hardness, Bend and Chemical check tests, in presence of TPI, to verify compliance strictly to IS 1030 Gr. 26-52 specification , without deviation.. TPI shall then conduct visual and dimensional check of the castings before & after machining.
4. Only after satisfactory results of check testing and inspection, the castings shall be released for machining.
5. After machining, the castings shall be dimensionally checked to approved drawing. The welding edges shall be dye penetrant tested as per ASTM E 165, to satisfaction, in presence of TPI. Any linear or rounded indications found are not acceptable. Acceptable Castings shall be released for fabrication.
   Note : If castings are to be tested Ultrasonically, the acceptance standard shall be as per ASME Std. SA 609 Clause 18.

OCP.NO. 2 : PROCEDURE FOR INSPECTION OF C.S. FORGINGS

1. Carbon Steel Forgings (90 thick End Rings and forged flanges) for the Autoclave shall be procured in duly forged and normalised condition from a reputed Forge Shop, with established Quality System. Scope of inspection (See 3 below) for Third Party Inspection Agency (TPI) based on the following requirements shall be stipulated in Sub-Order/s placed on Forge Shop.
2. Forgings shall be to ASME SA 105 specification , covered by Forge Master's Certificate, to that effect.
3. Following product quality check tests shall be witnessed by designated Third Party Inspection (TPI) agency.
   - Visual and Dimensional check in as-forged, as well as in as-machined condition, to approved drawings.
   - Review Forge Master's Test Certificate for compliance with Specification & Sub-Order.
   - Witness Hardness check and Ultrasonic Testing (UT) (by Pulse Echo method) of forgings. UT shall be carried out on forgings above 30mm thickness (or ruling section) as per ASME SA 388/or SA578 Level A.
4. Upon satisfactory results of testing & inspection the forgings shall be released by TPI for further process.

OCP.NO. 3 : PROCEDURE FOR INSPECTION OF C.S. PLATES & PIPES

1. Carbon Steel BQ Plates, structural quality plates and seamless and ERW Pipes for the Autoclave shall be procured in duly hot-finished and heat-treated (where applicable) condition from a reputed Steel/Pipe Mills, covered by authentic mill test certificates. Scope of inspection (See 3 below) for Third Party Inspection Agency (TPI) based on the following requirements shall be stipulated in Sub-Order/s placed on Steel Mill / Steel Supplier..
2. BQ Plates shall be to ASME SA 516 Gr. 70 specification , Seamless BQ Pipes to ASME SA 106 Gr. B specification, ERW Pipes for Limpet Coils to IS 1239, and structural quality steel plates to IS 2062 Gr. B specifications, duly covered by Steel Maker's/ Pipe Mill's Certificate/s , to that effect.
   a. Material shall be co-relatable as such with authentic markings / stamping there-on.
   b. Where the material is not co-relatable, but is partially identified or partially identifiable, then with Purchaser's prior concurrence, **full check tests on each plate/pipe as rolled, as per specifn**, may be carried out, and if results are satisfactory, same recorded in material history chart, in acceptance..
3. Following product quality check tests shall be witnessed by designated Third Party Inspection (TPI) agency.
   - Review the Steel Maker's Test Certificate for compliance with Specification and Sub-Order.
   - Co-relate the material markings/ stamping with Maker's Test Certificate, and transfer identification / heatmark on cut-outs and left-over material.
   - Witness check tests where applicable as stipulated in clause 2 b above. If results of testing & inspection are satisfactory then transfer identification / check test number on cut-outs and left-over material.
   - Visual and Dimensional check in as-rolled condition, to approved drawings and Bill of materials.
4. Upon satisfactory results of testing and inspection the materials shall be released by TPI for further process.

OCP.NO. 4 : PROCEDURE FOR TRIALS & TESTING OF STIRRER

1. The Stirrer / Agitator shaft shall be made exactly as per drawing. The shrink fitting operation of of hollow and solid sections of the shaft shall be witnessed by TPI. On completion of machining of the composite shaft, it shall be inspected as mounted on the Lathe itself, for visual, dimensional and run-out (deflection) checks. The acceptance tolerance limits are given in clause 41 of the Quality Plan above.
2. The Stirrer Rotor Assembly shall be checked for static balancing, swing diameter and clearances between vessel skin and scrapers, after assembly in the Vessel, and same shall be offered for verification by GRRP/ TPI (Quest Inspection Services P. Ltd.) before trial run. See clause 42 for acceptance tolerance limits.
3. Prior to full load trial, the Stirrer (Rotor) Assembly shall be run on no load in the vessel. No load test shall be at the rated speed with job motor, gear box/ chain drive and Rotor completely assembled. See Quality Plan clause 43 for the various checks required to be carried out.

OCP.NO. 4 : PROCEDURE FOR TRIALS & TESTING OF STIRRER (Contd/-)

4. Deflection (Run-out) & Clearance at the vessel/scraper interface
   a) Deflection on shaft near Stuffing Boxes +/- 0.1mm TIR.Max. b) Deflection on shaft upto 1 mtr. away from stuffing box +/- 0.5mm TIR. Max.. c) Deflection on mid-length of shaft +/- 1.5mm TIR Max.
   d) Clearance at the vessel skin / scraper edge interface 4 to 6mm max.

5. Full Load trial shall be carried out at design pressure, with rotor assembly turning at rated RPM, in each direction for fifteen minutes' duration, with a minute's break prior to reversal of direction. Autoclave shall be full of water. If the level of water is less than full capacity of the equipment then the balance volume shall be filled and pressurized with air to design pressure.
6. The pressure drop [through Stuffing Box], if any, at the end of 1 hour load trial shall not exceed
7. 0.5 kg/cm2.

DESPATCH : The Autoclave Equipment with the agitator unit and drive, shall be despatched, as assembled for trials with the Autoclave, after successful trials. .All the machined parts shall be given one coat of rust preventive .All the cases, carrying loose items if any, shall have proper packing lists.

QUEST QAP No. 2

Std. Quality Plan for Heat Exchangers with Expansion Bellows

A. Ground Work : Fabrication Drawings, Quality Plans, Welding Qualifications & Materials

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold Ven	Points Quest	Client
1.	Approval of Drawings & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code VIII Div 1: 1995 & P.O. Reqts.	P	V/A	A
2.	**Welding** Pre-**qualifications** WPS,PQR, WPQ	Review/Offer Qualification Tests to TPI	100%	ASME Code Section IX : use optimum heat input	P	W	V
2.	Pre-Qualification of SS weld-over-lay procedure, if required, for MS Body Flanges & Nozzle flanges.	SS overlay on MS: to check for Visual, PT, Chemical check at 0.5 mm depth & Air-leak Test	100%	Soundness in air-leak test @1.5 Kg/ cm2 ; PT of welds to App. 8 ASME VIII-1; Chemis-try per SS grade	P	W	V
3.	Traceability of **Welding Consumables**	Batch number to Correlate with Consum-able TC	100%	ASME Code Section II Part C	P	V	V
4.	**Material** Identification. & Stamp Transfer -Material for Plates, Body Flanges, Nozzle Pipes, Flanges, Tubesheets, and Expansion Bellows	Idfn.34orrelation with Mill TC Dim'l Inspn & Visual Inspn UT Check above 30mm thickness -If applicable	100% 100% - where Applicable	Drawing and Bill of Mat'ls , ASME Section II-Part A ASTM A435: Scan100% surfaces: Acc NormA578 Level A	P P P	H H H	V V V

B. Inspection of Tubesheets & Mock-up Test for proposed type of Tube to Tube-sheet Joints

5.	Mock-up Test for Tube to Tubesheet Joints : Establish Torque for % thin -ning of tubewall	Review of Pre- qualified Mock-up test records / -Witness fresh test if necessary	100%	ASME Sec.VIII-1 : Non Mandatory App. 'A' & TEMA Class B / C	P	R /W	V

6.	Tubesheets: Inspection on ground after it is fully machined	Orientation, Lay-out/ Finish & Size of tubeholes & Ligament size	100%	ASME Sec.VIII-1 App. A & TEMA Class B or C	P	R /W	V

C. Inspection of Dished Ends, Bonnet Dished Ends and Expansion Bellows

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold PM	Points Quest	ClientHPFL
7.	Inspection of Main Dished Ends & Bonnet DEs & of Expansion Bellow Halves	Dim'l.[Ovality, thickness,Height, D,Circumf.] Profile by Template;PT on weld edge, SF,knuckle	100%	Approved drawing DE Min. thick. shall be not less than specified. PT as per App. 8 ASME.VIII–1	P	W	V
7a	CS fit-up of Expn bellow halves	Weld edge prepn Concentricity		No mismatch			

D. Fabrication of Exchanger Shell

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold PM	Points Quest	Client HPFL
8.	Main Shell & Bonnet shells: fit-up of **Long seams**	Weld geometry Pre-pinching, Tack Weld PT Dbl.butt weld	100%	No flat spots; Edge Prepn as per Drawing Ovality 1% max	P	W	V
8a.	PT of Long Seam root chip-back	Chip-back root to sound metal	100%	No visible discontinuity allowed.	P	W	V
8b.	Final weld passes : Visual Inspn & PT before RT	PT as per ASME VIII-1 App. 8	100%	No Root suck back, undercuts or under-flush, discontinuity	P	W	V
8c.	RT: LS butt welds Full/Spot/Nil	Weld soundness	E=1.0/ 0.85/ 0.7	ASME Sec VIII-1 UW-51/ UW-52/Nil	P	E	V

9.	Set-up of **Circum – seams:** Shell to- Shell/DE or to Expansion bellow	Weld Geometry Alignment, Ovality & Orientation Dbl butt weld	100%	Approved Drg Details; Alignment 1mm/Mtr.>6m mOvality 1%max	P	H	V
9a.	CircSeams-root chip-back PT	Chip-back root to sound metal	100%	No visible discontinuity	P	W	V
9b.	Final weld passes : Visual Inspn & PT before RT	Visual Inspn & PT as per ASME VIII-1 App. 8	100%	No Root suck back, undercuts or under-flush, discontinuity	P	W	V
9c.	RT: CS butt welds E=1.0/0.85/0.7	Soundness of all the weld seams	Full/ Spot/ Nil	ASME Sec VIII-1 UW-51/ UW-52/Nil	P	E	V

D. <u>Inspection of Nozzles 'sub-assemblies' and their fitment on to the Equipment</u>

10.	Set-up of Nozzle Sub-assemblies : Pipe to Flange	Squareness;Weld Prepn; Size&Sch of Nozzle;Rating of Flange	100%	Approved Drawing & ANSI Standards B 16.9 , B16.11 and B 36.10	P	H	V
10 a.	Final Inspection of Nozzle sub-assemblies	Visual & Dimen- al check and Air Leak Test of Nozzle sub-assys	100%	Weld size as per Drawing; no leaks ; Squareness of Flange with Nozzle	P	H	V
10 b	Nozzle Marking on Shell & DE	Dimensional + Orientation	100%	Drawing Dimensions	P	H	V
10 c	Nozzle Sub-Assys fitment on Shell / DE, after checking markingsthereon.	Check Nozzle markings, elevation, orientation, stand-out height	100%	As per Drawing; Elevation /Orientn within tolerances; Tilt within ½°.	P	H	V
10 d	Couplings fitment on Shell/DE/ExB	Weld prepn plus chipback @ root	100%	Component Drawing	P	H	V

10 e.	Visual Inspection: weldedcouplings	Fillet weld size Int. surface flush	100%	Appd Drawing	P	H	V
10f.	Visual Surface Inspection of all fabricated parts, including DEs & Shells internally & externally	Visual Inspection :- Check for blemishes, weld sizes, completion of work; & Aesthetics	100%	No surface blemishes/discon -tinuities. No deformation Good workman -like finish.	P	H	V

E. Final Inspection of Main Shell (incl. Exp. Bellows) and Bonnet Shells with Bonnet DEs

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold Mfr.	Points Quest	Client
11.	Final Inspection: Shell,Bonnets & Nozzles; Fit saddle support pads before checking passage of a 3-baffle **Piston**	Visual & Dim'l Check & Visual Inspection of internal surface; No deformation.	100%	Int'l weldsflush. No blemishes. Piston Passage shd be smooth : **Piston** OD =Baffle OD Refer TEMAStd Table RCB 4.7]	P	H	V
11a	Pneumatic Test of Nozzle RF Pads	Pn. Pressure test at 1.5 Kg/cm2	100%	No Leaks:Use soap suds to detect leaks	P	H	V

F. Inspection of Tube Bundle

12.	Inspection of Tube Bundle skeleton set-up	Visual & Dim'l Check; No. of Baffles & Pitch	100%	Approved Drawing Dimensions of Baffles critical	P	H	V
12a	Tube Bundle Insp after expansion and/or seal weld or strength weld	Check length of expansion & thinning by 3-pronged Micro-meter. Check fillet weld size	Visual 100%; Rest 20% at Random	No molten tube-ends. Fillet weld size=tube thickness Uniform torque application for Expansion of tubes.	P	H	V

G. Final Inspection of Heat Exchanger Assembly

13.	Final Inspection of Heat Exchan-ger assembly.	Dimensional Check & Verifn of orientation of pass partitions	100%	Approved Drawing Overall Dimen-sional check, incl. Dowel Pin fitment	P	H	V
14.	Visual Surface Inspection of fabricated parts DEs internally & Shell externally	Visual Inspection	100%	No surface blemish -es, discontinuities. Check weld sizes & completion of work; Aesthetics	P	H	V
15.	**Pressure Tests** . Overlay welds of Nozzle & Body flanges . Slip-on Flange to Nozzle weld . Shell Side . Tube Side . Finally low-pressure sensitive test on Shell Side	Pn. Tests @ 1.5 Kg/cm2 with soap suds to detect leak s Hydrost.Test Hydrost. Test Pneumatic Test @1.5 Kg/cm2 with soap suds for leak detection	100% 100% 100% 100%	No leakage at test pressure ; Holding time min 30 minutes: Shell &Tube Sides : Hydrostatic Test Pressures shall be as per Appd drawing	P	W	W/ V
16.	External Surface Preparation & Treatment	Acid cleaning & Passivation by HNO3 (No HF)	100%	Refer HPFL QCP 9 No surface defects or blemishes.	P	W	W /V
29.	Painting of all MS parts	2 coats of Zinc Cr2O3 RedOxide	100%	Wire brush & paint DFT 60 microns	P	V / W	W /V
30.	Identif Marking, Documentation & Certification	Hard Punching Review of MDR Folders and sign	100%	Punch permanently welded name-plate; Quest Certification	P	V	V

QCP.NO. 9 : PROCEDURE FOR FINISHING, ACID CLEANING & PASSIVATION OF STAINLESS STEEL FABRICATION

STAINLESS STEEL – CLEANING AND FINISHING

During handling and processing operations such as forming, machining, tumbling and lapping, particles of iron or tool steel may get embedded in or smeared on the surfaces of stainless steel components. If allowed to remain, these particles may corrode and produce rust spots on the stainless steel. Mechanical cleaning, polishing and planishing, followed by acid-cleaning-and-passivation treatment is given to prevent this condition. Surface treatment should be proceeded with in the following stages :

MECHANICAL CLEANING

Flux or slag from welding or high temperature brazing should be removed by chipping, brushing with stainless steel wire-brush, grinding, polishing with an iron free abrasive or sand blasting. Mechanical polishing (by grinding / sandering etc.) Shot blasting [with steel grits] is prohibited, though sand-blasting is sometimes recommended.

