

FULTON COUNTY PURCHASING DEPARTMENT

**Winner 2000 - 2005 Achievement of Excellence in Procurement Award
National Association of Purchasing Management**

Jerome Noble, Director



November 10, 2005

**RE: RFP#05RFPPHASEJAIL-JD
Construction and Financing for the Fulton County Jail Mechanical, Plumbing and
Elevator Maintenance Upgrades**

Dear Proposers:

Attached is one (1) copy of Addendum 1, hereby made a part of the above referenced Request for Proposal (RFP).

Except as provided herein, all terms and conditions in the RFP referenced above remain unchanged and in full force and effect.

Sincerely,

Joyce Daniel
Assistant Purchasing Agent

This Addendum forms a part of the contract documents and **modifies** the original RFP documents as noted below:

1. Clarification:

Section 01-010 page 4 - 5.E Test & Balance

This paragraph relates to the scope of work required in division 15 section 15950 – HVAC Testing, Adjusting and Balancing. The cost for this section is to be included in the base proposal price.

2. Clarification and Change in Cost Proposal:

Section 01-040 page 5 – 7.D.4.d Project Coordination & Security

The \$ 200,000 allowance is to be included in the Proposal/Contract price. This allowance is included in the Owner's General Contingency Allowance of \$ 1,100,000 as listed in the COST PROPOSAL Division 01 – General Requirements – line 01.1.

3. Section 00-300 COST PROPOSAL FORM (Revised section issued)
(See Attachment)

4. Section 01-020 Allowances (Add this section) (See Attachment)

5. Section 01-030 COST PROPOSAL ALTERNATES (Revised section issued)
(See Attachment)

6. Question: The schedule shows that all elevator work is to start on 3-16-06 and be completed by 9-22-06 which is only 27 weeks total. That is a very fast track schedule and if we can only take one elevator at a time out of service (See 1500-2 1.04 A 4), that allows only +/- 3 weeks per elevator to perform the work, which would require working around the clock and adds to the project cost considerably. Being that this is a three year project, can the installation time be extended?

Answer: Section 00-302 SCHEDULE PROPOSAL – Elevator Upgrades 3/16/06 Projected Start, 9/22/06 Projected End. Note these schedule dates are projected dates and are not mandated as a Contract requirement. The Proposer shall present their base-line schedule dates for the proposed construction.

7. Add specification Section 05 500 – Metal Fabrications in its entirety.
(See Attachment)
8. Add specification Section 18 200 – Mechanical Maintenance in its entirety.
(See Attachment)
9. Revise paragraph 17 100 - 1.05.A to read as follows:
 “The Commissioning Authority shall be a representative of the Newcomb & Boyd Commissioning and Operations Group. The Commissioning Authority shall be financed by the contractor under this project (as indicated in the project documents and this addendum) on behalf of the owner. The Commissioning Authorities sole responsibility shall be as an agent of the owner. The Commissioning Authority shall direct and coordinate the activities of the commissioning team.”
10. Question: There is a requirement in the RFP to demonstrate savings. In order for our team to calculate/identify energy savings, we need the following information:
 1. Thirteen month (13) month utility bills for all utility account (s) - electric, gas, and water/sewer
 2. Areas (sq.ft.) for Low Rise building, North Tower and South Tower
 3. Existing As-Built drawings or design drawings

Answer: **Item # 1: power / water / gas usage**

2004 - 12 Month Totals

JAIL
 901 Rice St.

SERV PERIOD	GA POWER	KWH	WATER	SEWER	TOTAL W/S	CCF	GAS	THERMS
1.2004	\$29,793.00	557,452	\$30,579.50	\$77,759.30	\$108,338.80	17,474	\$27,694.92	4142
2.2004	\$29,053.00	527,578	\$45,819.32	\$114,228.94	\$160,048.26	31,111	\$30,541.32	4622
3.2004	\$28,752.00	515,111	\$42,617.54	\$102,186.63	\$144,804.17	31,688	\$22,259.44	5339
4.2004	\$30,535.00	586,151	\$41,148.80	\$98,664.93	\$139,813.73	30,596	\$15,934.46	2359
5.2004	\$30,416.00	581,146	\$58,779.06	\$140,938.23	\$199,717.29	43,704	\$11,143.59	1616
6.2004	\$35,772.00	706,499	\$20,147.97	\$48,309.78	\$68,457.75	14,982	\$9,135.75	1305
7.2004	\$39,217.00	811,413	\$32,960.44	\$79,031.13	\$111,991.57	24,508	\$15,052.87	2698
8.2004	\$37,202.00	738,223	\$39,435.27	\$94,556.28	\$133,991.55	29,322	\$11,384.08	1428
9.2004	\$38,139.00	762,148	\$36,721.06	\$88,048.23	\$124,769.29	27,304	\$11,389.87	1392
10.2004	\$30,511.00	577,622	\$40,557.00	\$97,245.93	\$137,802.93	30,156	\$14,439.28	1837
11.2004	\$31,041.00	599,005	\$10,098.13	\$24,212.58	\$34,310.71	7,510	\$28,667.16	3740
12.2004	\$32,214.00	647,345	\$26,913.32	\$64,531.53	\$91,444.85	20,012	\$36,761.81	4360
	\$392,645.00	7,609,693	\$425,777.41	\$1,029,713.49	\$1,455,490.90	308,367	\$234,404.55	34,838

FULTON COUNTY JAIL

901 RICE ST NW
 ATLANTA GA 30303
 0003470602

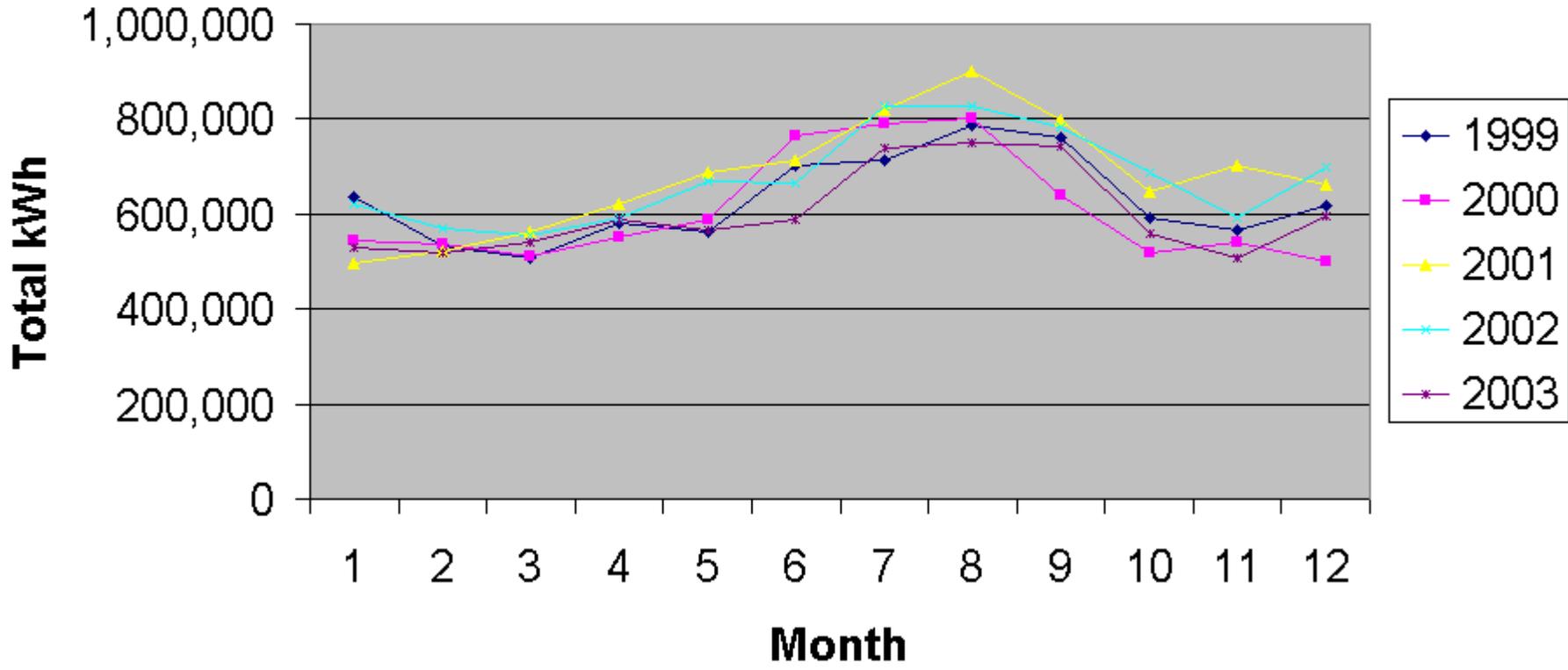


Month	Meter Read	Billing Days	Total kWh	Peak kW Demand	Electric Service Total
Jan-99	1/27/1999	35	636087	881	\$32,795
Feb-99	2/25/1999	29	533863	906	\$30,226
Mar-99	3/26/1999	29	505942	864	\$29,591
Apr-99	4/27/1999	32	582543	921	\$31,317
May-99	5/26/1999	29	562944	1014	\$30,865
Jun-99	6/28/1999	33	703728	1118	\$33,387
Jul-99	7/28/1999	30	712808	1291	\$34,418
Aug-99	8/26/1999	29	786821	1271	\$35,743
Sep-99	9/27/1999	32	759551	1192	\$34,624
Oct-99	10/26/1999	29	593682	1098	\$30,967
Nov-99	11/24/1999	29	566255	962	\$30,309
Dec-99	12/28/1999	34	616630	909	\$31,566
Jan-00	1/28/2000	31	545028	887	\$29,963
Feb-00	2/28/2000	31	537054	857	\$29,849
Mar-00	3/28/2000	29	512753	926	\$29,336
Apr-00	4/27/2000	30	550404	919	\$30,153
May-00	5/26/2000	29	587673	1162	\$31,027
Jun-00	6/27/2000	32	765581	1197	\$27,366
Jul-00	7/27/2000	30	791382	1290	\$36,282
Aug-00	8/28/2000	32	800847	1232	\$37,827
Sep-00	9/27/2000	30	640689	1041	\$33,887
Oct-00	10/26/2000	29	519997	903	\$30,836
Nov-00	11/28/2000	33	538961	880	\$31,295
Dec-00	12/28/2000	30	500419	889	\$30,323
Jan-01	1/29/2001	32	495786	1051	\$30,238
Feb-01	2/27/2001	29	522771	1002	\$30,883
Mar-01	3/28/2001	29	564128	953	\$31,922
Apr-01	4/27/2001	30	619625	1004	\$33,331
May-01	5/29/2001	32	687795	1013	\$35,030
Jun-01	6/27/2001	29	714114	1273	\$36,540
Jul-01	7/27/2001	30	819756	1265	\$34,507
Aug-01	8/28/2001	32	899097	1336	\$41,710
Sep-01	9/27/2001	30	796132	1264	\$38,483
Oct-01	10/26/2001	29	648734	1200	\$34,820
Nov-01	11/28/2001	33	701306	1073	\$36,153
Dec-01	12/28/2001	30	660109	1054	\$35,075
Jan-02	1/29/2002	32	622337	987	\$33,496
Feb-02	2/27/2002	29	568522	914	\$32,056
Mar-02	3/28/2002	29	554212	989	\$31,715

Apr-02	4/26/2002	29	591048	1022	\$32,662
May-02	5/29/2002	33	667462	974	\$34,564
Month	Meter Read	Billing Days	Total kWh	Peak kW Demand	Electric Service Total
Jun-02	6/27/2002	29	667099	1080	\$34,536
Jul-02	7/29/2002	32	828471	1283	\$38,640
Aug-02	8/28/2002	30	827694	1278	\$38,556
Sep-02	9/27/2002	30	781942	1221	\$36,813
Oct-02	10/28/2002	31	686262	1191	\$34,496
Nov-02	11/26/2002	29	592371	1031	\$32,106
Dec-02	12/30/2002	34	697080	1020	\$34,740
Jan-03	1/29/2003	30	528811	984	\$30,508
Feb-03	2/27/2003	29	517988	970	\$30,246
Mar-03	3/28/2003	29	540596	912	\$30,814
Apr-03	4/29/2003	32	586999	902	\$31,985
May-03	5/29/2003	30	565089	910	\$31,431
Jun-03	6/27/2003	29	586543	1033	\$31,991
Jul-03	7/29/2003	32	737166	1166	\$35,700
Aug-03	8/28/2003	30	749047	1160	\$35,299
Sep-03	9/29/2003	32	743439	1139	\$34,913
Oct-03	10/28/2003	29	560195	924	\$29,890
Nov-03	11/25/2003	28	507184	967	\$28,549
Dec-03	12/29/2003	34	596151	929	\$30,751
Jan-04	1/28/2004	30	557452	944	\$29,793

Total	1862	38,842,155		\$2,008,894.00
Peak	35	899,907	1336	\$41,710.00
Average	31	647,369		\$33,481.57

Acct # 00034-76602



616,630 500,419 660,109 0 596,151

**Fulton County Jail
Main Jail Complex
901 Rice ST
Meter # EA5604**

Item # 2 Facility at 901 Rice Street

No	Asset No	Name and address	Approximate Floor Area (Sq.Ft)
1	B504062	Fulton County Jail Complex, 901 Rice Street	554,000

Item # 3 Design drawings of existing 901 Rice Street facility

These drawings are available for review at General Services Building Engineering office 3977 Aviation Circle. Contact General Services for appointment – Dore' May 404-853-2317.

