



4100 CONTRACTING PLANS

Abstract

The size of refractory contracts is often large. For example, the refractory portion of the work on a major FCC Unit shutdown can easily run more than \$1 million. Particular attention should be paid to developing the most cost-effective contract for the Company. A typical schedule for planning a major refractory project is included. This section also discusses contract strategies for refractory work. The type of work to be done—new installations versus repair work, field work versus shop work—will govern the strategy chosen. Three types of contracts are discussed: 1) materials purchase, 2) installation, and 3) inspection.

Time-and-material contracts and lump sum contracts are compared for use in repair work and refractory installation in new plants and in new shop-lined equipment. Contracts for third-party inspection companies are also discussed and a table of current (1988) rates from these companies is included.

A sample bid request package (Figure 4100-2) serves as illustration.

Contents	<u>Page</u>
4110 General Information	4100-2
4120 Materials Purchase Order	4100-2
4130 Installation Contract	4100-4
4140 Jenkins Company Inspection Alliance Contract	4100-10



4110 GENERAL INFORMATION

Developing the best strategy for refractory work means careful preplanning. Know what steps are involved in the work, how long each one takes, and in what order they should be performed. Figure 4100-1 lists various steps to take before refractory installation can begin. While not all jobs will require all steps, the figure works as a reminder of what may be needed.

The time required to prequalify materials, installation contractor, and crew is hard to predict. Factors influencing length of time are discussed in Section 2900, Inspection.

A typical contract package will include: 1) a cover letter; 2) the specification of work to be done; 3) attachments to the specification that describe the lining systems to be installed and where they will be installed; 4) any EG specifications referred to in the work specification (these documents specify purchase and installation criteria); and 5) in the case of new construction or major revamping or replacement work, design drawings. (Figure 4100-2 will show the first three parts of a typical bid request package.)

Most refractory jobs will use all three types of contracts discussed below. On some jobs the installation contractor will also purchase the material, so there will be only two contracts: an installation contract (including purchase specifications) and an inspection contract. If Chevron uses its own inspection team for the job, the inspection contract will not be prepared.

4120 MATERIALS PURCHASE ORDER

In the case of monolithic refractory purchases, the Company's Specification IRM-EG-4785 will be a part of the purchase order. For the purchase of other types of refractory materials, the engineer will specify by means of an attachment similar to Attachment 1 of the sample bid request package (see Figure 4100-2). If the installation contractor is to purchase the material, the purchase specification must be part of the installation contract.

The purchase order typically covers refractory material only, not anchorage.

Monolithic Refractory Manufacturers

Addresses of monolithic refractory materials manufacturers are:

A. P. Green Refractories Co.
Mr. William R. Alder
580 Indiana St
San Francisco, CA
(415) 282-9166

Corhart Refractories Corp.
Mr. Gary J. Anderson
1600 West Lee St.
P. O. Box 10157
Louisville, KY 40210-0157
(502) 778-3311

General Refractories Co.
Mr. Gordon Snyder
600 Grant St. Room 3000
Pittsburgh, PA 15219
(412) 562-6095

Harbison Walker Refractories
Ms. Karla Kostuch
One Gateway Center
Pittsburgh, PA 15222
(412) 562-6484

National Refractories
Mr. W. M. Tietze
3483 West 12th St.
Houston, TX 77008
(713) 868-1881

North American Refractories Co.
Mr. Allen Jurowski
P.O. Box 4037
Hammond, IN 46324
(219) 932-5051

Premier Refractories
Mr. David C. Johnson
P.O. Box 828
Valley Forge, PA 19482
(215) 337-1100

Resco Products, Inc.
Ms. Bonnie Cassey
P.O. Box 108
Norristown, PA 19404
(215) 279-5010

Thermal Ceramics
Mr. Steve Chernack
P.O. Box 923
Augusta, GA 30903
(404) 796-4200