SOLVENT CLEANING

Machining, forming, grinding, oils shall be removed by solvent cleaning [e.g. with Acetone], followed by alkaline soak, cleaning and thorough water rinsing [immersion or swabbing].

COPPER SULPHATE CHECK

Embedded free iron, if present can be detected by wetting the surface with a Copper Sulphate solution, when bluish copper cast colour spots would indicate presence of free iron. This contamination is to be removed by sandering / polishing if not removed by passivation.

PASSIVATION

Consists of immersing in or swabbing stainless steel part with a solution of (i) Nitric Acid, or (ii) Nitric Acid plus Oxidising Salts. This results in dissolving of embedded or smeared iron, and thereby restoration of the original corrosion resistant surface.

TYPICAL SOLUTIONS : **These are strong oxidising agents and should be handled with care.**

Solution A : For series 200, 300 and 400 grades containing 17% Chromium or more [except free machining grades and polished surfaces],

70% HNO3 (with no traces of HF)	…..	20 to 40% by volume
Water	…..	Remaining
Operating Temperature	….	Upto 60 Deg.C. [140 Deg.F.]
Contact time	…..	30 to 60 minutes

Solution B : For free machining grades, polished surfaces and series 400 [less than 17% Chromium]

70% HNO3 [no traces of HF]	…..	20 to 40% by volume
Sodium Dichromate [Na2 Cr2O3, 2H2O]…		4 to 6% by weight
Water	…..	Remaining
Operating Temperature	….	Room temperature or 50 Deg.C. [120 Deg.F.]
Contact time	…..	30 minutes

PRECAUTIONS

Operating personnel should wear rubber aprons, gloves, eyeshields or goggles. Thorough rinsing of rinsed parts must precede air blow off in order to avoid dispersal or acid solutions. Handling equipments should be of Stainless Steel or Plastic.

QUEST QAP No. 3

TYPICAL QUALITY PLAN

FOR A REACTOR VESSEL WITH AGITATOR

Legend : P = Perform W = Witness E = Evaluation V = Verify H = Hold

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold PFI	Points Quest	Client
1.	Approval of Drawings & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code Sec. VIII Div 1: 1995 & P.O.	P	V/A	A
2.	Welding Prequalifications WPS,PQR, WPQ	Qualify afresh, using optimum heat input	100%	ASME Code Section IX plus A 262-Cat 'E' test	P	W	V
3.	Traceability of Welding Consumables	Batch number to corelate with Consumable TC	100%	ASME Code Section II Part C	P	V	V
4.	Material Identification. & Stamp Transfer (Vibro-etch marking on materials 6mm and less thick)	Idfn.corelation with Mill TC Dimensional Inspn and Visual Inspn….. UT Check above 50mm thickness -If applicable	100% 100% - where applic a -ble	Drawing and Bill of Materials; ASME Sec II PartA ASTM A 435 : Scanning 100% surfaces	P P P	H H H	V V V
5.	Inspection of Dished Ends	Diml.[Ovality, thickness,Height , OD,Circumf.]Pro file by Template. PT on weld edge, SF and knuckle	100%	DE thk shall be not less than 9mm. Approved drawing, ASME.VIII –Div1 App.8.	P	W	V

6.	Shell long seam set-ups	Weld geometry Pre-pinching, Ovality and Tack Weld PT	100%	No flat spots allowed. Set-up as per drg.details	P	W	V
7.	Back-chip DP Test for long seam	Back-chip DP test	100%	No visible discontinuity allowed.	P	W	V
8.	Radiography of Long Seams	Weld soundness	Spot	ASME Code Sec. VIII Div.1 UW-52	P	E	V
9.	Typ. Set-up of Circumf. seams Shell to Shell, DE to Shell	Weld geometry, Dimensions, Alignment and Ovality	100%	ASME Code Section VIII Divn.1 and Drawing	P	H	V
10.	Circ-seam backchip DP test	Back-chip DP test	100%	No visible disconti-nuity allowed.	P	H	V
11.	Radiography of Circ-seams	Weld soundness	Spot	ASME Code Sec. VIII Div.1 UW-52	P	E	V
12.	Inspection of Sample of Coil of 1560 PCD	% Thinning; Ovality & Visual Inspection	Two Sam-ples	6% Thinning; 8%ovality;Nokinks die-marks/wrinkles	P	H	V
13.	Coil Pipe to pipe circ. seam. set-up	Concentricity; Pitch; Single Vee Edge Prepn.	100%	Approved Drawing - Concentricity check on layout	P	H	V

14.	Welding with inert gas backing & 100% RT of all butt welds	Root Penetration Visual, 100% PT & RT	100%	Root suck back not accepted; No under -cuts or underflush; ASME CodeVIII-1 App 8 & UW-51	P	H	V
15.	Ground Inspection of Coil Assemblies: for Inner Coils	Helical Pitch; PCD, Concen-tricity; Vertica-lity; RT Comp-leteness; Passage clear by soft ball.	100%	Pitch +/- 5mm PCD +/- 5mm Concentr. +/-3mm Verticality 3mm RT(UW-51) 100% Ball Dia: 85 % ID	P	H	V
16.	Hydro Test of Coils on the ground	Low Chloride (25 ppm) Water; Proper Support	100%	Test @ 10 kg/cm2- No leaks accepted	P	W	V
17.	Surface dress-up & Acid Cleaning of Coils & Inner urface of Vessel	Blemishes to remove; dress-up & use of HNO3 without any HF	100%	No blemishes in visual Inspection; Verify absence of HF content	P	H	V
18.	Set-up of Coils with sleeves inside the Vessel	Alignment Weld fit-up Concentricity	100%	As per approved Drawing; Concen-ricity within 3mm	P	H	V

19.	Pneumatic Test of Coils after welding with sleeves in Vessel	Leak Test @ 5.0 Kg/cm2 with soap bubble test for leak detection	100%	No leaks allowed.	P	H	V
20.	Inspection of 3" NB Limpet Coil	Section bent coil On layout; V.I.	100%	No kinks /wrinkles; Edge prepration.	P	H	V
21.	Limpet Coil: Set up on Shell & DE . Also, set-up of half pipe to pipe weld set-up	Helical pitch; Single-Vee edge prepn. Inert gas backing & Full penetration weld	100%	Check layout of Limpet coils as marked on Shell & DE as per approved drawing	P	H	V
22.	Dyecheck of welds & Pn. Test of Limpet Coils; Using soap suds for leak detection	PT as per ASME Sec VIII App 8 Low Pressure Air Leak Test @ 7.0 Kg/cm2	100%	For PT : ASME Sec VIII App 8; For Pneumatic Test No leaks allowed	P	H	V
23.	Nozzle Marking on Shell, DE	Dimensional + Orientation	100%	Drawing Dimensions	P	V	V
24.	Nozzle set-up on shell & DE	Visual, Dim'l,& Weld Geometry	100%	Drawing Details	P	H	V
23.	Surface Inspec-tion of fabricated parts(internally & xternally) as well as machined sub-assys/ parts	Visual & Dimensional Inspection As per drawing	100%	No surface blemish -es, discontinuities Check weld sizes & completion of work; Aesthetics	P	H	V

24.	Agitator Machined Parts	Dimensional, Visual Inspn.	100%	As per appd. Drgs.within tolerances	P	H	V
25.	Rotor Assembly Agitator	Swing Diameter, Static & Dyna-mic Balancing Checks	100%	. Diameter +/-1mm . Dyn. Balancing @ 100 RPM to ISO 1940 Gr. 6.3	P	H	V
26. R2	Agitator Assem - bly with Vessel. Note : Please refer to the **PROCEDURE** for Trials & Testing of Agitator @ rated RPM., as given below; Also given below are deflection tolerances.	Dim'l Check, Deflection check Rotation – CW No-Load Trial Run in the open in the air on a Spl. Platform; Full load test in Vessel; Check Motor Current, Vibration, Noise Level,Brg Temp.	100%	No Load Trial : Smooth & trouble-free run. Load Trial @ Design Pressure: Current & Power consumption Noiselevel< 85dBA Vibrn: 6 mm/sec Brg. Temp. Rise less than 40 deg. C.Effectiveness of agitation.	P	W	V

27.	**Pressure Testing** . RF Pads . SORF & Blind Flange welds . Coils after welding with sleeves inside the Vessel . Main Shell	Pneumatic Test @ 1.5 Kg/cm2 with soap suds Pneumatic Test @ 10 Kg/cm2 when submerged Hydrostatic Test @ Test pressure	100% 100% 100%	No leaks/bubbles at test pressure; Use soap suds No leaks/bubble No leaks/bubble Holding time 30 mins . Low Chlo- ride Water 25 ppm.	P	W	W/V
28.	Surface Preparation	Pickling & passi -vation by HNO3 without HF	100%	Good Engineering Practices	P	W	W/V
29.	Painting of all MS parts, if any	2 coats of Zinc CrO3 Red Oxide	100%	Wire brush & paint DFT 60 microns	P	V/W	W/V
30.	Identification Marking	Hard Punching per Data sheet	100%	On permanently welded name-plate	P	V	V
31.	Certification and Documentation	Review Folders and sign	100%	Manufacturer's Document Folder	P	V	V

Quest's SUGGESTED PROCEDURE OF TESTING FOR AGITATOR

1. The agitator shall be made exactly as per drawing.
2. All the agitator assembly shall be balanced statically on knife-edges and to be shown to Client / Quest Inspection before trial run.
3. Prior to load/water test all the agitator assemblies shall be run on no load in air. This test shall be carried out on a independent platform with free access to measure the deflection/run out. No load test shall be at the rated speed (100 RPM in this case) with job motor, gear box and agitator completely assembled. See Quality Plan for the various checks required to be carried out.
4. Deflection
   a) Deflection near mechanical seal – 0.05mm TIR.MAX.
   b) Deflection near rigid coupling [lower shaft] – 0.10mm TIR. MAX.
   c) Deflection on shaft near impeller – 0.8mm per metre of unsupported length but max. 2.0 mm.
5. Load test shall be carried out at design pressure for one hour duration. if the level of liquid in operation conditions is less than full capacity of the equipment then the balance volume shall be filled and pressurised with air to design pressure.
6. The pressure drop at the 1 hour load trial shall not exceed Mech. Seal Manufacturer's recommendations.

DESPATCH : **The agitator unit and drive shall be separately packed in wooden cases after successful trials, after appropriate match-marking on hub and blades. All the machined parts shall be given one coat of rust preventive and all the items shall be suitably match marked. All the cases shall have proper packing lists.**

QUEST QAP No. 4

QUALITY PLAN

FOR A LIMPETED REACTOR VESSEL WITH AGITATOR

8000 Litres Benzyl Salicylate Reactor

Legend : P = Perform W = Witness E = Evaluation V = Verify H = Hold

S.No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold Fabr	Points Quest	Client
1.	Approval of Drawings & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code Sec. VIII Div 1: 1998 & P.O.	P	V/A	A
2.	Welding Prequalifications WPS,PQR, WPQ	Qualify afresh, using optimum heat input	100%	ASME Code Section IX plus A 262-Pract 'E' test	P	W	V
3.	Traceability of Welding Consumables	Batch number to corelate with Consumable TC	100%	ASME Code Section II Part C	P	V	V
4.	**Material Identification**. &Stamp Transfer (Vibro-etch marking on mat'l 6mm and less)	. Idfn.corelation with Mill TC	100%	Drawing and Bill of Materials; ASME Sec IIPart A; Spl. Reqt.: Wetted Parts of SS316L shall pass IGC Pr.'E' test.	P	H	V
		Dimensional Inspn and Visual Inspn…..	100%		P	H	V
	NDT of Material	. UT Check as per ASTM A435	50mm &abov	ASTM A 435 : Scanning 100%	P	H	V

5.	Toughened Glass 19thk x 123 dia (Na - Annealed)	Witness Polari-scope & Thermal shock Tests	100%	As per BS 3463:1975 & BS MA 24 and Dim'l per Order reqt	P	W	V
6.	Inspection of Dished Ends	Diml.[Ovality, thickness,Height, OD,Circumf.] Profile check by Template. PT on weld edge, SF and knuckle	100%	DE thk shall be not less than 8mm. (9mm as per Approved drawing) ASME.VIII – Div1 Appendix 8.	P	W	V
7.	Shell long seam set-ups	Weld geometry Pre-pinching, Ovality and Tack Weld PT	100%	No flat spots allowed. Set-up as per drawing details	P	W	V
8.	Long seams chip Back DP Test	Back-chip DP test	100%	No visible disconti-nuity allowed.	P	W	V
9.	Radiography of Long Seams	Weld soundness	Spot/ 100%	ASME Code SecVIII Div.1 UW-52 &51	P	E	V
10.	Typ. Set-up of Circumf. seams Shell to Shell, DE to Shell	Weld geometry, Dimensions, Alignment and Ovality	100%	ASME Code Section VIII Divn.1 and Drawing	P	H	V
11.	Circ-seam backchip DP test	Back-chip DP test	100%	No visible disconti- nuity allowed.	P	H	V