ACKNOWLEDGEMENT OF ADDENDUM NO. 1

The undersigned proposer acknowledges receipt of this addendum by returning one (1) copy of this form with the proposal package to the Purchasing Department, Fulton County Public Safety Building, 130 Peachtree Street, Suite 1168, Atlanta, Georgia 30335 by the RFP due date and time **Monday, December 5, 2005 no later than 11:00 A.M.**

This is to acknowledge receipt of Addendum No. 1, _____ day of _____, 2005.

Legal Name of Bidder

Signature of Authorized Representative

Title

ATTACHMENTS

SECTION 00 300 - COST PROPOSAL FORM

(THIS DOCUMENT MUST BE SUBMITTED IN A SEPARATE SEALED ENVELOPE)

SECTION 01 020 - ALLOWANCES

SECTION 01 030 - COST PROPOSAL ALTERNATES

SECTION 05 500 – METAL FABRICATIONS

SECTION 18 200 – MECHANICAL MAINTENANCE

SECTION 00 300 – COST PROPOSAL FORM

THIS DOCUMENT MUST BE SUBMITTED IN A SEPARATE SEALED ENVELOPE

**Fulton County Jail Mechanical, Plumbing & Elevator Maintenance Upgrades
RFP PHASE - Request for Proposals RFP No 05RFPPHASEJAIL-JD**

Submitted _____, 20_____.
(Month) (Day) (Year)

TO: OWNER BOARD OF COMMISSIONERS OF FULTON COUNTY
c/o Fulton County Purchasing Department
130 Peachtree Street, S.W., Suite 1168
Atlanta, Georgia 30303

FROM: PROPOSER

Name: _____

Business Address: _____

Business Phone: _____

Business Fax: _____

The above Proposer is:

- () An Individual
- () A Company
- () A Corporation
- () A Partnership
- () A Limited Liability Corporation
- () Other: (Describe) _____
- () A Joint Venture consisting of: _____

and _____

and _____

and _____

A. This Cost Proposal Form includes the following that must be completely filled-in by the

Proposer:

The Cost Proposal information will be incorporated into Section 0 500 - Owner-Contractor Agreement as an Exhibit..

1. Cost Proposal Option 1: 15 Year Amortization
 - a. 1-A Basis of Cost Table
 - b. 1-B Amortization Table

Cost Proposal Option 2: 20 Year Amortization

- a. 2-B Basis of Cost Table
 - b. 2-B Amortization Table
2. Cost Proposal Basis Schedules
 - a. Legal & Financial Schedule
 - b. Construction Schedule
3. Alternates

4. Unit Prices

- B. The undersigned, hereby declares that the only person or persons interested in the Cost Proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Cost Proposal or in the Contract to be entered into; that this Cost Proposal is made without connection with any other person, company or parties making a Cost Proposal; and that it is in all respects fair and in good faith without collusion or fraud.
- C. The Proposer further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the site, Drawings and Specifications for the work and contractual documents relative thereto, and has read all instructions to Proposer and General Conditions furnished in the RFP; that he has satisfied himself relative to the work to be performed.
- D. The Proposer proposes and agrees, if this proposal is accepted, to contract with the Board of Commissioners of Fulton County, Atlanta, Georgia, in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary, and to complete the construction of the work in full and complete accordance with the shown, noted, and reasonably intended requirements of the Specifications and Contract Documents to the full and entire satisfaction of the Board of Commissioners of Fulton County, Atlanta, Georgia, with a

definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents for the following prices.

- E. The Proposer agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written order of the Contracting Officer and to fully complete all work under this Contract within the schedule indicated in this RFP document.
- F. The Proposer declares that he understands that the quantities shown for the unit prices items are subject to either increase or decrease, and that should the quantities of any of the items of work be increased, the Proposer proposes to do the additional work at the unit prices stated herein; and should the quantities be decreased, the Proposer also understands that payment will be made on the basis of actual quantities at the unit price and will make no claim for anticipated profits for any decrease in quantities; and that actual quantities will be determined upon completion of work, at which time adjustments will be made to the contract amount by direct increase or decrease.
- G. The Proposer furthermore agrees that, in the case of a failure on his part to execute the Contract Agreement and Bonds within ten days after receipt of conformed contract documents for execution, the Security (Bid) Bond accompanying his proposal and the monies payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure.

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1. COST PROPOSAL OPTION 1: 15 Year

1- A. Basis of Cost:

A.	Basis of Cost – Total Capital Cost (Total All Divisions 00 – 18)	\$ _____
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B.	Total Capital Cost Breakdown Detail
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Div.	Title	Cost	Division Total
00	General Conditions		
	00.1 Contractor Bonds - Total Project	\$	
	00.2 Contractor Provided Insurance - Total Project	\$	
	00.3 Contractor Legal Costs - Total Project	\$	
	00.4 Contractor Overhead - Total Project	\$	
	00.5 Contractor Profit - Total Project	\$	
	00.6 All other Division 00 work not listed above	\$	
	00.7 Sub-Total All Division 00 Work		\$ _____
01	General Requirements		
	01.1 Owner's General Contingency Allowance	\$ 1,100,000	
	01.2 All other Division 00 work not listed above	\$	
	01.3 Sub-Total All Division 01 Work		\$ _____
02	Site Work - Sub-Total All Division 02 Work		\$ _____
03	Concrete - Sub-Total All Division 03 Work		\$ _____
04	Masonry - Sub-Total All Division 04 Work		\$ _____
05	Metals - Sub-Total All Division 05 Work		\$ _____
06	Wood & Plastics - Sub-Total All Division 06 Work		\$ _____
07	Therm & Moisture Prot. - Sub-Total All Division 07 Work		\$ _____
08	Doors & Windows - Sub-Total All Division 08 Work		\$ _____
09	Finishes - Sub-Total All Division 09 Work		\$ _____
10	Special Construction - Sub-Total All Division 10 Work		\$ _____
11	Equipment - Sub-Total All Division 11 Work		\$ _____
12	Furnishings - Sub-Total All Division 12 Work		\$ _____
13	Special Construction - Sub-Total All Division 13 Work		\$ _____
14	Conveying Systems - Sub-Total All Division 14 Work		\$ _____
15	Mechanical - Sub-Total All Division 15 Work		\$ _____

16	Electrical - Sub-Total All Division 16 Work			\$ _____
17	Commissioning - Sub-Total All Division 17 Work			NA-See 01 030
18	Maintenance - 3 Year Contract			
	18.1 3-Yr Maintenance Contracts	\$		
	18.1.1 – Mechanical Equip.	\$		
	18.1.2 – Controls	\$		
	18.1.3 – Plumbing Equip	\$		
	18.1.4 – Elevator Systems	\$		
	18.1.5 Sub-Total 3-Yr Maintenance Contracts			\$ _____
C.	Total All Divisions 00 - 18			\$ _____

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COST PROPOSAL OPTION 1: 15 Year (CONTINUED)

1-B. Amortization Schedule

Year	Date (20YY)	Interest Rate	Principle	Interest	Total (P&I)	Balance
1	20__	__%	\$_____	\$_____	\$_____	\$_____
2	20__	__%	\$_____	\$_____	\$_____	\$_____
3	20__	__%	\$_____	\$_____	\$_____	\$_____
4	20__	__%	\$_____	\$_____	\$_____	\$_____
5	20__	__%	\$_____	\$_____	\$_____	\$_____
6	20__	__%	\$_____	\$_____	\$_____	\$_____
7	20__	__%	\$_____	\$_____	\$_____	\$_____
8	20__	__%	\$_____	\$_____	\$_____	\$_____
9	20__	__%	\$_____	\$_____	\$_____	\$_____
10	20__	__%	\$_____	\$_____	\$_____	\$_____
11	20__	__%	\$_____	\$_____	\$_____	\$_____
12	20__	__%	\$_____	\$_____	\$_____	\$_____
13	20__	__%	\$_____	\$_____	\$_____	\$_____
14	20__	__%	\$_____	\$_____	\$_____	\$_____
15	20__	__%	\$_____	\$_____	\$_____	\$_____
TOTAL			\$_____	\$_____	\$_____	\$_____

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2. COST PROPOSAL OPTION 2: 20 Year

2- A. Basis of Cost:

A.	Basis of Cost – Total Capital Cost (Total All Divisions 00 – 18)	\$ _____
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B.	Total Capital Cost Breakdown Detail		
Div.	Title		

00	General Conditions		
	00.1 Contractor Bonds - Total Project	\$	
	00.2 Contractor Provided Insurance - Total Project	\$	
	00.3 Contractor Legal Costs - Total Project	\$	
	00.4 Contractor Overhead - Total Project	\$	
	00.5 Contractor Profit - Total Project	\$	
	00.6 All other Division 00 work not listed above	\$	
	00.7 Sub-Total All Division 00 Work		\$ _____

01	General Requirements		
	01.1 Owner's General Contingency Allowance	\$ 1,100,000	
	01.2 All other Division 00 work not listed above	\$	
	01.3 Sub-Total All Division 01 Work		\$ _____

02	Site Work - Sub-Total All Division 02 Work		\$ _____
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03	Concrete - Sub-Total All Division 03 Work		\$ _____
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04	Masonry - Sub-Total All Division 04 Work		\$ _____
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05	Metals - Sub-Total All Division 05 Work		\$ _____
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06	Wood & Plastics - Sub-Total All Division 06 Work		\$ _____
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07	Therm & Moisture Prot. - Sub-Total All Division 07 Work		\$ _____
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08	Doors & Windows - Sub-Total All Division 08 Work		\$ _____
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09	Finishes - Sub-Total All Division 09 Work		\$ _____
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10	Special Construction - Sub-Total All Division 10 Work		\$ _____
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11	Equipment - Sub-Total All Division 11 Work		\$ _____
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12	Furnishings - Sub-Total All Division 12 Work		\$ _____
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13	Special Construction - Sub-Total All Division 13 Work		\$ _____
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14	Conveying Systems - Sub-Total All Division 14 Work		\$ _____
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15	Mechanical - Sub-Total All Division 15 Work		\$ _____
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16	Electrical - Sub-Total All Division 16 Work		\$ _____
17	Commissioning - Sub-Total All Division 17 Work		NA-See 01 030
18	Maintenance – 3 Year Contract		
	18.1 3-Yr Maintenance Contracts	\$	
	18.1.1 – Mechanical Equip.	\$	
	18.1.2 – Controls	\$	
	18.1.3 – Plumbing Equip	\$	
	18.1.4 – Elevator Systems	\$	
	18.1.5 Sub-Total 3-Yr Maintenance Contracts		\$ _____
C.	Total All Divisions 00 - 18		\$ _____

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COST PROPOSAL OPTION 2: 20 Year (CONTINUED)

2-B. Amortization Schedule

Year	Date (20YY)	Interest Rate	Principle	Interest	Total (P&I)	Balance
1	20__	__%	\$_____	\$_____	\$_____	\$_____
2	20__	__%	\$_____	\$_____	\$_____	\$_____
3	20__	__%	\$_____	\$_____	\$_____	\$_____
4	20__	__%	\$_____	\$_____	\$_____	\$_____
5	20__	__%	\$_____	\$_____	\$_____	\$_____
6	20__	__%	\$_____	\$_____	\$_____	\$_____
7	20__	__%	\$_____	\$_____	\$_____	\$_____
8	20__	__%	\$_____	\$_____	\$_____	\$_____
9	20__	__%	\$_____	\$_____	\$_____	\$_____
10	20__	__%	\$_____	\$_____	\$_____	\$_____
11	20__	__%	\$_____	\$_____	\$_____	\$_____
12	20__	__%	\$_____	\$_____	\$_____	\$_____
13	20__	__%	\$_____	\$_____	\$_____	\$_____
14	20__	__%	\$_____	\$_____	\$_____	\$_____
15	20__	__%	\$_____	\$_____	\$_____	\$_____
16	20__	__%	\$_____	\$_____	\$_____	\$_____
17	20__	__%	\$_____	\$_____	\$_____	\$_____
18	20__	__%	\$_____	\$_____	\$_____	\$_____
19	20__	__%	\$_____	\$_____	\$_____	\$_____
20	20__	__%	\$_____	\$_____	\$_____	\$_____
TOTAL			\$_____	\$_____	\$_____	\$_____

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3. COST PROPOSAL ALTERNATES

Refer to Section 01 030 – Cost Proposal Alternates for a description of Alternates. The County shall have the option of exercising any or all of the below Alternates at the proposed prices at contract award or for up to one hundred and twenty (120) days after contract award.

Add Alternate costs shall also be financed if included in the Contract. Produce individual amortization schedules for each of these add alternates.