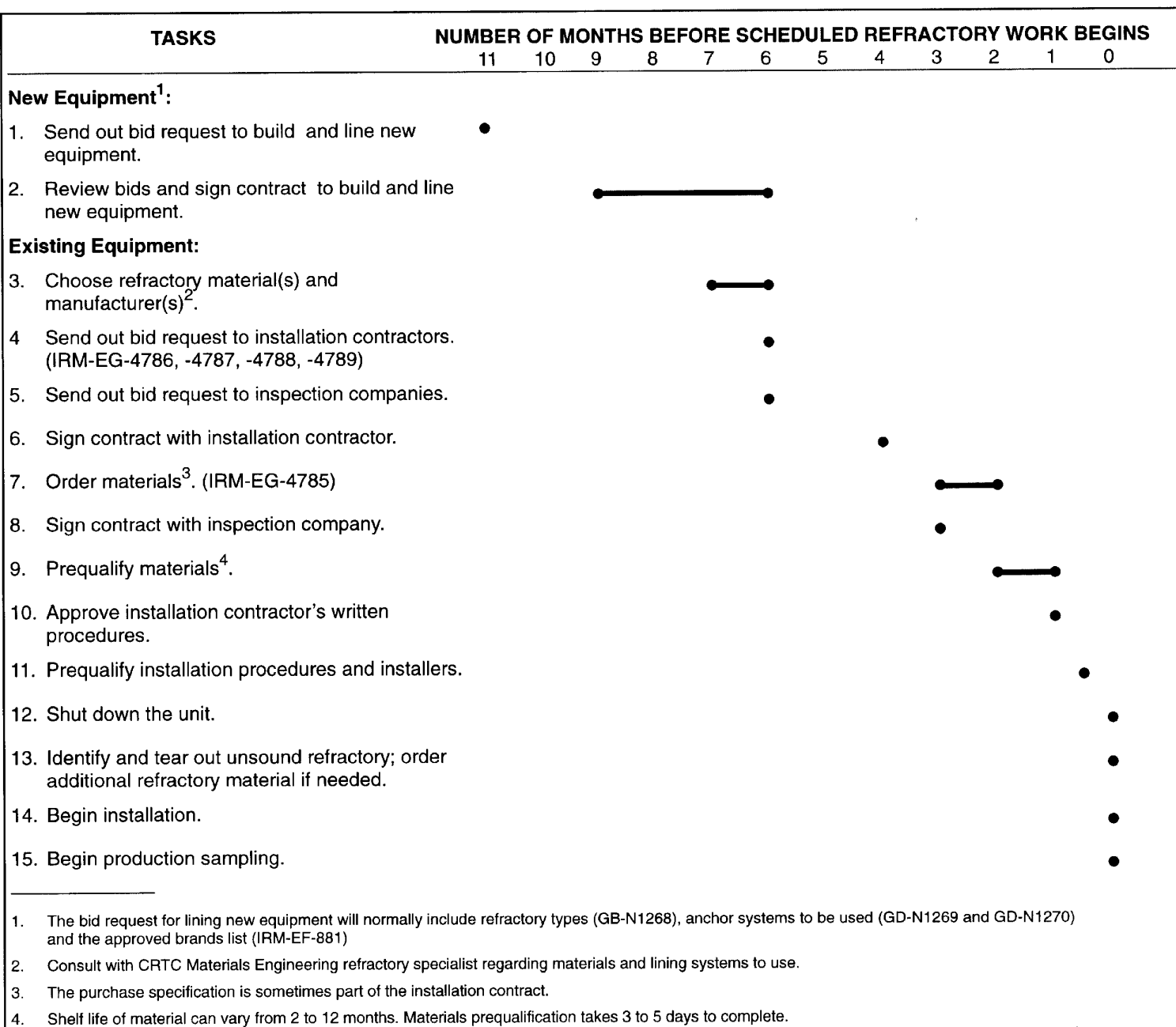


Fig. 4100-1 Shutdown Timeline for Refractory Installation

April 1992

4100-3



4130 INSTALLATION CONTRACT

The two main ways to handle the refractory contract are lump sum and time and material.