12.	Radiography of Circ-seams	Weld soundness	Spot	ASME Code Sec. VIII Div.1 UW-52	P	E	V
13.	Inspection of 3" NB Limpet Coil	Section bent coil on layout; V. I.	100%	Weld edge prepn. No kinks, wrinkles	P	H	V
14.	Limpet Coil: set up on shell & DE Also, half Pipe to Pipe : Circumf. Seam set-up	Helical Pitch; Single Vee Edge Prepn.; provision of inert gas back- ing; FP Weld	100%	Approved Drawing - check layout on Shell and DE as Per drawing	P	H	V
15.	PT & Pneumatic Test of Limpet Coils @ 12.5 Kg/cm2	PT on final welds & Pneu. Leak Test using Soap solution	100%	PT :ASME.VIII – Div1 Appendix 8. Pneumatic Test : No leaks	P	H	V
16.	Nozzle Marking on Shell, DE	Dimensional + Orientation	100%	Drawing Dimensions	P	V	V
17.	Nozzle to flange sub-assy set-up	Dimen'l check & weld prepn.	100%	As per Drawing	P	V	V
18.	Air test of nozzle to SORF fl.welds	Leak Test using Soap solution	100%	See Drawing No leaks	P	V	V

19.	Weld overlay on nozzle and Blind flanges, **after** pre-Qualifica-tion : SS overlay on MS	SS overlay on MS to check for Visual, PT, Chemical check at 0.5 mm depth & Air-leak Test	100%	Soundness in air- leak test @1.5 Kg/ cm2 ; PT of welds to App. 8 of ASME VIII-1; Chemistry as per SS 316L	P	W	V
20.	Nozzle set-up on shell & DE	Visual, Dim'l,& Weld Geometry	100%	Drawing Details	P	H	V
21.	Nozzle to shell/ DE back-chip PT	DP test: ASME Sec VIII-1 App8	100%	No visible disconti- nuity allowed.	P	H	V
22.	Sparger sub-Assembly	Mat'l Identifn, Visual, Dim'l check, Drilling, Weld Geometry	100%	Drawing Details	P	H	V
23.	Fit-up of Sparger with DE & N14	Visual, Dim'l Weld Geometry	100%	Drawing Details	P	H	V
24.	Final Inspection of all weld fabricated parts	Visual & Dim'l Check of Welds and Completion	100%	Drawing Details	P	H	V

25.	Surface Inspec-tion offabricated parts (internally & externally) as well as machined sub-assys/ parts	Visual & Dimensional Inspection As per drawing	100%	No surface blemish -es, discontinuities Check weld sizes & completion of work; Aesthetics	P	H	V
26.	**Pressure Testing** . RF Pads . SORF & Blind Flange welds . Limpet Coils . Main Shell	Pneumatic Test @ 1.5 Kg/cm2 with soap suds Pneumatic Test @ test pressure Hydrostatic Test @ Test pressure	100% 100% 100%	No leaks/bubbles at test pressure; Use soap suds No leaks/bubbles Holding time 30 mins . Low Chlo- ride Water 25 ppm.	P	W	W/V
27.	Surface dress-up & Acid Cleaning of Ext. & Inner surface of Vessel	Blemishes to remove; dress-up & use of HNO3 without any HF	100%	ASTM A 380 Code B : Use HNO3 without HF content See HPFL QPC 9	P	H	V
28.	Agitator Machined Parts	Dimensional , Visual Inspn.	100%	As per appd. Drgs. within tolerances	P	H	V

29.	Rotor /Agitator Assembly	Swing Diameter, Static & Dyna-mic Balancing checks	100%	. Diameter +/- 1mm . Dyn. Balancing @ 127 RPM to ISO 1940 Gr. 6.3	P	H	V
30.	Agitator Assem - bly with Vessel. Please refer to **HPFL QCP #8** Procedure for Trials & Testing of Agitator Assy - given below for tolerance limits for deflection .	Dim'l Check, Deflection check Rotation – CW **No-Load Trial** Run in the open in the air on a Spl. Platform; **Full load test** in Vessel; Check Motor Current, Vibration, Noise Level,Brg Temp.	100%	No Load Trial : Smooth & trouble-free run. Load Trial @ Design Pressure: Current & Power consumption; Noiselevel<85 dBA Vibrn: 6 mm/sec Brg. Temp. Rise less than 40 deg. C. Effectiveness of agitation.	P	H	V
31.	Final Surface Preparation	Pickling & passi -vation by HNO3 without HF	100%	No blemishes; See **HPFL QCP 9**.	P	W	W/V
32.	Painting of all MS parts	2 coats of Zinc CrO3 Red Oxide	100%	Wire brush & paint DFT 60 microns	P	V/W	W/V
33.	Identificati on Marking	Hard Punching per Data sheet	100%	On permanently welded name-plate	P	V	V

34.	Certification and Documentation	Review Folders and sign	100%	Manufacturer's Document Folder	P	V	V

QCP.NO. 8 : PROCEDURE FOR TRIALS & TESTING OF AGITATORS

7. The agitator shall be made exactly as per drawing.
8. All the agitator assembly shall be balanced statically on knife-edges and to be shown to HPFL/ Quest Inspection before trial run.
9. Prior to load/water test all the agitator assemblies shall be run on no load in air. This test shall be carried out on a independent platform with free access to measure the deflection/run out. No load test shall be at the rated speed (XXX RPM in this case) with job motor, gear box and agitator completely assembled. See Quality Plan for the various checks required to be carried out.
10. Deflection
    d) Deflection near mechanical seal – 0.05mm TIR.MAX.
    e) Deflection near rigid coupling [lower shaft] – 0.10mm TIR. MAX.
    f) Deflection on shaft near impeller – 0.8mm per metre of unsupported length but max. 2.0 mm.
11. Load test shall be carried out at design pressure for one hour duration. if the level of liquid in operation conditions is less than full capacity of the equipment then the balance volume shall be filled and pressurized with air to design pressure.
12. The pressure drop [through Mech. Seal] at the end of 1 hour load trial shall not exceed 50mm wC.

DESPATCH **: The agitator unit and drive shall be separately packed in wooden cases after successful trials, after appropriate match-marking on hub and blades. All the machined parts shall be given one coat of rust preventive and all the items shall be suitably match marked. All the cases shall have proper packing lists.**

QCP.NO. 9 : HPFL PROCEDURE FOR FINISHING, ACID CLEANING AND PASSIVATION OF STAINLESS STEEL FABRICATION

STAINLESS STEEL – CLEANING AND FINISHING

During handling and processing operations such as forming, machining, tumbling and lapping, particles of iron or tool steel may get embedded in or smeared on the surfaces of stainless steel components. If allowed to remain, these particles may corrode and produce rust spots on the stainless steel. Mechanical cleaning, polishing and planishing, followed by acid-cleaning-and-passivation treatment is given to prevent this condition. Surface treatment should be proceeded with in the following stages :

MECHANICAL CLEANING

Flux or slag from welding or high temperature brazing should be removed by chipping, brushing with stainless steel wire-brush, grinding, polishing with an iron free abrasive or sand blasting. Mechanical polishing (by

grinding / sandering etc.) Shot blasting [with steel grits] is prohibited, though sand-blasting is sometimes recommended.

SOLVENT CLEANING

Machining, forming, grinding, oils shall be removed by solvent cleaning [e.g. with Acetone], followed by alkaline soak, cleaning and thorough water rinsing [immersion or swabbing].

COPPER SULPHATE CHECK

Embedded free iron, if present can be detected by wetting the surface with a Copper Sulphate solution, when bluish copper cast colour spots would indicate presence of free iron. This contamination is to be removed by sandering / polishing if not removed by passivation.

QCP.NO. 10 PASSIVATION

Consists of immersing in or swabbing stainless steel part with a solution of (i) Nitric Acid, or (ii) Nitric Acid plus Oxidising Salts. This results in dissolving of embedded or smeared iron, and thereby restoration of the original corrosion resistant surface.

TYPICAL SOLUTIONS

These are strong oxidising agents and should be handled with care.

Solution A

For series 200, 300 and 400 grades containing 17% Chromium or more [except free machining grades and polished surfaces],

70% HNO3 (with no traces of HF)	…..	20 to 40% by volume
Water	…..	Remaining
Operating Temperature	….	Upto 60 Deg.C. [140 Deg.F.]
Contact time	…..	30 to 60 minutes

Solution B

For free machining grades, polished surfaces and series 400, containing less than 17% Chromium

70% HNO3 [no traces of HF]	…..	20 to 40% by volume
Sodium Dichromate [Na2 Cr2 O, 2H2O]	….	4 to 6% by weight
Water	…..	Remaining
Operating Temperature	….	Room temperature or 50 Deg.C. [120 Deg.F.]
Contact time	…..	30 minutes

PRECAUTIONS

Operating personnel should wear rubber aprons, gloves, eyeshields or goggles. Thorough rinsing of rinsed parts must precede air blow off in order to avoid dispersal or acid solutions. Handling equipments should be of Stainless Steel or Plastic.

QUEST QAP No. 5
QUALITY PLAN
For IPA Recovery Column

Legend:P = Perform W = Witness E = Evaluation V = Verify H = Hold

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold PFI	Points Quest	Client
1.	Approval of Drawings & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code Sec. VIII Div 1: 2001 & Addenda '02 &P.O.	P	V/A	A
2.	Welding Prequalifications WPS,PQR, WPQ	Qualify if not already done	100%	ASME Code Section IX : use optimum heat input	P	V/W	V
3.	Traceability of Welding Consumables	Batch number to corelate with Consumable TC	100%	ASME Code Section II Part C	P	V	V
4.	Welding with inert gas backing & Spot RT of all butt welds	Root Penetration Visual, 100% PT & Spot RT	100%	Root suck back not accepted; No under -cuts or underflush; ASME CodeVIII-1 App 8 & UW-52	P	H	V
5.	Material Identification. & Stamp Transfer	Idfn.corelation with Mill TC Dim'l Inspn & Visual Inspn….. UT Check above 30mm thickness -If applicable	100% 100% - where applica -ble	Drawing and Bill of Mat'ls , ASME Section II-Part A ASTM A 435 : 578 Level I : Scanning 100% surfaces	P P P	H H H	V V V

6.	Shell long seam set-ups	Weld geometry Pre-pinching, Tack Weld PT	100%	No flat spots are allowed; Set-up as per drawing details	P	W	V
7.	Back-chip DP Test of seams	Back-chip DP test	100%	No visible discon- tinuity allowed.	P	W	V
8.	Radiography of Long Seams	Weld soundness	Spot	ASME Code Sec. VIII Div.1 UW-52	P	E	V
9.	Typ. Set-up of Circumf. seams Shell to Shell.	Weld geometry, Alignment, Ovality, Orientation	100%	Drawing Details, Code and PO requirements	P	H	V
10.	Circ-seam backchip DP test	Back-chip DP test	100%	No visible disconti- nuity allowed.	P	H	V
11.	Visual & Dim'l Check of both shell segments	Inside Surface inspn; Welds to grind flush & PT; Alignment & Ovality Check	100%	No visible surface blemish allowed. PT to ASME-App 8 Ovality 0.3%			
12.	Radiography of Circ-seams	Weld soundness	Spot RT	ASME Code Sec. VIII Div.1 UW-52	P	E	V
13.	Weld overlay on Body Flanges & Nozzle flanges, **after** pre-Quali-fication : SS overlay on MS	SS overlay on MS to check for Visual, PT, Chemical check at 0.5 mm depth & Air-leak Test	100%	Soundness in air- leak test @1.5 Kg/ cm2 ; PT of welds to App. 8 of ASME VIII-1; Chemistry as per SS 316L	P	W	V

14.	6 Nos Body Flanges to shells & DEs - setup	Weld preparation Squarenss Total Length	100%	Weld body flanges to shell, with flan-ges bolted together	P	W	V
15.	Nozzle Marking on Shell & DE	Dimension al + Orientation	100%	Drawing Dimensions	P	V	V
16.	Nozzle set-up on Column segment	Visual, Dim'l,& Weld Geometry	100%	Drawing Details	P	H	V
17.	Set-up of inter-nals/ cleats/ packing supports	Visual, Dim'l, elevation,s quare- ness checks	100%	Detailed Drawings -and specified tolerance limits	P	H	V
18.	Visual & Dim'l Inspection of weld fabricated parts on comple-tion(internally & externally) - Note as-built dimensions	Blemishes to remove; dress-up Visual & Dim'l Inspection as per drawing; -Verticality +/- 2.5mm- Squareness of packing supports	100%	No surface blemish- es or discontinuities ; Check weld sizes & completion of work; Check Aesthetics; - As per tolerance limits specified	P	H	V

19.	**Pressure Testing** . RF Pads . SORF & Blind Flange welds . Body flanges . Main Shell…. At specified test Pressure/s	Pneumatic Test @ 1.5 Kg/cm2 with soap suds Hydrostatic Test Vertical or Hori-zontal position?	100% } 100% } 100%	. No leaks at test pressure; . Holding Time at least 10 mins .Low Cl' water max 25 ppm. .Holding time 30min	P P	W W	W/V W/V
20.	Acid Cleaning of all SS surfaces of Column shell Segments	Ensure use of pure Nitric Acid **without any trace of HF**	100%	No blemishes in visual Inspection; Refer to Client's specified procedure.	P	H	V
21.	Painting of all MS parts	2 coats of Zinc CrO3 Red Oxide	100%	Wire brush & paint DFT 60 microns	P	V/W	W/V
22.	Identification Marking	Hard Punching per Data sheet	100%	On permanently welded name-plate	P	V	V
23.	Certification and Documentation	Review Folders and sign	100%	Manufacturer's Document Folder	P	V/A	V