A. Add Alternates: Refer to Section 01 030 - Alternates

ADD ALTERNATE PRICE AMOUNTS				
#	Description	Unit	Add Amount	
1	<p>Add Alternate No. 1 Site Plan – Remove the remaining vegetation from the exterior building walls out to the paved area and service drive curb and install compacted # 57 stone 4” deep. To prevent erosion taper and grade the elevation for drainage away from the building and to the area drains This work is to be coordinated with the equipment installation and adhere to security requirements.</p>	Is	\$ _____	
2	<p>Add Alternate No. 2 Site Plan – Remove and replace the two security fence rows around the two housing towers from the Central Plant to the sally port at Inmate Transfer. This work is to be coordinated with the equipment installation and adhere to security requirements. The new fence and concertina shall be installed per specifications and match existing configuration with access gates, locks, and modifications shown the site plan. (The new height requirement is shown on the site drawing.)</p>	Ea.	\$ _____	

3	Add Alternate No. 3 Housing Floors – Showers – Prepare and seal all housing zone showers with waterproof coating.		\$ _____	
4	Add Alternate No. 4 Housing Floors – 800 Zones – Remove existing light fixtures and replace with new fixtures in the 800 Zones.		\$ _____	
5	Add Alternate No. 5 Housing Floors – Zones 100 through 600 – Install new icemakers with water dispensers in each of the housing floor dayrooms		\$ _____	
6	Add Alternate No. 6 General Requirements – Owner Allowances; Refer to Section 01 030, Add Alt No 6			
7	Add Alternate No. 7 Owner’s Construction Administration & Commissioning Agent Fee Allowance; Refer to Section 01 030, Add Alt No 7		\$ _____	
8	Add Alternate No. 8 Maintenance Contract; cost for additional 2 years (five year total) maintenance contract; Refer to Section 01 030, Add Alt No 8		\$ _____	

B. Deduct Alternates: Refer to Section 01 030 - Alternates

DEDUCT ALTERNATE PRICE AMOUNTS				
#	Description	Unit	Deduct Amount	
1	Deduct Alternate No. 1 Deduct costs for contractor insurance that will be covered by the Owner Controlled Insurance Program (OCIP).		\$ _____	

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4. UNIT PRICES

Refer to Section 01 027 – Unit Prices for a description and schedule of Unit Prices. The County shall have the option of exercising any or all of the below Unit Prices at the proposed prices at any point in the project.

UNIT PRICE AMOUNTS <i>All items furnished and installed, based on project-specified materials</i>				
#	Description	Unit	Add	Delete
1	<p>Supply and installation for domestic, chilled water and hot water pipe and fitting insulation, per each fitting and per foot of pipe.</p> <p>Note: Produce a unit pricing chart with the respective pipe sizes and respective insulation types. Pipe sizes shall range from ½” to 8” and insulation type per specifications. There is no estimated quantity for this work item. The proposed unit price, if accepted by the County, will be applied to actual quantities in the event the work described above is required.</p>	ls	\$ _____	\$ _____
2	<p>Prepare a unit price to ‘freeze-plug’ pipe for making repairs on large diameter in-service water pipes where water is leaking and the pipe section can not be isolated and drained completely down. Provide a pricing chart for steel and copper diameters 2” through 8” with standard pipe fittings.</p> <p>Note: There is no estimated quantity for this work item.</p>	Ea.	\$ _____	\$ _____

<p>3</p>	<p>Prepare a unit price to furnish and install one plumbing fixture number F9A. Include in the scope of work for this unit price all of the materials and labor typical to an installation within a typical cell within one of the Jail housing zones. The price shall be broken out according to the follow outline: 1. Removal of existing sink and lavatory and associated pipe, valves and fittings 2. Wall reconstruction and new sleeve placement 3. Installation of new pipe, valves, fittings, metering devices, pins and insulation 4. installation of new F9A fixture</p> <p>Note: There is no estimated quantity for this work item.</p>	<p>Ea.</p>	<p>\$ _____</p>	<p>\$ _____</p>
<p>4</p>	<p>Prepare a unit price to furnish and install one each, plumbing fixtures number F10A and F11A. Include in the scope of work for this unit price all of the materials and labor typical to an installation within a typical cell within one of the Jail housing zones. The price shall be broken out according to the follow outline: 1. Removal of existing sink and lavatory and associated pipe, valves and fittings 2. Wall reconstruction at both fixtures and new sleeve placement 3. Installation of new pipe, valves, fittings, metering devices, pins and insulation 4. installation of new fixtures, F10A and F11A</p> <p>Note: There is no estimated quantity for this work item.</p>	<p>Ea.</p>	<p>\$ _____</p>	<p>\$ _____</p>

5	Prepare a unit price to furnish and install a security mirror as typical to each housing cell. Include in this price the removal of an existing security mirror.	Per Seat	\$ _____	\$ _____
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5. SECURITY (BID) BOND

Required to accompany this proposal is a Security (Bid) Bond, made payable to the Board of Commissioners of Fulton County, which is not less than five percent (5%) of the Base Cost Proposal. No other form of security will be allowed. The Proposer agrees that the above stated amount is the amount of liquidated damages due and payable to the County in the event the undersigned fails to execute the Contract and deliver the bonds and other submittals required.

Refer to Section 00 610 – Security (Bid) Bond for requirements.

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6. CONCLUSIONS

It is understood that the County shall have the right to waive any informality or irregularity in any proposal received, and that it will have the right to reject any or all proposals and to re-advertise the Contract.

Respectfully submitted:

By: _____
(Authorized signature)

Name: _____

Title: _____

(Seal if by Corporation)

**If Proposer is a Joint Venture, include signatures of all joint venture partners:
(Also refer to Section 7 – Contract Compliance Requirements, for other documents or forms required to be submitted by Joint Ventures)**

By: _____

Title: _____

Firm: _____

(Seal if by Corporation)

By: _____

Title: _____

Firm: _____

(Seal if by Corporation)

By: _____

Title: _____

Firm: _____

(Seal if by Corporation)

END OF SECTION 00 300

SECTION 01 020 – ALLOWANCES**1. DEFINITIONS / GENERAL**

- A. Allowances: Allowances are defined as sums of monies within the Contract Sum which may, at Owner's option and under terms established in the Contract, be utilized at the Owner's sole discretion to supplement corresponding basic requirements..
- B. Owner allowances are exclusively for the cost of any services, special operations, materials, delivery to the site and associated installation. The total allowance amount is exclusively for Owner use, and shall include no markup for the Contractor or for its subcontractors.
- C. Owner's General Contingency Allowance: In the base Cost Proposal under Division 01 – General Requirements there is listed a contingency allowance of \$ 1,100,000. This cost allowance includes costs for security escorting (Section 01-040 – 5 - 7.D.5) and contingency costs for owner required and unforeseen project requirements.
- D. Add Alternate Allowances: The projected cost for add alternate allowances are listed as Add Alternates Number 6 & 7. The scope of work for Add Alternate Number 7 is included in the Contract Documents Section 17100 and shall be performed by the County's Commissioning Agent Newcomb & Boyd. The scope of services for Add Alternate Number 6 is not a part of this Contract; however, the County may choose to finance these costs of services. The County will issue separate Contracts for these specialty services. If the respective allowances are accepted by Fulton County, they shall be incorporated into the Finance portion of this Contract.

- 2. SCHEDULE OF ADD ALTERNATE ALLOWANCES:** Allowances are being considered under Alternates. Refer to Section 01 030, Cost Proposal Alternates.
- 3. SCOPE OF WORK:** As determined by the Owner, through the Construction Manager.
- 4. PROCUREMENT PROCEDURE:** By the Contractor, and coordinated by the County's Construction Manager.
- 5. SCHEDULE CONDITIONS:** As determined by the County's Construction Manager.
- 6. COORDINATION RESPONSIBILITY:** As determined by the County's Construction Manager.

END OF SECTION 01 020 - ALLOWANCES

SECTION 01 030 – COST PROPOSAL ALTERNATES

1. DEFINITIONS, STANDARDS AND SUBMITTALS

- A. The Cost Proposal Alternates listed and described below have been established and shall include the following:
1. The furnishing of all management, supervision, installation, start-up and service labor, materials, tools, equipment, overhead and profit.
 2. Complete coordination of the work in each Cost Proposal Alternate's scope of work with the work of all other trades, regardless of whether these trades are in the employment of the Contractor, or of the County or Construction Manager.
 3. All appropriate corresponding additions or deductions for materials being replaced or modifications to the structure, which must be made as a result of the addition or deletion of, the item(s) covered by each Cost Proposal Alternate.
 4. Although such work may not be specifically indicated, the furnishing and installation of all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
 5. If incorporated into the project, each Cost Proposal Alternate shall be considered to be subject to all terms and conditions of the Contract, including, but not necessarily limited to the Owner-Contractor Agreement, all Sections of the General Requirements, and all applicable Sections of the Technical Specifications.
- B. Quality Assurance: See individual Specification Sections for required standards modified to conform to alternate conditions.
- C. Submittals: See individual Specification Sections for required submittals modified to conform to alternate conditions.

2. ACCEPTANCE AND INCORPORATION OF COST PROPOSAL ALTERNATES

- A. The County reserves the right to accept or reject any and/or all of the Cost Proposal Alternates. Cost Proposal Alternates shall remain valid for the term of the Contract. Cost Proposal Alternates may be awarded with the Base Contract amount pending the scope of work requirement.

Cost Proposal Alternates may be awarded after award of the Base Contract, and if so, shall be incorporated into the Contract by change order.

- B. The price of each Cost Proposal Alternative and any combination thereof may be considered in the evaluation for award of any and/or all proposed prices for the Cost Proposal Alternates.

3. DESCRIPTION OF COST PROPOSAL ADD ALTERNATES

ADD ALTERNATE NO. 1

Site Plan – Remove the remaining vegetation from the exterior building walls out to the paved area and service drive curb and install compacted # 57 stone 4" deep. To prevent erosion taper and grade the elevation for drainage away from the building and to the area drains. This work is to be coordinated with the equipment installation and adhere to security requirements.

ADD ALTERNATE NO. 2

Site Plan – Remove and replace the two security fence rows around the two housing towers from the Central Plant to the sally port at Inmate Transfer. This work is to be coordinated with the equipment installation and adhere to security requirements. The new fence and concertina shall be installed per specifications and match existing configuration with access gates, locks, and modifications shown the site plan. (The new height requirement is shown on the site drawing.)

ADD ALTERNATE NO. 3

Housing Floors – Showers – Prepare and seal all housing zone showers with waterproof coating.

ADD ALTERNATE NO. 4

Housing Floors – 800 Zones – Remove existing light fixtures and replace with new fixtures in the 800 Zones.

ADD ALTERNATE NO. 5

Housing Floors – Zones 100 through 600 – Install new icemakers with water dispensers in each of the housing floor dayrooms.

ADD ALTERNATE NO. 6

Include in Proposer’s financing cost for Owner allowances for the following Owner Allowance

General Requirements – Owner Allowances	Add	
01.1 Owner’s Staffing Allowance		
01.1.1 Senior Project Manager (5 yr x \$80,000)	\$ 400,000	
01.1.2 Project Manager (5 yr. x 60,000)	\$ 300,000	
01.2 Owner’s Relocation & Swing Space Allowances		
01.2.1 Relocation & Swing Space - Inmate Towers	\$ 46,000,000	
01.2.2 Relocation & Swing Space - Medical Unit	\$ 1,500,000	
01.2.3 Relocation & Swing Space - Records	\$ 1,500,000	
01.2.4 Relocation & Swing Space – Prop. Stor.	\$ 1,500,000	
01.2.5 Relocation & Swing Space – Administration	\$ 500,000	
01.2.6 Relocation - Outside Laundry Service	\$ 2,000,000	
01.2.7 Relocation – IT Phone/Computer/Network	\$ 750,000	
01.3 Demolition Existing Facilities Allowance		
01.3 .1 Demolition Bellwood Annex	\$ 400,000	
01.3 .2 Demolition Marietta Annex	\$ 400,000	
01.4 Sub-Total All Division 01 Owner Allowances	\$55,250,000.00	

ADD ALTERNATE NO. 7

Include in Proposer’s financing cost for Owner allowances for the following Owner Allowances

Construction Administration & Commissioning (17 100)	Add	
17.1 Owner’s Commissioning Agent Allowance		
17.1.1 Commissioning Agent Fee	\$ 550,000	
17.2 Sub-Total All Division 01 Owner Allowances	\$ 550,000	

ADD ALTERNATE NO. 8

Include in Proposer’s financing cost a five (5) year maintenance agreement in lieu of three (3) year maintenance agreements. Show add amount above the 3-year cost in cost proposal.

Maintenance	Add	
18.1 5-Yr Maintenance Contracts	\$	
18.1.1 – Mechanical Equip.	\$	
18.1.2 – Controls	\$	
18.1.3 – Plumbing Equip	\$	
18.1.4 – Elevator Systems	\$	
18.1.5 – Other (list)	\$	
18.2 Sub-Total 3-Yr Maintenance Contracts	\$	

4. DESCRIPTION OF COST DEDUCT PROPOSAL ALTERNATES

DEDUCT ALTERNATE NO. 1

Deduct cost for contractor provided insurance and coordinate insurance that will be covered in the Fulton County Owner Controlled Insurance Program (OCIP) by enrolling the Contractor and all Sub-Contractors into the OCIP.

- A. Refer to Deduct Alternate No. 1, Sections 00 440 Alt. – County Provided Insurance Program
- B. Refer to Deduct Alternate No. 1, Section 00 500 Alt. - Article 10 - Insurance and Article 11 – Safety.
- C. Refer to Deduct Alternate No. 1, Section 01 800 Alt – Contractor Safety, Health & Loss Prevention Program Guidelines.

