

City of San Diego

CONTRACTOR'S NAME: _____
ADDRESS: _____
TELEPHONE NO.: _____ FAX NO.: _____
CITY CONTACT: Coselyn Goodrich, 600 B Street, Suite 500 San Diego CA 92101, MS. 908A
CGoodrich@sandiego.gov (619) 533-4633 Fax (619) 533-5476
BD/LJ/DS

CONTRACT DOCUMENTS



FOR

CASA DE BALBOA HVAC PROJECT

VOLUME 1 OF 2

BID NO.: _____ **K-12-5196-DBB-3-B**
SAP NO. (WBS/IO/CC): _____ **B-00939**
CLIENT DEPARTMENT: _____ **1914**
COUNCIL DISTRICT: _____ **3**
PROJECT TYPE: _____ **BS**

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

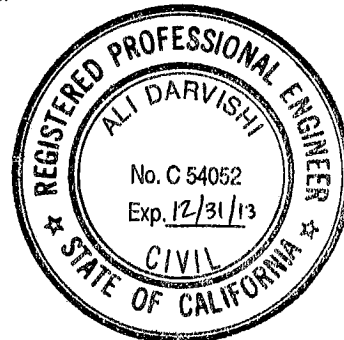
- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Professional Engineer or Licensed Architect:



Professional Engineer or Licensed Architect

Seal:



((((((((((((((((((((**ATTENTION**))))))))))))))))

The 2010 edition of the City of San Diego Standard Specifications for Public Works Construction (“The WHITEBOOK”) now contains the following distinct Contract Documents:

- 1) ***Equal Opportunity Contracting Program Requirements*** - This Contract Document sets forth the standard requirements for the City’s equal opportunity contracting program. When additional requirements by the funding source e.g., federal or state agencies are physically included in the contract documents or by reference and there is a discrepancy, the funding source requirements shall govern unless specified otherwise in the Special Provisions.

- 2) ***City Supplement*** – The City Supplement shall be used in conjunction with the Standard Specifications for Public Works Construction (“The GREENBOOK”), 2009 Edition. The specifications contained in City Supplement take precedence over the specifications contained in The GREENBOOK, 2009 Edition.

Certain parts of the City Supplement have been highlighted in yellow for the convenience of the users only and shall not affect the interpretation of the Contract.

To obtain The GREENBOOK contact the publisher at: <http://www.bnibooks.com>

The WHITEBOOK is available only in electronic format under Engineering Documents and References at: <http://www.sandiego.gov/engineering-cip/>

TABLE OF CONTENTS

DESCRIPTION	PAGE NUMBER
1. REQUIRED DOCUMENTS SCHEDULE.....	4 - 5
2. SPECIAL NOTICE SLBE AND ELBE PROGRAM.....	6 - 12
3. INVITATION TO BIDS	13 - 15
4. INSTRUCTION TO BIDDERS	16 - 24
5. CONTRACT FORMS	
• Agreement/Contract	25 - 26
• Performance Bond and Labor and Materialmen’s Bond	27 - 28
6. CONTRACTOR CERTIFICATION	
• Drug-Free Workplace	29
• American with Disabilities Act (ADA) Compliance.....	30
• Contractor Standards - Pledge of Compliance	31
• Affidavit of Disposal	32
7. SUPPLEMENTARY SPECIAL PROVISIONS	33 - 48
8. APPENDICES:	
• APPENDIX A - Environmental Exemption.....	49 - 50
• APPENDIX B - Section 23 09 23-N Direct Digital Control System Specification	51 - 106
• APPENDIX C - Division 23 Heating, Ventilation, and Air Conditioning Section 23 00 00 - Air Supply, Distribution, Ventilation, and Exhaust Systems	107 - 129
• APPENDIX D - McQuay Air Conditioning Submittals	130 - 169
• APPENDIX E - Electrode Steam Humidifiers – Cut Sheet	170 - 176
• APPENDIX F - Structural Calculations	177 - 178
• APPENDIX G - Building Energy Analysis Report.....	179 - 202
• APPENDIX H - Orion’s Structural Details and Johns Manville Details	203 - 207
• APPENDIX I - Sample City Invoice.....	208 - 209
• APPENDIX J - Asbestos and Lead Report	210 - 211
• APPENDIX K - Commissioning of HVAC Systems.....	212 - 236
• APPENDIX L - Thermal Insulation For Mechanical Systems.....	237 - 252
• APPENDIX M - Metal Ducts.....	253 - 267
• APPENDIX N - Bridge Inspection Report for Pepper Canyon Bridge.....	268 - 271

REQUIRED DOCUMENTS SCHEDULE

This table is intended to serve as a convenient tool for listing forms and documents required at different times. It is neither exhaustive nor must be considered a Contract Document by itself. Therefore, the users must review the entire Contract Documents and become familiar with the required documentation and the submittal schedule associated with each document.

Bidder's attention is directed to the City's Municipal Code §22.0807(e),(3)-(5) for important information regarding required documentation.

The specified EOC forms are all available for download from the EOC Program's web site at:

<http://www.sandiego.gov/eoc/forms/index.shtml>

ITEM	WHEN	BY	WHAT
1.	BID DUE DATE/TIME	ALL BIDDERS	Proposal (Bid)
2.	BID DUE DATE/TIME	ALL BIDDERS	Bid Bond
3.	BID DUE DATE/TIME	ALL BIDDERS	Non-collusion Affidavit to be Executed By Bidder and Submitted with Bid under 23 USC 112 and PCC 7106
4.	BID DUE DATE/TIME	ALL BIDDERS	Contractors Certification of Pending Actions
5.	BID DUE DATE/TIME	ALL BIDDERS	Equal Benefits Ordinance Certification of Compliance
6.	BID DUE DATE/TIME	ALL BIDDERS	Form AA35 - List of Subcontractors
7.	BID DUE DATE/TIME	ALL BIDDERS	Form AA40 - Named Equipment/Material Supplier List
8.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	Proof of Valid DBE-MBE-WBE-DVBE Certification Status e.g., Certs.
9.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	SLBE-ELBE Good Faith Documentations
10.	WITHIN 3 WORKING DAYS OF BID OPENING	ALL BIDDERS	Form AA60 – List of Work Made Available
11.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Names of the principle individual owners of the Apparent Low Bidder - In the event the firm is employee owned or publicly held, then the fact should be stated and the names of the firm's principals and officers shall be provided.
12.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	If the Contractor is a Joint Venture, the following information must be submitted: <ul style="list-style-type: none"> • Joint Venture Agreement • Joint Venture License

REQUIRED DOCUMENTS SCHEDULE

ITEM	WHEN	BY	WHAT
13.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Form BB05 - Work Force Report
14.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms – Agreement
15.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contract Forms - Payment and Performance Bond
16.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Certificates of Insurance and Endorsements
17.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - Drug-Free Workplace
18.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractor Certification - American with Disabilities Act
19.	WITHIN 10 WORKING DAYS AFTER RECEIPT BY BIDDER OF CONTRACT FORMS	APPARENT LOW BIDDER	Contractors Standards - Pledge of Compliance
20.	BY 5th OF EACH MONTH	CONTRACTOR	Form CC20 - Monthly Employment Report
21.	BY 5th OF EACH MONTH	CONTRACTOR	Form CC25 - Monthly Invoicing Report
22.	PRIOR TO ACCEPTANCE	CONTRACTOR	Form CC10 - Contract Change Order (CCO)
23.	PRIOR TO ACCEPTANCE	CONTRACTOR	Form CC15 - Final Summary Report
24.	PRIOR TO ACCEPTANCE	CONTRACTOR	Affidavit of Disposal

SPECIAL NOTICE
SMALL LOCAL BUSINESS ENTERPRISES (SLBE)
AND
EMERGING LOCAL BUSINESS ENTERPRISES (ELBE)
PROGRAM

1. **INTRODUCTION.** This contract is subject to the requirements of the SLBE Program as specified in the SLBE-ELBE section of the City’s EOCP Requirements included in The WHITEBOOK.

1.1. The Bidders are required to review The WHITEBOOK and become familiar with the detailed specifications including the required documentation and the submittal schedule as related to SLBE-ELBE program.

2. **AMENDMENTS TO THE CITY’S GENERAL EOCP REQUIREMENTS.**

III. Equal Employment Opportunity Outreach Program (A). DELETE in its entirety and SUBSTITUTE with the following:

A. Competitive Bids. If a contract is competitively solicited, the Apparent Low Bidder shall submit a *Work Force Report (Form BB05)* or an Equal Employment Opportunity (EEO) Plan, within 10 Working Days after receipt by the Bidder of Contract forms to the City for approval as specified in the Notice of Intent to Award letter from the City.

3. **AMENDMENTS TO THE CITY’S EOCP SLBE-ELBE REQUIREMENTS.**

VIII. Subcontracting Efforts Review and Evaluation (2b). DELETE in its entirety and SUBSTITUTE with the following:

b) “Make information of forthcoming opportunities available to SLBE-ELBE firms and arrange time for contracts and establish delivery schedules, where requirements permit, in a way that encourages and facilitates participation by SLBE-ELBE firms in the competitive process. This includes posting solicitations for bids or proposals for a minimum of 10 Working Days before the Bid or Proposal due date.”

VIII. Subcontracting Efforts Review and Evaluation (3) and (4). DELETE in its entirety and SUBSTITUTE with the following:

3. Good Faith Effort Documentation Requirements

If the stated SLBE-ELBE subcontractor participation percentages are not met, the Bidder shall submit, within 3 Working Days of the Bid opening, information necessary to establish adequate good faith efforts were taken to meet the contract subcontractor participation percentages. The required documentation includes the following:

A. ADVERTISEMENT REQUIREMENTS

Advertisements for subcontract work must comply with the following requirements:

1. Advertisements must be published at least 10 Working Days prior to bid opening. Provide the names and dates of each publication of where the advertisement was published.

Note: The advertisement is not required to be published everyday for the 10 Working Days prior to bid opening.

2. There must be at least 2 advertisements published, 1 advertisement in a trade publication and 1 in a focus group publication. Additional advertising for SLBE-ELBE participation may be placed in newspapers, trade papers and on the Internet. For a listing of publications accepting advertisements, please visit the City's EOC home page at <http://www.sandiego.gov/eoc/>

- 2.1 Newspaper advertisements must be in the Bids Wanted, Legal Notices section of the Classified Ads, Subcontracting Opportunities or Business Opportunities **NOT** the Employment Opportunities Section.

3. Advertisements must state which items or portions of work the Bidder is requesting subcontractor pricing.

- 3.1 It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet specified subcontracting participation percentage and at a minimum an amount of work equal to the specified subcontracting participation amount. If necessary to reach the specified subcontracting participation percentage, the Work shall include those items normally performed by the Bidder with its own forces or supplies and even items with a dollar value below 1/2 of 1% of the total Bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.

4. Advertisements must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.

5. Advertisements must state that assistance is available from the Bidder for SLBE-ELBE Subcontractors in obtaining necessary equipment, supplies, or materials.
6. Advertisements must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
7. Bidders MUST provide proof of publication of each advertisement by providing the publication affidavit which must include a legible copy of the entire advertisement and the original ENTIRE page of the publication in which the advertisement appears.

B. SLBE-ELBE WRITTEN SOLICITATION REQUIREMENTS

Bidders must directly solicit SLBE-ELBE firms on the City's approved SLBE-ELBE list. Solicitations for Subcontractor or Supplier work must comply with the following requirements:

1. The solicitation must be dated and list the name of the SLBE-ELBE firm. Solicitations must be made to the SLBE-ELBE firms at least 10 Working Days prior to bid opening.
2. Solicitation must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 2.1 It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet the specified subcontractor participation percentage and at a minimum an amount of work equal to the subcontractor participation amount. If necessary to reach the specified subcontracting participation percentage, the Work shall include those items normally performed by the Bidder with its own forces, supplies and even items with a dollar value below 1/2 of 1% of the total Bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
3. Solicitation must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.

4. Solicitations must state that assistance is available from the Bidder for SLBE-ELBE subcontractors in obtaining necessary equipment, supplies, or materials.
5. Solicitations must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
6. Bidder must solicit **ALL** SLBE-ELBE firms on the City's approved list, who have the NAICS code for the subcontract work sought by the Contractor.
7. Bidders must provide copies of **ALL** solicitations with one of the following forms of verification that the solicitations were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

C. **SLBE-ELBE WRITTEN SOLICITATION FOLLOW-UP REQUIREMENTS**

Bidders must follow-up with all SLBE – ELBE firms that were notified of the subcontracting opportunities to determine their level of interest and commitment to bid the Project. When following up with the SLBE – ELBE firms, the Bidder must do the following:

1. Follow up communications must start no less than 5 Working Days prior to bid opening.
2. Bidders must follow up with all SLBE-ELBE firms in writing. Bidders must provide copies of **ALL** written follow up notices with one of the following forms of verification that the follow up notices were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).
 - c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

3. Bidders must make at least 3 follow-up telephone calls to each SLBE – ELBE firm at least 5 days prior to bid opening date. Bidders must submit a telephone log as identified below.
 - 3.1. Submit a telephone log, as proof of telephone call, with the following requirements: project name, name of person making the phone call, name of firm contacted, contact person's name, date of call, time of call, and details of conversation.

D. SUBCONTRACT AWARD SUMMARY

Bidders must act in good faith with interested SLBE-ELBE firms and may only reject bids for legitimate business reasons. The Bidder must submit the following documentation:

1. A **DETAILED** summary sheet which includes Bid item number, scope of work, Subcontractor or Supplier name, bid amount, certification type, Subcontractor or Supplier selection and reason for selection or non-selection of all the Subcontractor or Supplier that responded.
2. Copies of all Subcontractor or Suppliers bids received including bids for areas of work that were not included in the outreach and quotes from both certified and non-certified Subcontractors or Suppliers. Subcontractor bid amounts **MUST** match the bid-listed dollar amounts on form AA35 and AA40 submitted with Bidders sealed bid and the summary sheet dollar amounts **MUST** also match these amounts. If the Bidder decides to self-perform a scope of work, the Bidder **MUST** submit a detailed quote to show that the Bidder's price is competitive to the price of the subcontractors that responded to outreach efforts. All dollar amounts and scopes of work on the Subcontractor or Supplier bid must not be altered by the prime Bidder. If a revision is necessary, a revised quote must be obtained and provided. All verbal quotes **MUST** be substantiated by corresponding written quote from the Subcontractor or Supplier.

E. OUTREACH ASSISTANCE REQUIREMENTS

Written notice of subcontractor opportunities must be forwarded to local organizations or groups to assist with outreach efforts. When contacting local organizations or groups, the Bidder **must do** the following:

1. Contact a minimum of 5 local organizations or groups to provide assistance in contacting, recruiting and using SLBE-ELBE firms by written notice. For a listing of organizations or groups offering assistance, please visit the City's EOC home page at <http://www.sandiego.gov/eoc/>
2. Written notice must indicate the date of the notice and name of the local organization or group. Written notices must be forwarded to the organizations or groups at least 10 Workings Days prior to bid opening.
3. Written notice must state which items or portions of work the Bidder is requesting subcontractor pricing.
 - 3.1 It is the Bidder's responsibility to demonstrate that enough work sufficient to meet the SLBE-ELBE subcontractor participation percentage was made available to SLBE-ELBE firms. The Bidder shall make as many items of Work available as possible to meet the subcontractor participation percentage, and at a minimum an amount of work equal to the subcontracting participation amount. If necessary to reach the subcontractor participation percentage, the work should include those items normally performed by the Bidder with its own forces, supplies and even items with a dollar value below 1/2 of 1% of the total bid. Bidders shall utilize Form AA60 to demonstrate compliance with this requirement and submit the completed form with Good Faith Effort documentation.
4. Written notice must state that Plans and Specifications are available at no cost to interested SLBE-ELBE firms and how to obtain them.
5. Written notice must state that assistance is available from the Bidder for SLBE-ELBE Subcontractors in obtaining necessary equipment, supplies, or materials.
6. Written notice must state that assistance is available from the Bidder for SLBE-ELBE firms in obtaining bonding, lines of credit, or insurance.
7. Bidders must provide copies of **ALL** notices with one of the following forms of verification that the notices were sent:
 - a) If mailed: provide copies of the metered envelopes or certified mail receipts.
 - b) If faxed: provide copies of the fax transmittal confirmation sheet(s).

c) If emailed: provide copies of the email delivery confirmation sheet(s).

No credit shall be given for error messages, busy, cancelled, undeliverable, etc.

4. SUBCONTRACTING PARTICIPATION PERCENTAGES. The Bidders are encouraged to take positive steps to diversify and expand their subcontractor solicitation base and to offer contracting opportunities to all certified Subcontractors including SLBEs, ELBEs, DBEs, MBEs, WBEs, DVBEs and OBEs.

4.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

- | | |
|----------------------------------|-------------|
| 1. SLBE participation | 0.5% |
| 2. ELBE participation | 0.9% |
| 3. Total mandatory participation | 1.4% |

4.2. For the purpose of achieving the subcontractor participation level (percentage), Additive, Deductive, and Allowance Bid Items will not be included in the calculation.

5. PRE-BID CONFERENCE. A Pre-Bid Conference is scheduled for this contract as specified in the Invitation to Bids. The purpose of this meeting is to inform Bidders of the submittal requirements and provisions relative to the SLBE Program. Bidders are strongly encouraged to attend the Pre-Bid Conference to better understand the Good Faith Effort requirements of this contract.

6. MANDATORY CONDITIONS. Bid will be declared **non-responsive** if the Bidder fails the following mandatory conditions.

6.1. Bidder's inclusion of SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**

6.2. Bidder's submission of Good Faith Effort documentation demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within 3 Working Days of the Bid opening if the overall mandatory participation percentage is not met.

7. BID DISCOUNT. This contract is subject to the Bid Discount program as described in The WHITEBOOK, SLBE-ELBE Program Requirements, Section IV(2).

8. RESOURCES. The current list of certified SLBE-ELBE firms can be found on the EOC Department website at <http://www.sandiego.gov/eoc/>

CITY OF SAN DIEGO, CALIFORNIA

INVITATION TO BIDS

- 1. RECEIPT AND OPENING OF BIDS:** Bid(s) will be received at the Public Works Contracting Group at **1200 THIRD AVENUE, SUITE 200, SAN DIEGO, CA 92101 UNTIL 2:00 PM ON JUNE 13, 2012** for performing work on the following project (Project):

Casa De Balboa HVAC Project

- 2. DESCRIPTION OF WORK:** The Work involves furnishing all labor, materials, equipment, services, and other incidental works and appurtenances for the construction of the Project as described below:

Upgrade existing HVAC system.