QUEST QAP No. 6

QUALITY PLAN

FOR TOP & VENT CONDENSERS

Legend : P = Perform W = Witness E = Evaluation V = Verify H = Hold

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold PFI	Points Quest	Client
1.	Approval of Drawings & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code Sec. VIII Div 1: 1995 & P.O.	P	V/A	A
2.	Welding Prequalifications WPS,PQR,WPQ	Qualify afresh, using optimum heat input	100%	ASME Code Section IX plus A 262-Cat 'E' test	P	W	V
3.	Traceability of Welding Consumables	Batch number to corelate with Consumable TC	100%	ASME Code Section II Part C	P	V	V
4.	Weld overlay on nozzle and Blind flanges, **after** pre- Qualification : SS overlay on MS	SS overlay on MS to check for Visual, PT, Chemical check at 0.5 mm depth & Air-leak Test	100%	Soundness in air-leak test @1.5 Kg/ cm2 ; PT of welds to App. 8 of ASME VIII-1; Chemistry as per SS 316L	P	W	V
4.	Material Identification. & Stamp Transfer (Vibro-etch marking on materials 6mm and less thick)	Idfn.corelation with Mill TC Dim'l Inspn & Visual Inspn….. UT Check above 50mm thickness -If applicable	100% 100% - where applicable	Appd. Drawing and Bill of Materials ASME Sec II-A ASTM A 435 :Scanning 100% surfaces	P P P	H H H	V V V
5.	Mock-up Test for Tube to Tubesheet Joint	Review of Pre-qualified Mock-up test records / - Witness afresh	100%	ASME Sec.VIII-1 NM App. A & TEMA Class C	P	R /W	V

6.	Tubesheets: Inspection on ground after M/c	Orientation, Lay-out, Finish / size 0f Tubeholes, Ligaments	100%	ASME Sec.VIII-1 NM App. A & TEMA Class C	P	R /W	V
7.	Inspection of Dished Ends/ Bonnets & seg-Ments of Expansion Bellows	Diml.[Ovality, thickness, Height, OD,Circumf.] Pr file by Template. PT on weld edge, SF and knuckle	100%	DE thk shall be not less than specified. Approved Drg., ASME.VIII–Div1 App.8.	P	W	V
8.	Welding with inert gas backing for all butt welds Spot RT for shell Full RT for Exp Bellow seams	Root Penetration In single-welded and chip back to sound metal for double welded joints.	100%	Root suck back not accepted; No undercuts or und-erflush; PT as per App 8 & RT as per UW-51 or 52 of ASME VIII-1	P	H	V
9.	Shell long seam set-ups	Weld geometry Pre-pinching, Ovality and Tack Weld PT	100%	No flat spots allowed. Set-up as per drawing details	P	W	V
10.	Back-chip DP Test for long seam	Back-chip DP test	100%	No visible Discontinuity allowed.	P	W	V
11.	Radiography of Long Seams.	Weld soundness	Spot	ASME Code Sec. VIII Div.1 UW52	P	E	V
12.	Typ. Set-up of Circumf. Seams Shell to Shell, DE to Shell, Exp Bellow seg.	Weld geometry, Dimensions, Alignment and Ovality and Concentricity	100%	ASME Code Section VIII Divn.1 and Drawing	P	H	V
13.	Circ-seam backchip DP test	Back-chip DP test	100%	No visible discon tinuity allowed.	P	H	V

14.	Radiography of Circ-seams	Shell-Spot & Exp.Bellow-Full	UW-52 U W-51	ASME Code Sec. VIII Div.1	P	E	V
15.	Nozzle Marking on Shell, DE	Dimensional + Orientation	100%	Drawing Dimensions	P	V	V
16.	Nozzle set-up on shell & DE	Visual, Dim'l,& Weld Geometry	100%	Drawing Details	P	H	V
17.	Nozzle to shell, DE & Bellow welds B/chip PT	Visual check for flaws	100%	ASME Code Sec. VIII Div.1 App 8	P	H	V
18.	Setup of Cone Plate in Noz N1 in Top Cond.	Visual & Dim'l Check; with N1 Flush with shell	100%	Drawing Dimensions	P	V/H	V
19.	Final Inspection of Shell, Bonnets & Piston Pass	Visual & Dim'l Check; internal welds flush.	100%	Approved Drg Baffle dmen. match with piston	P	H	V
20.	Inspection of Tube Bundle skeleton	Visual & Dim'l Check; No of Baffles & Pitch	100%	Approved Drg Dimensions of Baffles critical	P	H	V
21.	Final Inspection of Condensers after assembly	Dimensional Check & Verifn of Orientation	100%	Approved Drg Dimensions, incl. Dowel Pin fitment	P	H	V
22.	Visual Surface Inspection of fabricated parts DEs internally & Shell externally	Visual Inspection	100%	No surface blemishes, discontinuities Check weld sizes & completion of work; Aesthetics	P	H	V
26.	**Pressure Testing** . RF Pads…….. . SORF & Blind Flange welds… . Shell Side….. . Tube Side…… . Shell Side….. finally low-pressure test	Pneumatic Test @ 1.5 Kg/cm2 with soap suds Hydrostatic Test Hydrostatic Test (See Notes * & **) Pneumatic Test @1.5 Kg/cm2 with soap suds	100%	No leakage at test pressure ; holding time 30 mins. * Hydro Test Pressures as per Appd drawings.; ** Vent & TopCondensers shall be placed one above other for Shell & Tube side Hydro tests.	P	W	W/ V

27.	Surface Preparation	Pickling & passi -vation by NO3 without HF	100%	Good Engineering Practices	P	W	W/ V
28. R2	Trial assembly & Alignment of both ondensers with Column & Reactor	Match-marking, Orienations, Verticality quare-ness; SEE NOTE*	100%	Approved Drawing In 100% bolted condition.Vertical ity 6mm max	P	H	W/ V
29.	Painting of all MS parts	2 coats of Zinc CrO3 Red Oxide	100%	Wire brush & paint DFT 60 microns	P	V/ W	W/ V
30.	Identification Marking	Hard Punching per Data sheet	100%	On permanently welded name-plate	P	V	V
31.	Certification and Documentation	Review Folders and sign	100%	Manufacturer's Document Folder	P	V	V

***Note added below in Rev. 02**

NOTE*: Trial Assemblies of following subassemblies shall be carried out as a minimum:

i. Reactor Nozzle N1 with lower half of column – together assembled vertically
ii. Half Columns (lower & upper) – together assembled vertically on level base.
iii. Upper Half of Column to Top Xcondenser- assembled vertically on level base.
iv. Top Condenser to Vent Condenser- assembled vertically on level base.

Measure alignment , Verticality, orientation, and if satisfactory make match marks.
Matchmarking sketch should be prepared for future guidance.
Important Note : Tolerances specified are not cumulative at final assembly at Site.

QUALITY PLAN NO: QISPL/PFI/592-3 Rev 02FOR TOP & VENT CONDENSERS ORDERED BY HPFL ON POLYQUIP

QUEST QAP No. 7

Quality Plan for Pressure Vessels

Legend: P = Perform A =Approve W = Witness E = Evaluation V = Verify H = Hold

S. No	Activity	Characteristic	Ext of Check	Acceptance Standard	Hold Mfr	Points Quest	Client
1.	Approval of **Drawings** & Quality Plan	Purchaser's Requirements & Design Code	100%	ASME Code Sec. VIII Div 1: 1995 & P.O. Reqts.	P	V/A	A
2.	**Welding** Pre**qualifications** WPS,PQR,WPQ	Offer Qualification Tests to TPI	100%	ASME Code Section IX : use optimum heat input	P	W	V
2a.	Pre-Qualification of **SS weld-over- lay** procedure, if required for MS Body Flanges & Nozzle flanges.	SS overlay on MS to check for Visual, PT, Chemical check at 0.5 mm depth & Air-leak Test	100%	Soundness in air- leak test @1.5 Kg/ cm2 ; PT of welds to App. 8 of ASME VIII-1; Chemistry as per SS grade	P	W	V
3.	Traceability of **Welding Consumables**	Batch number to corelate with Consumable TC	100%	ASME Code Section II Part C	P	V	V
4.	**Material** Identification. & Stamp Transfer -Material for Plates, Body Flanges, Nozzle Pipes & Flanges, Jacket &couplings	Idfn.corelation with Mill TCDim'l Inspn & Visual Inspn….. UT Check above 30mm thickness -If applicable	100% 100% -where applica-ble	Drawing and Bill of Mat'ls , ASME Section II-Part A ASTM A435: Scan 100%surfaces: Acc Norm A578Level A	P P P	H H H	V V V

5.	Inspection of **Dished Ends**: 2:1 Semi-Ellipsoidal or Torispherical	Check Profile,ID Ovality, MinThk DP Test of SF & Knuckle	100%	Approved Drawing	P	H	V
6.	**Shell Long seam** set-ups : Double butt welds	Weld geometry Pre-pinching, Tack Weld PT	100%	No flat spots; Edge Prepn. Per Drawing Ovality 1% max.	P	W	V
6a.	Fabricated Nozzle **Long seam** setups Double butt welds	Weld geometry Pre-pinching, Tack Weld PT	100%	No flat spots; Edge Prepn. Per Drawing Ovality 1% max.	P	W	V
6b.	Root chipback to sound metal &PT	PT as per ASME VIII-1 App. 8	100%	No visible disconti- -nuity allowed.	P	W	V
6c.	Final weld pass : Visual Insp & PT	PT as per ASME VIII-1 App. 8	100%	No undercut, crack, porosity, underflush	P	W	V
6d.	RT: LS butt welds :- Full/Spot/Nil	Weld soundness	E=1.0/ 0.85/0. 7	ASME Sec VIII-1 UW-51/UW-52/Nil	P	E	V
7.	**Circum –seams:** Setup of Shell to Shell/DE- Double Butt welds	Weld geometry, Alignment, Ovality & Orientation	100%	Approved Drawing Details; Alignment 1mm/Mtr. > 6mm Max. Ovality 1%	P	H	V
7a.	Chip-back & PT of Circ. Seams	Chip-back root to sound metal	100%	No visible discon- tinuity allowed.	P	W	V
7b.	Final weld pass : Visual Inspn & PT before RT	PT as per ASME VIII-1 App. 8	100%	No undercut, crack, porosity, overlap or under-flush	P	W	V

7c.	RT of butt welds E=1.0/0.85/0.7	Soundness of weld seams	Full/ Spot/Nil	ASME Sec VIII-1 UW-51/UW-52/Nil	P	E	V
8.	Nozzle Sub-assem –lies: Pipe to slip-on Flange weld fit-up	Squareness; Weld Prepn; Size&Sch of Nozzle;Rating of Flange	100%	Approved Drawing & ANSI Standards B 36.19, B36.10 & B16.5	P	H	V
8a.	Final Inspection of welded Nozzle & Flange sub-assemblies	Visual & Dim'l check. Air Leak Test of Nozzle to Flange welds	100%	Weld size as per Drg; Squareness of Flange with Nozzle No leaks in air test.	P	H	V
8b.	Nozzle Marking on Shell & DE	Check Orienta-tion & Elevation	100%	Elevation & Orien -tation as per Drg.	P	H	V
8c.	Nozzle Sub-Assys fitment on Shell/ DE,after checking markings thereon.	Check weld pre- paration, eleva -tion, orientation, stand-out height	100%	As per Drg: Height Elevation /Orientn within tolerances; Tilt within ½°.	P	H	V
8d	Thermowell: Air Leak Test before fitting on Vessel	Use soap suds to detect leak at cap to tube weld.	100%	No leaks at 1.5 kg/cm2 pneumatic pressure	P	H	V
8e	Couplings fitment on Shell/DE	Weld preparation - groove & fillet	100%	Chip-back root to sound metal & PT	P	H	V
8f.	Visual Insp & PT of coupling welds	Fillet weld size Int surface flush	100%	Weld size & finish per Drg. No defect	P	H	V
	COMPONENTS	**Where applicable**					

9.	Body Flange: **If made of segments** L Seams fit-up	**Fit-up on layout;** Double Vee prep No mismatch	100%	**Check Dimensions Flat; No warpage;** Match lips at root	P	H	V
9a	**Chip-back root to sound metal & PT**	**PT as per ASME VIII-1 App 8**	100%	No visible discon- tinuity allowed.	P	W	V
9b	Final Inspn on weld completion	**Grind flush both sides & machine**	100%	Visual & Dim'l check; PT &RT	P	H	V
9c	**RT** Full if Flange is 31mm or more; Else, Spot or Nil	Soundness of Butt Welds	100%	**Full RT-UW 51 Spot RT UW52** of ASME VIII-1			
9d	SS Overlay/Liner welding on Body / Nozzle flanges [with test hole]	Ensure WPS is qualified; Carry out PT & Air test on Weld overlay.	100%	**Note PQR Number.** No discontinuity in PT; No leaks in air test allowed.	P	H	V
9e	Body Flanges to Shells weld setup (Avoid deforma- tion of flange/s)	Squareness; Total Length; Alignment; Flan-ge faces parallel.	100%	Square within 1mm imensions as per Drawing; Aligned within 1mm/Mtr.	P	H	V
9f	Final Inspection after welding of Flange to Shell	Visual & Dim'l check; Air leak test of the welds	100%	Same as above; No leaks in air test at a pressure 1.5kg/cm2	P	H	V
10	**Jacket** for Vessel: Plate to bend with one long seam, & ends knuckled	Ensure uniform annular gap, and weld prep for LS double butt weld	100%	Component Drg.; Knuckle profile to check by template; SingleV & root gap	P	V	V
10 a	LS root chipback to sound metal PT	PT as per ASME VIII-1 App. 8	100%	No visible disconti- -nuity allowed.	P	W	V