END OF SECTION 01 030, ALTERNATES

SECTION 05 500

METAL FABRICATIONS

PART 1: GENERAL

1.01 QUALITY ASSURANCE:

A. Industry Standards:

1. Some products and execution are specified in this section by reference to published specifications or standards (with respective abbreviations used); these referenced publications may be subject to special conditions where specified hereinafter.
2. Reference Publications:
 - a. The American Society for Testing & Materials (ASTM).
 - b. Federal Specifications (FS).
 - c. Code for "Welding in Building Construction" by American Welding Society (AWS).

1.02 SUBMITTALS:

- A. Shop Drawings: Fully dimensioned, showing actual field measurements, details of fabrication and anchorage and relationship to abutting materials and finishes.
- B. Product Data: Manufacturer's descriptive and specification data and installation details for each manufactured item described hereinafter.

1.03 JOB CONDITIONS:

- A. Coordination: Coordinate with other trades so that necessary backing for anchorage may be provided at proper locations and at proper time in the sequence of the work.

PART 2: PRODUCTS

2.01 MATERIALS:

- A. Structural Steel: Steel shapes, bars, and plates shall meet requirements of ASTM A36-94.

- B. Steel Pipe: ASTM A53-93, Grade B, of size(s) shown on the drawings.
- C. High Strength Bolts, Nuts, and Washers: Meet requirements of ASTM A325-93.
- D. Other Bolts, Nuts, and Washers: All other bolts, nuts, and washers shall meet requirements of ASTM A449-92.
- E. Expansion Shields: Sizes shown on the drawings and meet the requirements of FS FF-S-325, 1965.
- F. Wedge Anchors: Sizes shown on the drawings.
- G. Sheet Metal: Meet requirements of ASTM A366-93.
- H. Electrodes:
 - 1. Electrodes shall be Mild Steel Arc-Welded Electrodes conforming to requirements of ASTM A233.
 - 2. Electrodes for manual shielded arc welding shall be E70 18, subject to provisions as hereinafter described.
 - 3. Electrodes for automatic inert gas shielded arc welding shall be No. 70.
 - 4. Electrodes used in both shop and field shall be kept warm and dry after the seal is broken on the original container and shall not be used if exposed to atmospheric conditions for more than one hour.
- I. Anchoring Grout: non-shrink type manufactured for this purpose.
- J. Shop and Field Primer Paint: One of the following:
 - 1. Tnemec 99 Red Metal Primer as manufactured by Tnemec Company.
 - 2. Rust-Oleum 769 Damp-proof Red Primer as manufactured by Rust-Oleum Corp.
 - 3. Southern Coatings RIP476 as manufactured by Southern Coatings and Chemical Company.

2.02 FABRICATION:

- A. General: Fabricate metal items, including but not limited to angle lintels, bent plates, and elevator pit ladder, to the designs shown on the drawings and from the materials; all welds shall be ground smooth.
- B. Shop Cleaning and Priming:
 - 1. All ferrous metal items shall be thoroughly cleaned at the shop after fabrication and given one shop coat of paint.
 - 2. Dry Film thickness of shop paint shall be two mils.

PART 3: EXECUTION

3.01 INSTALLATION:

- A. General:
 - 1. Work shall be erected plumb and true in relation to adjoining work unless otherwise shown.
 - 2. The setting of items to be built into concrete or masonry work is included in their respective sections; the erection of all other items are included herein.
 - 3. Fastening shall be concealed.
 - 4. Provide holes and connections for the work of all other trades.
 - 5. Use toggle bolts for anchoring into concrete masonry.
 - 6. Use metal shields for expansion bolts and screws; steel drive bolts of same sizes as noted for expansion bolts, with split, closed ends, with threads at one end may be substituted for expansion bolts into concrete.
- B. Welding: All welding shall be done in accordance with AWS standards using shielded arc electrodes.

3.02 FIELD QUALITY CONTROL:

- A. Touch-Up Priming: After installation is complete, touch-up all shop priming coats damaged during transportation and installation and prime all welds, using the priming paint specified for shop painting.

- B. Finish Painting: Described in and is a part of Section 09900.

END OF SECTION

SECTION 18 200

MECHANICAL MAINTENANCE

PART 1: GENERAL

1.04 GENERAL:

- A. This section is an example of the scope of work that should be priced by the bidding contractor to provide and perform maintenance on the new HVAC and plumbing systems provided/replaced under this project scope. The base pricing scope should be to provide parts and labor from the start of the beneficial use of the specific equipment by the Owner (after commissioning is completed) to a fixed date three years after the substantial completion of the entire project. The base pricing is for services in addition to the required one (first) year warranty period/requirements already indicated in the contract documents.

Add Alternate Number 8 is to extend the maintenance (parts and labor) for an additional (2) two years for a total of five years after the project is substantially complete (as indicated by the Owner/Engineer).

The maintenance program shall be developed and issued as a full maintenance program plan for preventive and predictive maintenance tasks.

- B. Listed below are examples of typical maintenance that should be completed and provided for the major HVAC equipment being installed and replaced in this project. The equipment listed below is not intended to be all inclusive of the equipment being provided or covered by this maintenance agreement. Please refer to the contract documents for the specific scope of work for this project/Maintenance Agreement.
- C. The maintenance requirements indicated below are only an example and shall be tailored to the specific equipment (manufacturer) and systems provided for this project. The specific recommendations and requirements of the manufacturers for the equipment provided shall be followed exactly.

PART 2: PRODUCTS

2.03 MATERIALS/SYSTEMS:

- A. Centrifugal Chillers:
 - 1. Periodic Maintenance
 - a. Overview:

- 1) This section describes the basic chiller preventive maintenance procedures, and recommends the intervals at which these procedures should be performed. Use of a periodic maintenance program is important to ensure the best possible performance and efficiency from a chiller.
- b. Record Keeping Forms:
- 1) An important aspect of the chiller maintenance program is the regular completion of records. When filled out accurately by the machine operator, the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.
 - 2) For example, if the machine operator notices a gradual increase in condensing pressure during a month's time, he can systematically check, then correct the possible cause(s) of this condition (fouled condenser tubes, noncondensable in the system, etcetera).
- c. Daily Maintenance and Checks:
- 1) Check the chiller's evaporator and condenser pressures, oil tank pressure, differential oil pressure and discharge oil pressure. Compare the readings with the values provided in the Normal Chiller Operating Characteristics table. (Important: it is highly recommended that the operating log be completed on a daily basis.)
 - 2) Check the oil level in the chiller oil sump using the two sight glasses provided in the oil sump head. When the unit is operating, the oil level should be visible in the lower sight glass.
- d. Weekly Maintenance:
- 1) Complete all recommended daily maintenance procedures and checks. Complete logs on a daily basis.
- e. Every Three Months:

- 1) Complete all recommended weekly maintenance procedures. Refer to the previous sections for details. Clean all water strainers in the water piping system.
- f. Every Six Months:
- 1) Complete all recommended quarterly maintenance procedures.
 - 2) Lubricate the vane control linkage bearings, ball joints, and pivot points; as needed a few drops of light machine oil (SAE-20) is sufficient.
 - 3) Lubricate vane operator tang o-rings as described in the maintenance section.
 - 4) Lubricate the oil filter shutoff valve o-rings by removing the pipe plug and adding several drops of oil. Replace plug.
 - 5) Drain the contents of the rupture disc and purge discharge ventline drip-leg, into an evacuated waste container minimally and more often if the purge is operated excessively.
 - 6) Also, apply one or two drops of oil on the vane operator shaft and spread it into a very light film; this will protect the shaft from moisture and rust.
- g. Off-Season Maintenance:
- 1) During those periods of time when the chiller is not operated, be sure the control panel is energized. This is to keep the purge operational, the oil heater warm and will also keep air out of the machine.
- h. Annual Maintenance:
- 1) Shut down the chiller once each year to check the items listed.
 - 2) Perform the annual maintenance procedures referred to in the Maintenance Section of the purge manual.
 - 3) Use an ice water bath to verify that the accuracy of the evaporator refrigerant temperature sensor is still within

tolerance (+ or - 2.0° at 32°F (1° at 0°C)). If the evaporator refrigerant temperature displayed on the UCP's read-out is outside this 4-degree tolerance range, replace the sensor.

Note: if the sensor is exposed to temperature extremes outside its normal operating range (0°F to 90°F) (18°C to 32°C), check its accuracy at six-month intervals.

2. Oil Maintenance:

a. Compressor Oil Change:

- 1) Recommendations are to subscribe to an annual oil analysis program rather than automatically change the oil as part of scheduled maintenance. Change the oil only if indicated by the oil analysis. Use of an oil analysis program will reduce the chillers overall lifetime waste oil generation and minimize refrigerant emissions. The oil analysis should be performed by a qualified laboratory that is experienced in refrigerant and oil chemistry and in the servicing of centrifugal chillers.
- 2) In conjunction with other diagnostics performed by a qualified service technician, oil analyses can provide valuable information on the chiller to help minimize operating and maintenance costs and maximize its operating life. A drain fitting is installed in the oil filter top, after the oil filter, for obtaining oil samples.

b. Oil Change Procedure:

- 1) When oil analysis indicates the need to change compressor oil, use the following procedure for removing oil.
- 2) Draw the oil from the chiller through the oil charging valve on the chiller oil sump into an approved, evacuated tank; or, pump the oil from the chiller through the oil charging valve into an airtight resealable container, using a magnetically-driven auxiliary pump.
- 3) Forcing the oil from the oil sump by pressurizing the chiller (by raising chiller temperature or adding nitrogen) is not recommended.

- 4) Refrigerant dissolved in the oil can be removed and returned to the chiller by using an appropriate deep-vacuum recovery unit and heating and agitating the oil container. Follow all Federal, State and Local regulations with regard to disposal of waste oil.
- c. Replacing oil filter:
- 1) Replace oil filter: (1) annually, (2) at each oil change, (3) or if erratic oil pressure is experienced during chiller operation.
- d. Oil filter replacement:
- 1) Use the following procedure to service the oil filter.
 - a) Run the oil pump for two to three minutes to insure that the oil filter is warmed up to the oil sump temperature.
 - b) Turn the oil pump motor off.
 - c) Pull the "D" handle on the rotary valve locking pin out of its detent and rotate the valve to the "DRAIN" position. An offset pointer is located on top of the valve with wrench flats to allow turning. The spring force on the locking pin should allow the pin to drop into a detent at this position.
 - d) Allow at least 15 minutes for the oil to drain from the filter back into the oil sump.
 - e) Pull the "D" handle to unlock the pin and rotate the valve to the "Change Filter" position. This isolates the filter from the unit. The locking pin should drop into a detent in this position.
 - f) Remove and replace the filter as quickly as possible. Tighten filter 2/3 to 3/4 turn per instructions written on the filter. Place the used filter in a reusable container. Follow all local, state and federal regulations to dispose of the filter. Pull the "D" handle to unlock the pin and rotate the valve to the "RUN" position. The locking pin should drop into a detent in this position. The chiller is now ready for operation.

- g) Purge unit.
- h) Check oil pressure 18-27 psi.

3. Other Maintenance Requirements:

- a. Compressors using new seal technology will not use O-rings. The O-ring has been replaced by Loctite 515 applied at a minimum film thickness of .010 applied across the width of the flange. The current jack bolt holes remain for disassembly.
- b. Inspect the condenser tubes for fouling; clean if necessary.
- c. Measure the compressor motor winding resistance to ground; a qualified service technician should conduct this check to ensure that the findings are properly interpreted.
- d. Contact a qualified service organization to leak-test the chiller; this procedure is especially important if the system requires frequent purging.
- e. Use a nondestructive tube test to inspect the condenser and evaporator tubes at 3-year intervals.

Note: It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.

- f. Depending on chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to discern the condition of the compressor and internal components.

Note: (a) Chronic air leaks, which can cause acidic conditions in the compressor oil and result in premature bearing wear; and, (b) Evaporator or condenser water tube leaks. Water mixed with the compressor oil can result in bearing pitting, corrosion, or excessive wear.

- g. Submit a sample of the compressor oil to a qualified laboratory for comprehensive analysis on an annual basis; this analysis determines system moisture content, acid level and wear metal content of the oil, and can be used as a diagnostic tool.

h. Lubrication:

- 1) The only chiller component that requires periodic lubrication is the external vane linkage assembly and rotary oil valve.
- 2) Lubricate the vane linkage shaft bearings and rod end bearings and rod end bearings as needed with a few drops of light-weight machine oil.
- 3) The inlet guide vane tang operators should be serviced annually with R123 compatible grease.

i. To service the first stage tang operator of all units except extended capacity chillers with 1470 or 1720 compressors.

- 1) The chillers must be off.
- 2) Carefully remove any insulation that may have been placed over the two lubrication ports of the tang operator base. This insulation will need to be replaced after the service is complete.
- 3) Note the position of the tang operator arm, note the placement of spacing washers etc., then disconnect the linkage rod from the tang operator arm. Manually move the tang operator arm and note the amount of effort required to operate the assembly.
- 4) Loosen but DO NOT REMOVE the 1/16" NPT lubrication port plug that is highest on the assembly.
- 5) Loosen and remove the remaining lower 1/16" NPT plug.
- 6) Using a grease gun with an appropriate fitting, insert ONLY Rheolube grease into the open port until clean grease is seen to appear around the threads of the plug in the opposite port.
- 7) Tighten the plug that was loosened in step 4. Tighten the plug to hand tight plus 1/4 to 1/2 turn.
- 8) Remove the grease fitting, if used.

DO NOT LEAVE GREASE FITTINGS INSTALLED.