The Work shall be performed in accordance with:

- Bid No. **K-12-5196-DBB-3-B** and Plans numbered **36649-1-D** through **36649-21-D**, inclusive.
 - Provide and install McQuay Air Conditioning Units (Appendix D) or approved equal and Vapac LE Series Electrode Steam Humidifiers (Appendix E) or approved equal to meet all requirements in the supplied specification set forth by the customer, manufacturer, and all applicable codes and requirements.
 - Coordination with City Forces for Asbestos Removal
- 3. ENGINEER'S ESTIMATE:** The Engineer's estimate of the most probable price for this contract is **\$946,300**.
 - 4. LOCATION OF WORK:** The location of Work is Citywide unless specified otherwise as follows:

**Casa De Balboa
1649 El Prado
Balboa Park
San Diego, CA 92101**

- 5. CONTRACT TIME:** The Contract Time for completion of the Work shall be **66 Working Days**.
- 6. CONTRACTOR'S LICENSE CLASSIFICATION:** In accordance with the provisions of California Law, the Contractor shall possess valid appropriate license(s) at the time that the Bid is submitted. Failure to possess the specified license(s) shall render the Bid as **non-responsive** and shall act as a bar to award of the Contract to any Bidder not possessing required license(s) at the time of Bid.

The City has determined the following licensing classification(s) for this contract:

Option	Classification(s)
1	CLASS C 20
2	CLASS B

The Bidder shall satisfy the licensing requirement by meeting **at least** one of the listed options.

7. **PRE-BID CONFERENCE:** There will be a Pre-Bid Conference to discuss the scope of the Project, bidding requirements, and Equal Opportunity Contracting Program requirements and reporting procedures in the Public Works Contracting Group, Conference Room at 1200 Third Avenue, Suite 200, San Diego, CA 92101 at **10:00 A.M., on May 22, 2012.**

All potential bidders are strongly encouraged to attend.

To request a copy of the agenda on an alternative format, or to request a sign language or oral interpreter for this meeting, call the Public Works Contracting Group at (619)236-6000 at least 5 Working Days prior to the Pre-Bid Conference to ensure availability.

8. **CITY PROJECT MANAGER CONTACT INFORMATION:** See the cover of the Contract Documents.
9. **REFERENCE STANDARDS:** Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

1. STANDARD SPECIFICATIONS

Document No.	Filed	Description
PITS0504091	05-04-09	Standard Specifications for Public Works Construction (The GREENBOOK), 2009 Edition
PITS090110-1	09-01-10	City of San Diego Standard Specifications for Public Works Construction (The WHITEBOOK), 2010 Update *
AEC1231064	12-31-06	California Department of Transportation, Manual of Uniform Traffic Control Devices (MUTCD 2006)
769023	09-11-84	Standard Federal Equal Employment Opportunity Construction Contract Specifications and the Equal Opportunity Clause

NOTE: The City of San Diego Supplement, 2010 Update now consolidates various City Public Works Construction Standard Specifications which in the past were included in the Supplementary Special Provisions. The Bidders' attention is directed to this edition of the City Supplement for a close review to ensure no important information is missed for the preparation of the Bids.

2. STANDARD DRAWINGS

Document No.	Filed	Description
AEC1230163	12-31-06	City of San Diego Standard Drawings*
N/A	Varies	City Standard Drawings - Updates Approved For Use (when specified)*
AEC0925061	09-25-06	Caltrans 2006 U.S. Customary Unit Standard Plans

NOTE: Available online under Engineering Documents and References at: <http://www.sandiego.gov/engineering-cip>.

10. WAGE RATES: Prevailing wages are not applicable to this project unless specified otherwise on the cover page of these specifications and when included in these specifications. See Funding Agency Provisions that follow this Invitation to Bid for more information.

11. PRE-BID SITE VISIT: The prospective Bidders are **encouraged** to visit the Work Site with the Engineer. The purpose of the Site visit is to acquaint Bidders with the Site conditions. To request a sign language or oral interpreter for this visit, call the Public Works Contracting Group at (619) 236-6000 at least 5 Working Days prior to the meeting to ensure availability. A Pre-Bid Site Visit is offered when the details are provided as follows:

Time: 11 A.M.

Date: May 22, 2012

Location: Casa De Balboa, 1649 El Prado Balboa Park, San Diego, CA 92101

12. INSURANCE REQUIREMENTS: Upon receipt of the City's Notice of Intent to Award letter, the Contractor will be asked to submit all certificates of insurance and endorsements to the City.

Refer to sections 7-3, "LIABILITY INSURANCE", and 7-4, "WORKERS' COMPENSATION INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.

You must ensure all required insurance certificates and endorsements are submitted accurately and on time. Failure to provide the requisite insurance documents by the date stated in the City's Notice of Intent to Award will result in delay of contract award and may result in annulment of the contract award or other more severe sanctions as provided in the City's Municipal Code §22.0807(e),(3)-(5).

Tony Heinrichs, Director
Public Works Department

INSTRUCTIONS TO BIDDERS

- 1. PREQUALIFICATION OF CONTRACTORS:** The contractor(s) who intend to submit Bid or Proposal in response to this invitation to bid, or RFP's for GRC or As-Needed Design-Build Task Orders valued over \$50,000, must be pre-qualified for total amount proposed, inclusive of all alternate bid items or the specified Task Order limits prior to the date of Bid submittal.

Bids from contractors who have not been pre-qualified as applicable, and Bids that exceed the maximum dollar amount at which contractors are pre-qualified, will be deemed **non-responsive** and ineligible for award or a Task Order authorization. Complete information and prequalification questionnaires are available at:

<http://www.sandiego.gov/engineering-cip/services/consultcontract/prequal.shtml>

The completed questionnaire, financial statement, and bond letter or a copy of the contractor's SLBE-ELBE certification and bond letter, must be submitted no later than 2 weeks prior to the bid opening to the Public Works Department - Engineering & Capital Project, Prequalification Program, 1010 Second Avenue, Suite 1200, San Diego, CA 92101. For additional information or the answer to questions about the prequalification program, please contact David Stucky at 619-533-3474 or dstucky@sandiego.gov.

- 2. CONTRACTOR REGISTRATION:** Prospective bidder(s) as well as existing contractors and suppliers are required to register with the City's EOCP. Refer to 2-17, "CONTRACTOR REGISTRATION" for details.
- 3. CITY'S RESPONSES AND ADDENDA:** The City at its option, may respond to any or all questions submitted in writing, via letter, or FAX in the form of an addendum. No oral comment shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addendum are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda on the form provided for this purpose in the Bid.
- 4. CITY'S RIGHTS RESERVED:** The City reserves the right to cancel the Invitation to Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Invitation to Bid shall be the sole responsibility of each bidder. The Invitation to Bid creates or imposes no obligation upon the City to enter a contract.
- 5. CONTRACT PRICING FORMAT:** This solicitation is for a Lump Sum contract with Unit Price provisions as set forth in the Bid Proposal Form(s), Volume 2 unless specified otherwise such as as-needed contracts e.g., GRC in the Contract Documents.
- 6. SUBMITTAL OF "OR EQUAL" ITEMS:** See 4-1.6, "Trade Names or Equals."
- 7. AWARD PROCESS:** The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award, including the submittal of acceptable insurance and surety bonds pursuant to San Diego Municipal Code § 22.3007. If the responsible Bid does not exceed the City's engineering estimate, the City will, in most cases, prepare contract documents for execution within 3 weeks of the date of the Bid opening and award the Contract within 5 Working Days of receipt of properly executed Contract, bond, and insurance documents.

This contract is deemed to be awarded, and effective, only upon the signing of the Contract by the Mayor or designee of the City.

8. **SUBCONTRACT LIMITATIONS:** The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" which requires the Contractor to perform not less than the amount therein stipulated with its own forces. Failure to comply with these requirements may render the Bid **non-responsive** and ineligible for award.
9. **AVAILABILITY OF PLANS AND SPECIFICATIONS:** Contract Documents may be obtained by visiting the City's website: <http://www.sandiego.gov/engineering-cip/services/consultcontract/advertising.shtml>. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracting Group.
10. **QUESTIONS:** Questions about the meaning or intent of the Contract Documents as related to the scope of Work and of technical nature shall be directed to the Project Manager prior to Bid opening. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda, which will be uploaded to eBidboard (or mailed or delivered to all parties recorded by the City as having received the Contract Documents for Minor Construction contracts).

The Director (or designee), Public Works Department is the officer responsible for opening, examining, and declaring of competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Questions in these areas of responsibility (e.g., i.e. Pre-qualification, EOCP information, bidding activities, bonds and insurance, etc. as related to this contract shall be addressed to the Contract Administration, Public Works Contracting Group, 1200 Third Avenue, Suite 200, San Diego, California, 92101, Telephone No. (619) 236-6000.

Questions received less than 14 days prior to the date for opening of Bids may not be answered. Only questions answered by formal written addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. It is the Bidder's responsibility to become informed of any addenda that have been issued and to include all such information in its Bid.

11. **ELIGIBLE BIDDERS:** No person, firm, or corporation shall be allowed to make, file, or be interested in more than 1 Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf.
12. **SAN DIEGO BUSINESS TAX CERTIFICATE:** All Contractors, including Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, first floor, before the Contract can be executed.
13. **PROPOSAL FORMS:** Bid shall be made only upon the Bidding Documents i.e., Proposal form attached to and forming a part of the specifications. The signature of each person signing shall be in longhand.

The entire specifications for the bid package do not need to be submitted with the bid. Bidder shall complete and submit, only, all pages in the "Bidding Document" Section (see Volume 2) as their Bid per the schedule given under "Required Documents Schedule," (see Volume 1). Bidder is requested to retain for their reference other portions of the Contract Documents that are not required to be submitted with the Bid.

The City may require any Bidder to furnish a statement of experience, financial responsibility, technical ability, equipment, and references.

Bids and certain other specified forms and documents shall be enclosed in a sealed envelope and shall bear the title of the work and name of the Bidder and the appropriate State Contractors License designation which the Bidder holds.

Bids may be withdrawn by the Bidder prior to, but not after, the time fixed for opening of Bids.

14. BIDDERS' GUARANTEE OF GOOD FAITH (BID SECURITY):

With the exception of the contracts valued \$5,000 or less, GRC and Design-Build contracts, and contracts subject to the Small and Local Business Program of \$250,000 or less e.g., ELBE contracts, each Bidder shall accompany its Bid with either a cashier's check upon some responsible bank, or a check upon such bank properly certified or an approved corporate surety bond payable to the City of San Diego, for an amount of not less than 10% of the aggregate sum of the Bid, which check or bond, and the monies represented thereby shall be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into such contract and furnish the required final bonds.

The Bidder agrees that in case of Bidder's refusal or failure to execute this contract and give required final bonds, the money represented by a cashier's or certified check shall remain the property of the City, and if the Bidder shall fail to execute this contract, the Surety agrees that it will pay to the City damages which the City may suffer by reason of such failure, not exceeding the sum of 10% of the amount of the Bid.

A Bid received without the specified bid security will be rejected as being **non-responsive**.

15. AWARD OF CONTRACT OR REJECTION OF BIDS:

This contract may be awarded to the lowest responsible and reliable Bidder (for Design-Build contracts refer to the RFP for the selection and award information). Bidders shall complete the entire Bid schedule (e.g., schedule of prices). Incomplete price schedules will be rejected as being non-responsive.

The City reserves the right to reject any or all Bids, and to waive any informality or technicality in Bids received and any requirements of these specifications as to bidding procedure.

Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City from the Bidder within 3 Working Days, excluding Saturdays, Sundays, and state holidays, after the opening of Bids, of written notice which includes proof of honest, credible, clerical error of material nature, free from fraud or fraudulent intent, and of evidence that reasonable care was observed in the preparation of the Bid.

A non-selected Bidder may protest award of the Contract to the selected Bidder by submitting a written "Notice of Intent to Protest" including supporting documentation which shall be received by Public Works Contracting Group no later than 10 days after the City's announcement of the selected Bidder or no later than 10 days from the date that the City issues notice of designation of a Bidder as non-responsible in accordance with San Diego Municipal Code Chapter 2, § 22.3029, "Protests of Contract Award."

The City of San Diego will not discriminate with regard to race, religious creed, color, national origin, ancestry, physical handicap, marital status, sex or age, in the award of contracts.

Each Bid package properly executed as required by these specifications shall constitute a firm offer, which may be accepted by the City within the time specified in the Invitation to Bids.

The City reserves the right to evaluate all Bids and determine the lowest Bidder (or winner for Design-Build contracts) on the basis of any proposed alternates, additive items or options, at its discretion.

- 16. BID RESULTS:** The Bid opening by the City shall constitute the public announcement of the Apparent Low Bidder (or Apparent Winner in case of Design-Build contracts). In the event that the Apparent Low Bidder (or Apparent Winner in case of Design-Build contracts) is subsequently deemed non-responsive or non-responsible, a public announcement will be posted in the City's web page, with the name of the newly designated Apparent Low Bidder (or Apparent Winner in case of Design-Build contracts).

To obtain Bid results, either attend Bid opening, review the results on the City's web site, or provide a self-addressed, stamped envelope, referencing Bid number, and Bid tabulation will be mailed to you upon verification of extensions. Due to time constraints, Bid results cannot be given out over the telephone.

- 17. THE CONTRACT:** The Bidder to whom award is made shall execute a written contract with the City of San Diego and furnish good and approved bonds and insurance certificates specified by the City within 10 Working Days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.

If the Bidder takes longer than 10 Working Days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.

If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.

For contracts that are not Design-Build, pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 10

Working Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.

The award of the Contract is contingent upon the satisfactory completion of the above mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.

18. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK: The Bidder shall examine carefully the Project Site, the Plans and Specifications, the GRC Unit Price Books if applicable, other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents) therefore. The submission of a Bid or GRC Task Order Proposal shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of Work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.

19. DRUG-FREE WORKPLACE:

a) General:

City projects are subject to City of San Diego Resolution No. R-277952 adopted on May 20, 1991. Bidders shall become aware of the provisions of Council Policy 100-17 which was established by Resolution No. R-277952. The policy applies equally to the Contractor and Subcontractors. The elements of the policy are outlined below.

b) Definitions:

"Drug-free workplace" means a site for the performance of work done in connection with a contract let by City of San Diego for the construction, maintenance, or repair of any facility or public work by an entity at which employees of the entity are prohibited from engaging in the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance in accordance with the requirements of this section.

"Employee" means the employee of a contractor directly engaged in the performance of work pursuant to a contract as described in Section 3, "City Contractor Requirements."

"Controlled substance" means a controlled substance in schedules I through V of Section 202 of the Controlled Substances Act (21 U.S.C. Sec. 812).

"Contractor" means the department, division, or other unit of a person or organization responsible to the contractor for the performance of a portion of the work under the contract.

c) City Contractor Requirements:

Every person or organization awarded a contract or grant by the City of San Diego for the provision of services shall certify to the City that it will provide a drug-free workplace by doing all following:

- a. Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in the person's organization's workplace and specifying the actions that will be taken against employees for violations of the prohibition.
- b. Establishing a drug-free awareness program to inform employees about all of the following:
 - i. The dangers of drug abuse in the workplace.
 - ii. The person's or organization's policy of maintaining a drug-free workplace.
 - iii. Any available drug counseling, rehabilitation, and employee assistance programs.
 - iv. The penalties that may be imposed upon employees for drug abuse violations.
- c. Posting the statement required by subdivision (1) in a prominent place at contractor's main office. For projects large enough to necessitate a construction trailer at the job site, the required signage would also be posted at the Site.

The Contractor shall include in each subcontract agreement language which indicates the Subcontractor's agreement to abide by the provisions of subdivisions a) through c) above. The Contractors and Subcontractors shall be individually responsible for their own drug-free workplace programs.

Note: The requirements of a drug-free awareness program can be satisfied by periodic tailgate sessions covering the various aspects of drug-abuse education. Although an in-house employee assistance program is not required, contractors should be able to provide a listing of drug rehabilitation and counseling programs available in the community at large.

Questions about the City's Drug-free Workplace Policy shall be referred to the Contract Specialist, Public Works Contracting Group.

20. AMERICANS WITH DISABILITIES ACT:

- a) General: City projects are subject to City of San Diego Resolution No. R-282153 adopted on June 14, 1993. The Bidders shall become aware of the provisions of Council Policy 100-04 which was established by Resolution No. R-282153. The policy applies equally to the Contractor and all Subcontractors. The elements of the policy are outlined below.
- b) Definitions:

"Qualified individual with a disability" means an individual with a disability who satisfies the requisite skill, experience, education and other job-related requirements of the employment position such individual holds or desires, and who, with or without reasonable accommodation, can perform the essential functions of such position.

"Employee" means the employee of the Contractor directly engaged in the performance of Work.

- c) The City Requirements: Every person or organization entering into a contractual agreement with or receiving a grant from the City of San Diego shall certify to the City of San Diego that it will comply with the ADA by adhering to all of the provisions of the ADA listed below.
 - i. The Contractor shall not discriminate against qualified persons with disabilities in any aspects of employment, including recruitment, hiring, promotions, conditions and privileges of employment, training, compensation, benefits, discipline, layoffs, and termination of employment.
 - ii. No qualified individual with a disability may be excluded on the basis of disability, from participation in, or be denied the benefits of services, programs, or activities by the Contractor or Subcontractors providing services for the City.
 - iii. The Contractor shall post a statement addressing the requirements of the ADA in a prominent place at the worksite. The Contractor shall include in each subcontract agreement, language which indicates the Subcontractor's agreement to abide by the provisions of subdivisions (a) through (c) inclusive of Section 3. The Contractor and Subcontractors shall be individually responsible for their own ADA employment programs. Questions about the City's ADA Policy should be referred to the Contract Administrator.

21. CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE: This contract is subject to City of San Diego Municipal Code §22.3224 as amended 11/24/08 by ordinance O-19808. Bidders shall become aware that the requirements apply to Contractors and Subcontractors for contracts greater than \$50,000 in value.