10 b	Final weld pass : Visual Insp & PT	PT as per ASME VIII-1 App. 8	100%	No undercut, crack, porosity, underflush	P	W	V
10 c	RT: LS butt welds :- Full/Spot/Nil	Weld soundness	E=1.0/ 0.85/0. 7	ASME Sec VIII-1 UW-51/UW-52/Nil	P	E	V
10 d	Jacket Fitment on Shell or DEs, after L.S.welding & PT	Prepare Welding Edge for FPW. Check Elevation	100%	Uniform root gap on shell; Sequential welding essential	P	H	V
10 e	Hydro-Test of Jacket & welds	@ Specified Test Pressure per Drg	100%	No Leaks; Jacket sound & tight	P	H	V
10 f	Pneumatic Test of Jacket welds	@ low pressure of 1.5Kg/cm2	100%	Soap suds for leak detection: No leaks	P	H	V
11 .	**Completed Vessel** : Visual & Dim'l Inspection; Check completion of all welding & fabrication work including Support Pads & Stiffening Rings Surface inspection of vessel : internal & external;	-Conduct Visual & Dimensional inspection as per appd. drawing; -Note as-built dimensions Remove surface blemishes and dress-up. - Aesthetics, No surface defects or blemishes	100%	-Weld sizes as per approved drawing -Verticality, Align-ment, within 1mm/ Mtr Height/Length -Work completion, as per Drawing. No surface blemish or discontinuity -Ensure Workman-like finish	P	H	V

12.	Pressure Testing .Thermowell . RF Pads . Slip-on & Blind Flange overlays . Body flange to Shell & Nozzle to flange welds . Main Shell…. . Jacket…… at specified test Pressure/s	Pneumatic Test @ 1.5 Kg/cm2 with soap suds **Hydrostatic Test** Vertical position Vessel adequate-ly supported	100%} 100%} 100%} 100%} 100%	No leaks at air test pressure; Holding Time at least 10 mins . . Low Cl' water:- max Cl' 25 ppm. . Holding time :- 30min minimum	P P	W W	W/V W/V
13.	Acid Cleaning & **Passivation** of all SS surfaces of Vessel	Ensure use of pure Nitric Acid **without any trace of HF**	100%	No blemishes in visual Inspection; Refer to HPFL QCP No. 9	P	H	V
14.	**Painting** of all MS parts	2 coats of Zinc CrO3 Red Oxide	100%	Wire brush & paint DFT 60 microns	P	V/W	W/V
15.	**Identification** Marking	Hard Punching per Data sheet	100%	On permanently welded name-plate	P	V	V
16.	**Certification** and Documentation	Review Folders and sign	100%	Manufacturer's Document Folder	P	V/A	V

QCP.NO. 9 : PROCEDURE FOR FINISHING, ACID CLEANING AND PASSIVATION OF STAINLESS STEEL FABRICATION

STAINLESS STEEL – CLEANING AND FINISHING

During handling and processing operations such as forming, machining, tumbling and lapping, particles of iron

or tool steel may get embedded in or smeared on the surfaces of stainless steel components. If allowed to remain, these particles may corrode and produce rust spots on the stainless steel. Mechanical cleaning, polishing and planishing, followed by acid-cleaning-and-passivation treatment is given to prevent this condition. Surface treatment should be proceeded with in the following stages :

MECHANICAL CLEANING

Flux or slag from welding or high temperature brazing should be removed by chipping, brushing with stainless steel wire-brush, grinding, polishing with an iron free abrasive or sand blasting. Mechanical polishing (by grinding / sandering etc.) Shot blasting [with steel grits] is prohibited, though sand-blasting is sometimes recommended.

SOLVENT CLEANING

Machining, forming, grinding, oils shall be removed by solvent cleaning [e.g. with Acetone], followed by alkaline soak, cleaning and thorough water rinsing [immersion or swabbing].

COPPER SULPHATE CHECK

Embedded free iron, if present can be detected by wetting the surface with a Copper Sulphate solution, when bluish copper cast colour spots would indicate presence of free iron. This contamination is to be removed by sandering / polishing if not removed by passivation.

PASSIVATION

Consists of immersing in or swabbing stainless steel part with a solution of (i) Nitric Acid, or (ii) Nitric Acid plus Oxidising Salts. This results in dissolving of embedded or smeared iron, and thereby restoration of the original corrosion resistant surface.

TYPICAL SOLUTIONS : **These are strong oxidising agents and should be handled with care.**

Solution A : For series 200, 300 and 400 grades containing 17% Chromium or more [except free machining grades and polished surfaces],

70% HNO3 (with no traces of HF)	…..	20 to 40% by volume
Water	…..	Remaining
Operating Temperature	….	Upto 60 Deg.C. [140 Deg.F.]
Contact time	…..	30 to 60 minutes

Solution B : For free machining grades, polished surfaces and series 400 [less than 17% Chromium]

70% HNO3 [no traces of HF]	…..	20 to 40% by volume
Sodium Dichromate [Na2 Cr2O3, 2H2O	……	4 to 6% by weight
Water	…..	Remaining
Operating Temperature	….	Room temperature or 50 Deg.C. [120 Deg.F.]
Contact time	…..	30 minutes

PRECAUTIONS

Operating personnel should wear rubber aprons, gloves, eyeshields or goggles. Thorough rinsing of rinsed parts must precede air blow off in order to avoid dispersal or acid solutions. Handling equipments should be of Stainless Steel or Plastic.

Quest's SUGGESTED PROCEDURE OF TESTING FOR AGITATORS

1. The agitator shall be made exactly as per drawing.
2. All the agitator assembly shall be balanced statically on knife edges and shall be shown to Client/ Quest Inspection before trial run.

3. Prior to load/water test all the agitator assemblies shall be run on no load in air. This test shall be carried out on a independent platform with free access to measure the deflection/run out. No load test shall be at the rated speed with job motor, gear box and agitator completely assembled.
4. Deflection

   g) Deflection near mechanical seal /stuffing box : 0. 05mm TIR.MAX.

   h) Deflection near rigid coupling [lower shaft] : 0.10mm TIR. MAX.

   i) Deflection on shaft near impeller/open-end : 0.5 mm per metre of unsupported length but max. 2.0 mm.

5. Load test shall be carried out at design pressure for one hour duration. if the level of liquid in operation conditions is less than full capacity of the equipment then the balance volume shall be filled and pressurised with air to design pressure.

6. The pressure drop at the 1 hour load trial [through stuffing box] shall not exceed 0.25 kg/cm2. And for mechanical seal there shall be no leak at all.

Note : In case of lined agitator, the load trial shall be performed before and after lining.

DESPATCH

The agitator unit and drive shall be separately packed in wooden cases after successful trials, after appropriate match-marking on hub and blades.
All the machined parts shall be given one coat of rust preventive and all the items shall be suitably match marked. All the cases shall have proper packing lists.

CANADIAN TEMPERATURE CONVERSION CHART

+70^{0}F	Texans turn on the heat and unpack the thermal underwear.	Canadians go swimming in the Lakes.
+60^{0}F	North Carolinians try to turn on the heat.	Canadians plant gardens.
+50^{0}F	Californians shiver uncontrollably.	Canadians sunbathe.
+40^{0}F	Italian & English cars won't start.	Canadians drive with the windows down.
+32^{0}F	Distilled water freezes.	Lake Superior's water gets thicker.
+20^{0}F	Floridians don coats, thermal underwear, gloves, and woolly hats.	Canadians throw on a flannel shirt.
+15^{0}F	Philadelphia landlords finally turn up the heat.	Canadians have the last cookout before it gets cold.
0^{0}F	People in Miami all die...	Canadians lick the flagpole.
20^{0}F below	Californians fly away to Mexico.	Canadians get out their winter coats.
40^{0}F below	Hollywood disintegrates.	Girl Scouts in Canada selling cookies door to door.
60^{0}F below	Polar bears begin to evacuate the Arctic.	Canadian Boy Scouts postpone "Winter Survival" classes until it gets cold enough.
80^{0}F below	Mt. St. Helens freezes.	Canadians rent videos.
100^{0}F below	Santa Claus abandons the North Pole.	Canadians get frustrated because they can't thaw the keg.
297^{0}F below	Microbial life no longer survives on dairy products.	Cows in Canada complain about farmers with cold hands.
460^{0}F below	ALL atomic motion stops (absolute zero in the Kelvin scale).	Canadians start saying, "Eh, Cold 'nuff for ya?"
500^{0}F below	Hell freezes over.	The Leafs win the Stanley Cup.
+70^{0}F	Texans turn on the heat and unpack the thermal underwear.	Canadians go swimming in the Lakes.
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EIL SPECIFICATION
PROTECTION AND PAINTING

1. **All exposed carbon steel parts to be painted shall be thoroughly cleaned from inside and outside to remove scale, rust, dirt and other foreign materials by wire brushing and sand blasting, as applicable. Minimum acceptable standard in case of power tool cleaning shall be 'St3' and in case of blast cleaning shall be Sa 2 ½ as per Swedish Standard SIS 0055900**
2. **Non-ferrous materials, austenitic stainless steels, plastic or plastic coated materials insulated surface of equipment and pre-painted items shall not be painted.**
3. **Stainless steel surfaces both inside and outside shall be pickled and passivated.**
4. **Machined and bearing surfaces shall be protected with varnish or thick coat of grease.**
5. **Depending on the environment, following primer and finish coats shall be applied, unless otherwise stated in Job Specification / Data Sheet.**

	Environment		Description
i)	**Normal industrial**	**Primer**	**2 coats of Red-oxide Zinc chromate, each 25 microns [min.] thick**
		Finish Coat	**2 coats of synthetic enamel, each 25 microns (min.) thick.**
ii)	**Corrosion Industrial**	**Primer**	**2 coats of Epoxy Zinc chromate each 35 microns (min.) thick**
		Finish Coat	**3 coats of Epoxy high build paint, each 100 microns (min.) thick**
iii)	**Coastal and Marine**	**Primer**	**2 coats of high build chlorinated rubber zinc phosphate each 50 microns (min.) thick**
		Finish Coat	**2 coats of chlorinated rubber paint each 35 microns (min.) thick**
iv)	**All environments [Temp. 80-250 Deg.C.]**	**Finish Coat**	**2 coats of Heat resistant Aluminium paint suitable for specified temperature each of thickness 0 microns.**

[All values refer to dry film thickness : The colour of finish coat shall be as specified]

NOTE **: For Coastal and Marine Environment, kindly note that "**BERGER" **supplies gives primer as** LINOSOL **and finish paint as** LINOSOL CHLORO RUBBER.

EPIL STANDARD for FITMENT of AGITATOR SEAL

All EPIL Seals for Agitators, Autoclaves or Mixers are factory-assembled and cartridges are tested prior to supply. Therefore, a careful preparation prior to removal from packing box(es) should be done.

1) Cleanliness is most essential. Clean all work surfaces (the shaft, the lantern space, the surroundings) thoroughly before you start assembly and installation, and maintain cleanliness throughout installation.

2) Do not place the Seal components and cartridge on rough surface. Place the Cartridge away in a safe and dust free place, where possibility of damage is unlikely, on wooden planks or on other soft or smooth surface.

3) During assembly follow the step by step procedure given below.

   3.1 Check shaft straightness :should be within 0.05mm (or 0.08mm max)

   3.2 Check shaft diameter is within the limits given on the drawing or as per check list i.e. within +0.00 / -0.05mm.The ovality shall be within 0.025mm max. The shaft surface finish shall be as per the drawing or of 250 CLA (0.04 to 0.08μm). In any case, the surface shall be free from nicks, burrs and sharp corners.

   3.3 To avoid damage to secondary packings [elastomers etc.] the shaft should have 1.6mm chamfer or radius. All sharp edges must be removed from key ways and grooves on the shaft.

4. Carefully check the stool / lantern pad, pad for seal cartridge. Remove any foreign matter and see the surfaces are smooth and flat.
   4.1 Check seal cartridge register diameter fits / matches corresponding part on the pad.

   4.2 Check seal cartridge pad square to within 0.05 mm maximum T.I.R.

5. Assemble stool / lantern on the vessel. Assemble shaft.
   5.1 Check Shaft run-out does not exceed 0.05 mm / 0.08 mm max. TIR

   5.2 Check shaft is concentric to vessel diameter to within 0.08mm max. TIR.

6. Check bearing assembly and bearing clearance do not exceed :
   a) 0.08mm max. axially
   b) 0.08mm max. radially

7. After ascertaining the above checks and position of stool / lantern on the vessel; remove shaft and then stool / lantern.

8. Remove `O' ring packing from inside the sleeve but not the one on top of the sleeve.

9. Place gasket on the pad and place the seal cartridge on the pad.

10. Fix the stud & nuts, or bolts

11. Assemble the stool / lantern.
12. Raise the shaft up the seal cartridge sleeve after lightly lubricating with clean compatible Oil / Liquid, and secure the shaft in bearing housing.
13. Screw down the hexagon headed screws on the drive collar, so that the packing on the sleeve is lightly squeezed.
14. Mark the holes for dimpling shaft.
15. Remove the shaft.
16. Dimple on the bench drill, and de-burr the dimples.
17. Lightly lubricate the shaft with oil / compatible liquid. Do not use mineral oil or grease for EPR `O' ring, use soap water.
18. Assemble `O' ring in the seal cartridge sleeve.
19. Raise the shaft up the cartridge sleeve.
20. Secure the shaft in bearing housing loosely.
21. Loosen the seal cartridge fasteners : studs, nuts/bolts etc.
22. Lift the cartridge off the register diameter, etc.
23. Secure the bearing assembly properly. Re-check shaft run out and end play. These must be within permissible limit as mentioned in points 5 & 6 above.
24. Place seal cartridge on the groove pad. It should register on its own.
25. Tighten stud nuts / bolts
26. Assemble drive unit assembly on the stool lantern.
27. Align the coupling within 0.08mm maximum concentricity at all outer faces.
28. After assembling coupling and drive unit, check shaft sleeve seal is effectively fitted. After aligning dimpled holes with socket set screws, do not forget to tighten the hexagonal screws on drive collar to make sleeve on drive collar to make sleeve shaft top sealing effective.
29. Fix the socket set screws on the drive collar.
30. Check the final assembly for run out etc. :TIR 0.08mm max. per Point 5 above

Summary Check List

1) Check shaft straightness within 0.05mm T.I.R. [At Bearings and at seal]

2) Check Tolerance and Ovality

   a) Surface finish - 0.04 / 0.08μm (250 CLA)
   b) Shaft Diameter Ovality not exceeding 0.025mm
   c) Tolerance on Diameter = plus (+)0.00/ minus(-) 0.05mm

3) Check : Run out : 0.05 / 0.08mm max. T.I.R.