If grease fittings have been used for this procedure then they **MUST BE REMOVED** before returning the unit to service. Grease fittings are not vacuum-tight and will become a leak path.

- 9) Using a clean wooden dowel or other similar tool, remove excess grease from the remaining open lubrication port.
 - 10) Clean and then lightly coat the threads of the plug with Rheolube grease and re-install it into the lubrication port. Tighten the plug to hand tight plus 1/4 to 1/2 turn.
 - 11) Before reconnecting the vane linkage, grasp the tang operator arm and manually operate the vane assembly. If it is now difficult to move, then the tang operator may have become "hydraulically locked" because of excess grease in the assembly. This situation could cause damage to the O-ring of the assembly. If this occurs then remove one of the lubrication plugs, remove some of the grease, then re-install the plug.
 - 12) Reconnect the linkage to the tang operator arm. Ensure the space washer between the linkage and the arm are properly placed and that the assembly does not bind. Re-install any insulation that was cut or removed. The unit may be restarted.
- j. To serve the first and second stage tang operators on extended capacity chillers with 1470 or 1720 compressors.
- k. The first and second stage rotary inlet guide vane tang operators of the extended capacity chillers also require periodic lubrication, at least annually, with R123 compatible Rheolube grease. These actuators have two 1/8" NPT plugs located 180 degrees apart, with one on the top and the other on the bottom of the operator base. Use the same procedure as described above, except that it will be necessary to temporarily disconnect the vane actuators from the tang operator arms in order to test for "hydraulically locked" condition.
- l. The oil valve block rotary valve uses dual O-rings to seal to atmosphere. These should be manually lubricated by removing the pipe plug at the valve lubrication port and placing a few drops of oil in the cavity. Be sure to reinstall the pipe plug when lubrication is complete.

- m. The refrigerant charging procedure for centrifugal chillers is:
- 1) If water is present in the tubes, break machine vacuum with refrigerant vapor, or circulate water, to avoid tube damage.
 - 2) Always use refrigerant compatible hoses or copper-tubing with self-sealing connections or shut-off valves.
 - 3) Transfer the refrigerant using one of the following (listed in order of preference):
 - a) An approved low-pressure refrigerant recovery and recycle unit.
 - b) The available pressure differential.
 - c) Gravity. (Use a return vent line to refrigerant drums toe equalize pressure.)
 - 4) Do not use dry nitrogen to push refrigerant into the chiller as was common practice in the past. This will contaminate the charge and require excessive purging, which will result in unnecessary release of refrigerant.
 - 5) Weight in the proper charge.
 - 6) Use recovery and recycle unit or vacuum pump to evacuate hoses; discharge outdoors.

Depending on the chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to discern the condition of the compressor and internal components.

Note: If your chiller is covered by an extended warranty, the terms of the warranty may require that the procedures listed in the Periodic Maintenance section of this manual be followed for your extended warranty to remain in force. The terms may also require that the chiller be inspected by a authorized warranty agent every 4-years or 40,000 operating hours, whichever occurs first. This inspection will include, at a minimum, a review of the annual inspection checklists and the daily operating logs, as well as performance of a leak test and a general inspection of the chiller. The owner is then required

to follow the recommendations made as a result of this inspection at the owner's expense.

4. Recovery and Recycle Connections:
 - a. To facilitate refrigerant removal and replacement, newer-design are provide with a 3/4-inch vapor fitting with shutoff valve on the chiller suction and with a 3/4-inch liquid connection with shutoff valve at the bottom of the evaporator shell. (Refer to Refrigerant Handling Guidelines.)

5. Leak Testing:
 - a. To leak-test a chiller containing full refrigerant charge, raise chiller pressure using a controlled hot water or electric-resistance system to a maximum of 8 psig. Do not use nitrogen, which will cause excessive refrigerant discharge by the purge system.

6. Cleaning the Condenser:
 - a. Condenser tube fouling is indicated when the approach temperature (the difference between the condensing refrigerant temperature and the leaving condenser water temperature) is higher than predicted.
 - b. If the annual condenser tube inspection indicates that the tubes are fouled, two cleaning methods, mechanical and chemical, can be used to rid the tubes of contaminants.
 - c. Use the mechanical cleaning method to remove sludge and loose material from smooth-bore tubes.
 - d. To clean other types of tubes including internally-enhanced types, consult a qualified service organization for recommendations.
 - 1) Remove the retaining nuts and bolts form the water box covers at each end of the condenser. Use a hoist to lift the covers off the water box. (A threaded connection is provided on each water box cover to allow insertion of an eyebolt.)
 - 2) Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.

- 1) Remove all liquid refrigerant if the unit is charged.
- 2) After the liquid refrigerant is removed, using a recovery or recycle unit or vacuum pump, pull a vacuum to remove remaining refrigerant vapor from the unit.
- 3) After all traces of refrigerant are out of the unit, a positive nitrogen charge should be put into the unit (6 to 8 psig). This positive pressure must be checked monthly to insure no noncondensable get into the unit. Use a pressure gage on the evaporator shell to verify that the 6 to 8 psig dry nitrogen holding charge is still in the chiller. If this charge has escaped contact a qualified service organization and the sales engineer that handled the order.
- 4) The refrigerant charge should be stored in proper refrigerant containers. Due to possible leakage, do not store in used drums.
- 5) Maintain control power to the control panel. This will maintain oil temperature in the oil sump and the capacity of the control panel to present report information. The Chiller Reports should be viewed once a week for normal readings. Any abnormal observation must be reported to the Engineer that handled the order.
- 6) Remove the factory installed jumper or the field installed wiring on terminals in the unit control panel. This will prevent unwanted chiller operation.
- 7) Set the purge operating mode to OFF on UCP chillers.
- 8) The oil can be left in the unit.
- 9) The water side should not cause a problem if shut down and drained. There may be slight scaling inside the tubes, but not enough to cause a problem. The customer should inspect and clean tubes before the unit is returned to service.
- 10) Motor bearings: if the motor sits for a long time the bearings could take a set and cause bearing problems or replacement later. Once every six months the chillers oil pump must be started and the compressor

motor bump started to rotate the shaft. Contact a qualified service organization to perform this task. If the compressor motor cannot be bump started, then the shaft must be rotated manually by a qualified service organization.

- 11) Obtain an oil analysis initially after six months of storage, and once each succeeding year. If no oil breakdown is evident do not change the oil. If breakdown is evident, the oil must be replaced.
- 12) If the unit is stored for more than five years, and the storage is expected to be indefinite, the unit should be examined for leaks every five years from the initial storage date.
- 13) When the unit is to be returned to service, the services of a qualified service organization should be obtained to conduct all activities associated with the startup of a new chiller.

B. Pumps:

1. Double-suction, single stage, bronze fitted horizontal or vertical split case type:
 - a. Maintenance:
 - 1) General Maintenance:
 - a) Operating conditions vary so widely that to recommend one schedule of preventative maintenance for all centrifugal pumps is not possible. Yet some sort of regular inspection must be planned and followed. We suggest a permanent record be kept of the periodic inspections and maintenance performed on your pump. This recognition of maintenance procedure will keep your pump in good working condition, and prevent costly breakdown.
 - b) One of the best rules to follow in the proper maintenance of your centrifugal pump is to keep a record of actual operating hours. Then, after a predetermined period of operation has elapsed, the pump should be given a thorough inspection.

The length of this operating period will vary with different applications, and can only be determined from experience. New equipment, however, should be examined after a relatively short period of operation. The next inspection period can be lengthened somewhat. This system can be followed until a maximum period of operation is reached which should be considered the operating schedule between inspections.

2) Maintenance of Pump Due to Floor Damage:

- a) The servicing of centrifugal pumps after a flooded condition is a comparatively simple matter under normal conditions.
- b) Bearings are a primary concern on pumping units. First, dismantle the bearings; clean and inspect them for any rusted or badly worn surfaces. If bearings are free from rust and wear, reassemble and relubricate them with one of the recommended pump lubricants. Depending on the length of time the pump has remained in the flooded area, it is unlikely that bearing replacement is necessary; however, in the event that rust or worn surfaces appear, it may be necessary to replace the bearings.
- c) Next, inspect the stuffing box, and clean out any foreign matter that might clog the box. Mechanical seals should be cleaned and thoroughly flushed.
- d) Couplings should be dismantled and thoroughly cleaned.
- e) Any pump that is properly sealed at all joints and connected to both the suction and discharge should exclude outside liquid. Therefore, it should not be necessary to go beyond the bearings, stuffing box, and coupling when servicing the pump.

3) Bearing Lubrication – Grease:

- a) Grease lubricated ball bearings are packed with grease at the factory and ordinarily will require no attention before starting, provided the pump has been stored in a clean, dry place prior to its first operation. The bearings should be watched the first hour or so after the pump has been started to see that they are operating properly.
- b) The importance of proper lubrication cannot be over emphasized. It is difficult to say how often a bearing should be greased, since that depends on the conditions of operation. It is well to add one ounce of grease at regular intervals, but it is equally important to avoid adding too much grease. For average operating conditions, it is recommended that 1 ounce of grease be added at intervals of three to six months, and only clean grease be used. It is always best if unit can be stopped while grease is added to avoid overloading.

NOTE: Excess grease is the most common cause of overheating.

- c) A lithium based NLGI-2 grade grease should be used for lubricating bearings where the ambient temperature is above -20°F. Grease lubricated bearings are packed at the factory with Shell Alvania No. 2. Other recommended greases are Texaco Multifak No. 2 and Mobilux No. 2 grease.
- d) Grease made from animal or vegetable oils are not recommended due to the danger of deterioration and forming of acid. Do not use graphite. Use of an ISO VG 100 mineral base oil with rust and oxidation inhibitors is recommended.
- e) The maximum desirable operating temperature for ball bearings is 180°F. Should the temperature of the bearing frame rise above 180°F, the pump should be shut down to determine the cause.

4) Mechanical Seals:

- a) Mechanical seals are precision products and should be treated with care. Use special care when handling seals. Clean parts are essential to prevent scratching the finely lapped sealing faces. Even light scratches on these faces could result in leaky seals.
 - b) Normally, mechanical seals require no adjustment or maintenance, except routine replacement of worn, or broken parts.
- 5) Packing Seal:
- a) When a pump with packing is first started it is advisable to have the packing slightly loose without causing an air leak. As the pump runs in, gradually tighten the gland bolts evenly. The gland should never be drawn to the point where packing is compressed too tightly and no leakage occurs. This will cause the packing to burn, score the shaft sleeve and prevent liquid from circulating through the stuffing box cooling the package.

NOTE: Eccentric run-out of the shaft or sleeve through the packing could result in excessive leakage that cannot be compensated for. Correction of this defect requires shaft and/or sleeve replacement. Packing should be checked frequently and replaced as service indicates. Six months might be a reasonable expected life, depending on the operating conditions.
- 6) Cleaning Without Dismantling Pump:
- a) A short section of pipe so designed that it can be readily dropped out of the line can be installed adjacent to the suction flange. With this arrangement, any matter clogging the impeller is accessible by removing the pipe section.
 - b) If the pump cannot be freed of clogging after the above methods have been tried, dismantle the unit as previously described to locate the trouble.

2. End suction, split case, back pull out type, bronze fitted, flexible coupled:
 - a. Lubrication:
 - 1) While pump is running regrease pump bearing with NLGI Grade #2 lithium base petroleum grease after every 2500 hours of operation or every 6 months whichever occurs first.
 - 2) Lubricate motor per motor manufacturer's instructions.
 - b. General Instructions:
 - 1) Keep this pump and motor properly lubricated.
 - 2) When there is a danger of freezing, drain the pump.
 - 3) Inspect pump regularly for leaky seals or gaskets and loose or damaged components. Replace or repair as required.
 - c. Service Instructions:
 - 1) Close valves on suction and discharge sides of pump. (If no valves have been installed, it will be necessary to drain the system.)
 - 2) Remove the Hex Coupler Guard as follows:
 - a) Remove the two cap screws that hold the outer (motor side) coupler guard to the support bracket(s).
 - b) Spread the outer guard and pull it off the inner guard. **NOTE:** Do not spread the inner and outer guards more than necessary for guard removal. Over spreading the guards may alter their fit and appearance.
 - c) Remove the cap screw that holds the inner guard to the support bracket.
 - d) Spread the inner guard and pull it over the coupler.

- 3) Loosen set screws in both coupler halves and slide each half back as far as possible on its shaft. Remove coupler sleeve. Where a full diameter impeller is used, it may be necessary to remove the pump side coupler half and to slide the motor back on its base in order to gain sufficient clearance to remove the pump assembly from the volute.
- 4) Remove support foot capscrews. Loosen volute capscrews, do not remove them. Use capscrews in the jack screw holes. Loosen the pump assembly from the volute.
Remove seal flushing tube, if used.
Remove the volute capscrews and remove the pump assembly from the volute.
- 5) **With Standard Mechanical Seal:**
 - a) Remove the impeller capscrew, lock washer and washer. Remove the impeller.
 - b) Remove the rotating portion of the seal, use a screwdriver to loosen the rubber ring.
 - c) Remove the seal insert along with the insert gasket and retainer (if used).
 - d) Thoroughly clean the shaft sleeve and the coverplate seal cavity. Inspect for surface damage like pitting, corrosion, nicks or scratches. Replace if necessary.
 - e) Lubricate the shaft sleeve and coverplate seal cavity with soapy water (do not use petroleum lubricant). Install a new insert gasket and a new seal insert with indentation side down into the cup.
 - f) Slide a new rotating seal assembly onto the shaft sleeve. With a screwdriver push on the top of the compression ring until the seal is tight against the seal insert. Install seal spring, with narrow end toward seal.
 - g) Install impeller, impeller washer, lock washer and capscrew. Tighten capscrew per torque chart.