Upon award, amendment, renewal, or extension of this contract, the Contractors shall complete a Pledge of Compliance attesting under penalty of perjury that they complied with the requirements of this section.

The Contractors shall ensure that their Subcontractors whose subcontracts are greater than \$50,000 in value complete a Pledge of Compliance attesting under penalty of perjury that they complied with the requirements of this section. Subcontractors may access the Pledge of Compliance at:

http://www.sandiego.gov/purchasing/pdf/contractor_standards_questionnaire.pdf.

The Contractors shall include in each subcontract agreement, language which requires Subcontractors to abide by the provisions of City of San Diego Municipal Code §22.3224. A sample provision is as follows:

“Compliance with San Diego Municipal Code §22.3224: Subcontractor acknowledges that it is familiar with the requirements of San Diego Municipal Code §22.3224 (“Contractor Standards”), and agrees to comply with requirements of that section. The Subcontractor further agrees to complete the Pledge of Compliance, incorporated herein by reference.”

- 22. NOTICE OF LABOR COMPLIANCE PROGRAM APPROVAL:** The City of San Diego received initial approval as a Labor Compliance Program on August 11, 2003. The Labor Compliance Program Manual is available at:

<http://www.sandiego.gov/eoc/laborcompliance/#manual>.

The limited exemption from prevailing wages pursuant to Labor Code §1771.5(a) does not apply to contracts under jurisdiction of the Labor Compliance Program. Inquiries, questions, or assistance about the Labor Compliance Program should be directed to: Equal Opportunity Contracting Program, 1200 Third Ave., Suite 200 MS56P, San Diego, CA 92101, Tel. 619-236-6000.

- 23. PAYROLL RECORDS:** The Contractor's attention is directed to the City of San Diego Labor Compliance Program, Section IV, pages 4-7, and the State of California Labor Code §§ 1771.5(b) and 1776 (Stats. 1978, Ch. 1249). These require, in part, that the Contractor and Subcontractors maintain and furnish to the City, at a designated time, a certified copy of each weekly payroll containing a statement of compliance signed under penalty of perjury.

The Contractor and Subcontractors shall submit weekly certified payrolls online via Prism® i.e., the City's web-based labor compliance program. Instructions on how to use the system will be provided to the Contractor after the award.

The Contractor shall be responsible for the compliance with these provisions by Subcontractors. The City shall withhold contract payments when payroll records are delinquent or inadequate, or when it is established after investigation that underpayment has occurred.

- 24. APPRENTICES ON PUBLIC WORKS:** The Contractor shall abide by the requirements of §§1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.

- 25. EQUAL BENEFITS:** This contract is subject to the City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of the San Diego Municipal Code (SDMC).

In accordance with the EBO, Bidders shall certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the Contract (SDMC §22.4304(f)). Failure to maintain equal benefits is a material breach of the Contract (SDMC §22.4304(e)). The Contractor shall notify employees of their equal benefits policy at the time of hire and during open enrollment periods and shall post a copy of the following statement in an area frequented by employees:

“During the performance of a contract with the City of San Diego, this employer will provide equal benefits to its employees with spouses and its employees with domestic partners.”

The Contractor shall give the City access to documents and records sufficient for the City to verify the contractors are providing equal benefits and otherwise complying with EBO requirements.

Full text of the EBO and the Rules Implementing the Equal Benefits Ordinance are posted on the City's website at www.sandiego.gov/purchasing/ or can be requested from the Equal Benefits Program at (619) 533-3948.

26. PRE-AWARD ACTIVITIES:

Pre-award Submittals - The Apparent Low Bidder (or winner in case of Design-Build contracts) shall provide the information required within the time specified in “Required Documents,” of this bid package. Failure to provide the information within the time specified may result in the Bid being rejected as **non-responsive**.

If the Bid is rejected as non-responsive, the Apparent Low Bidder (or winner in case of Design-Build contracts) shall forfeit the Bid Security required under Invitation to Bids, of this bid package. The decision that the Apparent Low Bidder (or winner in case of Design-Build contracts) is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

CONTRACT FORMS AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and PARADIGM MECHANICAL CORPORATION, herein called "Contractor" for construction of Casa De Balboa HVAC Project; Bid No. K-12-5196-DBB-3-B, in the amount of EIGHT HUNDRED EIGHTY-EIGHT THOUSAND DOLLARS AND 00/100 (\$888,000.00), which is comprised of the Base Bid alone.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

1. The following are incorporated into this contract as though fully set forth herein:
 - (a) The attached Faithful Performance and Payment Bonds.
 - (b) The attached Proposal included in the Bid documents by the Contractor.
 - (c) That certain documents entitled Casa De Balboa HVAC Project, on file in Public Works Contracting Group as Document No. B-00939, as well as all matters referenced therein.
2. Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner Casa De Balboa HVAC Project; Bid No. K-12-5196-DBB-3-B, San Diego, California.
3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and Contractor shall accept such payment in full satisfaction of all claims incident to such performances.
4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.
5. This contract is effective as of the date that the Mayor or designee signs the agreement.

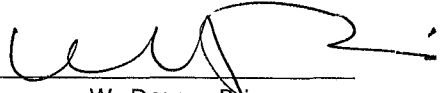
**CONTRACT FORMS (continued)
AGREEMENT**

IN WITNESS WHEREOF, this agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Resolution No. R-~~22.3010~~ or Municipal Code 22.3102 authorizing such execution. (WDP)

THE CITY OF SAN DIEGO

APPROVED AS TO FORM AND LEGALITY

Jan I. Goldsmith, City Attorney

By: 
W. Downs Prior
Principal Contract Specialist
Public Works Contracting

Mayor or designee

By: 
Print Name: Christina L. Rae
Deputy City Attorney

Date: 8/17/12

Date: 8/21/12

CONTRACTOR

By: Melinda Dicharry

Print Name: Melinda Dicharry

Title: President

Date: July 30, 2012

City of San Diego License No.: B 2011 005569

State Contractor's License No.: 947497

CONTRACT FORMS (continued)
PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

PARADIGM MECHANICAL CORPORATION _____, a corporation, as principal, and _____
Capitol Indemnity Corporation _____, a corporation authorized to
do business in the State of California, as Surety, hereby obligate themselves, their successors and
assigns, jointly and severally, to The City of San Diego a municipal corporation in the sum of
EIGHT HUNDRED EIGHTY-EIGHT THOUSAND DOLLARS AND 00/100 (\$888,000.00) for
the faithful performance of the annexed contract, and in the sum of **EIGHT HUNDRED EIGHTY-**
EIGHT THOUSAND DOLLARS AND 00/100 (\$888,000.00) for the benefit of laborers and
materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract **Casa De Balboa HVAC
Project; Bid No. K-12-5196-DBB-3-B**, San Diego, California then the obligation herein with respect
to a faithful performance shall be void; otherwise it shall remain in full force.

If the Principal shall promptly pay all persons, firms and corporations furnishing materials for
or performing labor in the execution of this contract, and shall pay all amounts due under the
California Unemployment Insurance Act then the obligation herein with respect to laborers and
materialmen shall be void; otherwise it shall remain in full force.

The obligation herein with respect to laborers and materialmen shall inure to the benefit of all
persons, firms and corporations entitled to file claims under the provisions of Chapter 3 of Division 5
of Title I of the Government Code of the State of California or under the provisions of Section 3082
et seq. of the Civil Code of the State of California.

Changes in the terms of the annexed contract or specifications accompanying same or
referred to therein shall not affect the Surety's obligation on this bond, and the Surety hereby waives
notice of same.

CONTRACT FORMS (continued)
PERFORMANCE BOND AND LABOR AND MATERIAL MEN'S BOND

The Surety shall pay reasonable attorney's fees should suit be brought to enforce the provisions of this bond.

Dated August 1, 2012

Approved as to Form and Legality

Paradigm Mechanical Corporation
Principal

By Melinda Dichary 07/30/12
Melinda Dichary, President
Printed Name of Person Signing for Principal

Jan I. Goldsmith, City Attorney

By Christina Kay 8/21/12
Deputy City Attorney

Capitol Indemnity Corporation
Surety

By [Signature]
Anne Wright, Attorney-in-fact

Approved:

By: [Signature]
W. Downs Prior
Principal Contract Specialist
Public Works Contracting 8/17/12

2121 N. California Blvd., Ste 300
Local Address of Surety

Walnut Creek, CA 94596
Local Address (City, State) of Surety

805-285-8777 or 925-262-2700
Local Telephone No. of Surety

Premium \$ 15,984

Bond No. 60076944

Note: For Notary, See Attached CA All

Purpose Ack. For MELINDA R. DICARY 28 | Page

CALIFORNIA ALL-PURPOSE ACKNOWLEDGEMENT

State of California

County of San Diego

} SS.

On 07/30/2012 Before Me VICTOR SINGH MALHI, a Notary Public
Name of Notary Public

Personally Appeared MELINDA R. DICHARRY
Name(s) of Signer(s)



Proved to me on the basis of satisfactory evidence

To be the person(s) whose name(s) is / are subscribed to the within instrument and acknowledged to me that he / she / they executed the same in his / her / their authorized capacity(ies) and that by his / her / their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

[Signature]
Signature of Notary Public

Notary Stamp

License Number Expires

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title our Type of Document: Contract Form

Document Date: 07/30/2012 Number of Pages 2

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signers Name: _____

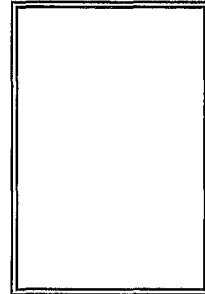
- Individual:
- Corporate Officer - Title(s): _____
- Partner - Limited General
- Attorney-in-fact
- Trustee
- Guardian or Conservator
- Other: _____

Signer is Representing _____

Right Thumb Print
of Signer 1



Right Thumb Print
of Signer 2



CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA

County of San Diego }

On August 1, 2012 before me, Dana L. Michaelis, Notary Public,
Date Here Insert Name and Title of the Officer

personally appeared Anne Wright
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

Witness my hand and official seal.

Signature Dana L. Michaelis
Signature of Notary Public Dana L. Michaelis



Place Notary Seal Above

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____ Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

- Individual
- Corporate Officer — Title(s): _____
- Partner — Limited General
- Attorney in Fact
- Trustee
- Guardian or Conservator
- Other: _____

RIGHT THUMBPRINT OF SIGNER

Top of thumb here

Signer Is Representing:

Signer's Name: _____

- Individual
- Corporate Officer — Title(s): _____
- Partner — Limited General
- Attorney in Fact
- Trustee
- Guardian or Conservator
- Other: _____

RIGHT THUMBPRINT OF SIGNER

Top of thumb here

Signer Is Representing:

**CAPITOL INDEMNITY CORPORATION
POWER OF ATTORNEY**

60076944

KNOW ALL MEN BY THESE PRESENTS, That the CAPITOL INDEMNITY CORPORATION, a corporation of the State of Wisconsin, having its principal offices in the City of Middleton, Wisconsin, does make, constitute and appoint

-----CYNDI BEILMAN, ANNE WRIGHT, DANA MICHAELIS-----

its true and lawful Attorney(s)-in-fact, to make, execute, seal and deliver for and on its behalf, as surety, and as its act and deed, any and all bonds, undertakings and contracts of suretyship, provided that no bond or undertaking or contract of suretyship executed under this authority shall exceed in amount the sum of

-----ALL WRITTEN INSTRUMENTS IN AN AMOUNT NOT TO EXCEED: \$20,000,000.00-----

This Power of Attorney is granted and is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of **CAPITOL INDEMNITY CORPORATION** at a meeting duly called and held on the 15th day of May, 2002.

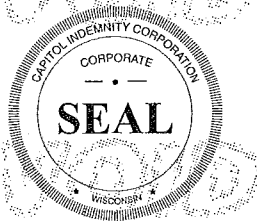
"RESOLVED, that the President, Executive Vice President, Vice President, Secretary or Treasurer, acting individually or otherwise, be and they hereby are granted the power and authorization to appoint by a Power of Attorney for the purposes only of executing and attesting bonds and undertakings, and other writings obligatory in the nature thereof, one or more resident vice-presidents, assistant secretaries and attorney(s)-in-fact, each appointee to have the powers and duties usual to such offices to the business of this company; the signature of such officers and seal of the Company may be affixed to any such power of attorney or to any certificate relating thereto, by facsimile, and any such power of attorney or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the Company; and any such power so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking or other writing obligatory in the nature thereof to which it is attached. Any such appointment may be revoked, for cause, or without cause, by any of said officers, at any time."

IN WITNESS WHEREOF, the **CAPITOL INDEMNITY CORPORATION** has caused these presents to be signed by its officer undersigned and its corporate seal to be hereto affixed duly attested, this 2nd day of May, 2011.

Attest:

Richard W. Allen III

Richard W. Allen III
President
Surety & Fidelity Operations



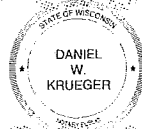
CAPITOL INDEMNITY CORPORATION

David F. Pauly

David F. Pauly
CEO & President

STATE OF WISCONSIN } s.s.
COUNTY OF DANE

On the 2nd day of May, 2011 before me personally came David F. Pauly, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Dane, State of Wisconsin; that he is President of **CAPITOL INDEMNITY CORPORATION**, the corporation described herein and which executed the above instrument; that he knows the seal of the said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.



Daniel W. Krueger

Daniel W. Krueger
Notary Public, Dane Co., WI
My Commission Is Permanent

STATE OF WISCONSIN } s.s.
COUNTY OF DANE

I, the undersigned, duly elected to the office stated below, now the incumbent in **CAPITOL INDEMNITY CORPORATION**, a Wisconsin Corporation, authorized to make this certificate, **DO HEREBY CERTIFY** that the foregoing attached Power of Attorney remains in full force and has not been revoked; and furthermore, that the Resolution of the Board of Directors, set forth in the Power of Attorney is now in force.

Signed and sealed at the City of Middleton, State of Wisconsin this 1st day of August, 2012.



Alan S. Ogilvie

Alan S. Ogilvie
Secretary

THIS DOCUMENT IS NOT VALID UNLESS PRINTED ON GRAY SHADED BACKGROUND WITH A RED SERIAL NUMBER IN THE UPPER RIGHT HAND CORNER. IF YOU HAVE ANY QUESTIONS CONCERNING THE AUTHENTICITY OF THIS DOCUMENT CALL 800-475-4450.

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

PROJECT TITLE: Casa De Balboa HVAC Project

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in INSTRUCTION TO BIDDERS, "Drug-Free Workplace", of the project specifications, and that;

Paradigm Mechanical Corp.

(Name under which business is conducted)

has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.

Signed Melinda Dicharry

Printed Name Melinda Dicharry

Title President

CONTRACTOR CERTIFICATION

AMERICAN WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

PROJECT TITLE: Casa De Balboa HVAC Project

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the American With Disabilities Act (ADA) outlined in the INSTRUCTION TO BIDDERS, "American With Disabilities Act", of the project specifications, and that;

Paradigm Mechanical Corp.
(Name under which business is conducted)

has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

Signed Melinda Dicharry
Printed Name Melinda Dicharry
Title President

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

PROJECT TITLE: Casa De Balboa HVAC Project

I declare under penalty of perjury that I am authorized to make this certification on behalf of Paradigm Mechanical Corp., as Contractor, that I am familiar with the requirements of City of San Diego Municipal Code § 22.3224 regarding Contractor Standards as outlined in INSTRUCTION TO BIDDERS ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors whose subcontracts are greater than \$50,000 in value has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3224.

Dated this 30 Day of July, 2012.

Signed Melinda Dicharry

Printed Name Melinda Dicharry

Title President

AFFIDAVIT OF DISPOSAL

WHEREAS, on the _____ DAY OF _____, 2____, the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

Casa De Balboa HVAC Project

(Project)

as particularly described in said contract and identified **Bid No. K-12-5196-DBB-3-B; SAP No. (WBS/CC/IO) B-00939**; and **WHEREAS**, the specifications of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

NOW, THEREFORE, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

and that they have been disposed of according to all applicable laws and regulations.

Dated this _____ DAY OF _____, 2_____.

by _____ Contractor

ATTEST:

State of _____
County of _____

On this _____ DAY OF _____, 2____, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared _____ known to me to be the _____ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

THESE SUPPLEMENTARY SPECIAL PROVISIONS CONFORM TO THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (THE GREENBOOK) CURRENTLY ADOPTED BY THE CITY, INCLUDING ITS CURRENT SUPPLEMENT AMENDMENTS (CITY SUPPLEMENTS INCLUDED IN THE WHITEBOOK), EXCEPT FOR THE FOLLOWING:

STYLE OF SPECIFICATIONS

The City is gradually standardizing the style and language of the standard specifications for the public works construction. The new style and language follows the Federal guidelines for “Plain Language” to the extent possible.

The use of this new style does not change the meaning of a specification not yet using this style. Where used in the Contract Documents, statement or command type phrases (i.e., active voice and imperative mood) refer to and are directed at the Bidder or Contractor as applicable. The specifications are written to the Bidder before award and the Contractor after. Before award, interpret sentences written in the imperative mood as starting with "The Bidder must" and interpret "you" as "the Bidder" and "your" as "the Bidder's." After award, interpret sentences written in the imperative mood as starting with "The Contractor must" and interpret "you" as "the Contractor" and "your" as "the Contractor's." Similarly, interpret "we" and “us” as "the City" and "our" as "the City's.”

PART 1 – GENERAL PROVISIONS

SECTION 1 – TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

1-2 TERMS AND DEFINITIONS.

Agency – ADD the following:

Regulatory activities handled by the City of San Diego Developmental Services, Fire and Planning Departments, or any other City Department are not subject to the responsibilities of the City under this contract.

Certificate of Compliance – To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

A written document signed and submitted by a supplier or manufacturer that certifies that the material or assembled material supplied to the Work site complies with the requirements of the Contract Documents.

Contract Documents – To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

The Agreement, Addendum, Invitation to Bid, Instructions to Bidders, special notice page, funding agency provisions, Bid and documentation accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award when attached as an exhibit to the Contract, Bonds, permits from jurisdictional regulatory agencies, Supplementary Special Provisions (SSP), City’s EOCP Requirements, City Supplement, Plans, Standard Plans, Construction Documents, Reference Specifications listed in the Invitation to Bid or the RFP for Design-Build contracts, Request for

Qualifications (RFQ), Statement of Qualifications (SOQ), Request for Proposals (RFP), modifications issued after the execution of the Contract e.g., Change Orders, Construction Manager At Risk's Guaranteed Maximum Price including written qualifications, assumptions and conditions thereto and Pre-construction Services Agreement.