4) Check : pad square-ness to within 0.05mm max. T.I.R.

5) Check : Concentricity to within 0.08mm T.I.R.

6) Check : Bearing clearance

   a) Axial : 0.08 mm max.
   b) Radial : 0.08 mm max.

7) Check : Coupling alignment, coupling concentricity, after completion of coupling, drive unit [i.e. complete equipment assembly]. Max. 0.08mm.

8) Check Sleeve / Shaft sealing is effectively fitted.

9) Check : Final Assembly T.I.R. 0.08mm

POLYQUIP FABRICATION INDUSTRIES (PFI)
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Factory : W 128, MIDC Ph.II, Dombivali East Distt Thane

Requirement for Proof Load Testing of 123mm dia x 19mm thick Sight Glass / Light Glass of Annealed / Toughened Glass Quality.

1. Following proprietary Standard Specification for Proof Load Testing is based on BS:MA:24:1974 principles.

   a. Initially all 8 Nos. tests shall be subjected to **Plane Polariscope Test** ; on rotating the glass over 90 degrees, the incident polarised light from one end, should get fully blanked off, as seen from the opposite side.

   b. All the eight nos. glasses shall be subjected to a **Proof load test** at a proof load of 1025 kgf. at ambient temperature (equivalent to hydrotest pressure incident on the glass at ambient temperature); the additional fixture for this test (an SS ring with 100mm orifice) will be provided to M/s TCR Engineers, by M/s Polyquip Fabrication Industries. The size of the plunger etc. shall be as per BS: MA: 1974 standard.

   c. **Thermal Shock test** for a gradient of 170 deg. C : as suggested by M/s Dura Hart's Mr. Vakil, shall be carried out on one sample selected at random.

2. **Justification**

   1. 1025 kgf = Hydrotest Pressure x area based on effective gasket seating diameter
      $= 10.5 \text{ kgf/cm}^2 \times \{ (11.25)^2 \times 3.1416 \} / 4$
      (where effective gasket seating diameter = 112.5mm=11.25cm.)
      = 1025 kgf
   2. 1667 kgf = Please refer to Table 5 of BS MA 24:1974
      for Nom. 19mm thick glass & orifice 150mm, the proof load is 36800 N = 3751.25 kgf
      Therefore 19mm thick glass with orifice 100mm would be

$$\frac{3751.25 \times 100^2}{150^2} = 1667 \text{ kgf}$$ (subsequent step in proof loading, if agreed to)

Notes :

1. Mr. Vakil of M/s Dura Hart explained that "Toughened" glass and "Annealed" Glass had opposite properties : while "Annealed" glass was stress-free, "Toughened glass" was pre-stressed with a tough exterior and a soft interior through-thickness cross section. He also men-tioned that Thermal Shock test was an important proving test for sight/light glasses of process vessels. For the given temperature and pressure loadings M/s Dura Hart wuld be happy to suggest a (possibly lower) thickness of sight glass which will also pass the Thermal Shock Test.
2. It was explained to Mr. Vakil that buckling load on the sight glass (due to internal pressure and in vacuum condition) was an important consideration in designing mechanical strength of the sight glass. As such M/s Polyquip needs sight glasses which are annealed (stress free) and able to withstand a buckling load of 1025 Kgf at ambient temperature (maximum operating pressure and temperature being 7kgf/cm2 and 200deg C).
3. Thermal Shock test on the batch for a differential of 170 degrees C would also be beneficial

EXTRACTS FROM ASME SECTION-VIII DIVN.1 : REGARDING PROOF TESTS

UG-101 [L] : Brittle Coating Test Procedure

UG-101 (l) (1) Subject to the limitations of (a)(2)(a) above (i.e.YP = 0.625 of Min. Sp. T.S.), this procedure may be used only for vessels and vessel parts under internal pressure, constructed of materials having a definitely determinable yield point. The component parts that require proof testing shall be coated with a brittle coating in accordance with UG 101(g) above. Pressure shall be applied in accordance with (h) above. The parts being proof tested shall be examined between pressure increments for signs of yielding as evidenced by flaking of the brittle coating, or by the appearance of strain lines. The application of pressure shall be stopped at the first sign of yielding, or if desired, at some lower pressure.

UG-101(1)(2) : The maximum allowable working pressure P in pounds per square inch at test temperature for parts tested under this paragraph shall be computed by one of the following formulas:

(a) If the average yield strength is determined in accordance with (j) above

$$P = 0.5\ H\ Sy / Sy\ ave$$

(b) To eliminate the necessity of breaking tensile specimens and determining the actual yield strength of the material under test, one of the following formulas may be used to determine the maximum allowable working pressure.

(l) For carbon steel meeting an acceptable Code specification, with a specified minimum tensile strength of not over 70,000 psi (480 Mpa), for customary units.

$$P = 0.5H\ (St / St+5000)$$

(2) For any acceptable material listed in this Division, P = 0.4 H.

H = hydrostatic test pressure at which the test was stopped, psi
Sy = specified minimum yield strength at room temperature, psi
Sy ave = actual average yield.str. from test specimens at room temp. psi
St = specified minimum tensile strength at room temperature, psi

When the above formulae are used, the material in the pressure part shall have had no appreciable cold working etc.that would tend to raise the yield strength above the normal.

The maximum allowable working pressure at other temperatures shall be determined as follows :

Pmax = Pt x {S/ S2}, where Pmax = max. allowable working pressure at design temp. in psi.

Pt = max. allowable working pressure at test temp., psi.
S = max. allowable stress value at design temp. as per UG 23; but not to exceed S2 value.
S2 = max. allowable stress value for the material used in the test, at test temp., psi., as given in tables UG 23.

UG-101 (m) Bursting Test Procedure

UG-101(m)(l) : This procedure may be used for vessels or vessel parts under internal pressure when constructed of any material permitted to be used under the rules of this Division. The maximum allowable working pressure of any component part proof tested by this method shall be established by a hydrostatic test to failure by rupture of a full-size sample of such pressure part. The hydrostatic pressure at which rupture occurs shall be determined. Alternatively, the test may be stopped at any pressure before rupture that will satisfy the requirements for the desired maximum allowable working pressure.

UG-101(m)(2) The maximum allowable working pressure P in psi at test temperature for parts tested under this paragraph shall be computed by one of the following formulas :

(a) For parts constructed of materials other than cast materials.

$$P = B/4\ x\ (St\ E / St\ ave) \text{ or } P = B/4\ x\ \{St\ E / Str\}$$

(b) For parts constructed of cast iron – see UCI-101; parts constructed of cast ductile iron – see UCD-101.

(c) parts constructed of cast materials, except cast iron and ductile iron :

$$P = \{ Bf / 4 \}x\ (St\ E / St\ ave) \text{ OR } P = \{ Bf / 4\} x\ St\ E / Str$$ where

B = bursting test pressure, or hydro.test pressure at which the test was stopped, psi
E = efficiency of welded joint, if used [See Table UW-12]
f = casting quality factor as specified in UG-24
St = specified minimum tensile strength at room temperature, psi

St ave = average actual tensile strength of test specimens at room temperature, psi
Str = maximum tensile strength of range of specification at room temp. psi
The maximum allowable working pressure at other temperatures shall be determined as follows :
Pmax = Pt x {S/ S2}, where Pmax = max. allowable working pressure at design temp. in psi.
Pt = max. allowable working pressure at test temp., psi.
S = max. allowable stress value at design temp. as per UG 23; but not to exceed S2 value.
S2 = max. allowable stress value for the material used in the test, at test temp., psi., as given in tables UG 23.

UG-101(a) Displacement Measurement Test Procedure

Subject to the limitations of (a)(2)(a) above (i.e.YP = 0.625 of Min. Sp. T.S.), this procedure may be used only for vessels and vessel parts under internal pressure, constructed of materials having a definitely determinable yield point. Displacement shall be measured at the most highly stressed parts by means of measuring devices of any type capable of measuring to 0.001 in (0.02mm). The displacement may be measured between two diametrically opposed reference points in a symmetrical structure, or between a reference point and a fixed base point. Pressure shall be applied gradually at steps of one tenth the test pressure.

After each increment of pressure has been applied, readings of displacement and hydrostatic test pressure shall be taken and recorded. The pressure shall be released and any permanent displacement shall be determined after any pressure increment that indicates an increase in measured displacement for this increment over the previous equal pressure increment. Only one application of each increment is required. Care must be taken to assure that the readings represent only displacements of the parts on which measurements are being made and do not include any slip of the measuring devices or any movement of the fixed base points or of the pressure part as a whole.

Two curves of displacement against test pressure shall be plotted for each reference point as the test progresses, one showing the displacement under pressure and one showing the permanent displacement when the pressure is removed. The application of pressure shall be stopped when it is evident that the curve through the points representing displacement under pressure has deviated from a straight line.

The pressure coincident with the proportional limit of the material shall be determined by noting the pressure at which the curve representing displacement under pressure deviates from a straight line. The pressure at the proportional limit may be checked from the curve of permanent displacement by locating the point where the permanent displacement begins to increase regularly with further increases in pressure. Permanent deformation at the beginning of the curve that results from the equalization of stresses and irregularities in the material may be disregarded.

The maximum allowable working pressure P in pounds per square inch [kilopascals] at test temperature for parts tested under this paragraph shall be computed by one of the following formulas:

(a) If the average yield strength is determined in accordance with above,
P = 0.5 H { St / St ave }

(b) To eliminate the necessity of cutting tensile specimens and determining the actual yield strength of the material under test, one of the following formulas may be used to determine the maximum allowable working pressure.

1. For carbon steel, meeting an acceptable Code specification, with a specified minimum tensile strength of not over 70,000 psi for customary Units
P = 0.5 H x { St / St + 5000 }

(2) For any acceptable material listed in this Division, P = 0.4 H , where
H = hydrostatic test pressure coincident with the proportional limit of the weakest element of the component part tested, psi
Sy = specified minimum yield strength at room temperature, psi
Sy ave = actual average YS from test specimens at room temp. psi
St = specified minimum tensile strength at room temperature, psi

When the above are used, the material in the pressure part shall have had no appreciable cold working or

other treatment that would tend to raise the yield strength above the normal. The maximum allowable working pressure at other temperatures shall be determined as given above.

Atlas Copco (India) Ltd., Pune	ACIL Procedure No. BX 01 Rev. 0 Dated 01.10.2003

BURSTING TEST OF CASTINGS FOR "Z" TYPE COMPRESSORS

1. **Objective** : Establishing maximum allowable working pressure of casting by either
   a. hydrostatic test to failure by rupture or
   b. by stopping the pressurising at a predetermined pressure before rupture.
   [i.e at a pressure that will satisfy requirements for desired maximum allowable working pressure].
2. **Scope :** Bursting Test of 18 Nos. castings of various sizes and shapes for `Z' type Compressor; Material Specifications : SG Iron and Cast Iron.
3. **Preamble**: Castings are made to Atlas Copco drawings. The drawings specify
   Design Pressure : **P**
   Minimum Wall Thickness of pressure containing walls of castings = **t**
   Hydrotest Pressure : **2 x P**
   Bursting Test Pressure approx **8 x P**
4. **Method** : Castings shall be pressure tested after being efficiently blanked / closed by high tension fasteners and adequately designed blanks/blinds/closures, to specified pressures in steps as given below :
   a. Safety : Cages will be made for keeping castings inside the to protect personnel and property from the consequences possible premature failure/bursting.
   b. 2 Nos. Pressure Gauges of 0 to140 kgs/cm2 Range duly calibrated –shall be used for each test.
   c. Brittle lacquer Coating : Thin adherent paste of lime-wash shall be applied all over the surface of casting and allowed to dry before pressurising. The pressure at which the coating cracks, shall be noted.
   d. **Gradual Pressure rise in Steps for Bursting Test** :

Initial (zero reading)	at atmospheric pressure, after purging air.	
Second reading	First Step	@ Design Pressure
Third Reading	* Second Step	@ 1.5 times the Design Pressure
Fourth Reading	* Third Step	@ 2 times the Design Pressure
Fifth Reading	Fourth Step	@ 3 times the Design Pressure
Sixth Reading	Fifth Step	@ 4 times the Design Pressure
Seventh Reading	Sixth Step	@ 6 times the Design Pressure
Eighth Reading	* Seventh Step	@ Burst Test Pressure as per drawing
Ninth Reading	After depressurising : at atmospheric pressure.	

   e. **Measurement of elastic and plastic deformation, if any :** Use dial gauges of 0.001mm accuracy; place 2 to 4 dial gauges on vulnerable [highest stressed] locations. Zero reading with a pretension on 2mm. Shall be noted at at atmospheric pressure. Later at each of above 7 steps, the deformation readings shall be noted. Final reading shall b taken after release of pressure to atmosphere. Note the difference between 1st and 9th reading. If any, this is the permanent set.
   f. **Check for seepage / leakage** at steps 2, 3 and 7 : Visual and by developer spray.
5. **Expected Result :**
   a. Either there is no rupture or at specified bursting pressure
   b. If rupture takes, place, note the pressure. Work back maximum allowable design pressure.
   c. Note the permanent set. Assess acceptability. Should be less than 8% of volume of casting.
   d. Look for leakage; seepage if any. Record observations.

QAP For HP Compressor, Base frame Assembly with coolers and piping:-

TYPICAL QUALITY PLAN ACIL -1.