- h) Install new volute gasket then install pump assembly into volute. Tighten volute capscrews per torque chart. Install seal flushing tube, if used. Install support foot capscrews and tighten per torque chart. Install coupler and align. Install drain plug, close drain valve.

- i) Install the Hex Coupler Guard as follows:
 - (1) Spread the inner guard and place it over the coupler. **NOTE:** Do not spread the inner and outer guards more than necessary for guard installation. Over spreading the guards may alter their fit and appearance.

 - (2) With the inner guard straddling the support bracket, install a cap screw through the hole in the support bracket and guard located closest to the pump. Do not tighten the capscrew.

 - (3) Spread the outer guard and place it over the inner guard.

 - (4) Install the outer guard cap screws by following the step stated below which pertains to your particular pump:
 - (a) For pumps with motor saddle support bracket: ensure the outer guard is straddling the support arm, and install but do not tighten the two remaining cap screws.

 - (b) For pumps without a motor saddle support bracket: insert the spacer washer between the holes located closest to the motor in the outer guard, and install but do not tighten the two remaining cap screws.

- (5) Position the outer guard so it is centered around the shaft, and so there is less than a ¼" of shaft exposed.
 - (6) Holding the guard in this position, tighten the three cap screws.
 - j) Open isolation valves, inspect pump for leaks, if not leaking return pump to service.
- 6) **With Special Single Mechanical Seal:**
- a) Remove the impeller capscrew, lock washer and washer. Remove the impeller.
 - b) Remove hex nuts from seal cap bolts and remove coverplate capscrews. Remove coverplate from bracket.
 - c) Remove seal assembly. Thoroughly clean and inspect seal sleeve and seal cap, replace if required.
 - d) Lubricate shaft sleeve and seal cap with soapy water (do not use petroleum lubricant). Insert stationary seal with O-ring into the seal cap and slide onto the shaft. Replace the seal cap gasket. Slide rotating portion of the seal assembly onto shaft sleeve and lock in place. For 1-1/4" I.D. seals, the collar should be 1 13/32" from the impeller end of the shaft sleeve. For 1-5/8" and 2-3/8" I.D. seals, the distance should be 1-1/4".
 - e) Assemble coverplate to bracket, tighten capscrews per torque chart. Assemble seal cap to coverplate, tighten hex nuts to seal cap bolts per torque chart.
- 7) **With Special Double Mechanical Seal:**
- a) Remove the impeller capscrew, lock washer and washer. Remove the impeller

- b) Remove hex nuts from seal cap bolts and remove coverplate capscrews. Remove coverplate from bracket.
 - c) Remove seal assembly. Thoroughly clean and inspect shaft sleeve, seal cap, and coverplate seal cavity, replace if required.
 - d) Lubricate shaft sleeve, seal cap and coverplate cavity with soapy water (do not use petroleum lubricant). Insert one stationary seal and O-ring into seal cap and the other into the coverplate. Slide the seal cap onto the shaft. Replace seal cap gasket. Slide rotating portion of seal assembly onto shaft sleeve.
 - e) Assemble coverplate to bracket, tighten capscrews per torque chart. Assemble seal cap to coverplate, tighten hex nuts on seal cap bolts per torque chart.
- 8) **With Standard Mechanical Seal:**
- a) Remove the impeller nut and washer. Remove the impeller and impeller key.
 - b) Remove spacer sleeve and two nuts holding the gland to the stuffing box.
 - c) Pull the coverplate off the bearing frame assembly. Remove the seal, sleeve and gland.
 - d) Thoroughly clean the shaft, shaft sleeve and the coverplate seal cavity. Inspect for surface damage like pitting, corrosion, nicks or scratches.
 - e) Apply Dow Corning Silicone Rubber #732 or equal to the shaft at sleeve location. Slide the shaft sleeve onto the shaft and spin sleeve to distribute sealant. Wipe off excess.
 - f) Slide the seal gland (flat side towards the stuffing box) on the shaft.

- g) Lubricate the outer surface of the shaft sleeve, interior of the stuffing box and seal elastomer with soapy water (do not use petroleum lubricant). Install the stationary element and rotating assembly of the mechanical seal on the shaft sleeve; being certain that the two wearing surfaces face each other and rotating half of the seal is installed closest to the impeller end.
 - h) Install the seal spring and spring retainer onto the shaft sleeve. Slide the coverplate onto the bearing frame.
 - i) Install spacer sleeve (over the shaft sleeve), impeller key, impeller, washer and impeller nut, then tighten impeller nut to 25-30 ft-lbs. Install and tighten the gland nuts evenly against the stuffing box.
 - j) Inspect volute "O" ring for damage, replace if necessary. Install "O" ring around coverplate seat. Slide the bearing frame/coverplate assembly into the volute (coverplate flush tube fitting must be to top). Install volute capscrews and gradually tighten with a star pattern (prevents impeller rub) to 25-30 ft-lbs. Install drain plug. Close drain valve.
- 9) **With Packing:**
- a) Remove the impeller capscrew, lock washer and washer. Remove the impeller and impeller key.
 - b) Remove hex nuts from packing gland and remove coverplate capscrews. Remove coverplate from bracket.
 - c) Remove packing rings from the stuffing box.
 - d) Check condition of shaft sleeve and replace if scored or otherwise damaged.
 - e) Insert two packing rings in the stuffing box followed by the lantern ring and then the remaining two pieces of packing. Make certain that the packing joints are staggered 90 degrees.

- f) Install, but do not tighten the packing gland.
- g) Install coverplate over the pump shaft, tighten capscrews per torque chart.
- h) Tighten packing gland to compress packing, read note on packed pump operation.

10) **Note on Packed Pump Operation:**

- a) Before starting pump, back off packing gland nuts or screws until gland is loose. Re-tighten with fingers until gland is just snug against the first packing ring. Initially, water may run freely from packing. This is normal and should be allowed to continue for a period of time before further tightening of the gland. Tighten gland nuts slowly and uniformly, one flat at a time.
- b) An adequate leakage rate is not one single value for all pumps and installations, but is the amount required to provide adequate cooling and lubrication. The required leakage will be largely influenced by operating pressure, fluid temperature, shaft speed, etc.
- c) For fluid temperatures in the range of 32° to 190°F, average leakage rates of 60 to 80 drops per minute are recommended. However, each individual pump and installation will have unique operating conditions that will result in broadly variable leakage rate requirements.
- d) At fluid operating temperatures near the upper limit of 190°F, the maximum temperature rise of the leakage is particularly important. A packed pump should never operate with steam forming at the gland. This necessarily limits the temperature rise to maximum of about 20°F. If the formation of steam persists at higher leakage rates, cooling water must be provided by means of an external supply, or a heat exchanger used to cool the by-pass flush.

C. Cooling Towers:

1. Operation and Maintenance:
 - a. Initial and Seasonal Start-up:
 - 1) Prior to initial start-up or after a shut-down period, the cooling tower must be thoroughly inspected and cleaned:
 - a) Clean all debris, such as leaves and dirt, from inside the tower, the air inlets and the hot water basins.
 - b) Remove, clean and install the inlet pre-strainer.
 - c) Drain the cold water basin (with basin strainers in place) and flush to remove accumulated dirt.
 - d) Remove the suction strainer, clean and reinstall.
 - e) Turn the fan(s) by hand to insure rotation without obstruction.
 - f) Bump the fan motor(s) and check for proper fan rotation.
 - g) At seasonal start-up, check and adjust the belt tension on the fan drive system. Note, during initial start-up, the belt tension may not require adjustment since the drive has been properly tensioned at the factory prior to shipment.
 - h) Check float operated make-up valve to be sure it is operating freely.
 - i) Lubricate the fan shaft bearings prior to seasonal start-up.
 - j) At start-up, when the cold water basin is completely drained, fill the cold water basin with fresh water to the overflow level. For new installations, initiate the biocide water treatment program at this time. At seasonal start-up, and following a shutdown period of more than 3 days, resume the biocide treatment program or administer a shock treatment of appropriate

biocides prior to operating the cooling tower fans to eliminate accumulated biological contaminants.

- k) Set the float on the make-up valve to close the valve when the float is approximately ½" below the overflow level.
- l) Balance flow to the hot water basin(s) by adjusting the flow balancing valves on the cooling towers. Multi-cell arrangements will require flow balancing between cells to obtain even water distribution.
- m) Open the valve in the tower bleed line and adjust bleed.
- n) Check the voltage and current of all three legs of the fan motor. The current should not exceed the nameplate rating.

Note: Current should be measured during warm ambient conditions and with a heat load on the tower. After prolonged shutdowns, the motor insulation should be checked with an insulation tester prior to restarting the motor.

- 2) Caution: Rapid on-off cycling can cause the fan motor to overheat. It is recommended that the controls be set to allow a maximum of 6 on-off cycles per hour. When using a 2-speed motor, the starter should include a 15-second time delay when switching from high speed to low speed.
- 3) Inverter duty fan motors, furnished in accordance with NEMA Standard MG.1 Part 31, are required for applications using variable frequency drives for fan motor control.
- 4) After 24 Hours: After 24 hours of operation under thermal load, the following services should be performed:
 - a) Check the tower for any unusual noise or vibration.

- b) Check the operating water level in the hot and cold water basins and adjust balancing valves.
 - c) Adjust make-up valve.
 - d) Readjust the bolt tension..
- b. Operation:
- 1) During operation, the tower should be inspected, cleaned, and lubricated on a regular basis.
- c. Seasonal Shut-down:
- 1) The following services should be performed whenever the cooling tower is to be shutdown for more than 3 days:
 - a) Drain the cold water basin and all piping that will be exposed to freezing temperatures.
 - b) Clean and flush the hot and cold water basins with the basin strainers in place. Leave the cold water basin drain open so rain and melting snow will drain from the tower.
 - c) Clean the basin strainers and reinstall.
 - d) Cover the fan discharge opening to keep out dirt and debris.
 - e) Lubricate the fan shaft bearings and motor base adjusting screw.
 - f) Close the shutoff valve in the make-up water line (supplied by others) and drain all exposed make-up water piping.
 - g) Inspect the integrity of the corrosion protection system on the steel portion of the tower.
 - h) On the cooling tower, inspect the anti-skid tape on the internal walkway and replace as necessary if deterioration or lifting is observed.

checked monthly and the float re-adjusted as necessary to maintain the recommended operating level.

- 3) The water level in the cold water basin of units designed for remote sump operation is a function of the circulating water flow rate, along with quantity, location, size and configuration of the water outlet piping. Units designed for remote sump applications are not supplied with a water make-up assembly and the basin operating level is not adjustable during operation.
- 4) The cold water basin should be inspected regularly. Any trash or debris which may have accumulated in the basin or on the strainers should be removed and, if necessary, the float adjusted to maintain the design operating level.
- 5) Quarterly, or more often if necessary, the entire cold water basin should be drained, cleaned, and flushed with fresh water to remove the silt and sediment which normally collects in the basin.
- 6) It is important to note that the same maintenance applies to galvanized steel basins, basins protected by the Corrosion Protection System, and stainless steel basins. If not removed periodically, sediment can become corrosive and cause deterioration of the protective finish of metallic basins. When flushing the basin, the strainers should be left in place to prevent the sediment from re-entering the tower system. After the basin has been flushed, the strainers should be removed, cleaned, and replaced before refilling the basin with fresh water.

d. Make-Up Valve:

- 1) A float-operated mechanical water make-up assembly is furnished as standard equipment on the cooling tower (unless the unit has been ordered with the optional electric water control package or is equipped for remote sump application). The mechanical make-up assembly is located within easy reach from the access door at the connection end of the unit. The mechanical make-up valve is easily accessible from the louver face of the cooling towers. The standard make-up assembly consists of a bronze make-up valve connected to a float

arm assembly and is actuated by a large diameter polystyrene-filled plastic float. The float is mounted on an all-thread rod held in place by wing nuts. The operating water level in the cold water basin can be adjusted by repositioning the float and all-thread rod using the wing nuts provided.

- 2) The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary. The make-up water supply pressure should be maintained between 15 and 50 psig for proper operation of the valve.
- 3) To set the initial basin water level, adjust the wing nuts so that the make-up valve is completely closed when the water level in the cold water basin is ½" below the overflow connection. Under design thermal load and with average water pressure (15 to 50 psig) at the valve, this setting should produce the operating water levels.
- 4) Note that if the thermal load is less than the design load at the time of unit start-up, the procedure may produce operating levels greater than that shown. It may be necessary to re-adjust the float in order to attain the recommended operating level. The unit basin should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.
- 5) As an option, an electric water level control package is available in lieu of the above-described mechanical make-up assembly. The package consists of a probe-type liquid level control assembly and a slow-closing solenoid valve. Stainless steel electrodes, factory-set at predetermined lengths, extend from an electrode holder into the cold water basin. These electrodes should be periodically cleaned to prevent accumulations of scale, corrosion, sludge or biological growth which could interfere with the electrical circuit. With the electric water level control package, the water level is maintained at the recommended operating level regardless of the system thermal load. Therefore, it is not necessary, nor is it recommended, that the operating level be adjusted. During the start-up of units equipped with the electric water level control package,

the control unit should be bypassed in order to fill the unit ½" below the overflow connection.