Time and Material

A time and material contract is normally the best approach to a major shutdown since the work scope is not known with certainty prior to the actual shutting down of the equipment and internal inspection. Following definition of the repair work, the labor, material and equipment requirements can be established. As minimizing shutdown delays is necessary for bringing the plant back on stream as quickly as possible, the bidding and cost estimating process is too time consuming to be undertaken once a shutdown is in progress.

With a time and material contract, the refractory contractor can bring in his people almost immediately and begin tear-out of refractory as marked by the inspection agency. The crew size can be adjusted quickly according to the nature and extent of the repair work. This type of contract still requires adequate definition of the work to order the refractory material in advance of the shutdown.

Forms similar to Attachments 1 and 2 of the sample lump sum bid package (Figure 4100-2) are useful documents for time and material contracts also.

Lump Sum

A lump sum contract is best suited for refractory linings in a new plant or in new shop-lined equipment such as cyclones. Here the work scope is well defined (for example, "refractory line 8 new cyclones with 1-inch erosion-resistant lining of Resco's AA-22 in 1-inch offset lance tight clinched hexmetal per Chevron Specification IRM-EG-4787") and can be competitively bid.

Lump sum contracts have also been used for major shutdown refractory repairs. In this case you review historical data to estimate the amount of refractory repair anticipated. Contractors can bid a lump sum price for this estimated scope of work and supply unit prices for additions or subtractions on a square foot basis to this work scope. This method is more difficult to administer because each repair (and there may be 100 to 200 different repair locations) must be measured and tabulated. This bidding exercise does give excellent cost data from each bidder and enables comparisons to be made.

Sample Bid Request Package

See Figure 4100-2, which is an "Invitation to Bid" letter and a work specification (CH-872) with two attachments. Many of the documents referred to in the sample letter (such as GO-279) are Hawaii Refinery local documents. These documents would be replaced by similar documents from your own contract organization. The Lotus® file BIDBASIS.WK1, from which Attachment 1 was created, is on the PC disc at the back of the manual. Use this blank spreadsheet to specify work for a particular project.

While this sample package is for a lump sum contract, it can also be used for a time and material contract with some changes.

**SAMPLE COVER LETTER**

INVITATION TO BID:
MAY 1988 FCC SHUTDOWN - HAWAIIAN REFINERY
REFRACTORY REPAIRS: CH-872
FILE: CONTRACT
March 1, 1989

Gentlemen:

You are invited to submit a lump sum bid for the May 1988 FCC shutdown repair work at the Hawaiian Refinery, Barbers Point, Hawaii. The work shall be in accordance with attached Specification No. CH-872, dated February 26, 1988 and entitled "May 1988 FCC Shutdown Refractory Repairs."

Please base your bid on work starting on or about May 11, 1988 with completion no later than May 25, 1988. Work may start 1-2 weeks earlier, depending on possible additional pre-shutdown work.

Please provide labor, equipment and material rates for additional, unspecified work which may be required. Specify the supervisory personnel you will assign to this job, their work experience and references where available. Please also specify whether craftsman and laborers will be brought in from the mainland or hired locally.

Due to the time constraints of materials delivery to Hawaii, you should be prepared to work with your suppliers to have additional, contingency, materials on hand which would have to be restocked if unused. Note also that we intend to use a third-party inspection firm for materials pre-qualification and on the job quality assurance.

If desired, arrangements to inspect the jobsite and discuss the work may be made by contacting the Company engineer.

Contractors are reminded that hard hats, safety glasses and long sleeve shirts are mandatory for admittance into the Refinery. Additionally, corporation policy requires use of respirators and whole body protective clothing when working with or around ceramic fiber insulation.