ADD: Limited Notice To Proceed – A written notice given from the City to the Contractor that authorizes the Contractor to start a limited amount of work that is not Construction Work, such as finalizing subcontract agreements, ordering materials, mobilization, furnishing a field office, and any other preliminary work done prior to performing Construction Work.

Normal Working Hours. To the City Supplement, ADD the following:

The Normal Working Hours shall be **7:00 AM to 3:30 PM**.

Notice of Completion (NOC) – ADD the following:

See California Civil Code section 3093.

Samples - Physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be evaluated.

SECTION 2 - SCOPE AND CONTROL OF WORK

2-1.2.2 Joint Venture Contractors. To the City Supplement, last paragraph, DELETE in its entirety and SUBSTITUTE with the following:

The Joint Venture shall designate an on-site representative and an alternate in writing. The on-site representative and the alternate shall have the full authority to bind all Joint Venture partners.

The Joint Venture shall provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 10 Working Days after receipt by the Bidder of Contract forms.

2-3.1.2 Subcontractor List. ADD the following:

For Extra Work, the Contractor shall submit Form CC10, "CONTRACT CHANGE ORDER (CCO)" with each CCO proposal. Form CC10 is available for download from the EOCP site at: <http://www.sandiego.gov/eoc/pdf/cc10.pdf>

2-3.2 Self Performance. DELETE in its entirety and SUBSTITUTE with the following:

The Contractor shall perform, with its own organization, Contract work amounting to at least **50 percent** of the base bid alone or base bid and any additive or deductive alternate(s) that together when added or deducted form the basis of determining the Apparent Low Bidder as specified. The self performance percentage requirement will be waived for contracts when a "B" License is required or allowed.

2-3.3 Status of Subcontractors. ADD the following:

With every request for payment, the Contractor shall submit to the Engineer a breakdown showing monthly and cumulative amounts of the Work performed under Change Order by the Contractor and the Subcontractors. The reporting format shall be approved by the Engineer.

2-3.4 Subcontract Requirements. To the City Supplement, ADD the following paragraph:

The Contractor shall ensure that all of its Subcontractors are licensed at the time of the execution of their subcontract agreements. In the event a Subcontractor is not properly licensed, the Contractor shall cease payment to Subcontractor for all work performed when the Subcontractor was improperly licensed. Any payment made by the Contractor to a Subcontractor for work performed when the Subcontractor was unlicensed shall be returned to the City.

Where the Contract Documents require that a particular product be installed or applied by an applicator approved by the manufacturer, it is the Contractor's responsibility to ensure the Subcontractor or Supplier employed for such work is approved by the manufacturer.

2-5.2 Precedence of Contract Documents. To the Cit Supplement, DELETE in its entirety and SUBSTITUTE with the following:

2-5.2 Precedence of Contract Documents. If there is a conflict between any of the Contract Documents, the document highest in the order of precedence shall control. The order of precedence, from highest to lowest, shall be as follows:

- 1) Permits (i.e., issued by jurisdictional regulatory agencies)
- 2) Change Orders and Supplemental Agreements; whichever occurs last
- 3) Contract and Agreement
- 4) Addenda
- 5) Bid (e.g., price Proposal for Design-Build contracts)
- 6) Request for Proposal (RFP)
- 7) Invitation to Bid
- 8) Instruction to Bidders
- 9) Request for Qualifications (RFQ)
- 10) Special Provisions (i.e., City's EOCB Requirements, City Supplement, and Supplementary Special Provisions (SSP))
- 11) Plans
- 12) Construction Documents (for Design-Build contracts)
- 13) Standard Drawings
- 14) Reference Specifications (e.g., GREENBOOK)
- 15) Technical Proposal (for Design-Build contracts)
- 16) Statement of Qualifications (SOQ)

When additional requirements by the funding sources are physically or by reference incorporated in the Contract Documents, the funding source's requirements shall govern **unless specified otherwise**.

Figured dimensions shall take precedence over scaled dimensions. Detailed drawings shall take precedence over general drawings.

2-5.3.1 General. DELETE in its entirety and SUBSTITUTE with the following:

When required by the Contract Documents or when requested by the Engineer, the Contractor shall provide the submittals as specified in 2-5.3.2, 2-5.3.3, and 2-5.3.4 to the Engineer. Materials shall neither be furnished nor fabricated, nor shall any work for which submittals are required be performed before the required submittals have been reviewed and accepted by the Engineer. The

payment for the submittals shall be included in the various Bid items. Neither review nor acceptance of submittals by the Engineer shall relieve the Contractor from responsibility for errors, omissions, or deviations from the Contract Documents, unless such deviations were specifically called to the attention of the Engineer in the letter of transmittal. The Contractor shall be responsible for the correctness of the submittals.

The Contractor shall allow a minimum of 20 working days for review of submittals unless otherwise specified in the Special Provisions. Each submittal shall be accompanied by a letter of transmittal.

2-5.4.1 General. ADD the following:

Source Identification e.g., RFI numbers and Change Order numbers as required to identify the source of the change to the Contract Documents shall be noted.

2-5.4.2 Asset Specific Red-lines (d). ADD the following:

- Dimensional changes to the drawings.
- Revisions to details shown on drawings.
- Depths of foundations below first floor.
- Locations and depths of underground utilities.
- Revisions to routing of piping and conduits.
- Revisions to electrical circuitry.
- Actual equipment locations.
- Duct size and routing.
- Locations of concealed internal utilities.
- Changes made by Change Order.
- Details not on original Plans.

2-6 WORK TO BE DONE. ADD the following:

In accordance with the provisions of California Law, the Contractor shall possess or require the Subcontractor(s) to possess valid appropriate license(s) for the Work being performed.

2-10 AUTHORITY OF BOARD AND ENGINEER. ADD the following:

Regulating agencies of the City, such as Developmental Services, Fire and Planning Departments, enforce Legal Requirements and standards. These enforcement activities are not subject to the responsibilities of the Engineer under this Agreement.

2-11 INSPECTION. ADD the following:

The City may utilize field inspectors to assist the Engineer during construction in observing performance of the Contractor. The inspector is for the purpose of assisting the Engineer and shall not be confused with an inspector with a City regulatory agency or with a Special Inspector.

Code compliance testing (including all Geotechnical requirements) and inspections required by codes or ordinances, or by a plan approval authority, shall be the responsibility of and shall be paid by the Contractor, unless otherwise provided in the Contract Documents.

The Contractor's quality control testing and inspections shall be the sole responsibility of the Contractor and paid by the Contractor included in the Bid price.

2-16 TECHNICAL STUDIES AND DATA. To the City Supplement, ADD the following:

In preparation of the Contract Documents, the designer has relied upon the following studies, data, reports of explorations, and tests:

1. Structural Calculations by Orion Structural Engineering, Inc.

The report(s) listed above is(are) available for review by contacting the City Project Manager or visiting:

ADD: 2-17 CONTRACTOR REGISTRATION. The Contractor, Subcontractors, and Suppliers shall register with the City's EOCP via Prism® i.e., the City's web-based contract compliance portal at: <https://pro.prismscompliance.com/contractor/plugins/pages/contractormenu.aspx>.

The Contractor shall ensure that proposed Subcontractors and Suppliers have completed the registration prior to Notice of Intent to Award. If the Contractor fails to have its Subcontractors and Suppliers registered after the NTP has been issued, the City will withhold a minimum of 10% in addition to the Retention from all invoices submitted until the Contractor and all listed Subcontractors and Suppliers are properly registered in PRISM.

SECTION 3 – CHANGES IN WORK

3-3.2.2 Basis for Establishing Costs. To the City Supplement, item (a) Labor, 1st and 2nd paragraphs, DELETE in their entirety and SUBSTITUTE with the following:

The City reserves the right to request financial records of salaries for an employee, wages, bonuses and deductions to substantiate the actual cost of labor certified by a California licensed Certified Public Accountant. The Contractor shall use the City provided form i.e., "PUBLIC WORKS PAYROLL REPORTING FORM" which is available at <http://www.sandiego.gov/eoc/pdf/payrollreport.pdf> to list the labor rates of its personnel and Subcontractors who work on this Project. An initial submittal shall be made prior to NTP.

The payment for payroll records shall be included in the various Bid item unless a separate Bid item has been provided.

SECTION 4 - CONTROL OF MATERIALS

4-1.3.4 Inspection Paid For By the Contractor. To the City Supplement, ADD the following:

The Contractor shall employ and pay for the services of qualified inspection entity to perform specialty inspection services as specified here:

- Welding Inspector

4-1.3.5 Special Inspections. To the City Supplement, ADD the following:

Special Inspection and testing by the Special Inspectors shall meet the minimum requirements of the prevailing Codes and by the City's Development Services Department (DSD) and reference in <http://www.sandiego.gov/development-services/industry/special.shtml>

4-1.5 Certificates of Compliance. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

4-1.5 Certificates of Compliance. DELETE in its entirety and SUBSTITUTE with the following:

Certificates of Compliance shall be furnished to the Engineer prior to the use of any material or assembled material for which these Specifications so require or if so required by the Engineer.

The Engineer may waive the materials testing requirements of the Specifications and accept a Certificate of Compliance. Manufacturing test data may be required by the Engineer to be included with the submittal.

Materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The submission of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the Work which conforms to the requirements of the Contract Documents, and any material not conforming to the requirements will be subject to rejection whether in place or not.

When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the City shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

4-1.6 Trade Names or Equals. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the naming of the item is intended to establish the type, function, and quality required. Unless stated otherwise, materials or equipment of other Suppliers may be accepted if sufficient information is submitted to the Engineer for review to determine whether the material or equipment proposed is equivalent or equal to that named.

- a) The Contractor shall submit its list of proposed substitutions for “an equal” (“or equal”) item(s) **no later than 5 Working Days after the determination of the Apparent Low Bidder** and on a City form when provided by the City.
- b) The request for substitution shall include the following information:
 - i. Whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents to adopt the design to the proposed substitute.
 - ii. Whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.
 - iii. All variations of the proposed substitute from the items originally specified will be identified.
 - iv. Available maintenance, repair, and replacement service requirements. The manufacturer shall have a local service agency within 50 miles of the site which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
 - v. Certification that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, and be similar and of equal substance to that indicated, and be suited to the same use as that specified.
- c) There is no guaranteed time frame for the City’s review of the substitution requests.
- d) The burden of proof as to the type, function, and quality of any such substitute product, material or equipment shall be upon the Contractor. The Engineer may require at the Contractor’s expense additional data about the proposed substitute.

- e) If the Engineer takes no exceptions to the proposed substitution, it shall not relieve the Contractor from responsibility for the efficiency, sufficiency, quality, and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name.
- f) The lack of action(s) on the Engineer's side within the Contractor's requested time shall not constitute acceptance of the substitution.
- g) Acceptance by the Engineer of a substitute item shall not relieve the Contractor of the responsibility for full compliance with the Contract Documents.
- h) For the substitution review process or to have materials listed on the AML, refer to the AML standard review process.
- i) The Bid submittal shall be based on the material and equipment specified by name in the Contract. If the proposal is rejected by the Engineer, the Contractor shall not be entitled to either an extension in Contract Time, increase in the Contract Price, or both.
- j) As applicable, no Shop Drawing or Working Drawing submittals shall be made for a substitute item nor shall any substitute item be ordered, installed, or utilized without the Engineer's prior written.
- k) The Contractor shall reimburse the City for the charges of the Engineer for evaluating each proposed substitute.
- l) For Design-Build contracts, one copy of all designer reviewed submittals shall be provided to the Engineer.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1.2 Commencement of Work. To the GREENBOOK and the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Unless specified otherwise, construction shall start within 5 Working Days after NTP and be diligently prosecuted to completion within the Contract Time. The Contractor shall not start any construction activity at the Site until the Pre-construction Meeting is held and the NTP has been issued by the Engineer.

Upon the Contractor's written request, the City may delay the NTP as follows:

- a) Up to 5 Working Days from the Pre-construction Meeting, or
- b) Up to 40 Working Days from the Limited NTP for the preparation, submittal, obtaining approval for and filing of the PRDs in accordance with 801, "STORM WATER POLLUTION CONTROL," or
- c) Up to 60 Working Days from the Limited NTP for the preparation, submittal, and approval of the TCP on "D-sheets" when specified in 7-10.2, "Traffic Control."

For areas that do not require engineered TCP on D-sheets, the Contractor may at any time after the Pre-construction Meeting obtain a TCP Permit via Working Drawings or the City's over the counter process and start the Work. If the Contractor decides to commence the construction work before the completion of the D-sheet TCPs, the Contractor shall forfeit the 60 Working Days specified here. The D-sheet TCP shall be done concurrently and no additional time will be granted.

For paving Work, the Contractor shall coordinate the Work to facilitate the installation and protection of the new curb ramps and associated concrete work prior to commencing the asphalt overlay operations. The Work at a specific location shall not commence until all layouts and measurements are agreed upon by both the Contractor and the Engineer.

There is no specific access path designated for the units and crane. The crane may be used in front of the building but the crane use should be minimized due to pedestrian traffic. Coordination with any park events or adjacent construction will need to take place. Crane operation hours will need to be approved by the City prior to commencement of work.

ADD: 6-1.8 Pre-construction Meeting. Within 20 Working Days from the Limited NTP the Engineer will schedule a mandatory pre-construction meeting (Pre-construction Meeting) with the Contractor. The agenda will include items such as NTP, design services and submittal and review process for Design-Build contracts, critical elements of the work schedule, submittal schedule, cost breakdown of major lump sum items, payment requests and processing, environmental and community concerns, coordination with the involved utility firms, the level of record project documents required and emergency telephone numbers for all representatives involved in the course of construction.

6-2.1 Moratoriums. To the City Supplement, ADD the following:

No Work shall be allowed in the areas where there is currently a moratorium issued by the City. The areas subject to moratorium are listed here:

No Work shall be allowed between December 5, 2012 through December 9, 2012 in Balboa Park.

ADD: 6-8.1 Completion. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

6-8.1 Completion. The Contractor shall submit a written assertion that the Work has been completed. If, in the Engineer's judgment, the Work has been completed in accordance with the Contract Documents, the Engineer will set forth in writing the date the Work was completed. This will be the date when the Contractor is relieved from responsibility to protect and maintain the Work.

6-8.2 Acceptance. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

6-8.2 Acceptance. Acceptance will occur after all of the requirements contained in the Contract Documents have been fulfilled. If, in the Engineer's judgment, the Contractor has fully performed the Contract, the Engineer will accept the Contractor's performance of the Contract.

6-8.3 Warranty. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

6-8.3 Warranty. Unless specified otherwise, the Work shall be warranted by the Contractor against defective workmanship and materials for a period of 1 year.

- a) The warranty period shall start on the date of completion of the Work as determined by the Engineer.
- b) The Contractor shall provide an unconditional warranty on all installed fiber optic cable for a minimum period of 2 years.
- c) The warranty period for the following items of the Work shall be 3 years:
 1. Work under Section 500 (requires Long Term Warranty Contract (LTWC))
 2. DWT Construction (requires manufacturer's warranty)
 3. LED signal modules (requires manufacturer's warranty)

4. Private sewer pumps including the alarm panel and all other accessories. The Contractor shall provide the City and property owner a copy of the warranty. (requires manufacturer's warranty)
- d) The Contractor shall involve the manufacturer in the installation and startup as needed to secure any extended warranty required.
- e) The warranty period for specific items covered under manufacturers' or suppliers' warranties shall commence on the date they are placed into service at the direction of or as approved by the Engineer in writing.
- f) All warranties, express or implied, from Subcontractors or Suppliers, of any tier, for the work performed and materials furnished shall be assigned, in writing, to the City, and such warranties shall be delivered to the Engineer prior to acceptance of the Contractor's performance of the Contract.
- g) The Contractor shall replace or repair defective Work in a manner satisfactory to the Engineer, after notice to do so from the Engineer, and within the time specified in the notice. If the Contractor fails to make such replacement or repairs within the time specified in the notice, the City may perform the replacement or repairs at the Contractor's expense. If the Contractor fails to reimburse the City for the actual costs, the Contractor's Surety shall be liable for the cost thereof.
- h) Nothing in this warranty is intended to limit any manufacturer's warranty which provides the City with greater warranty rights than set forth in this section or the Contract Documents.
- i) These specifications are not intended to constitute a period of limitations or waiver of any other rights or remedies City may have regarding the Contractor's other obligations under the Contract Documents or federal or state law.
- j) The Contractor shall respond and initiate corrective action within 24 hours of notice of nonconforming Work that poses an imminent threat to person or property.

6-9 LIQUIDATED DAMAGES. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

ODIFY to increase the daily value from \$250 to \$1,000 for contracts with a value of over \$100,000.

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-3 LIABILITY INSURANCE. DELETE in its entirety and SUBSTITUTE with the following:

The insurance provisions herein must not be construed to limit your indemnity obligations contained in this contract.

ADD: 7-3.1 Policies and Procedures.

- a) You must procure the insurance described below, at your sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or subcontractors.

- b) Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.
- c) You must maintain this insurance for the duration of this contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this contract. Your liabilities under this contract, e.g., your indemnity obligations, will is not deemed limited to the insurance coverage required by this contract.
- d) Payment for insurance is included in the various items of Work as bid by you, and except as specifically agreed to by the City in writing, you are not entitled to any additional payment. Do not begin any work under this contract until you have provided and the City has approved all required insurance.
- e) Policies of insurance must provide that the City is entitled to 30 days (10 days for cancellation due to non-payment of premium) prior written notice of cancellation or non-renewal of the policy. Maintenance of specified insurance coverage is a material element of this contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of this contract may be treated by the City as a material breach of contract.

ADD: 7-3.2 Types of Insurance.

7-3.2.1 Commercial General Liability Insurance.