- 6) Operation at the recommended water level will ensure that the unit basin contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up and to provide sufficient excess basin capacity to accept the total system pull-down volume. ("Pull-down volume" is defined as that quantity of water suspended in the tower during operation plus that contained in the hot water basin, wet deck surface, external piping, and any heat exchangers which could drain to the tower cold water basin when the circulating pump is shut down.)

e. Fan Motors:

- 1) The standard fan motors used on cooling towers are cooling tower duty motors, either a TEAO (Totally Enclosed, Air Over), or a TEFC (Totally Enclosed, Fan Cooled) configuration, with permanently lubricated ball bearings and special moisture protection on the bearings, shaft, and windings. The only servicing required during operation is to clean the outside surface of the motor at least quarterly to ensure proper motor cooling. Additionally, after prolonged shutdowns, the motor insulation should be checked with an insulation tester prior to restarting the motor.

f. Fan Shaft Bearings:

- 1) The fan shaft is supported by two pillow ball bearings, each equipped with a lubrication fitting and a slinger/locking collar to keep out moisture. The bearings should be lubricated as follows:
 - a) Initial Start-Up: Normally, no lubrication is required since the bearings have been lubricated at the factory prior to shipment. However, if the cooling tower has been stored at the job site for more than one year, bearings should be lubricated with new grease before initial operation. When lubricating, purge the old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal on the underside of the bearing.

- b) Seasonal Start-Up: Purge both bearings with new grease prior to start-up.
- c) Operation: Lubricate bearings every 2,000 hours of operation or once every three months, whichever occurs first.
- d) Seasonal Shutdown: Purge bearings with new grease prior to any prolonged storage or downtime.

CAUTION: The fan shaft bearing should be lubricated only with a hand grease gun. Do not use high pressure grease guns since they may rupture the bearing seals. Lubricate the bearings with only one of the following water resistant greases which are suitable for ambient temperatures ranging from -65°F to +250°F.

Amoco – Rycon Premium #3	Chevron – SRI
Mobile – Mobile #28	Mobile – SHC 32
Shell – Alvania 3	Shell – Dolium "R"
Texaco – Regal AFB 2	

g. Locking Collars:

- 1) Each eccentric locking collar should be checked every six months to ensure that the inner bearing race is secured to the fan shaft. The locking collar can be set using the following procedure:
 - a) Loosen the set screw.
 - b) Using a drift pin or centerpunch, tap the collar (in the hold provided) tangentially in the direction of rotation while holding the shaft.
 - c) Retighten the set screw.

h. Fan Belt Adjustment:

- 1) Belt tension should be checked and adjusted at least quarterly, or as needed. To properly adjust the belt tension, position the fan motor so that the belt will deflect ½" when moderate pressure (approximately 15 lbs.) is applied midway between the sheaves.

NOTE: There should be no "chirp" or "squeal" when the fan motor is started.

- 2) The position of the fan motor can easily be changed by adjusting the rod which extends from the frame to the motor base. Loosen the locknut on top of the frame and rotate the nut under the frame with a wrench as necessary. Then retighten the locknut.

NOTE: Direct drive units do not employ fan shaft bearings, adjustable motor bases, fan drives or belts. The fans are driven directly by the motor and there is never a need for any adjustment.

i. Initial Start-Up:

- 1) No servicing is required prior to initial tower start-up since the drive has been tensioned and aligned at the factory.

j. Seasonal Start-Up:

- 1) Readjust the tension on the belt.

k. Operation:

- 1) At the initial tower start-up or the installation of a new belt, the tension must be readjusted after the first 24 hours of operation. Thereafter, the condition of the belt should be checked monthly and the tension adjusted as necessary, but at least once every three months.
- 2) To check the belt tension, place a straight edge along the belt sheave to sheave or use a tape measure to measure belt deflection. Apply a moderate force by hand (approximately 40 lbs) evenly across the width of the belt in the center of the span between the sheaves. If the belt deflects between 1/4" and 3/8", the belt is adequately tensioned.
- 3) If belt tensioning if required, proceed as follows:
 - a) Loosen the lock nut on the motor base adjusting screw.

- b) Turn the motor base adjusting screw clockwise to tension the belt, or counterclockwise to relieve belt tension. During adjustment of belt tension, the drives should be rotated several times by hand to evenly distribute the tension throughout the belt.
- c) When the belt is properly tensioned, retighten the locking nut on the motor base adjusting screw.

NOTE: There should be no "chirp" or "squeal" when the fan motor is started.

- 4) The drive alignment should be checked annually to ensure maximum belt life. This can be done by placing a straight edge across the drive sheaves for standard drives. When the drives are properly aligned, the straight edge will contact all four points as indicated. There should be no more than 1/16" deviation from four points of contact. If realignment is necessary, loosen the motor sheave and align it with the fan sheave. Allow approximately 1/4" for draw-up as the bushing screw is retighten.

1. Fan Operation:

- 1) If the unit is already in operation, check while the fan is running for any unusual noise or vibration.
- 2) With the fan off and the motor locked out and tagged:
 - a) Inspect for any loose or missing bolts in the fan shaft bushing, the fan hub and the fan shaft bearings.
 - b) Check the fan blades for looseness, first by twisting the blade by hand and then by moving the blade tip up and down. There should be no play or slippage whatsoever.
 - c) Inspect along each blade for excessive scale build-up that could cause vibration and for any signs of cracking.

- 3) Tip Clearance – Check the clearance between the tip of the blade and the fan cowl. This should be between 1/2" and 1".
 - 4) Drain Holes – On hollow blades, the drain hole in the blade tip should be unobstructed. (Hint: Use a piece of wire to probe the hole.)
 - 5) Blade Pitch: Check to ensure that the blades are all at the same pitch. If uncertain, measure the pitch with an inclinometer. All blades should be within $\pm 1/2^\circ$.
 - 6) Rotation – Turn the fan by hand to ensure that it move freely with no rough spots, binding or other malfunctions that could cause vibration or fan motor overload. While rotating the fan, check the blade tracking. All blades should be within a 1" band at any single point around the cowl.
 - 7) Direction of Rotation – On initial start up, or if the fan motor has been rewired for some reason, bump the fan motor and note the direction of rotation. It should rotate in the direction indicated by the arrow on the fan cowl.
 - 8) Operation – On initial start up, run the fan in the manual position for several minutes and check for any unusual noises or vibration.
- m. Gear Drive System:
- 1) Inspection: All gear drives are shipped with oil installed. The initial oil level should be at or near the middle of the oil level sight gage, and should be maintained so that the oil level is always visible in the sight gage window when the unit is idle or not energized and the oil is at ambient temperature. Prior to start-up, check all fittings on the gear drive to ensure that there are no visible leaks. The standard oil provided in gear drive systems is mineral oil. Synthetic lubricants are also available as an option. Refer to the unit nameplate for the oil type provided with the gear drive system.
 - 2) Gear drive units with internally mounted motors are properly installed and aligned at the factory. All fasteners are factory tightened, but should be checked after installation. For units supplied with externally

mounted motors, install and align the motor and driveshaft in accordance with the Customer Assembly Instructions (CAI) included with the unit. It is recommended that alignment and all external fasteners be rechecked after two weeks of operation.

- 3) Operation: No special break-in procedures, other than rechecking alignment and external fasteners, are necessary except as noted under the Lubrication section of this specification.
 - a) Excessive noise or vibration at initial operation is an indication of one or more of the following:
 - (1) Misalignment.
 - (2) Imbalance of the fan or other rotating parts.
 - (3) Improperly adjusted fan blades.
 - (4) Operation at mechanical equipment resonant speed.
 - b) On installations with two speed motors, when slowing from high speed, allow a minimum 15 seconds time delay for the fan to slow down before energizing the low-speed winding.

CAUTION: When reversing the direction of rotation, allow the fan to come to a complete stop before restarting the motor.

n. Variable Frequency Drive Operation:

- 1) **CAUTION:** On installation with variable speed motors, do not operate standard gear drives below 450 RPM motor speed (gear input speed). Modifications to the lubrication system or special gear oil pumps are required for operation at input speeds lower than 450 RPM.
- 2) **CAUTION:** Continued operation at a resonant speed condition will result in torsional vibrations within the gear which can be damaging to all components of the system. The most common indicator of torsional

vibrations is an unusual rumbling or grinding noise from the gear drive at a sharply defined speed. The noise will disappear when the speed is increased or decreased. This noise is not indicative of a defect but results when the vibratory torque exceeds the drive torque causing the gear teeth to separate and clash together very rapidly. On variable speed applications, operation close to a resonant speed should be avoided and transition through a resonant speed range should be swift.

- 3) At start-up, the variable frequency drive should be increased through the range from 0 RPM to maximum motor speed. As the speed is increased, the gear drive system should be observed to note the onset of any unusual rumbling or grinding at specific speeds. These resonant speeds ($\pm 10\%$) should be "locked out" by the variable speed drive. Please refer to the variable frequency drive manufacturer's recommended start-up procedure for further information.
- 4) Lubrication: Use only rust and oxidation inhibited gear oils in accordance with AGMA (American Gear Manufacturer's Association), Standard 9005-D94. For general operating conditions, AGMA lubricant number and corresponding ISO Grade for mineral oils and for synthetic lubricants (reference the cooling tower nameplate to determine if synthetic lubricant was furnished). For operation under extremely hot or cold ambient conditions, contact your local representative for specific recommendations.
 - a) Start-up at an ambient temperature less than 20°F (-7°C) requires either the use of lube oil heaters (for mineral oils) or synthetic oil (ambient temperature to -20°F (-29°C)). Each unit has provisions for an internal oil reservoir heater. Heaters and synthetic oil are extra cost accessories and can be ordered with new units or may be ordered and installed in existing units.
 - b) The vertical and horizontal shafts are equipped with grease-lubricated dual seals. Relubrication is not required.

- 5) **Synthetic Lubricants:** Synthetic lubricants offer advantages such as extended service life, a broader operational temperature range, reduced friction, and the ability to maintain a higher film strength which can extend the service life of the gear drive. For general operation conditions, AGMA lubricant number and corresponding ISO Grade should be as shown. Synthetic lubricants can be made of various base stocks which are incompatible with certain gear drive components; therefore, any synthetic lubricant not listed in this manual should not be used without first consulting the manufacturer.
- 6) **Change Interval:** The original oil should be replaced after 500 hours or four weeks of operation, whichever comes first. It is recommended that the oil be drained through the drain plug when it is at operating temperature. Refill the drive through the air breather port with the recommended type and amount of lubricant.
- 7) **Maintenance:** Check oil level weekly with the unit idle. Add oil if level is below oil level indicator. Specific gear model number for each unit can also be found on the gear drive nameplate. Daily visual inspections and observation for oil leaks and unusual noises and vibrations are recommended. If any of these occur, the unit should be shut down and the cause found and corrected.
- 8) **Periodic checks** should be made to ensure the proper alignment of all system components and that all bolts and external fasteners are tight.
- 9) **Special precautions** are necessary during periods of inactivity. When the internal parts are not continually bathed by the lubricant as during operation, the gear drive is susceptible to corrosion. For best results, let the drive cool for approximately four hours after shutdown, start the fan and let run for approximately five minutes. This will coat the internal parts of the drive with cool oil. Thereafter run the fan for five minutes once a week throughout the shutdown period to maintain the oil film on the internal parts of the gear drive.

- 10) On seasonal shut down, it is recommended that the drive unit be completely filled with oil. This can be accomplished by filling through the air breather port. Cover the drive with a tarpaulin or other protective covering.
- 11) **CAUTION:** Drain the excess oil before returning the gear drive to service.

D. Indoor Modular Draw-Through Air Handling Units:

1. Maintenance and Inspection Services:

- a. Fan: check blades for dirt and/or grease built-up especially on concave sides. Check set screws and/or set collars of fan wheel and bearings for tightness. Check bearing mounting bolts and fan housing cut off blade bolts and nuts for tightness. If fans are furnished with housing drains, see that "weep holes" in bottom are open. If housing access door is furnished be sure it is properly sealed and latched. Remove all debris from fan section and unit in general.
- b. Bearings and Shaft: Ball or roller bearings are greased at the factory and therefore ready to run at "start-up"; however, routine maintenance and inspection is required thereafter. Normal operation of bearings are "cool or warm to touch". High bearing temperature accompanied by excessive leakage of grease indicates too much grease. High temperature with no grease showing at the seals, particularly if the bearing seems noisy, indicates too little grease. If running discloses an excessive amount of grease in the bearings, the grease fittings should be removed until the excess has escaped. Fan shafts should be coated to prevent corrosion yet check that dirt or debris build-up is not accumulating which could affect balance.
- c. Fan Bearing Lubrication: Lubrication intervals vary with the period of operation and temperature of the air. Do not over-lubricate. The bearing is factory lubricated with Lithium based grease of NGL1#2 consistency, such as Sinclair Litholene Multipurpose, Avalinia #2, Texaco Multifax #2, Humble Lidok #2, Mobile Armyac#781, or Phillips Philube L2.
- d. Motor and Motor Bearings: check for dirt and debris accumulation on "air travel" openings of open type motors to prevent overheating. Relubricate motor bearings every 2000 hours of operation while it is warm and at a stand still. Remove

and clean upper and lower grease plugs. Insert grease fittings into upper hole adding a small amount of clean grease with a low pressure gun. Run motor 5 minutes before replacing plugs. Excessive grease will overheat the bearings. Use only high grade mineral grease having a 200 degrees F safe operating temperature. (If special lubrication instructions are shown on the motor nameplate they will supersede all other instructions).