Enclosed for your review is a sample copy of our Contractor Form GO-279, which will be expected to be executed if awarded the contract. Contractor is required to file with Company evidence of insurance before the work is started in accordance with Section 6 of the Contract Terms and Conditions.

Please use the enclosed proposal Sheet No. P-CH-872, along with Specification No. CH-872, Attachment 1, and Forms GO-279-7 and GO-279-8 for submitting your bid. Your proposed price for the work shall be in strict accordance with the Specification, Proposal Sheet, form of Contract, and form of Certificate of Nonsegregated Facilities, including all attachments and Exhibits. If you wish to take exceptions or propose alternates to these papers, please describe in a separate proposal letter the deviations you propose and indicate the adjustment to your proposed price applicable to each deviation should we elect to accept individual deviations. Deviations not described in a separate proposal letter will be considered invalid. Bids must be received at the Hawaiian Refinery not later than March 18, 1988 to receive consideration. Bids shall be addressed to Chief Engineer and marked "Confidential - Bid CH-872."

The Company does not obligate itself to accept the lowest bid, and reserves the right to reject any or all bids.

Unsuccessful bidders are requested to return drawings and specifications.

Very truly yours,

Fig. 4100-2 Sample Contract Package—Cover letter (1 of 5)

**SAMPLE REFRACTORY SPECIFICATION**

May 1988 FCC Shutdown Refractory Repairs
Specification CH-872
February 26, 1988
Page 1 of 1
(3 pp. Attachments)

1. SCOPE

CONTRACTOR shall provide all materials and labor required to perform refractory repairs to the Hawaiian Refinery FCC Unit for the May 1988 FCC Shutdown. Work performed during shutdown execution shall be on a 24 hour/day basis or as required, and in cooperation with other work taking place simultaneously in the FCC Unit.

2. COMPENSATION

2.1 **CONTRACTOR** shall perform work as specified in Attachment 1, "Refractory Repair Bid Basis" on a lump sum basis. Attachment 2 indicates repair locations referenced in Attachment 1.

2.2 Adjustments to compensation paid to **CONTRACTOR** shall be made for work greater or less than the refractory repair bid basis according to rates specified by **CONTRACTOR** in Attachment 1.

2.3 Additional work not specified in Attachment 1 shall be performed on a time and materials basis per rates provided by **CONTRACTOR**.

3. MATERIALS AND INSTALLATION

All work shall be performed in accordance with the attached Specification H-008, "General Refractory Materials, Installation and Inspection," and Engineering Instruction EH-623, "General Instructions to Contractors Working Within the Refinery."

Note: Specification H-008 discussed in Section 3 will be replaced by the new Specifications IRM-EG-4785 and either IRM-EG-4786, -4787, -4788, or -4789, whichever is appropriate. Specification IRM-EG-4775 will be included if RCF tear-out work will be part of the contract.