Sl No	Component / Assembly / Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Record Format	Agency			Remarks
									P	W	V	
1.	PRE-PRODUCTION											
1.1.	Approval of Drawing & Design Spec	Dimensions & other pertinent details	A	Identification & Correlation	100%	ACIL Spec	ACIL Spec	Approved Drawing	2	2	3	
1.2.	Approval of QAP	Pertinent Details	A	Identification & Correlation	100%	ACIL Spec	ACIL Spec	Approved QAP	2	2	3	
1.3.	Welding Qualification	WPS, PQR & WPQ	B	ASME Sec IX	100%	ASME Sex IX / Appvd dwg	ASME Sex IX / Appvd dwg	WPS, PQR & WPQ	2	2	2,3	
2.	RAW MATERIAL - IDENTIFICATION											
2.1.	Carbon Steel for Pressure Parts	Chemical Properties	B	Identification & Correlation	100%	As per Appvd dwg / spec	TC	Inspection at supplier by Quest / Mill TC of Reputed Supplier	1	2,3	3	In case of non-availability of TC, check test to be carried out for respective specifications
		Mechanical Properties	B	Identification & Correlation / UT for plates 25 mm and above	Review TC 100%	As per Appvd dwg / spec	TC		1	2,3	3	
		Measurement of Size	A	Dimension	100%	Ordering Spec	TC		1	2,3	3	
2.2.	Carbon Steel for Non - Pressure Parts.	Chemical Properties	B	Identification & Correlation	Review TC	As per Appvd dwg / spec	TC		1	2,3	3	
		Mechanical Properties	B	Identification & Correlation	Review TC	As per Appvd dwg / spec	TC		1	2,3	3	
		Measurement of Size	A	Dimension	100%	Ordering Spec	TC		1	2,3	3	

Sl No	Component / Assembly / Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Record Format	Agency			Remarks
									P	W	V	
3.	IN PROCESS INSPECTION											
3.1.	Shell 'L' Seam Set-up	Measurement of Size / Ovality	B	Dimension	100%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2	3	Not applicable for seamless pipes
		Weld Preparation	B	Visual / Dimension	100%	As per Appvd dwg / Code	As per Appvd dwg / Code	-	2	2	3	Not applicable for seamless pipes
3.2.	Shell 'L' Seam Full Weld	Weld Quality	A	Radiography	100%	As per Appvd dwg / Code	ASME Sec VIII Div 1, Sec UW 51	Radiography Film with Report	1	2	2,3	Not applicable for seamless pipes
3.3.	Shell 'C' Seam Set-up	Measurement of Size / Ovality	B	Dimension	100%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2	3	
		Weld Preparation	B	Visual / Dimension	100%	As per Appvd dwg / Code	As per Appvd dwg / Code	-	2	2	3	
3.4.	Shell 'C' Seam Full Weld	Weld Quality	A	Radiography	100%	As per Appvd dwg / Code	ASME Sec VIII Div 1, Sec UW 51	Radiography Film with Report	1	2	2,3	
3.5.	Nozzle Setup	Dimension	B	Visual / Dimension	100%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2,3	3	
3.6.	Nozzle Root DP	Weld Quality	B	Dye Pentrant Test	100%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2,3	3	Nozzle DPT to be witnessed
3.7.	Nozzle Full Weld	Weld Quality	B	Dye Pentrant Test	100%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2,3	3	Nozzle DPT to be witnessed

Sl No	Component / Assembly / Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Record Format	Agency			Remarks
									P	W	V	
3.8.	Shell-Tube Bundle Fixing Flange	Dimension / Visual	B	Dimension	100%	Approved Drawing	Approved Drawing	Dimension Report	2	2,3	3	Flange Alignment to be verified by plumb-line
3.9.	Welding of Saddle Support and Lifting Lugs	Weld Quality / Dimension / Level	B	Visual / Dimension	100%	Approved Drawing	Approved Drawing	Dimension Report	2	2,3	3	
4.	FINAL INSPECTION											
4.1.	Hydro Pressure Test	Check for any leaks	A	Pressure Test	100%	Approved Drawing / Tech.Spec / Code	Approved Drawing / Tech.Spec / Code	Pressure Test Report	2	2,3	3	Hard punching on tube sheet & body flange with metal punch
4.2.	Shell Side Pneumatic Pressure Test with tube bundle	Check for any leaks	A	Pressure Test @ 2 kg/cm^2	100%	Approved Drawing / Tech.Spec / Code	Approved Drawing / Tech.Spec / Code	Pressure Test Report	2	2,3	3	
4.3.	Painting ACIL Specification 1311640115	Surface Preparation, Uniformity, Coverage	B	Visual	100%	SA 2 ½	SA 2 ½	—	2	2	3	
		Coating Thickness	B	Coating Thickness Meter	100%	Approved Drawing / Tech.Spec	Approved Drawing / Tech.Spec	Paint Thickness Report	2	2	3	
4.4.	Inspection Reports	Review of TC's, Pressure Test Reports, Dimension Report & Paint Thickness Report	B	Visual	100%	—	—	—	2	2	3	
4.5.	Cleaning and Packing	—	B	Visual	100%	—	—	—	2	2	3	

TYPICAL QUALITY PLAN ACIL -2.

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING							
1.1	Plates, Pipes, Tubes flanges	Mechanical , Chemical Properties, visual and Dimensional	Lab TC or Mill TC	100%,	As per Approved Drawing & Specification.	Test Certificate,	H	W
2.0	STAGE INSPECTION.							
2.1	L' Seam weldment	Weld soundness	Radiography Test	100%	As per ASME Sec. VIII Div.-1, UW 51	NDE Report	H	R
2.2	C' Seam weldment	Weld soundness of 'C' Seam	Radiography Test	100%	As per ASME Sec. VIII Div. 1 UW 51	NDE Report	H	W
2.3	Weld Joint at Detail 'X'	Weld Soundness of joint	Ultrasonic Test	100%	As per ASME Sec. VIII Div. 1 App. 7	NDE Report	H	R
2.4	Nozzle set-up for Air Inlet & Outlet	Orientation & projection & Elevation	Dimensional	100%	As per approved drawing	Inspection Report	H	W
2.5	Shell Internal Dress - Up	Ovality, Nozzle flush / Rounded of nozzle edges from	Piston Gauge Passing Test & Visual	100%	As per approved drawing & free from oil, grease	Inspection Report	H	W
2.6	Compressor Base (separate before welding & after per-machining)	Dimensional + visual Machined dimension of 'O' Ring groove	Dimensional	100%	As per approved drawing	Inspection Report	H	R
2.7	Sub frame- set-up of Motor pads to I-Beam	Dimensional & Visual	Dimensional & Visual	100%	As per approved drg.	Inspection Report	H	R
2.8	Sub frame complete with stress relieving	1) Time Temperature chart of stress releasing @600°C min	Document review of Time-Temperance chart & dimensional	100%	S.R. @ 600°C min	Inspection Report	H	R

2.9	Non Destructive Testing RT	Soundness of weld & Visual	RT as per RT-1 of ASME Sec VIII Div 1.	RT-1	As per Procedure, ASME Code	NDE Report	H	R
2.10	Set up of Sub frame & Compressor Base on Base frame	Dimensional	Dimensional	100%	As per approved drg	Inspection Report	H	W
2.11	Final Dimensions after machining / Visual	Overall dimensions & Alignment of Frame & Base support to be checked on Machine bed before unloading. Diagonals to be checked. Comp. Base mounting hole marking	Dimensional+ LPT	100%	As per specified in Drg	Inspection Report	H	W
2.11	Shell side hydro Test with Victaulic couplings	Hydro Test (Test Pressures as per Approved Drgs.)	Visual	100%	No Leakage	Pressure Test Report	H	H
2.12	Oil Reservoir	Pneumatic Test @ 0.5 kg/cm^2	Visual	100%	No Leakage at 0.5kg/cm^2	Pressure Test Report	H	H
3.0	**FINAL INSPECTION**							
3.1	Surface Preparation.	Sand Blasting to SA 2.1/2 Visual, Completeness as per drg.	Visual,	100%	SA 2 1/2.	Inspection Report	H	R
3.2	Final Inspection after painting	Uniformity of painting & DFT	Visual & DFT meter	100%	As per approved drg. . Free from Sand and major paint bubbles. DFT as per specifications.	Inspection Report	H	W
3.3	Low pressure test	Pneumatic at 2 kg/cm^2	Visual	100%	No leakages	Pressure Test Report	H	W
3.4	Stamping, Final & Visual	Visual appearance	Visual	100%	Inside surface to ensure for smoothness, free from oil, grease.	Inspection Report	H	W

Note -

1. Mock up test and WPS , PQR, WPQ will be offered for Atlas Review at Radiant no copy will be provided.
2. The inspection stages which are to be offered to quest insp. Services, will be offered either at vendors premises or at i.e. (vendors may be located outside pune) inspection record will be prepared by inspection agency in inspection agency's format.

TYPICAL QUALITY PLAN ACIL -4

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING							
1.1	Shell Plate, Shell Flange, Nozzle pipe, flanges.	Surface defects & Dimensional, Physical and chemical properties	Correlation with Mill TC or Lab TC	100% (for UT of plate wherever applicable) plates 25mm & above	As per standard dimensions specified in approved drg.	Inspection report	H	W
2.0	STAGE INSPECTION.							
2.1	Shell to nozzle Set up and orientation except Air inlet and outlet	Orientation, Projection, Elevation	Dimensional & Visual	100%	As per approved drg.	Inspection Report	H	R
2.2	Nozzle Setup for Air Inlet & Outlet	Orientation, Projection, Elevation	Dimensional & Visual	100%	As per approved drg. (Set on type)	Inspection Report	H	R
2.3	Shell Internal dressing	Piston pass, Nozzle internal edges rounding off.	Visual	100%	Free pass, Nozzles weld / Flushing & rounding from inside	Inspection Report	H	R
3.0	FINAL INSPECTION							
3.1	Final Inspection before Hydro Test	Completeness as per Drg. Cleanliness of internal	Dimensional & Visual	100%	As per approved drg. Free from oil, grease	Inspection Report	H	H
3.2	Shell side Hydro Test with Victaulic coupling	Leak Tightness	Visual	100%	No Leakage / No pressure drop.	Pressure Test Report	H	W
3.3	Surface Preparation.	Sand Blasting to SA 2.1/2 Visual, Completeness as per drg.	Visual	100%	SA 2 1/2.	Inspection Report	H	R
3.4	Final Inspection after painting, Finish	Uniformity of painting & DFT	Visual & DFT meter	100%	As per approved drg. And ACIL Spec.	Inspection Report	H	W
3.5	Low pressure Pneumatic Test @ 2 Kg/sq.cm.g on shell side assembled with tube bundle	Leak Tightness	Visual	100%	No Leakage / No pressure drop	Pressure Test Report	H	W

Notes-

1. Mock up test and WPS , PQR, WPQ will be offered for Atlas Review at Radiant no copy will be provided

Revision history

Sr No	Drg Rev No	QAP Revision Required (Yes / No)	Reviewed By QA Engineer	Accepted By Head QA

TYPICAL QUALITY PLAN ACIL -5.

WO. NO.: KH-4006-1, KH-4006-2

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	**RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING**							
1.1	Tubes,	Surface Defects &Dimensions, Tensile and chemical Properties.	Correlation with Mill T.C. or Lab T.C.	100%	As per Standard Specified in Drg. Approved drg.	Test Certificate,	H	W
1.2	Plates ,flanges, pipes	Surface Defects & Dimensions, Tensile and chemical Testing	Correlation with Mill T.C. or Lab T.C.	100%	As per dimensions Specified in Drg.	Inspection report.	H	W
2.0	**STAGE INSPECTION.**							
2.1	Tube Sheet after Completion	Overall dimensions, No. Of tube holes, tube holes with GO NOGO gauges	Dimensional & Visual	100%	As per approved Drg. & TEMA	Inspection Report	H	R
2.2	Skeleton before insertion	Baffle spacing orientation, Baffle OD, Baffle Cut & Notch / Provision of lock nut / Tack welds to be ensured	Dimensional & Visual	100%	As per approved Drg.	Inspection Report	H	R
2.3	Shell and Cover Inspection	LPT, Dimensional and Visual	Dimensional , LPT & Visual	100%	As per approved drg.	Inspection Report	H	W
3.0	**FINAL INSPECTION**							
3.1	Shell Side Hydro Test	Leak Tightness	Visual	100%	No leakage at Test pressure as per Drg.	Pressure Test Report	H	H
3.2	Tube side Hydraulic Test	Leak Tightness	Visual	100%	No leakage at Test pressure as per Drg.	Pressure Test Report	H	H
3.3	Surface Preparation.	Blasting to SA 2.1/2 Visual, Completeness as per drg.	Visual	100%	SA 2 1/2.	Inspection Report	H	R
3.4	Final Inspection after painting	Uniformity of painting & DFT	Visual & DFT meter	100%	As per approved drg. Free from Sand and major paint bubbles. DFT as per specifications.	Inspection Report	H	W
3.5	Low Pressure Pneumatic Test	Sealing of gasket and 'O' ring	Visual	100%	No Leakage at 2kg/Cm2	Pressure Test Report	H	W
3.6	Shell Internal cleaning	Cleanness of shell side circuit	Visual	100%	No dirt or looses particles to be observed	Inspection Report	H	R
3.7	Final stamping identification	Hand punching	Drg. No. + HTP	100%	Approved Drawing	Inspection Report	H	W

NOTE:

1. Mock up test and WPS , PQR, WPQ will be offered for Atlas Review at Radiant no copy will be provided

TYPICAL QUALITY PLAN ACIL -6.

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING							
1.1	Bought out / Instrument / Fabricated Items	a) Visual and Dimensional	Visual	100%	As per approved Drg. And specification	Test Certificate, Inspection report	H	W
		b) Assembly on cooler base - Fitment	Mounting on base frame to be ensured	100%	Proper Fitment			
		c) Continuity Test for Heaters	Continuity Meter	100%	Proper continuity			

TYPICAL QUALITY PLAN ACIL -7.