- a) Commercial General Liability Insurance must be written on the current version of the ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad.
- b) The policy must cover liability arising from premises and operations, XCU (explosions, underground, and collapse), independent contractors, products/completed operations, personal injury and advertising injury, bodily injury, property damage, and liability assumed under an insured’s contract (including the tort liability of another assumed in a business contract).
- c) There must be no endorsement or modification limiting the scope of coverage for either “insured vs. insured” claims or contractual liability. You must maintain the same or equivalent insurance for at least 10 years following completion of the Work.
- d) All costs of defense must be outside the policy limits. Policy coverage must be in liability limits of not less than the following:

General Annual Aggregate Limit	Limits of Liability
Other than Products/Completed Operations	\$2,000,000
Products/Completed Operations Aggregate Limit	\$2,000,000
Personal Injury Limit	\$1,000,000
Each Occurrence	\$1,000,000

7-3.2.2 Commercial Automobile Liability Insurance.

- a) You must provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the amount of \$1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles (“Any Auto”).
- b) All costs of defense must be outside the limits of the policy.

7-3.2.5 Contractors Builders Risk Property Insurance.

- a) You must provide at your expense, and maintain until Final Acceptance of the Work, a Special Form Builders Risk Policy or Policies. This insurance must be in an amount equal to the replacement cost of the completed Work (without deduction for depreciation) including the cost of excavations, grading, and filling. The policy or policies limits must be 100% of this contract value of the Work plus 15% to cover administrative costs, design costs, and the costs of inspections and construction management.
- b) Insured property must include material or portions of the Work located away from the Site but intended for use at the Site, and must cover material or portions of the Work in transit. The policy or policies must include as insured property scaffolding, falsework, and temporary buildings located at the Site. The policy or policies must cover the cost of removing debris, including demolition.
- c) The policy or policies must provide that all proceeds thereunder must be payable to the City as Trustee for the insured, and must name the City, you, Subcontractors, and Suppliers of all tiers as named insured. We as Trustee will collect, adjust, and receive all monies which may become due and payable under the policy or policies, may compromise any and all claims thereunder, and will apply the proceeds of such insurance to the repair, reconstruction, or replacement of the Work.
- d) Any deductible applicable to the insurance must be identified in the policy or policies documents and responsibility for paying the part of any loss not covered because of the application of such deductibles must be apportioned among the parties except for the City as follows: if there is more than one claimant for a single occurrence, then each claimant must pay a pro-rata share of the per occurrence deductible based upon the percentage of their paid claim to the total paid for insured. The City must be entitled to 100% of its loss. You must pay the City any portion of that loss not covered because of a deductible, at the same time the proceeds of the insurance are paid to the City as trustee.
- e) Any insured, other than the City, making claim to which a deductible applies must be responsible for 100% of the loss not insured because of the deductible. Except as provided for under California law, the policy or policies must provide that the City is entitled to 30 days prior written notice (10 days for cancellation due to non-payment of premium) of cancellation or non-renewal of the policy or policies.

ADD: 7-3.3 Rating Requirements.

Except for the State Compensation Insurance Fund, all insurance required by this contract as described herein must be carried only by responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the State, and that have been approved by the City.

7-3.3.1 Non-Admitted Carriers.

The City will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the State and is included on the List of Eligible Surplus Lines Insurers (LESLI list).

All policies of insurance carried by non-admitted carriers must be subject to all of the requirements for policies of insurance provided by admitted carriers described herein.

ADD: 7-3.4 Evidence of Insurance.

Furnish to the City documents e.g., certificates of insurance and endorsements evidencing the insurance required herein, and furnish renewal documentation prior to expiration of this insurance.

Each required document must be signed by the insurer or a person authorized by the insurer to bind coverage on its behalf. We reserve the right to require complete, certified copies of all insurance policies required herein.

ADD: 7-3.5 Policy Endorsements.

7-3.5.1 Commercial General Liability Insurance

7-3.5.1.1 Additional Insured.

- a) You must provide at your expense policy endorsement written on the current version of the ISO Occurrence form CG 20 10 11 85 or an equivalent form providing coverage at least as broad.
- b) To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy must be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.
 1. The additional insured coverage for projects for which the Engineer's Estimate is \$1,000,000 or more must include liability arising out of: (a) Ongoing operations performed by you or on your behalf, (b) Your products, (c) Your work, e.g., your completed operations performed by you or on your behalf, or (d) premises owned, leased, controlled, or used by you.
 2. The additional insured coverage for projects for which the Engineer's Estimate is less than \$1,000,000 must include liability arising out of: (a) Ongoing operations performed by you or on your behalf, (b) Your products, or (c) premises owned, leased, controlled, or used by you.

7-3.5.1.2 Primary and Non-Contributory Coverage.

The policy must be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the City and its elected officials, officers, employees, agents and representatives. Further, it must provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives must be in excess of the Contractor's insurance and must not contribute to it.

7-3.5.1.3 Project General Aggregate Limit.

The policy or policies must be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work must reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit must be in addition to the aggregate limit provided for the products-completed operations hazard.

7-3.5.2 Commercial Automobile Liability Insurance.

7-3.5.2.1 Additional Insured.

Unless the policy or policies of Commercial Auto Liability Insurance are written on an ISO form CA 00 01 12 90 or a later version of this form or equivalent form providing coverage at least as broad, the policy must be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured, with respect to liability arising out of automobiles owned, leased, hired or borrowed by you or on your behalf. This endorsement is limited to the obligations permitted by California Insurance Code §11580.04.

7-3.5.5 Builders Risk Endorsements.

7-3.5.5.1 Waiver of Subrogation.

The policy or policies must be endorsed to provide that the insurer will waive all rights of subrogation against the City, and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from work performed by the Named Insured for the City.

7-3.5.5.2 Builders Risk – Partial Utilization.

If we desire to occupy or use a portion or portions of the Work prior to Acceptance in accordance with this contract, we will notify you and you must immediately notify your Builder's Risk insurer and obtain an endorsement that the policy or policies must not be cancelled or lapse on account of any such partial use or occupancy. You must obtain the endorsement prior to our occupation and use.

ADD: 7-3.6 Deductibles and Self-Insured Retentions.

You are responsible for the payment of all deductibles and self-insured retentions. Disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided.

ADD: 7-3.7 Reservation of Rights.

We reserve the right, from time to time, to review your insurance coverage, limits, deductibles and self-insured retentions to determine if they are acceptable to the City. We will reimburse you, without overhead, profit, or any other markup, for the cost of additional premium for any coverage requested by the Engineer but not required by this contract.

ADD: 7-3.8 Notice of Changes to Insurance.

You must notify the City 30 days prior to any material change to the policies of insurance provided under this contract.

ADD: 7-3.9 Excess Insurance.

Policies providing excess coverage must follow the form of the primary policy or policies e.g., all endorsements.

7-4 WORKERS' COMPENSATION INSURANCE. DELETE in its entirety and SUBSTITUTE with the following:

7-4.1 Workers' Compensation Insurance and Employers Liability Insurance.

- a) In accordance with the provisions of §3700 of the California Labor Code, you must provide at its expense Workers' Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable state workers compensation laws. The City, its elected officials, and employees will not be responsible for any claims in law or equity occasioned by your failure to comply with the requirements of this section.

b) Limits for this insurance must be not less than the following:

<u>Workers' Compensation</u>	<u>Statutory Employers Liability</u>
Bodily Injury by Accident	\$1,000,000 each accident
Bodily Injury by Disease	\$1,000,000 each employee
Bodily Injury by Disease	\$1,000,000 policy limit

c) By signing and returning this contract you certify that you are aware of the provisions of §3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code and you will comply with such provisions before commencing the Work as required by § 1861 of the California Labor Code.

7-4.1.1 Waiver of Subrogation.

The policy or policies must be endorsed to provide that the insurer will waive all rights of subrogation against the City, and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from work performed by the Named Insured for the City.

7-5 PERMITS, FEES, AND NOTICES. To the City Supplement, DELETE item e) in its entirety.

To the City Supplement, ADD the following:

The City will obtain, at no cost to the Contractor; the following permits:

- a) Mechanical
- b) Electrical
- c) Structural
- d) Historical
- e) Fire
- f) Noise

7-9 PROTECTION AND RESTORATION OF EXISTING IMPROVEMENTS. ADD the following:

In any emergency affecting the safety of persons or property, the Contractor shall act, at its discretion, to prevent threatened damage, injury or loss. Any change in Contract Price or Contract Time resulting from emergency work shall be determined as provided in SECTION 3, "CHANGES IN WORK."

7-10.1 Traffic and Access. To the City Supplement, DELETE the agency notification listing in its entirety and SUBSTITUTE with the following:

The Contractor shall notify Metropolitan Transit System (MTS), a minimum of 5 Working Days prior to excavation, construction, or traffic control affecting bus stops. The Contractor shall notify the remaining agencies a minimum of two 2 Working Days prior to construction activities affecting the agencies:

Fire Department Dispatch	(Street or alley closure)	(858) 573-1300
Police Department Traffic	(Street or alley closure)	(858) 495-7800
Street Division/Electrical	(Traffic signals)	(619) 527-7500
U.S. Navy	(32nd Street Naval Station)	(619) 556-1319
Underground Service Alert	(Any excavation)	(800) 422-4133
MTS	(Street Closure and Bus Stops)	(619) 238-0100 Ext 6451

7-10.6 Traffic Plate Bridging. To the City Supplement, DELETE in its entirety and SUBSTITUTE with the following:

Transverse or longitudinal cuts, voids, trenches, holes, and excavations in the right-of-way that cannot be properly completed within 1 Working Day shall be protected by adequately designed barricades and structural steel plates [plates] that will support legal vehicle loads in such a way as to preserve unobstructed traffic flow.

The Contractor shall secure approval, in advance, from authorities concerning the use of any bridging proposed on the Work.

Plates shall conform to the following:

- a) The trench shall be adequately shored to support the bridging and traffic loads.
- b) Plates shall be designed for HS 20-44 truck loading in accordance with Caltrans Bridge Design Specifications Manual.
- c) For the minimum thickness of plates refer to Table 7-10.6(A):

Table 7-10.6(A) - Trench Width / Minimum Plate Thickness

Trench Width	Minimum Plate Thickness
10" (0.25 m)	1/2" (13 mm)
1'-11" (0.58 m)	3/4" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.6 m)	1 1/4" (32 mm)

For spans greater than 5'-3" (1.6 m), a structural design shall be prepared by a California Registered Civil Engineer and approved by the Engineer.

- d) Plates shall have a skid-resistant surface with a nominal Coefficient Of Friction (COF) of 0.35 as determined by California Test Method 342.
- e) Plates shall extend a minimum of 12" (300 mm) beyond the edges of the trench.
- f) Plates shall provide complete coverage to prevent any person, bicycle, motorcycle or motor vehicle from being endangered due to plate movement causing separations or gaps.
- g) Plates shall be secured against movement or displacement by using adjustable cleats, shims, welding, or other devices, and shall be installed in a manner that will minimize noise as traffic drives over them. Plates shall be installed using either Method (1) or (2):
 - i. Method 1 [For speeds greater than 45 mph (70 Km/hr)]: The pavement shall be cold planed to a depth equal to the thickness of the plate and to a width and length equal to the dimensions of the plate.

- ii. Method 2 [For Speeds less than 45 mph (70 Km/hr)]: Approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of 2 dowels pre-drilled into the corners of the plate and drilled 2" (50 mm) into the pavement. Subsequent plates are butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope 8.5 % with a minimum 12" (305 mm) taper to cover all edges of the plates.

Alternative installation method may be submitted in accordance with 2-5.3, "Submittals" for the Engineer's approval.

- h) The Contractor shall be responsible for maintenance of the plates, shoring, and asphalt concrete ramps or any other approved device used to secure the plates. The Contractor shall immediately mobilize necessary personnel and equipment after being notified by the Engineer, the City's station 38, or a member of the public of a repair needed e.g., plate movement, noise, anchors, and asphalt ramps. Failure to respond to the emergency request within 2 hours will be grounds for the City to perform necessary repairs that will be invoiced at actual cost including overhead or \$500 per incident, whichever is greater. Failure by the Contractor to comply may result in automatic grounds suspension of permit, Contract, or both.
- i) When plates are removed, any damage to the pavement shall be repaired with fine graded asphalt concrete mix or slurry seal satisfactory to the Engineer.

Payment for traffic plate bridging shall be included in the various Bid items unless a Bid Item has been provided for steel plate bridging.

SECTION 8 - FACILITIES FOR AGENCY PERSONNEL

8-2 FIELD OFFICE FACILITIES. To the City Supplement, DELETE in its entirety.

ADD: PART 8 – ENVIRONMENTAL WORKS

SECTION 807 – RESOURCE DISCOVERIES

ADD: 807-1.1 Environmental Document. The City of San Diego Environmental Analysis Section (EAS) of the Development Services Department has prepared Environmental Exemption for Casa De Balboa HVAC Project, as referenced in the Contract Appendix A. The Contractor shall comply with all requirements of the Environmental Exemption as set forth in Contract Appendix A.

SECTION 808 – ABSESTOS MATERIALS

808-1.2 Friable Asbestos. To the City Supplement, ADD the following:

Asbestos to be removed by others. See Appendix J for the Asbestos and Lead Report

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

APPENDIX A
Environmental Exemption

DETERMINATION OF ENVIRONMENTAL EXEMPTION

Pursuant to the California Environmental Quality Act (CEQA) and State CEQA Guidelines

Agency: CITY OF SAN DIEGO

Project No.: N/A

Date: 5/8/09

Action/Permit(s): Allocation of funds

Description of Activity: Casa de Balboa: Allocation of funds for the HVAC Improvements to replace eight air conditioning units in an existing City-owned building. The dimensions of the new units shall not exceed the existing dimensions nor should they be visible above the parapet. This activity has been reviewed by the Historical Resources Board staff for consistency with Secretary of Interior Standards. Removal, disposal and installation of HVAC systems will be performed in accordance with contract specifications. The facility will be open during the entire construction operation. The project is not within areas identified on any government hazardous materials list and no archaeological or biological resources would be impacted with implementation of this project.

Location of Activity: 1350 El Prado, Balboa Park, Balboa Park Community Planning area, City and County of San Diego.

1. This activity is **EXEMPT FROM CEQA** pursuant to:
 - Section 15060(c) (3) of the State CEQA Guidelines (the activity is not a project as defined in Section 15378).
2. This project is **EXEMPT FROM CEQA** pursuant to State CEQA Guidelines Section checked below:

**ARTICLE 19 of GUIDELINES
CATEGORICAL EXEMPTIONS**
(Incomplete list)

Section	Short Name
<input checked="" type="checkbox"/> 15301	Existing Facilities
<input type="checkbox"/> 15302	Replacement or Reconstruction
<input type="checkbox"/> 15303	New Construction or Conversion of Small Structures
<input type="checkbox"/> 15304	Minor Alterations to Land
<input type="checkbox"/> 15305	Minor Alteration in Land Use
<input type="checkbox"/> 15306	Information Collection
<input type="checkbox"/> 15311	Accessory Structures
<input type="checkbox"/> 15312	Surplus Government Property Sales
<input type="checkbox"/> 15315	Minor Land Divisions
<input type="checkbox"/> 15317	Open Space Contracts or Easements
<input type="checkbox"/> 15319	Annexation of Existing Facilities and Lots for Exempt Facilities
<input type="checkbox"/> 15325	Transfer of Ownership of Interest in Land to Preserve Open Space
<input checked="" type="checkbox"/> Other	15331 Historic Resources

**ARTICLE 18 of GUIDELINES
STATUTORY EXEMPTIONS**
(Incomplete list)

Section	Short Name
<input type="checkbox"/> 15261	Ongoing Project
<input type="checkbox"/> 15262	Feasibility and Planning Studies
<input type="checkbox"/> 15265	Adoption of Coastal Plans and Programs
<input type="checkbox"/> 15268	Ministerial Projects
<input type="checkbox"/> 15269	Emergency Projects
<input type="checkbox"/> Other	

It is hereby certified that the City of San Diego has determined the above activity to be exempt:


 Myra Herrmann, Senior Planner
 Environmental Analysis Section
 Development Services Department

Distribution:

Exemption or Project file
 Nikki Lewis, ECP (MS 908A)
 Carrie Purcell, Senior Planner, ECP (MS 908A)

APPENDIX B

**SECTION 23 09 23-N
DIRECT DIGITAL CONTROL SYSTEM SPECIFICATION**

SECTION 23 09 23-N
DIRECT DIGITAL CONTROL SYSTEM SPECIFICATION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION, INC. (AMCA)

AMCA 500 (1991) Louvers, Dampers and Shutters

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B16.18 (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings

ANSI C12.10 (1987) Electromechanical Watt-hour Meters

ANSI C57.13 (1978; R 1987) Instrument Transformers

AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-
CONDITIONING ENGINEERS, INC. (ASHRAE)

ASHRAE 3 (1996) Reducing Emission of Fully Halogenated Chlorofluorocarbon (CFC) Refrigerants in Refrigeration and Air-Conditioning Equipment and Applications

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ANSI B16.5 (1996) Pipe Flanges and Flanged Fittings

ASME/ANSI B16.34 (1996) Valves - Flanged, Threaded, and Welding End

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 126 (1995) Gray Iron Castings for Valves, Flanges, and Pipe Fittings

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1998) National Electrical Code

NFPA 90A (1996) Installation of Air Conditioning and Ventilating Systems

SHEET METAL & AIR CONDITIONING CONTRACTORS NATIONAL
ASSOCIATION, INC. (SMACNA)

SMACNA DCS	(1985) HVAC Duct Construction Standards - Metal and Flexible
SMACNA HVACTAB	(1993) HVAC Systems Testing, Adjusting and Balancing
UNDERWRITERS LABORATORIES INC. (UL)	
UL 506	(1994; R 1997, Bul. 1997) Specialty Transformers
UL 555S	(1996) Leakage Rated Dampers for Use in Smoke Control Systems
UL 1449	(1996) Transient Voltage Surge Suppressors

1.2 DEFINITIONS

1.2.1 Extended Application and Data Servers (ADXs)

Server class computers that manages the collection, presentation, and long-term storage of trend data, event messages, operator transactions, graphic displays and system configuration data. The ADX servers communicate with the Building Network Controllers on the network. In addition, the user interface of the ADX servers provides system navigation, viewing of graphic displays, comprehensive alarm management, trend analysis and summary reporting capabilities.

1.2.2 Building Level Network

The communication network within a building that connects Digital Controllers and Field Equipment Controllers to a Building Network Controller. The Building Level Network utilizes Ethernet, LON, and RS-485 that connects Digital Controllers to a Building Network Controller in a daisy-chain configuration.