Fig. 4100-2 Sample Contract Package—*Specification of work (2 of 5)*



SPECIFICATION CH-872, ATTACHMENT 1 CHEVRON USA INC HAWAIIAN REFINERY MAY 1988 FCC SHUTDOWN REFRACTORY REPAIR BID BASIS						
					Bidders Please Provide	
Location	Existing Refractory	Area, sq. ft.	Repair Material/ Anchors/Method	Notes	Cost/sq.ft. for repair greater than Basis Amount	Credit/sq.ft. for repair less than Basis Amount
1. Reactor plenum, dense phase dilute phase	1" E.S. Refracrete (135 lb/cu ft) over 3" Litecrete 50 in 3/4" c.s. hex-mesh on 3 & 1/4" c.s. Nelson T-studs.(3" back-up layer only where hex-mesh removed).	200	4" Gunited medium-den- sity monolithic with nee- dles (CE Lite Wate 80 ES preferred) in 304 ss wavy-vee anchors.	Approx. 50% of orig. hex-mesh already removed. Reactor shell ID = 21'2"		
2. Reactor Stripping section	(Same as #1; much of orig. hex- mesh already removed)	50	(same as #1)	Several mechanical repairs required prior to refractory work. Shell ID = 10'6"		
3. Reactor Cyclones	3/4" AA-22 in 14 Ga. 410 ss hex- mesh.	5	3/4" AA-22S rammed into 410 ss S-Bars or curl an- chors	Cyclone barrel lining ID = 3'7"		
4. Feed Riser	3/4" AA-22 in 12 Ga 405 ss hex-mesh (hex-mesh eroded down to mid-rivet in s-bend area)	50	1" AA-22S rammed into 410 ss S-Bars or curl an- chors	Feed riser pipe ID = 3 ft 6 and 1/2 in Anticipate difficult repairs		
5. Spent Cat & Regen Cat U-Bends	3" RS-17E with needles in 2 & 1/4" 304 ss vee-studs spaced on 4" centers	30	Same as existing except use CE AR-400 VC (160 lb/cu ft) and vibracast (or handpack, as approp.)	Mean ID of existing U-Bends lining is approx. 26"		
6. Regen Spent Cat Riser (SCR)	1" E.S. Refracrete over 2" Litecrete 50 in 3/4" c.s. hex-mesh on 2 & 1/4" c.s. Nelson T-studs, except a 8' section replaced with 3" Hargun ER (135 lb/cu ft) with needles in 304 ss Longhorns (9" o.c.)	12	Same as #5	SCR pipe ID = 3'9"		
7. Regen Overflow well (OFW)	3" RS-17E with needles in 304 ss vee-studs spaced on 4" centers.	40	Same as #5	OFW pipe ID = 7'6" at top, cones down to 32" at bottom. Known repairs at approx. 4 ft to 4 & 1/2 ft ID area.		
8. Regen Dilute phase (upper 3/4 of vessel)	4" of original Kaiser Mex-R-Co IRC G-711 (90 lb/cu ft) in 2 & 3/4" c.s. vee-studs, spaced 10" x 12".	20	Same as #1	Regen shell ID = 30'8"		

Fig. 4100-2 Sample Contract Package—Attachment 1, created via BIDBASIS.WK1
on the PC disc (3 of 5)

April 1992

4100-7



SPECIFICATION CH-872, ATTACHMENT 1 CHEVRON USA INC HAWAIIAN REFINERY MAY 1988 FCC SHUTDOWN REFRACTORY REPAIR BID BASIS						
					Bidders Please Provide	
Location	Existing Refractory	Area, sq. ft.	Repair Material/ Anchors/Method	Notes	Cost/sq.ft. for repair greater than Basis Amount	Credit/sq.ft. for repair less than Basis Amount
9. Regen Dense phase (lower 1/4 of vessel)	4" of Litecrete 90 with needles in 3 & 1/8" 304 ss Longhorn anchors, spaced on 10" centers.	10	Same as #1	Regen shell ID = 30'8"		
10. Regen Grid Cap	2" E.S. Refracrete (135 lb/cu ft) in 2" 304 ss Longhorn anchors spaced 10" apart	5	2" AR-400 (without needles) in 304 ss S-Bars or curl anchors	Easily accessible		
11. Regen Cyclones	3/4" AA-22 in 14 Ga 304 ss hex-mesh	5	3/4" AA-22S rammed into 304 ss S-Bars or curl anchors	Cyclone barrel lining ID = 4'7"		
12. Regen Plenum skirt O.D.	4" Litecrete 90 gunnited through 3/4" 405 ss hex-mesh on 3 & 1/4" ss Nelson T-studs spaced 12" x 10 & 1/2"	10	Same as existing, except CE Lite Wate 80 ES (without needles) preferred.	New system installed last shutdown.		
13. Regen Plenum Dished, Floor	Same as #9 existing	5	Same as #1	Regen skirt shell ID = 18'0"		
14. Regen Plenum skirt ID and ceiling	Same as #1 existing	5	Same as #12			
15. Regen overhead Line to Flue Gas Cooler	same as #6 existing	30	Same as #5	Regen Ovhd Line lining ID = 4'5" Most failures at mitered bends.		
Per - Job Items					Credit if Job not done	
- Remove old Kaowool bulk ceramic fiber from feed riser expansion joint and re-pack after installation of new expansion joint ring (approx. 10-12 cu. ft. of packing material to be replaced). - Install approx. 25 sq. ft. of new 3/4" AA-22S in S-Bars or Curl anchors on bottom (180) O.D. of internal feed riser mitered S-bend.						