- e. Sheaves: after air balance, require no further adjustment. However, sheave locking devices, wear, alignment and belt tension should be checked on a regular basis.
- f. Damper Blades and Linkage: should be inspected regularly for dirt and/or debris build up to insure abnormal wear or damage does not occur. Winterize damper system prior to cold weather to insure that proper sequence of control is being maintained, paying close attention to operation of outside air intake. Outside air damper should be check closely for minimal leakage when closed.
- g. Outside Air Intake Hood: should be checked for debris in birdscreen and/or obstructions to air flow (such as old boxes, new walls or fences, etc.) around unit. Clean or remove as required.
- h. Water Coils: (Heating and Cooling) if not antifreeze protected or heater protected should be drained as thoroughly as possible and then treated in the following manner:
 - 1) Fill each coil independently with an antifreeze solution using a small circulating pump and again drain. Check freezing point of antifreeze before proceeding to next coil. Due to a small amount of water always remaining in each coil, there will be a diluting effect. The small amount of antifreeze solution remaining in coil must always be concentrated enough to prevent freeze-up. Carefully read instruction for mixing antifreeze solution used. Some products will have a higher freezing point in its natural state than when mixed with water.

Failure of controls, outside air dampers and air stratification can cause freeze-up and permanent coil damage if above precautions are not observed. Do not allow dirt to accumulate between the fins of coils. Use water, steam or air to remove dirt.

- i. Condensate Pan: should be checked for dirt and debris build-up and cleaned. Trap and drain should also be cleaned especially if blockage is evident.
- j. Filter Assembly: tracks should be checked for rail seal retention where required and all rails should be cleaned annually to control dirt build-up, filter drag and dust by-pass during change out of media. Dirty filters reduce the air volume handled by the unit, and thereby its capacity. Unit should not be run without proper filters or fan motor overload, dirty coil and restricted air flow will result. Proper media retainers should be used at all times to avoid possible media "blow-out", which can cause blockage of air flow and/or damage rotating fan and motor parts. Do not operate media beyond its rated capacities before change out or "blow-out" damage can result.
- k. Casing and Access Doors: should be checked for leakage (air and/or water). Door gasket must be in proper alignment and if damaged, should be replaced. Inside access panels must be latched properly to avoid air recirculation.
 - 1) Door Hinges Adjustment: (All adjustments must be made with 1/8" Allen wrench)
 - a) Vertical Adjustment:
 - (1) Loosen vertical adjustment screws on top and bottom hinges.
 - (2) Raise or lower door accordingly.
 - (3) Tighten vertical adjustment screws on top and bottom hinges.
 - b) Compression Adjustment:
 - (1) Adjust the two compression adjustment screws on both top and bottom hinges by turning them to achieve the desired compression of the door against the seal.
 - c) Horizontal Adjustment:

- (1) Loosen four horizontal adjustment screws on top hinge, and four horizontal adjustment screws on bottom hinge.
 - (2) Move door left or right accordingly.
 - (3) Tighten the four horizontal adjustment screws on top hinge, and four horizontal adjustment screws on bottom hinge.
- l. Coils: can be removed from unit through either end of unit. After removing piping and end panels, remove bolts holding coil to structural frame at the air entering side of coil. The coil and casing can then be pulled out.
- m. Wiring and Components: should be made and remain in accordance with National, State, and local codes that apply to this equipment. Check connections of wiring and retighten so danger of a poor connection causing overheating and component failure through inadequate current handling can be avoided. Good practice and safety indicates that before attempting service to components, de-energize the systems and only after workers are clear of rotating and electrical devices can unit be energized again.
- n. Air Filter Gauge: "pick-up" should point against air flow for best results without restriction. Oil manometers require split to operate properly (check zero set).
- o. Humidifier: strainer screen in supply line should be cleaned a few days after put in operation and thereafter at least once a season – more often if much dirt is found in the screen. The trap should be inspected at the same time strainer is cleaned.
- p. Unit Heater or Electric Coil: should be checked for dirt on resistors and removed by use of air only. **DO NOT** attempt cleaning without positive shut down.
- q. Pneumatic Operators: and linkage should be inspected for sequence and travel and vacuum hose leaks especially prior to cold weather usage where furnished.
- r. Other Components: not mentioned should be maintained per instructions attached to component.

**MAINTENANCE
FREQUENCY SCHEDULE**

Recommended Maintenance Service

Type of Service	Start-Up	Monthly	Every 6 Months	Shutdown	Annually
Inspect General Condition of Unit	X	X			
Clean Debris From Unit	X	X		X	
Check and Adjust Fan Belt Tension	X	X			
Check Unit for Unusual Noise or Vibration	X	X			
Check Fan Bearing Locking Collars	X		X		
Check Motor Voltage and Current	X		X		
Lubricate Fan Shaft Bearings	X		See Below	X	
Lubricate Motor Base Adjusting Screws	X		X	X	
Check Fan for Rotation Without Obstruct	X				
Check Fan for Proper Rotation	X				
Inspect Protective Finish					X
Replace Filters		X			
Lubricate Damper Linkage			X		
Check Fans for Unusual Vibration	X				X
Clean Outside of Coils			X	X	

IMPORTANT SAFETY NOTES

Before performing any maintenance or inspection, make certain that all power has been disconnected.

Adequate precautions should be taken to safeguard the equipment and the premises from damage, also the public from possible injury as appropriate for the installation of these products.

The following table should be used as a relubrication guide:

	<u>Conditions</u>			
<u>SPEED</u>	<u>TEMPERATURE</u>	<u>CLEANLINESS</u>	<u>GREASE INTERVAL</u>	

100 RPM	Up to 120 degrees F	Clean	6 to 12 months
500 RPM	Up to 150 degrees F	Clean	2 to 6 months
1000 RPM	Up to 180 degrees F	Clean	2 weeks to 2 months
1500 RPM	Over 210 degrees F	Clean	Weekly
Any Speed	Up to 150 degrees F	Dirty	Daily to 2 weeks
Any Speed	Over 150 degrees F	Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Very Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Extreme Cond.	Daily to 2 weeks

Add grease slowly with shaft rotating, until a slight bead forms at the seals.

E. Outdoor Modular Draw-Through Air Handling Units:

1. Maintenance and Inspection Services:

- a. Fan: check blades for dirt and/or grease built-up especially on concave sides. Check set screws and/or set collars of fan wheel and bearings for tightness. Check bearing mounting bolts and fan housing cut off blade bolts and nuts for tightness. If fans are furnished with housing drains, see that "weep holes" in bottom are open. If housing access door is furnished be sure it is properly sealed and latched. Remove all debris from fan section and unit in general.
- b. Bearings and Shaft: Ball or roller bearings are greased at the factory and therefore ready to run at "start-up"; however, routine maintenance and inspection is required thereafter. Normal operation of bearings are "cool or warm to touch". High bearing temperature accompanied by excessive leakage of grease indicates too much grease. High temperature with no grease showing at the seals, particularly if the bearing seems noisy, indicates too little grease. If running discloses an excessive amount of grease in the bearings, the grease fittings should be removed until the excess has escaped. Fan shafts should be coated to prevent corrosion yet check that dirt or debris build-up is not accumulating which could affect balance.
- c. Fan Bearing Lubrication: Lubrication intervals vary with the period of operation and temperature of the air. Do not over-lubricate. The bearing is factory lubricated with Lithium based grease of NGL1#2 consistency, such as Sinclair Litholene Multipurpose, Avalinia #2, Texaco Multifax #2, Humble Lidok #2, Mobile Armyac#781, or Phillips Philube L2.
- d. Motor and Motor Bearings: check for dirt and debris accumulation on "air travel" openings of open type motors to prevent overheating. Relubricate motor bearings every 2000

hours of operation while it is warm and at a stand still. Remove and clean upper and lower grease plugs. Insert grease fittings into upper hole adding a small amount of clean grease with a low pressure gun. Run motor 5 minutes before replacing plugs. Excessive grease will overheat the bearings. Use only high grade mineral grease having a 200 degrees F safe operating temperature. (If special lubrication instructions are shown on the motor nameplate they will supersede all other instructions).

- e. Sheaves: after air balance, require no further adjustment. However, sheave locking devices, wear, alignment and belt tension should be checked on a regular basis.
- f. Damper Blades and Linkage: should be inspected regularly for dirt and/or debris build up to insure abnormal wear or damage does not occur. Winterize damper system prior to cold weather to insure that proper sequence of control is being maintained, paying close attention to operation of outside air intake. Outside air damper should be check closely for minimal leakage when closed.
- g. Outside Air Intake Hood: should be checked for debris in birdscreen and/or obstructions to air flow (such as old boxes, new walls or fences, etc.) around unit. Clean or remove as required.
- h. Water Coils: (Heating and Cooling) if not antifreeze protected or heater protected should be drained as thoroughly as possible and then treated in the following manner:
 - 1) Fill each coil independently with an antifreeze solution using a small circulating pump and again drain. Check freezing point of antifreeze before proceeding to next coil. Due to a small amount of water always remaining in each coil, there will be a diluting effect. The small amount of antifreeze solution remaining in coil must always be concentrated enough to prevent freeze-up. Carefully read instruction for mixing antifreeze solution used. Some products will have a higher freezing point in its natural state than when mixed with water.

Failure of controls, outside air dampers and air stratification can cause freeze-up and permanent coil damage if above precautions are not observed. Do not allow dirt to accumulate

between the fins of coils. Use water, steam or air to remove dirt.

- i. Condensate Pan: should be checked for dirt and debris build-up and cleaned. Trap and drain should also be cleaned especially if blockage is evident.
- j. Filter Assembly: tracks should be checked for rail seal retention where required and all rails should be cleaned annually to control dirt build-up, filter drag and dust by-pass during change out of media. Dirty filters reduce the air volume handled by the unit, and thereby its capacity. Unit should not be run without proper filters or fan motor overload, dirty coil and restricted air flow will result. Proper media retainers should be used at all times to avoid possible media "blow-out", which can cause blockage of air flow and/or damage rotating fan and motor parts. Do not operate media beyond its rated capacities before change out or "blow-out" damage can result.
- k. Casing and Access Doors: should be checked for leakage (air and/or water). Door gasket must be in proper alignment and if damaged, should be replaced. Inside access panels must be latched properly to avoid air recirculation.
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- m. Wiring and Components: should be made and remain in accordance with National, State, and local codes that apply to this equipment. Check connections of wiring and retighten so danger of a poor connection causing overheating and component failure through inadequate current handling can be avoided. Good practice and safety indicates that before attempting service to components, de-energize the systems and only after workers are clear of rotating and electrical devices can unit be energized again.
- n. Air Filter Gauge: "pick-up" should point against air flow for best results without restriction. Oil manometers require split to operate properly (check zero set).
- o. Humidifier: strainer screen in supply line should be cleaned a few days after put in operation and thereafter at least once a season – more often if much dirt is found in the screen. The trap should be inspected at the same time strainer is cleaned.
- p. Unit Heater or Electric Coil: should be checked for dirt on resistors and removed by use of air only. **DO NOT** attempt cleaning without positive shut down.
- q. Pneumatic Operators: and linkage should be inspected for sequence and travel and vacuum hose leaks especially prior to cold weather usage where furnished.
- r. Other Components: not mentioned should be maintained per instructions attached to component.

MAINTENANCE FREQUENCY SCHEDULE

Recommended Maintenance Service

Type of Service	Start-Up	Monthly	Every 6 Months	Shutdown	Annually
Inspect General Condition of Unit	X	X			
Clean Debris From Unit	X	X		X	
Check and Adjust Fan Belt Tension	X	X			
Check Unit for Unusual Noise or Vibration	X	X			
Check Fan Bearing Locking Collars	X		X		
Check Motor Voltage and Current	X		X		
Lubricate Fan Shaft Bearings	X		See Below	X	
Lubricate Motor Base Adjusting Screws	X		X	X	
Check Fan for Rotation Without Obstruct	X				
Check Fan for Proper Rotation	X				
Inspect Protective Finish					X
Replace Filters		X			
Lubricate Damper Linkage			X		
Check Fans for Unusual Vibration	X				X
Clean Outside of Coils			X	X	

IMPORTANT SAFETY NOTES

Before performing any maintenance or inspection, make certain that all power has been disconnected.

Adequate precautions should be taken to safeguard the equipment and the premises from damage, also the public from possible injury as appropriate for the installation of these products.

The following table should be used as a relubrication guide:

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500 RPM	Up to 150 degrees F	Clean	2 to 6 months
1000 RPM	Up to 180 degrees F	Clean	2 weeks to 2 months
1500 RPM	Over 210 degrees F	Clean	Weekly
Any Speed	Up to 150 degrees F	Dirty	Daily to 2 weeks
Any Speed	Over 150 degrees F	Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Very Dirty	Daily to 2 weeks
Any Speed	Any Temperature	Extreme Cond.	Daily to 2 weeks

Add grease slowly with shaft rotating, until a slight bead forms at the seals.

END OF SECTION