1.2.3 Building Network Controller

A microprocessor-based device that is connected to and supervises Digital Controllers and Field Equipment Control Devices over a Building Level Network. The Building Network Controller provides monitoring, control, alarm and event management, data exchange, trending, scheduling and data storage of the ancillary controllers associated with it. The Building Network Controller also has interfaces for communicating with Portable Workstation Laptop Computers as well communicating with the ADX servers via the network.

1.2.4 Device

Any control system component, usually a sensor, switch, relay, or actuator, that provides an input or receives an output from a Digital Controller.

1.2.5 Digital Controller

A microprocessor based electronic controller, with integral programming logic and digital and analog input/output capability to perform closed loop control functions in a stand-alone capacity.

a. Universal Programmable Controller

A Digital Controller that processes analog, digital, and software inputs through user-defined programming logic (via multi-purpose programmable function modules, software implemented Programmable Logic Controller (PLC) modules, time schedule modules, optimal start/stop modules, etc) to produce required outputs and operating parameters.

b. Application Specific Controller (ASC)

A Digital Controller that processes analog, digital, and software inputs through pre-defined programming logic in the firmware of the controller to produce required outputs and operating parameters.

c. Network Communication Capable Thermostat

An equipment-specific Digital Controller with an internal programmable time clock that provides the functionality of a thermostat as well as processing analog, digital, and software inputs through pre-defined programming logic in the firmware of the controller to produce required outputs and operating parameters.

1.2.6 Direct Digital Control (DDC)

Digital Controllers performing control logic. The controller directly senses physical values, makes control decisions based on internal programs, and provides output control signals that directly operate devices such as relays, valve and damper actuators, variable frequency drives, etc.

The new DDC system is only for the seven (7) new City owned roof top units and is not to be connected to the existing DDC system for the MOPA roof top units.

1.2.7 DDC System

A building level network of Digital Controllers and Field Equipment Control Device that communicate with a Building Network Controller. The DDC system includes the sensors, actuators, relays, software, programming, graphic displays “graphics”, system database and any other component, parameters, and attributes of the devices used in measuring inputs or controlling outputs. The DDC system may also include a local desktop Operator Workstation or a Portable Workstation Laptop Computer.

1.2.8 Distributed Control

Controllers located near the equipment being controlled, with physical input and output points that allows distributed processing at each standalone Digital Controller. Individual system or equipment control is not split between controllers, and the failure of any single Digital Controller does not cause any other Digital Controller to fail. See also “Stand-Alone Control”.

1.2.9 Dynamic Control

A process that optimizes operation of HVAC systems (air handling units, converters, chillers, and boilers) by increasing and decreasing setpoints or starting and stopping equipment in response to heating and cooling needs of downstream equipment. A requirement of dynamic control is knowing the heating/cooling demand status of downstream equipment, therefore dynamic control requires Digital Controllers be connected in a communications network.

1.2.10 Field Equipment Control Device

A microprocessor-based electronic controller (such as a Variable Frequency Drive, Chiller Controller, or Lighting Controller), designed to control a specific piece of equipment (such as a motor, chiller, or lighting system) that can communicate directly on the Building Level Network.

1.2.11 Firmware

Firmware is software programmed into read only memory (ROM) and erasable programmable read only memory (EPROM) chips. Software may not be changed without physically altering the chip.

1.2.12 Graphic Displays (Graphics)

Graphical schematic displays on an operator workstation of the hardware and software points on a DDC system. Graphic displays give a visual representation of HVAC systems that allow the operational status to be monitored and controlled.

1.2.13 Hand-Held Terminal

A portable device which can be connected directly to a communications port on a Digital Controller through which the Digital Controller can be interrogated and, in some cases, programmed.

1.2.14 Input/Output (I/O)

Physical inputs and outputs to and from a Digital Controller including analog inputs (AI), digital inputs (DI), analog outputs (AO), and digital outputs (DO). Inputs are from analog sensors (such as temperature, pressure, flow, humidity) and digital sensors (such as motor status, flow switches, switch position, and pulse output devices). Outputs operate modulating and on/off control devices. The term also encompasses software, or “virtual” I/O in a digital controller. (In regards to I/O, throughout this document, the terms software and virtual will be used interchangeably.) Software/Virtual points typically reside within the programming of the Digital Controller or the Building Network Controller and typically are used as set points or to provide the status or run time of a device for use in the execution of a control loop or program logic.

1.2.15 Internet Protocol (IP, TCP/IP, UDP/IP)

A protocol for communication between computers, used as a standard for transmitting data over networks and as the basis for standard Internet protocols, the most common use is the World Wide Web. At the lowest level, it is based on Internet Protocol (IP), a method for conveying and routing packets of information over various LAN media. Two other protocols are User Datagram Protocol (UDP) and Transmission Control Protocol (TCP). UDP conveys information to well-known

"sockets" without confirmation of receipt. TCP establishes "sessions", which have end-to-end confirmation and guaranteed sequence of delivery.

1.2.16 I/O Expansion Unit

An I/O expansion unit provides local additional point capacity to a Digital Controller within the Digital Controller enclosure.

1.2.17 IP Address

A numeric identifier for a computer or Building Network Controller on a TCP/IP network. Networks using the TCP/IP protocol route messages based on the IP address of the destination. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address.

1.2.18 IP Subnet

Internet protocol (IP) identifies individual devices with a 32-bit number divided into four groups from 0 to 255. Devices are often grouped and share some portion of this number. For example, one device has IP address 209.185.47.68 and another device has IP address 209.185.47.82. These two devices share Class C subnet 209.185.47.

1.2.19 DDC Communications Protocols

In order to achieve the maximum savings, benefits and permit sharing of global information making it possible to apply network-wide control strategies (such as peak demand limiting, coordinated alarm gathering and response, remote monitoring, and remote programming of building network controllers and digital controllers), the various components must be able to seamlessly communicate. The new expanded system utilizes Transmission Control Protocol/Internet Protocol (TCP/IP) and Hypertext Transfer Protocol (HTTP) to communicate with Building Network Controllers via Ethernet. Similar, the LON Network is extended to enable the Owner to utilize existing software and hardware for programming the Digital Controllers and monitoring/controlling devices.

1.2.20 Local Area Network (LAN)

A communication network that spans a finite geographic area and uses the same basic communication technology throughout.

1.2.21 Microprocessor

A microprocessor refers to the central processing unit (CPU) that contains all the registers and logic circuitry that make it possible for Digital Controllers to do computing.

1.2.22 Operator Workstation (OWS)

A desktop computer that allows the hardware and software I/Os of the DDC system to be viewed in both a text based and graphic format. The Operator Workstation is equipped with software that allows setup and collection of trends, as well as allowing the storage, creation, modification and downloading of Building Network Controller and Digital Controller programming.

1.2.23 Optimum Start/Stop

Optimum Start/Stop utilizes prediction software to determine the minimum time of HVAC system operation needed to satisfy space environmental requirements at the start of the occupied cycle, and determine the earliest time for stopping equipment at the day's end without exceeding space environmental requirements.

1.2.24 Peer-to-Peer

A network of Digital Controllers that act independently as equals and communicate with each other to pass information which facilitate control.

1.2.25 PID

PID refers to proportional, integral, and derivative control; the three types of actions that are used in controlling modulating equipment to maintain a set point.

1.2.26 Point Name

A standard name that is assigned to any software or hardware I/O.

1.2.27 Portable Workstation Laptop Computer

A laptop computer that allows the hardware and software I/Os of the DDC system to be viewed in both a text based and graphic format by direct connection to the Building Network Controller or Digital Controller. The Portable Workstation Laptop Computer is equipped with software that allows setup and collection of trends, creation of graphic displays, as well as allowing the storage, creation, modification and downloading of Building Network Controller and Digital Controller programming.

1.2.28 Stand-Alone Control

The ability of a Digital Controller being to perform required climate control, and energy management functions without connection to another Digital Controller or central site computer. Digital Controller requirements for stand-alone control are a time clock, a microprocessor, microchip resident control programs, PID control, a communications port for interfacing with and programming the controller, firmware for interrogation and programming, and I/O for sensing and effecting control of its control environment.

1.2.29 Wide Area Network (WAN)

A communication network that spans a relatively large geographic area or two or more geographically disparate areas. Typically, a WAN consists of two or more local-area networks (LANs) to form a single network.

1.3 DDC SYSTEM PROJECTDESCRIPTION

- a. Provide a DDC systems to maintain stable temperature control and all other conditions as indicated. The end-to-end accuracy of the system, including temperature sensor error, wiring error, A/D conversion, and display, shall be 1 deg F for space, duct, and outside air temperatures, 3% for relative humidity; 2% of range for pressure; and 3% of range for flow.

b. A Building Level Network Controller (BLC) shall be provided to integrate control of the new Roof Top Units. The BLC shall communicate with the smart controller integral with the RTUs using BACnet IP.

c. The controller integral to each RTU shall provide all the following data/control points:

- Cooling Capacity
- Heating Capacity
- Occupancy
- Occupancy Mode
- Emergency Override Mode
- Discharge Air Temperature
- Return Air Temperature
- Space Temperature
- Outdoor Air Temperature
- Discharge Fan Status
- Return Fan Status
- Duct Static Pressure
- Duct Static Pressure Setpoint
- Discharge Fan Capacity
- Building Static Pressure
- Building Static Pressure Setpoint
- Return Fan Capacity
- Effective Cooling Enable Setpoint
- Occupied Cooling Setpoint
- Unoccupied Cooling Setpoint
- Effective Cooling Discharge Setpoint
- Discharge Air Cooling Setpoint
- Outdoor Air Damper Position
- Effective Minimum Outdoor Damper Position Setpoint
- Outdoor Airflow
- Outdoor Air Damper Minimum Position
- Minimum Outdoor Airflow Damper Position
- Effective Heating Discharge Setpoint
- Discharge Air Heating Setpoint
- Dehumidification Status
- Relative Humidity
- Dew Point Temperature
- Relative Humidity Setpoint
- occupancy Scheduler Input

d. The controller integral to each RTU shall provide the following Alarms:

- Freeze Alarm
- Smoke Alarm
- Discharge Air Temperature Sensor Failure
- Mixed Air Temperature Sensor Failure
- Outdoor Air Temperature Sensor Failure

- Return Air Temperature Sensor Failure
 - Space Temperature Sensor Failure
 - Duct Pressure High Limit
 - High Return Air Temperature
 - High Discharge Air Temperature
 - Low Discharge Air Temperature
 - Fan Failure
 - Heat Failure
 - Economizer/Outdoor Air Damper Stuck Failure
 - Airflow Switch Alarm
 - Dirty Filter Alarm
 - Low Airflow Alarm
 - No Water Flow Alarm
 - Water Regulating Valve Alarm
 - Circuit High Pressure Alarm (per circuit)
 - Circuit Low Pressure/Frost Alarm (per circuit)
 - Compressor Motor Protection Alarm (per compressor)
- e. Exhaust Fan control for exhaust fans shall be provided from the RTU controller located closest to the particular fan. This control shall allow for 2 speed fan operation at full speed or half speed.
- f. All points shall be proven to work end-to-end from a Portable Workstation Laptop Computer directly connected to the Building Network Controller and shall be proven by interrogating and/or overriding each Input / Output channel during the Performance Verification Test (PVT). The database for the DDC System shall be created using the latest revision of the System Configuration Tools (SCT) software available at the time construction begins.
- g. Software and Hardware naming shall be in accordance with naming conventions established by the Owner and shall be compatible with existing DDC naming conventions.
- h. All Digital Controllers and Field Equipment Control Devices shall communicate using BACnet IP. The building level controller shall have the ability to communicate to higher level computer using Ethernet or shall have the ability to communicate directly using the Internet to remotely located computers.
- i. All application software necessary to control the system shall be provided. Complete and Integrated hardware and software shall be ready to completely control the DDC system.
- j. DDC System shall be secure from outside intervention or monitoring using built in protection software. Only authorized personnel shall have access to the DDC system.

1.4 PROJECT SEQUENCE OF WORK

The control system work for this project shall proceed in the following order:

- a. Schedule and participate in a Pre-Controls meeting with the building Owner.
- b. Submit Contractor's Qualifications, Manufacturer's Product Specification Data, and Shop Drawings as specified under the paragraph "Submittals."

- c. Receive QC approval and Owner on the above submittals.
- d. Submit Pre-field Test Plan for Contractor use during the Contractor Field Test.
- e. Receive QC approval and Owner on the above submittals.
- f. Perform the control system installation work, including all field check-outs and tuning.
- g. Create the Contractor Field Test Report from the field checkout sheets, tuning documentation and trend data.
- h. When applicable, Provide support to TAB personnel as specified under the paragraph "TEST AND BALANCE SUPPORT.
- i. Submit SD-04, Contractor Field Test Report.
- j. Receive QC approval and Owner on the above submittals
- k. Submit Pre-field Test Plan for Contractor use during the Performance Verification Test.
- l. Receive QC approval Owner on the above submittals.
- m. Submit Certificate of Test Readiness.
- n. Receive QC approval and Owner of the Certificate of Test Readiness and then schedule the Performance Verification Test.
- o. Conduct the Performance Verification Test with the Owner, (the graphics portion of the test may be run in parallel or subsequent to the rest of the test) and record any deficiencies in the performance of the system or deviations from the design in a Performance Verification Test (PVT) Punch List.
- p. Schedule and participate in the Performance Verification Test Review meeting to discuss Punch List items and determine a time line of when they will be corrected.
- q. Correct all items and issues on the PVT Punch List.
- r. Submit SD-05, Performance Verification Test Report.
- t. Submit, Final Shop Drawings for review.
- u. Receive QC approval and Owner on the above submittals.
- v. Schedule and participate in a PVT Punch List back-check with the Owner and affix laminated copies of the Final Shop Drawings to the Digital Controller and Building Controller panels as specified under paragraph "Laminated Final Shop Drawings".
- w. Controls System Operator's Manual specified under the paragraph "Control System Operator's Manuals and VFD Service Manuals".
- x. Receive QC approval and Owner approval on the above submittal.

- x. Training Documentation specified under the paragraph "INSTRUCTION TO OWNER PERSONNEL" and "VFD Service Support". Submit at least 30 days before training.
- y. Receive QC approval and Owner approval on the above submittal.
- z. Perform Opposite Season Test if required.
- aa. Schedule Training.
- bb. Conduct the Phase I Training and VFD on-site/hands-on training.
- cc. Conduct the Phase II Training.
- dd. Submit SD-09 Project Closeout Documentation.
- ee. Receive QC approval and Owner on the above submittal.

1.5 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item, that clearly show compliance with the project specifications.

a. Submittals:

See GREENBOOK and 2010 City Supplement, Section 2-5.3 for Shop Drawings and Submittals.

b. Substitutions:

See GREENBOOK and 2010 City Supplement, Section 4-1.6 for Substitutions.

1.5.1 Contractors' Qualifications

Submit documentation demonstrating compliance with the requirements specified under the paragraph, 'Contractor's Qualifications'.

1.5.2 Manufacturer's Product Specification Data

Submit Manufacturers' Product Specification Data sheets for every product that is to be installed in the DDC system to show compliance of the product with the design drawings and the specifications. If information on multiple products is provided on the Manufacturers' Product Specification Data sheets, highlight the specific product (or products) of relevance, and indicate the specification paragraph number that the item is in compliance with. Submit sufficient manufacturers' information to allow verification of compliance by the Owner. Equipment and software, for which Manufacturers' Product Specification Data shall be submitted, should include but not be limited to the following:

a. DDC hardware

i. Digital Controllers

- ii. Building Network Controller
 - iii. Field Equipment Control Devices
 - iv. LAN devices including media converters, routers, hubs, bridges, and switches
- b. DDC Programming Software
- i. Programming software for Digital Controllers
 - ii. Programming software for Building Network Controllers
 - iii. Software for creating Graphics
 - iv. Software used on Internet based workstations & laptops
- c. Input devices
- i. Temperature Sensors
 - ii. Flow Sensors/Switches
 - iii. Current Sensors/switches
 - iv. Damper & Valve position
 - v. Cooling Tower Flow Meter
 - vi. Data From VFDs
- d. Output Devices
- i. Damper and Valve actuators
 - ii. Control Relays/motor starter contactors
 - iii. VFD Commands
- e. Surge and transient protection
- i. Power line conditioners
 - ii. Network surge protectors
- f. Operator Workstation Software
- g. Portable Workstation Laptop computer Software
- h. Hand-held terminal
- i. Smoke detectors

j. Variable Frequency Drives

Any piece of equipment to be installed as part of the DDC system shall have a data sheet provided. For each submitted Manufacturers' Product Specification Data sheet, highlight in a reproducible form each unique piece of equipment and reference each item to the relevant specification paragraph number. Submit sufficient manufacturers' information to allow verification of compliance by the owner.

1.5.3 Shop Drawings

- a. Control System Drawing Title Sheet
- b. Building Level Network Communication Architecture Schematic
- c. Control System Schematics
- d. Control System Components List
- e. Table of I/O Points
- f. HVAC Equipment Electrical Ladder Diagrams
- g. Component Wiring Diagrams (Shop Drawing)
- h. Terminal Strip Diagrams (Shop Drawing)
- i. AC Power Table (Shop Drawing)
- j. Floor Plan Hardware Location Drawings

Show all information in the descriptions listed below on the drawings. Due are to be developed during the design stage and presented for review by Owner. Drawings labeled as (Shop Drawings) maybe submitted after 100% Design Review is accomplished. Obtain the signature of the Owner prior to commencement of the control system installation work.

1.5.3.1 Control System Drawing Title Sheet

Provide a title sheet for the control system drawing set. Include the project title, project location, contract number, the controls contractor preparing the drawings, an index of the control drawings in the set and a legend of the symbols and abbreviations used throughout the control systems drawings.

1.5.3.2 Building Level Network Communication Architecture Schematic

Provide a schematic showing the architecture of the DDC system's entire Building Level Network, including the locations in the building (with room numbers) of all Digital Controllers, Field Equipment Control Devices (such as VFDs, factory chiller control panels, etc.), Building Network Controllers, Operator Workstation, and LAN devices including media converters, routers, hubs, bridges, and switches. In addition, provide notation on the schematic of the addressing of the

Digital Controllers, Expansion Modules, Field Equipment Control Devices LON and RS/485 communications links, and the IP Addressing of the Building Network Controllers.