Fig. 4100-2 Sample Contract Package—Attachment 1, continued (4 of 5)

4100-8

April 1992

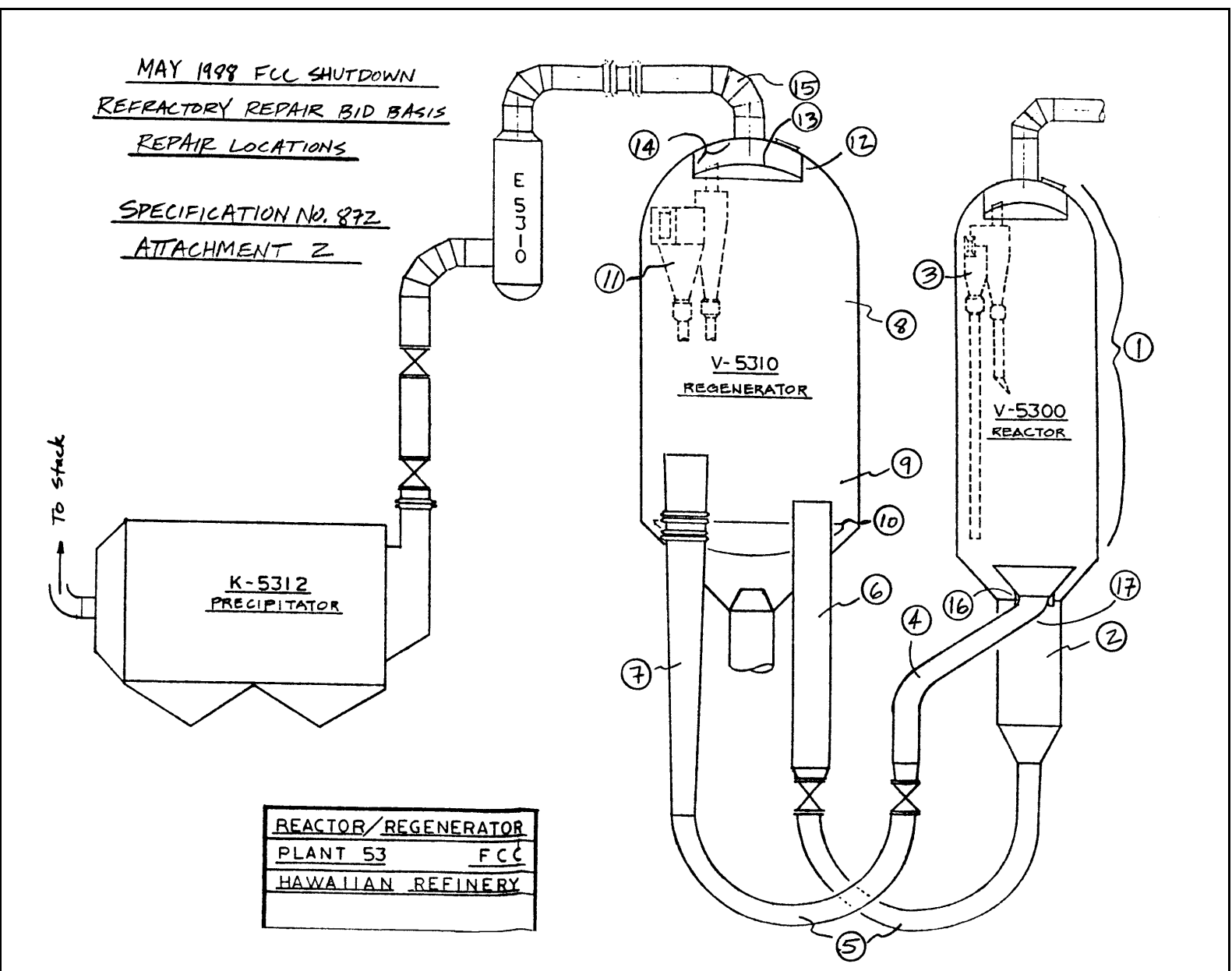


Fig. 4100-2 Sample Contract Package—Attachment 2, sketch of repair locations (5 of 5)

April 1992

4100-9



4140 JENKINS COMPANY INSPECTION ALLIANCE CONTRACT

A contract is required for the third party inspection company. In 1992 the Company negotiated a refractory inspection partnering alliance with R.J. Jenkins Company of Webster, TX. To get a copy of the contract, contact your contract representative or the CRTC Materials Engineering Unit.

Alliance Benefits

Through this alliance the Company benefits from:

- Specialized inspectors with many years experience
- Continuity between shutdowns; same pair of eyes to review chronic refractory problems — especially in Fluid Cat Crackers
- Inspectors who are familiar with Company specifications and practices at individual locations
- Access to knowledge of successes and failures at other plants
- Use of West Coast, East Coast or Gulf Coast testing laboratories
- Mobile labs that can be installed on-site to expedite testing during critical pathwork

Contract Scope

The location contract representative can initiate Jenkins' services by attaching the alliance agreement to a simple service contract form. The service contract should spell out the scope of the Jenkins Company services required, such as:

- Overseeing the manufacturer's material pre-qualification testing, or performing material pre-qualification testing
- Reviewing the installation contractors written procedures for approval
- Overseeing crew prequalification
- Overseeing production sampling
- Performing production sample testing
- Inspecting refractory internals
- Preparing written reports on all test results
- Preparing inspection reports