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING							
1.1	Pipes and Fittings (Pressure Parts)	Mechanical & Chemical Properties	Correlation with Mill TC or Lab TC	100%	As per approved drg.	Test Certificate,	H	H
2.0	STAGE INSPECTION.							
2.1	Set Up / socket orientation + hole size	Dimensional	Dimensional	100%	As per approved Drg.	Inspection Report	H	R
2.2	Weldment	Soundness and Root Weld of C/S	Visual	100%	ASME Sec. VIII Div.1	Inspection Report	H	R
2.3	Nozzle Internals	Turning vanes fitment + Welding	Ensure FPW	100%	As per approved Drg.	Inspection Report	H	R
2.4	Final set up with compressor & cooler shells	Alignment/ sockets size, hole size & orientation	Visual	100%	As per approved Drg.	Inspection Report	H	W
2.5	Weldment (Butt joints)	Weld soundness	Radiography Test	RT-1	ASME Sec. VIII Div. 1UW 51	NDE Report	H	R
2.6	Pipe Assembly	Hydro Test As per App Drg With Victaulic coupling	Visual	100%	No leakage / No pressure drop	Pressure Test Report	H	H

TYPICAL QUALITY PLAN ACIL -8

3.0	FINAL INSPECTION							
3.1	Surface Preparation.	Sand Blasting to SA 2.1/2 Visual, Completeness as per drg.	Visual	100%	SA 2 1/2.	Inspection Report	H	R
3.2	Final Inspection after painting, Primer & Finish	Uniformity of painting & DFT	Visual & DFT meter	100%	As per approved drg. Free from Sand and major paint bubbles. DFT as per specifications. ACIL Spec No 1311640115 Rev -1	Inspection Report	H	W
3.3	Fitment Inspection	Fitment with Compressor & Cooler Shells with Victaulic Couplings	Visual	100%	As per approved drawings	Inspection Report	H	R

Note -

1. Mock up test and WPS , PQR, WPQ will be offered for Atlas Review at Radiant no copy will be provided.
2. The inspection stages which are to be offered to quest insp. Services, will be offered either at vendors premises or at i.e. (vendors may be located outside pune) inspection record will be prepared by inspection agency in inspection agency's format.

Revision history

Sr No	Drg Rev No	QAP Revision Required (Yes / No)	Reviewed By QA Engineer	Accepted By Head QA

TYPICAL QUALITY PLAN ACIL -9

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING							
1.1	Pipes and Fittings (Pressure Parts only)	Mechanical & Chemical Properties	Correlation with Mill TC or Lab TC	100%	As per approved drg.	Test Certificate,	H	W
2.0	STAGE INSPECTION.							
2.1	Set Up	Dimensional	Dimensional	100%	As per approved drg.	Inspection Report	H	R
2.2	Radiography Test (if applicable)	Weld Soundness	Radiography Test	RT-1	ASME Sect VIII Div-1	Inspection Report	H	R
2.3	Pipe Assembly.	Hydro Test as per Drg.	Visual	100%	No leakage	Pressure Test Report	H	W
2.4	Trial Assembly. With coolers	Dimensional , Visual, Alignment	Dimensional , Visual, Level	100%	As per approved drg.	Inspection Report	H	R
3.0	FINAL INSPECTION							
3.1	Final Inspection after painting	DFT	Visual	100%	As per approved drg.	Inspection Report	H	H

TYPICAL QUALITY PLAN ACIL -10

Sr. No.	COMPONENTS/ STAGE	CHARACTERISTICS CHECKED	TYPE OF CHECK	EXTENT OF CHECK	REF. STD/ ACCEPTANCE NORMS/CUSTOMER SPECIFICATIONS	FORMAT OF RECORD	AGENCY	
							RHEPL	ACIL
1.0	RAW MATERIAL IDENTIFICATION AND TRANSFER OF MARKING							
1.1	All Parts	Dimensional & Surface Defects	Visual & Dimensional	100%	As per dimensions specified in drg.	Inspection report	H	R
2.0	STAGE INSPECTION.							
2.1	Weldments of Brackets	Weld soundness	LPT on Fillet welds	100%	No visible defect to be observed	Inspection Report	H	R
3.0	FINAL INSPECTION							
3.1	Final Inspection	Completeness as per drg.	Visual & Dimensional	100.00%	As per approved drg.	Inspection Report	H	R
3.2	Trial assly. With coolers	Dimensional, Visual, Alignment	Dimensional, Visual,	100%	As per approved drg.	Inspection Report	H	W

Revision history

Sr No	Drg Rev No	QAP Revision Required (Yes / No)	Reviewed By QA Engineer	Accepted By Head QA

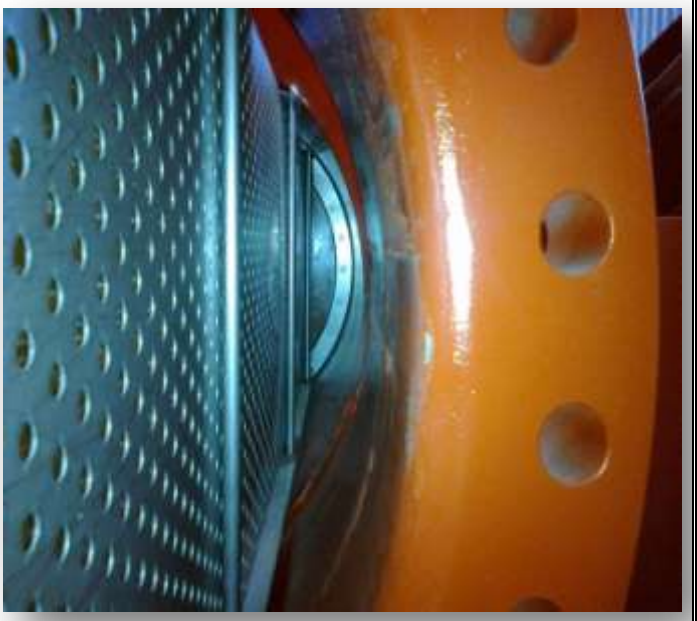
TYPICAL QUALITY PLAN ACIL -11

Sl No	Component / Assembly / Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Record Format	Agency			Remarks
									P	W	V	
1.	PRE-PRODUCTION											
1.1.	Approval of Drawing & Design Spec	Dimensions & other pertinent details	A	Identification & Correlation	100%	ACIL Spec	ACIL Spec	Approved Drawing	1	1	1	
1.2.	Approval of QAP	Pertinent Details	A	Identification & Correlation	100%	ACIL Spec	ACIL Spec	Approved QAP	1	1	1	
1.3.	Welding Qualification	WPS, PQR & WPQ	B	ASME Sec IX	100%	ASME Sex IX / Appvd dwg	ASME Sex IX / Appvd dwg	WPS, PQR & WPQ	2	1	1	
1.4.	Tube to Tube Sheet Joint Expansion Qualification	Pull Out Test / Pressure Test & F_r Values	B	Pull Out Test Pressure Test F_r Values Fracture	Sample	ASME Sec VIII Appx A	F_r Values	Lab TC & F_r Calculation	2	1	1	
1.5.	Tube Bundle Mockup sample at 90° Cross section	Fin Bonding / Expansion	B	Visual	Sample	Bonding	Bonding	Micro Analysis Lab TC of cross section	2	1	1	Specimen to be bonded in resin prior to cross section
2.	RAW MATERIAL - IDENTIFICATION											
2.1.	Tubes	Chemical Properties	B	Identification & Correlation	Review TC	As per Appvd dwg / spec	TC	TC	3	3,1	2,1	Inspection at Supplier / MTC of reputable supplier for review. In case of non-availability of TC, check test to be carried out for respective specifications
		Mechanical Properties	B	Identification & Correlation	Review TC	As per Appvd dwg / spec	TC	TC	3	3,1	2,1	
2.2.	Carbon Steel Material for Tube Plates, Side Frames, Water Boxes, Nozzle Pipe, Flanges, Support Plates, etc	Chemical Properties	B	Identification & Correlation	Review TC	As per Appvd dwg / spec	As per Appvd dwg / spec	Mill TC	3	3,1	2,1	
		Mechanical Properties	B	Identification & Correlation	Review TC	As per Appvd dwg / spec	As per Appvd dwg / spec	Mill TC	3	3,1	2,1	
		Measurement of Size	A	Dimension	100%	Ordering Spec	Ordering Spec	Mill TC	3	3,1	2,1	

Sl No	Component / Assembly / Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Record Format	Agency			Remarks
									P	W	V	
3.	IN PROCESS INSPECTION											
3.1.	Cu Ni Cladding Mock Up Test (Explosion Bonded)	Visual / Bend Test / UT	B	Visual / Bend Test / UT	Sample	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	3	3,1	2,1	If Applicable inspection at supplier location
3.2.	Tube Sheet	Visual, Dimension, Hole Size	B	Visual / Dimension	Random @ 25%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2,1	1	Holes must be reamed
3.3.	Headers / Nozzles Setup & Welding	Dimension	B	Visual / Dimension	100%	As per Appvd dwg / spec	As per Appvd dwg / spec	Inspection Record	2	2,1	1	Nozzle PT to be witnessed
3.4.	Cooler Assembly	Dimension of Tube Bundle	A	Dimension	100%	Approved Drawing	Approved Drawing	Dimension Report	2	2,1	1	Fin density to be verified @ random
4.	FINAL INSPECTION											
4.1.	Tube Side Hydro Pressure Test	Check for any leaks	A	Pressure Test	100%	Approved Drawing / Tech.Spec / Code	Approved Drawing / Tech.Spec / Code	Pressure Test Report	2	1	1	Hard punching on tube sheet & body flange with metal punch
4.2.	Shell Side Pneumatic Pressure Test with Dummy Shell (2kg/cm^2 pressure)	Check for any leaks with soap bubbles	A	Pressure Test	100%	Approved Drawing / Tech.Spec / Code	Approved Drawing / Tech.Spec / Code	Pressure Test Report	2	1	1	
4.3.	Painting ACIL Specification 1311640115	Surface Preparation, Uniformity, Coverage	B	Visual	100%	SA 2 ½	SA 2 ½	----	2	2	1	Hesder Internal Painting must be done prior to assembly
		Coating Thickness	B	Coating Thickness Meter	100%	Approved Drawing / Tech.Spec	Approved Drawing / Tech.Spec	Paint Thickness Report	2	2	1	
4.4.	Inspection Reports	Review of TC's, Pressure Test Reports, Dimension Report & Paint Thickness Report	B	Visual	100%	----	----	----	2	1	1	
4.5.	Name Plate Fixing	Details Verification	B	Visual	100%	Approved Drawing / Tech.Spec	Approved Drawing / Tech.Spec	----	2	2	1	

Sl No	Component / Assembly / Operation	Characteristics	Class	Type of Check	Quantum of Check	Reference Document	Acceptance Norms	Record Format	Agency			Remarks
									P	W	V	
4.6.	Cleaning and Packing	----	B	Visual	100%	----	----	----	2	2	1	

Photos :-

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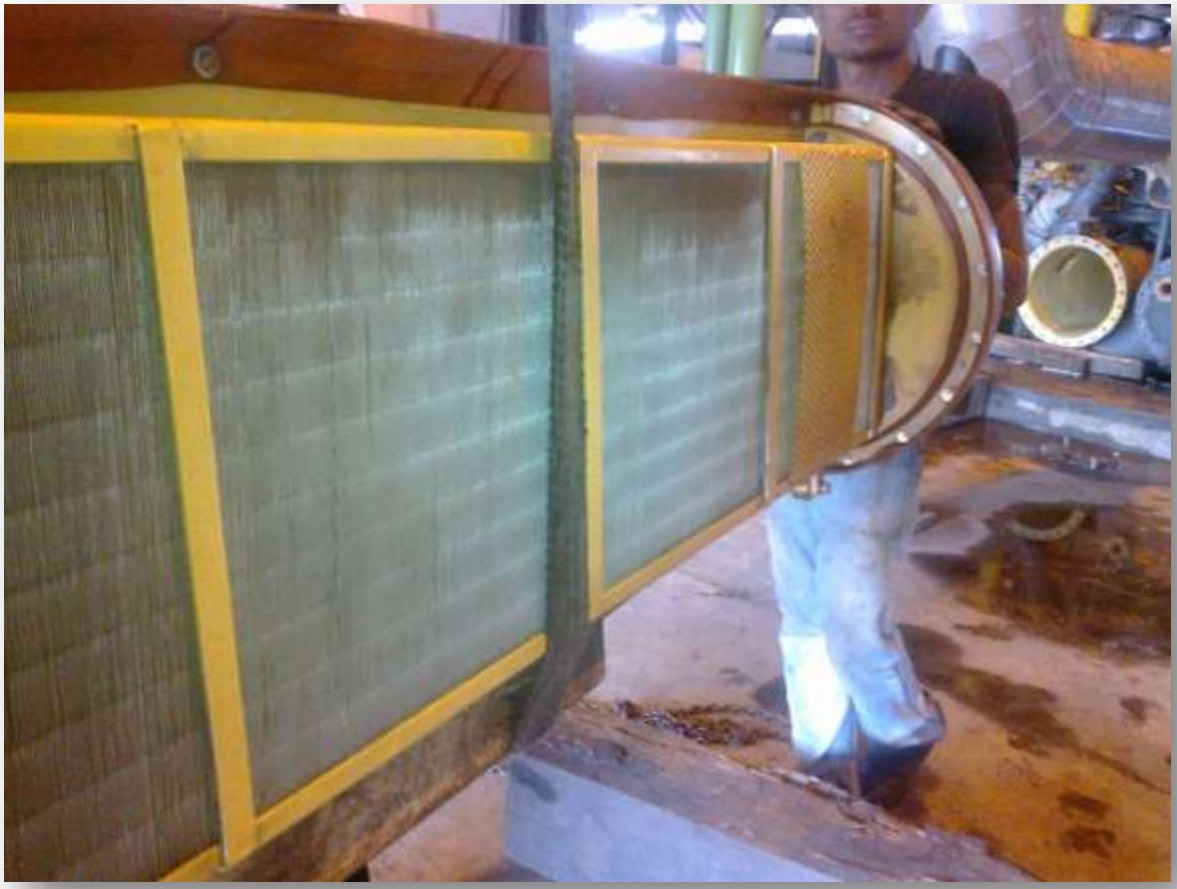

THANK YOU..