1.5.3.3 Control System Schematics

Provide a control system schematic for each Digital Controller and Building Network Controllers. Typical schematics for multiple pieces of exactly identical equipment with exactly identical sequences of operation are allowed unless otherwise requested in design or contract criteria. For similar pieces of equipment where a typical schematic is to be submitted, if the sequence of operation is the same, but there is only a slight deviation in the quantity or type of I/Os, indicate on the drawing the points that deviate from the standard and what digital controller(s)/piece(s) of equipment the deviation is applicable to. Include the following:

- a. Location of each input and output device
- b. Flow diagram for each piece of HVAC equipment
- c. Point *Name* for each control system component, such as SA-T for a Supply Air Temperature sensor.
- d. Setpoints, with differential or proportional band values
- e. Written sequence of operation for the HVAC equipment
- f. Valve and Damper Schedules, with normal (power fail) position

1.5.3.4 Control System Components List

Also known as a Bill of Materials, provide a complete list of control system components installed on this project. Include for each controller and device: control system schematic name, control system schematic designation, device description, manufacturer, and manufacturer part number. For sensors, include point name, sensor range, and operating limits. For valves, include body style, Cv, design flow rate, pressure drop, valve characteristic (linear or equal percentage), and pipe connection size. For actuators, include point name, spring return, modulating or two-position action, normal (power fail) position, nominal control signal operating range (0-10 volts DC or 4-20 milliamps), and operating limits.

1.5.3.5 Table of I/O Points

Also known as a Point Schedule, provide for each input and output point physically connected to a digital controller: point name, point description, point type (Analog Output (AO), Analog Input (AI), Digital Output (DO), or Digital Input (DI)), point sensor range, point actuator range, point address, and point connection terminal number, the controller address, controller type, controller location (with room number), and the associated Control System Schematic drawing. Typical schedules for multiple pieces of exactly identical equipment with exactly identical sequences of operation are allowed unless otherwise requested in design or contract criteria. For similar pieces of equipment where a typical schematic is to be submitted, if there is only a slight deviation in the quantity or type of I/Os, indicate on the schedule the points that deviate from the standard and what digital controller(s)/piece(s) of equipment the deviation is applicable to.

1.5.3.6 HVAC Equipment Electrical Ladder Diagrams

Provide HVAC equipment electrical ladder diagrams. Indicate required electrical interlocks, including voltages and currents.

1.5.3.7 Component Wiring Diagrams

Provide a wiring diagram for each type of input device and each type of output device. Diagram shall show how the device is wired and powered; showing typical connections at the Digital Controller and each power supply, as well as at the device itself. Show for all field connected devices, including, but not limited to, control relays, motor starters, electric or electronic actuators, and temperature, pressure, flow, and proof sensors and transmitters.

1.5.3.8 Terminal Strip Diagrams

Provide a diagram of each terminal strip, including Digital Controller terminal strips, terminal strip location, termination numbers and the associated point names.

1.5.3.9 AC Power Table

Provide a table listing each controller and the circuit breaker number, panel box number, and physical location of each controller's source of AC power.

1.5.3.10 Floor Plan Hardware Location Drawings

Provide architectural floor plan drawings indicating the physical location of the Building Network Controller, Digital controllers, [NETWORK repeaters], NETWORK bus wiring paths, outside air temperature sensor, room sensors/thermostats, [duct static/differential pressure sensors], and each building network and digital controller's source of AC power. (i.e. transformer locations). In addition, indicate the electrical panel location and circuit breaker number providing power to the building network and Digital Controllers.

1.5.4 Contractor Field Test Report

Provide a Contractor Field Test Report showing results of the testing in accordance with paragraph 'Contractor's Field Testing'. Documentation shall consist of calibration of sensors, expected/actual response of sensors, actuators, and controllers, trend logs/graphs proving control loop stability and accuracy, as well as proper execution of temperature control programs (sequence of operation), and proper operation of equipment interlocks.

1.5.5 Performance Verification Test Report

At the conclusion of the execution of the Performance Verification Test, a report documenting the results of the testing shall be provided in accordance with paragraph 3.3.5 'Performance Verification Test (PVT)'.

1.5.6 Final Shop Drawings

Provide a complete set of Final Shop Drawings, also known as 'As-built' drawings that incorporate all information, details, or data (such as the Building Network Controller IP address) that may not have been available to be documented on the SD-03 submittals. Also incorporate any

changes, modifications, or revisions from the SD-03 submittals that occurred in the installation of the controls system so that the final shop drawings reflect an accurate as-built condition of the controls system. Permanently affix a complete set of laminated Final Shop drawings in each Building Network Controller cabinet. In addition, for each Digital Controller, permanently affix laminated copies of the Control System Schematic, Control System Component List, Table of I/O Points, Component Wiring Diagrams, & AC power table associated with the controller, in the Digital Controller cabinet.

1.5.7 Operations and Maintenance Manuals

Provide six copies of the Operations and Maintenance Manual for the DDC system in printed and CD format. Provide printed manuals in sturdy 3-ring binders with a title sheet on the outside of each binder indicating the project title, project location, contract number, and the prime, mechanical and controls contractor's names, address', and telephone numbers. Each binder shall include a table of contents and tabbed dividers, with all material neatly organized. The manual contents shall be specifically applicable to the project, written to reflect actual project conditions, and shall provide a complete and concise depiction of the installed work. Provide information in detail to clearly explain all user operation requirements at each level of the HVAC and control system. The manuals shall include the following parts:

- a. PART 1. DDC and HVAC Systems Operator's Manual
- b. PART 2. DDC Manufacturer's Hardware and Software Manuals
- c. PART 3. VFD Manufacturer's Service Manual

1.5.7.1 PART 1- DDC and HVAC Systems Operator's Manual

This manual is designed to document the design, installation, and operation of the HVAC systems and the associated DDC system. Construct this manual with a minimum of the following 7 sections. Use tabs to divide each section.

- a. Section 1 Description of HVAC Systems: Provide a listing and description of each HVAC system component and their associated Digital Controllers.
- b. Section 2 Mechanical Design Drawings: Provide a set of the project's final mechanical design drawings, which incorporate all changes, modifications, or revisions that occurred in the installation of the HVAC systems, such that the drawings reflect an accurate 'As-built' condition of the HVAC systems.
- c. Section 3 Controls Drawings: Provide a set of final shop drawings that incorporate all changes, modifications or revisions that occurred during the installation of the controls system. The final shop drawings shall reflect an accurate 'As-built' condition of the controls system as specified in Paragraph "SD-06 Final Shop Drawings".
- d. Section 4 Performance Verification Test Report: Provide a copy of the approved Performance Verification Test Report.
- e. Section 5 Test, Adjust, and Balance Report: Provide a copy of the approved Test, Adjust, and Balance Report.

- f. Section 6 Control Equipment Cut Sheets: Provide cut sheets of all controller hardware and accessories. Include temperature versus resistance charts for temperature sensors, and calibration charts for pressure transducers.
- g. Section 7 Backup of Control Program: Provide a soft copy of the control programs on CD ROM.

1.5.7.2 PART 2-DDC Manufacturer's Hardware and Software Manuals

Provide the following manuals. Use tabs to divide each section.

- a. Section 1 Installation and Technical Manuals for all Digital Controller and Field Equipment Controller hardware.
- b. Section 2 Operators Manuals for all Digital Controllers
- c. Section 3 Operators Manuals for Building Network Controller
- d. Section 4 Programming Manuals for all Digital Controllers
- e. Section 5 Programming Manuals for Building Network Controller
- f. Section 6 Installation and Technical Manuals for the Operator Workstation.
- g. Section 7 Programming Manuals for the Operator Workstation software.

1.5.7.3 PART 3-VFD Manufacturer's Service Manual

Provide a complete set of the VFD manufacturer's Operators Manuals that specifically cite the data and control words formats. Also included shall be any VFD communication interfaces to the DDC.

1.5.8 Training Documentation

Submit schedule, syllabus, and training materials in accordance with the paragraph 'Training'.

1.5.9 Project Closeout Documentation

Provide administrative and closeout submittals:

- a. Training course documentation
- b. Service organization
- c. Contractor certification

1.5.9.1 Training Course Documentation

Training course documentation shall include a manual for each trainee plus two additional copies and two copies of audiovisual training aids, if used. Documentation shall include an agenda, defined objectives for each lesson and detailed description of the subject matter of each lesson.

1.5.9.2 Service Organization

Qualified service organization list, within 50 miles of the jobsite, that shall include the names and telephone numbers of organizations qualified to service the HVAC control systems.

1.5.9.3 Contractor Certification

Provide certification that the installation of the control system is complete and the technical requirements of this section have been met.

1.6 QUALITY ASSURANCE

1.6.1 Standard Products

- a. Provide material and equipment that are standard products of manufacturers regularly engaged in the manufacturing of such product, using similar materials, design and workmanship. The standard products shall have been in commercial or industrial use for 2 years prior to bid opening, unless otherwise approved by the City. The 2-year use shall include applications of similarly sized equipment and materials used under similar circumstances. The 2-year experience must be satisfactorily completed by a product which has been sold on the commercial market through advertisements, manufacturers' catalogs, or brochures.
- b. Provide materials and equipment that are manufacturer's products currently in production, and supported by a local service organization.

1.6.2 Storage

Stored products shall be protected from the weather, humidity and temperature variations, dirt and dust, and other contaminants, within the storage condition limits published by the equipment manufacturer.

1.6.3 Verification of Dimensions

The contractor shall become familiar with all details of the work, shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing the work.

1.6.4 Drawings

Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the mechanical, electrical, and finish conditions that could affect the work to be performed, and shall furnish all work necessary to meet such conditions.

1.6.5 Contractor's Qualifications

- a. The Contractor or subcontractor that will perform the work, with whom the Contractor has a firm contractual agreement, shall have completed at least three DDC systems installations of the same type and design specified, that have successfully operated the required sequence of operation for at least one year.

- b. The programmer responsible for programming the Digital Controllers shall have a minimum of 2 years experience programming Digital Controllers, of the same manufacturer, for HVAC systems.

1.6.6 Support

Certified local technical support shall exist within 50 miles of the site.

PART 2 PRODUCTS

2.1 DDC SYSTEM

In addition to the scope of work shown on the drawings, the scope of work shall include the following:

- a. Provide a DDC system as a distributed control system that is totally integrated with the existing DDC system. Provide and install an appropriate quantity and type of Building Network Controller(s) to supervise the associated Digital Controllers. Provide a LAN connection between the new Building Network Controller(s) and the Ethernet switch (located in the building telecom room) and establish communication with all operator workstations and laptop interfaces including internet connections.
- b. Provide the quantity and type of Digital Controllers and Field Equipment Control Devices indicated on the mechanical design drawings, that will perform the required climate control, energy management, and alarm functions. The quantity of controllers shall be no less than the number shown on design drawings. The DDC system shall consist of Digital Controllers and Field Equipment Control Devices communicating via communications networks that allows the sharing of common data amongst the Digital Controllers and Field Equipment Control Devices, as well as communication with the Building Network Controller(s) and Operator Workstation.
- c. Provide an operator programmable system with all of the necessary programming to perform closed-loop, modulating control that will execute the sequences of operations indicated on the mechanical design drawings, for all of the building's HVAC equipment. Provide a database/interface in both a text based format and graphic display format for viewing the operation of the DDC system. The database shall be created using the latest revision of software available at the time construction begins.
- d. Provide an Operator Workstation and the associated LAN connection to the Ethernet switch and establish communication with the Internet and the Building Network Controller(s). The Operator Workstation computer shall be provided with both a text based and graphic display interface of the DDC system. All software provided shall also be compatible with the existing DDC systems and software. The Operator Workstation computer shall be able to create and collect trends, monitor alarms, and allow overrides, set point and parameter changes. In addition the Operator Workstation computer shall be able to create graphics; and download, upload, and modify the programs in the Building Network Controllers and Digital Controllers.
- e. Provide a Portable Workstation Laptop Computer for connecting to the Building Network Controller. The Portable Workstation Laptop Computer shall be provided with both a text based and graphic display interface of the DDC system. The Portable Workstation Laptop

Computer shall be able to create and collect trends; monitor alarms; and allow overrides, set point and parameter changes. In addition, the Portable Workstation Laptop Computer shall be able to create graphics; and download, u. All software provided shall also be compatible with the existing DDC systems and software upload, and modify the programs in the Building Network Controller and Digital Controllers.

2.1.1 DIGITAL CONTROLLERS

2.1.1.1 Application Specific Controllers

Each Application Specific Controller shall be provided with the necessary power supplies, transformers, memory, I/O functions and communications interfaces necessary to perform its required functions and to provide control and monitoring of connected equipment and devices. It shall contain all necessary I/O functions to connect to field sensors and control devices. Communication on the Building Level Network shall provide I/O operation to be fully supervised by the Building Network Controller to detect I/O function failures. Each Application Specific Controllers shall be accessible for purposes of viewing, adjusting, modifying, or creating programming, control parameters, and setpoints; and calibrating sensors from an Operator Workstation. A Portable Workstation Laptop Computer connected to Building Network Controller or directly connected to an Application Specific Controller, shall have the same capabilities. At a minimum:

- a. ASCs shall automatically start-up on return of power after a failure, and previous operating parameters shall exist or shall be automatically downloaded from the Building Network Controller.
- b. ASCs do not require an internal clock, if they get time information from the Building Network Controller.
- c. ASCs shall have the following minimum point capacities, with the exception of variable air volume controllers:
 - (1) 6 Analog Inputs
 - (2) 6 Binary Inputs (with the option to use at least one binary input for pulse accumulation)
 - (3) 4 Analog Outputs
 - (4) 4 Binary Outputs
- d. Interface to Existing Owner Hand-Held Terminals shall be supported.

2.1.1.2 Universal Programmable Controllers

Each Universal Programmable Controller shall be provided with the necessary power, memory, I/O functions and communications interfaces necessary to perform its required functions and to provide control and monitoring of connected equipment and devices. It shall contain all necessary I/O functions to connect to field sensors and control devices. Communication on the Building Level Network shall provide I/O operation to be fully supervised by the Building Network Controller to detect I/O function failures. Universal Programmable Controllers shall be accessible for purposes of

viewing, adjusting, modifying, or creating programming, control parameters, and setpoints; and calibrating sensors from an Operator Workstation via a Internet interface. A Portable Workstation Laptop Computer connected to Building Network Controller or directly connected to a Universal Programmable Controller, shall have the same capabilities.

2.1.1.3 Integral Features

The Universal Programmable Controller shall include as a minimum:

- a. Universal Programmable Controllers shall automatically start-up on return of power after a failure, and previous operating parameters shall exist or shall be automatically downloaded from the Building Network Controller.
- b. Universal Programmable Controllers shall have the following minimum point capacities:
 - (1) 8 Analog Inputs
 - (2) 8 Digital Inputs (with the option to use at least one binary input for pulse accumulation)
 - (3) 8 Analog Outputs
 - (4) 6 Digital Outputs
- c. 8-hour backup for volatile memory.
- d. Seven-day calendar and real time clock with 8-hour backup.

2.1.1.4 Communication-and-Programming Interface

A communication and programming interface shall be provided as an integral part of each Universal Programmable Controller installed. The communication and programming interface shall directly readout variables, override control, servicing, troubleshooting and adjustment of control parameters. The interface shall:

- a. Indicate system status.
- b. Display point status.
- c. Display, set and change setpoints.
- d. Manually override setpoints.
- e. Set and change PID control loop gains.
- f. Select application mode.
- g. Change unoccupied/occupied periods.

2.1.1.5 Failure Mode

Upon failure of the Universal Programmable Controller, it shall revert to the failure mode of operation and shall cause all outputs to go to a safe mode (OFF, Closed etc.).

2.1.2 Distributed Control

Apply Digital Controllers in a distributed control manner. Provide repeaters on the communication link per manufactures instructions.

2.1.3 I/O Point Limitation

Total number of I/O hardware points connected to a single stand-alone Digital Controller shall not exceed 64. I/O expansion units are not permitted unless all the required type of I/Os are exhausted on the digital controller. Place I/O expansion units in the same Controller Cabinet as the Digital Controller it is associated with. Multiplexing of I/O is not permitted.

2.1.4 Environmental Operating Limits

Provide Digital Controllers that operate in environmental conditions between 32 and 120 degrees F. Controllers shall be suitable for, and placed in protective enclosures suitable for the environment (temperature, humidity, dust, and vibration) where they are located.

2.1.5 Stand-Alone Control

Provide stand-alone Digital Controllers. All I/O points specified in the mechanical design drawings for a single piece of equipment or system (such as a chiller plant or boiler plant) shall be integral to one controller and its associated I/O expansion units. Control of a single piece of equipment or system shall not be split between two controllers. Failure of any single controller shall not cause a failure with any other controllers.

2.1.6 Internal Clock

Provide an internal clock for the Building Network Controller, accurate within 2 seconds per day. The Building Network Controller shall have its clock backed up by a battery or capacitor with sufficient capacity to maintain clock operation for a minimum of 72 hours during a line power outage. When connectivity of the Building Network Controller has been established, automatic synchronization of the clock will be made from an operator-designated point of reference. The system shall automatically adjust for daylight savings time.

2.1.7 Memory

- a. Provide sufficient memory for each Digital Controller and Building Network Controller to support required control, communication, trend, alarm, and messaging functions.
- b. Memory Protection: Programs residing in memory shall be protected either by using EEPROM or by an uninterruptible power source (battery or uninterruptible power supply (UPS)). The backup power source shall have sufficient capacity to maintain volatile memory in event of an AC power failure. Where the uninterruptible power source is rechargeable (a rechargeable battery), provide sufficient capacity for a minimum of seventy-two hours back up. Trend and alarm history collected during normal operation

shall not be lost during power outages less than 72 hours long. The rechargeable power source shall be constantly charged by charging circuitry while the controller is operating under normal line power. If a non-rechargeable power source is used, the non-rechargeable power source shall be capable of providing a backup power supply for not less than a two years period. Batteries shall be designed to allow replacement without soldering.

2.1.8 Immunity to Power Fluctuations and Noise

Controllers shall operate at 90% to 110% nominal voltage rating. Protect against electrical noise of 5 to 120Hz and from keyed radios up to 5 watts at 3 ft.