The alliance contract contains a Checklist of Services to help the initiator decide what services are appropriate for each job.

Each location is encouraged to meet with Jenkins Company prior to the turnaround so that job duties and expectations can be clearly defined.

Continuous Quality Improvement

The intent of the Jenkins alliance contract is to benefit from a continuously improving partnership between Jenkins inspectors and the Company maintenance/inspection team. The Company location should conduct pre-shutdown meetings with Jenkins to communicate expectations, and post-shutdown reviews to share ideas for improvement.

The Jenkins inspectors should be considered part of the reliability team, and as such, take on long-term responsibility for field decisions.

The alliance contains a Quality Feedback Survey which can be a tool for encouraging continuous improvement of the alliance.

Rate Structure

Figure 4100-3 outlines the current rate structure for the Jenkins Alliance Contract, and Jenkins/Chevron experience. This figure will be updated periodically.

R.J. Jenkins Company Partnering Alliance Chevron Experience/Rate Structure	
Major Chevron FCC refractory experience	
Richmond:	1985
Port Arthur:	1987
Philadelphia:	1988
Richmond:	1989
Used the Alliance terms	
El Segundo:	1990
Salt Lake:	1990
St. Helens:	1991
Pascagoula:	1991
Richmond	1992
Partnering Alliance Rates	
Inspector ST/OT	\$36/\$45
Testing (full set) ¹	@ \$150
Per diem	\$26
Expenses	Cost
Mobile lab ²	\$300/day minimum
1. Full set = prep, cutting, 3 CCS cubes, 1 MOR/LC bar, 2 C-704 plates. 2. Includes testing charges up to \$300. Technician and per diem not included. No charge for technician labor. Testing more than two full sets would typically raise the daily rate above \$300.	

Fig. 4100-3 R.J. Jenkins Company current rates (early 1992) and Chevron experience