2.1.9 Wiring Terminations

Use screw terminal wiring terminations for all controllers. Provision of field removable modular terminal strips is required for all controllers, except controllers integral to terminal units (like VAV controllers with an integral damper actuator) or Network Communication Capable Thermostats, unless specified otherwise.

2.1.10 Input and Output Interface

Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with sources up to 24 volts AC or DC for any duration shall cause no controller damage. Provide hard-wired input and output interface for all controllers as follows:

2.1.10.1 Inputs

Provide input function integral to the direct digital controller. Provide input type as required by the DDC design.

- a. Analog Inputs: Allowable input types are 1000 ohm platinum RTDs, 4 to 20 mA signals, or 0-10 VDC signals. Direct RTD inputs must have appropriate conversion curves stored in controller software or firmware. Analog to digital (A/D) conversion shall be a minimum of 10-bit resolution.
- b. Digital Inputs: Digital inputs shall sense open/close, on/off, or other two state indications.
- c. Pulse Accumulation Inputs: Pulse accumulation inputs shall conform to the binary input requirements and accumulate a minimum of 2 pulses per second for Application Specific Controllers, and up to 10 pulses per second for Universal Programmable Controllers.

2.1.10.2 Outputs

Provide output function integral to the direct digital controller. Provide output type as required by the DDC design.

- a. Analog Outputs: Provide controllers with a minimum output resolution of 8 bits. Analog Outputs shall send modulating 0-10 VDC or 4 to 20 MA signals to control output devices. Feedback shall be integral to the output function.

- b. Digital Outputs: Binary outputs shall send a pulsed low-voltage signal for pulse-width-modulation control, or provide a maintained open-closed position for on-off control. Provide contact closure with contacts rated at a minimum of 1 ampere at 24 volts. For HVAC equipment, provide for manual overrides, either with three-position (hand-off-auto) override switches and status lights, or with an adjacent operator display and interface.
- c. Tri-State Outputs: Tri-State outputs (floating point control outputs) are strictly prohibited.

2.1.11 PID Control

Provide controllers with proportional, proportional plus integral, and proportional plus integral plus derivative control capability. Application Specific Controllers and Network Communication Capable Thermostat controllers are not required to have the derivative component.

2.1.12 Communications Ports

- a. Controller-to-Controller Communications Ports: Digital Controllers shall be equipped with a communication port that allows the controllers to be connected in a daisy chained to form a Building Level Network. Building Network Controllers shall have a communication port for connectivity to the Building Level Network. The Building Level Network shall permit sharing of common data amongst the Digital Controllers. Minimum baud rate for the Building Level Network shall be 9600 Baud per second. Communication ports utilizing the LON open protocol shall be provided including required hardware and software for all Controllers installed on the following pieces of equipment:

- Air Handling Units
- Variable Frequency Drives
- Exhaust Fans

The contractor shall provide, install and establish communications between the communication ports of all Digital Controllers, Field Equipment Control Devices, and the Building Network Controller.

- b. Digital Controller On-Site Interface Ports: Provide a communications port for each Digital Controller that allows direct connection of a computer or hand held terminal through which the controller may be fully interrogated. Controller access may also be by Internet.
- c. Building level controllers shall use Transmission Control Protocol/Internet Protocol (TCP/IP) and Hypertext Transfer Protocol (HTTP) to communicate with Building Network Controllers via the various communication links. Provide a communications port on the Building Network Controller, that when connected to the Ethernet switch will provide communications, or when connected to a Portable Workstation Laptop Computer will allow every controller in the direct digital control system to be fully interrogated and programmed. When the Building Network Controller is connected the following operations shall be available: creation, modification, downloading and uploading control programs; creation and modification of graphics and program data base; and creating and collecting of trend reports, status reports, messages, and alarms.

- d. Whenever available as an OEM standard option, provide Field Equipment Control Devices with a communication port that allows the controllers to be connected to the Building Level Network in a daisy chained manner. Typical Field Equipment Control Devices equipped with communication ports include, but are not limited to, boilers, chillers, lighting control panels, and variable frequency motor drives.

2.1.13 Controller Cabinets

Every Digital Controller shall be provided with a cabinet having a minimum NEMA 1 for indoor locations to protect the controller from dust and provide protection from moisture. Cabinets located outdoors, in moist environments shall protect against all outdoor conditions, and have a minimum NEMA 4 or 3R rating. All cabinets shall have a hinged lockable door and an removable mounting plate, Controller cabinets shall be lockable (manufactured by Hoffman Enclosures, Inc., model no. A-CLSN12). . All penetrations to the cabinet for wiring shall be through the bottom of the cabinet. Penetrations to the top or sides of the cabinet are strictly prohibited for outdoor locations.

2.1.13.1 Duplex Outlet

Not used.

2.1.13.2 Main Power Switch

Provide every power transformer or DC Power Supply with a fused main power switch or circuit breaker for isolation from AC power.. The switch shall be protected from tampering by being located within the Controller Cabinet.

2.1.14 Wire & Conduit Routing

Contractor shall utilize the existing conduit system to the maximum extent feasible.

Contractor shall route new thermostat wiring using the present routing for the pneumatic tubing. This will minimize exposure to Asbestos which is present.

Contractor shall route new LON, CAT-5 Ethernet, Power and RS-285/Modbus cabling as required to power the Extended DDC system

2.2 DDC SOFTWARE

Software resides in the Digital Controllers and performs control sequences.

Provide a complete, clear, and concise written sequence of operation for the HVAC equipment. Include all conventional control operations, time event operations, energy management functions (night setback, reset schedules, optimum start, enthalpy economizer control); demand limiting, safeties, and emergency conditions. Put the sequence of operation on the design drawings, not in the specifications.

2.2.1 Programming

Provide programming and software configuration to execute the sequence of operation indicated in the DDC design. Provide all programming and tools to configure and program all controllers. Provide programming routines in simple, easy-to-follow logic with detailed text comments

describing what the logic does and how it corresponds to the project's written sequence of operation.

- a. Graphic-based programming shall use a library of function blocks made from pre-programmed code objects designed for direct digital control. Function blocks or objects shall be assembled with interconnecting lines, depicting the control sequence in a flowchart. Graphic programs shall be viewable in real time showing present values and logical results from each function block or objects. Graphical HAND-AUTO-OFF icons shall be provided to control all active equipment.
- b. Menu-based programming shall be done by entering parameters, definitions, conditions, requirements, and constraints.
- c. For line-by-line and text-based programming, declare variable types (local, global, real, integer, etc.) at the beginning of the program. Use descriptive comments frequently to describe the programming.
- d. Provide a means for detecting program errors and testing software strategies with a program compiler and/or digital simulation tool prior to downloading programming into the Digital Controllers.

2.2.1.1 Optimum Start/Stop Program

This program shall start and stop equipment as specified for the scheduled start-stop program, but shall include a sliding schedule based on indoor and outdoor air conditions. The program shall take into account the thermal characteristics of the structure, and indoor and outdoor air conditions, using prediction software to determine the minimum time of HVAC system operation needed to satisfy space environmental requirements at the start of the occupied cycle, and determine the earliest time for stopping equipment at the day's end without exceeding space environmental requirements.

- a. Program Inputs
 - (1) Day of week/holiday.
 - (2) Time of day.
 - (3) Cooling or heating mode of operation.
 - (4) Equipment status.
 - (5) Cooling and heating building occupancy schedules.
 - (6) Space temperature(s).
 - (7) Building heating constant (operator adjustable and automatically optimized).
 - (8) Building cooling constant (operator adjustable and automatically optimized).
 - (9) OA temperature.

- (10) Required space temperature at occupancy (heating).
- (11) Required space temperature at occupancy (cooling).
- (12) Equipment constraints.
- (13) Cooling and heating high-low alarm limits.

b. Program Outputs:

- (1) Start/stop signal.

2.2.1.2 Electrical Power Demand Limiting

The EMS shall monitor and limit the electrical demand at individual installations using a demand minimization program and a time of day demand limiting program. The demand minimization program shall be activated manually by an operator who will be advised when a utility wide peak is expected, as well as the duration of the peak period. The time of day demand limiting program shall be active at all times in accordance with the re-established seasonal schedules and peak demand limits. The time of day demand limiting program shall use installation electric utility meters and predict an electrical peak demand. When the predicted demand exceeds a preset value, the demand limiting programs shall change equipment operating set points and shed loads on a pre-scheduled step basis to reduce the connected load before the actual electrical demand peak exceeds the target peak demand value.

2.2.1.2.1 Standard Demand Limiting Steps-Summer

The electrical power demand limiting program shall assign standard demand limiting steps for HVAC equipment as follows:

a. Constant Volume Air Handling Units and Fan Coil Units:

- Step 1. Reset air handling cooling discharge air temperature or reset space temperature upwards as shown.
- Step 2. Stop chilled water flow to coil.
- Step 3. Shut off system, including return and exhaust fans.

b. Boilers and Heat Exchanger Systems:

- Step 1. Reset hot water discharge temperature downwards.
- Step 2. Limit capacity.
- Step 3. Shut off system (including auxiliaries).

2.2.1.2.2 Standard Demand Limiting Steps-Winter

The time of day demand limiting program shall assign standard demand limiting steps for HVAC equipment as follows:

a. Constant Volume Air Handling Units and Fan Coil Units:

- Step 1. Reset discharge air temperature lower if heating, or reset discharge air temperature higher if cooling.
- Step 2. Stop chilled water flow to coil.

2.2.1.3 Economizer Program

The software shall reduce the HVAC system cooling requirements when weather conditions allow the use of outside air for cooling. Ambient air conditions shall be monitored by the DDC through the outside air temperature (OA-T) sensor and the outside air humidity (OA-H) sensor. The economizer program shall be inhibited if the enthalpy of the outside air exceeds an operator selectable value or the enthalpy of the return air. When outside air conditions are favorable for economizer operation, based on a comparison of the enthalpy of the outside air to the enthalpy of the return air], the Digital Controller shall enable economizer operation. When the economizer operation is enabled, the OA, return air, and exhaust air dampers shall be positioned to maintain the required mixed air temperature. Mixed air temperature shall be set equal to the required unit supply air temperature. When economizer operation is disabled; the OA dampers, return air dampers, and relief air dampers shall be positioned to provide minimum required OA.

a. Program Input

- (1) Changeover conditions.
- (2) OA dry bulb temperature.
- (3) Return air dry bulb temperature.
- (4) Mixed air dry bulb temperature.
- (5) Maximum allowable OA air dry bulb temperature.
- (6) OA-humidity and RA humidity

b. Program Output: Damper actuator/cooling control signal.

2.2.1.4 Ventilation-Recirculation Program

The software shall reduce the HVAC system thermal load for two modes of operation as follows:

a. Ventilation mode:

In this mode, the system shall pre-cool the space prior to building occupancy. When the outside air temperature is lower than the space temperature, the outside air damper and exhaust air damper shall open to their maximum positions and the return air damper shall close to its minimum position.

b. Recirculation mode:

In this mode, the system shall preheat the space prior to building occupancy. When the outside air temperature is lower than the space temperature, the outside air damper and the exhaust air damper shall close to their minimum positions and, the return air damper shall open to its maximum position.

The outside air damper and the exhaust air damper shall be closed at all other times during unoccupied periods, except for economizer operation during day/night setback periods. For systems without mechanical cooling, this program shall, in addition to the above requirements, act as an economizer. The EMS shall modulate the outside, return, and exhaust air dampers to maintain the required mixed air temperature setpoint. When this program is released, the outside and exhaust air dampers shall return to their minimum positions, and the return air damper shall return to its maximum position.

c. Program Inputs

- (1) Day of week.
- (2) Time of day.
- (3) Cooling or heating mode of operation.
- (4) Equipment status.
- (5) Cooling and heating occupancy schedules.
- (6) OA dry bulb temperature.
- (7) Space temperature.
- (8) Equipment constraints.

d. Program Output: Damper actuator control signal.

2.2.1.5 Hot Deck Cold Deck Temperature Reset Program

Not Used.

2.2.1.6 Reheat Coil Reset Program

Not Used.

2.2.1.7 Chilled Water Temperature Reset Program

Not Used.

2.2.1.8 Condenser Water Temperature Reset Program

Not Used.

2.2.1.9 Chiller Demand Limit Program

Not Used.

2.2.1.10 Hot Water OA Reset Program

Not Used.

2.2.1.11 Timed Local Override for Temporary Occupancy Program

Thermostats and wall mounted temperature sensors shall have a means for a temporary manual override of the program schedule, with automatic program restoration after the scheduled interval. Interval shall be adjustable, at an initial interval of one hour. Provide programming for a timed local override of the program schedule of each HVAC system via its system designated temporary occupancy pushbutton (either a standalone pushbutton that is labeled as to its function or a pushbutton integral to a thermostat or wall mounted temperature sensor), with automatic program restoration after a user defined time interval. Timed local overrides are to be disabled during occupancy periods. For systems such variable air volume systems, the timed local override shall not only enable the VAV box for the zone in which the button was pushed, but shall also enable all other associated pieces of equipment (the air handler, chiller, boiler, etc.) allowing the zone to be conditioned to the normal occupied set points.

2.2.2 Database Modification

All setpoints, software points, writeable object properties, and all other programming parameters needed to comply with the project specification shall be adjustable regardless of programming methods used to create the applications. Database modification shall be accomplished through a network connected OWS, local OWS, Portable workstation laptop computer, hand held terminal, or through a keypad integral to the controller. When the control program is of the line-by-line type, or block programming language, database parameters shall require assignment of variable names so parameters can be changed without modifying the programming. The following shall be modifiable in this way:

- a. Setpoints
- b. Dead band limits and spans
- c. Reset schedules
- d. Switchover points
- e. PID gains and time between control output changes
- f. Time
- g. Timed local override time
- h. Occupancy schedules
- i. Holidays

- j. Alarm points, alarm limits, and alarm messages
- k. Point definition database
- l. Point enable, disable, and override
- m. Trend points, trend intervals, trend reports
- n. Analog input default values
- o. Passwords
- p. Communications parameters including network and telephone communications setups

2.2.3 Short Cycling Prevention

Where equipment is started and stopped or opened and closed in response to some analog input such as temperature, or pressure, include a differential or an appropriate minimum off time delay for the control loop to prevent short cycling of equipment.

2.2.4 Motor and Flow Status Delay

Provide an adjustable delay between when a motor is commanded on or off and when the control program looks to the motor or flow status input for confirmation of successful execution of the command.

2.2.5 Runtime Accumulation

Provide resettable run time accumulation for each Binary Output connected to mechanical loads greater than 1HP, electrical loads greater than 10KW, or wherever else specified.

2.2.6 Time Programs

Provide programming to automatically adjust for leap years, allow operator time adjustments, and make daylight savings time and standard time adjustments.

2.2.7 Scheduling

- a. Each control output point shall be schedulable and its operation based on time of day, day of week, and day of year. Output points may be associated into groups. Each group may be associated with a different schedule. Changing the schedule of a group shall change the schedule of each point in the group. Points may be added to and deleted from groups. Groups may be created and deleted by the operator.
- b. Provide capability that will allow current schedules to be viewed and modified in a seven-day week format. When control program does not automatically compute holidays, provide capability to allow holiday schedules to be entered one full year at a time.

2.2.8 Point Override

I/O and virtual points shall be able to accept overrides in the software and be commanded to any valid value from a hand held terminal, through a keypad integral to a Digital Controller, any OWS, or a Portable Workstation Laptop Computer connected to the Building Network Controller or direct connected to a Digital Controller. When documented, exceptions to these requirements are allowed for life, machine, and process safeties.

2.2.9 Alarming

I/O points and virtual points shall be alarmable. Alarms may be enabled and disabled for every point. Alarm limits shall be adjustable on analog points. Building Network Controllers connected to the network shall download alarms and alarm messages to the data servers when an alarm occurs. Otherwise alarms will be stored at the Building Network Controller until connected to a Portable Workstation Laptop Computer and retrieved. When a Building Network Controller is not connected to the network, and the memory on the Building Network Controller becomes full, the most recent data shall overwrite the oldest data. Provide alarming in accordance with the point schedule, sequence of operation, and any other notation in the design drawings. At a minimum the following conditions shall generate alarms including alarms defined in prior section of this document:

- a. Motor is commanded on or off but the motor status input indicates no change
- b. Room temperature or pressure strays outside selectable limits
- c. An analog input takes a value indicating sensor failure
- d. A module is "dead" to the LAN
- e. A power outage occurs
- f. Damper is commanded open or closed but the limit switch status or positional status has not changed
- g. Hand-Off-Auto switch has been placed in the Hand or Off position
- h. Smoke detectors sense smoke condition; fire alarms
- i. Filter differential pressure
- j. Supply fan high limit switch
- k. Tank levels outside limits
- l. Equipment safeties (chiller, boiler, VFD, etc.)
- m. Emergency shutoff switch (Demand Limit Step 3)

2.2.10 Messages

Messages shall be operator defined and assigned to alarm points. Messages shall be displayed when a point goes into alarm.

2.2.11 Trending

DDC system shall have the capability to trend I/O and virtual points. Points may be associated into groups. A trend report may be set up for each group. The period between logging consecutive trend values shall range from one minute to 60 minutes at a minimum. Trend data type shall be selectable as either averages over the logging period or instantaneous values at the time of logging. The minimum number of consecutive trend values stored at one time shall be 100 per variable. When trend memory is full, the most recent data shall overwrite the oldest data. Trend data shall be capable of being uploaded to computer. Trend data shall be available on a real time basis; trend data shall appear either numerically or graphically on a connected computer's screen as the data is being processed from the DDC system data environment. Trend reports shall be capable of being uploaded to computer disc and archived.

2.2.12 Status Display

Current status of I/O and virtual points shall be displayed on command. Points shall be associated into functional groups, such as all the I/O and virtual points associated with control of a single air handling unit, and displayed as a group, so the status of a single mechanical system can be readily checked. A group shall be selectable from a menu of groups having meaningful names; such as AHU-4, Second Floor, Chiller System, and other such names.

2.2.13 Diagnostics

Each controller shall perform self-diagnostic routines and provide messages to an operator when errors are detected. DDC system shall be capable of recognizing a non-responsive module on a LAN. The remaining, responsive modules on a LAN shall not operate in a degraded mode.

2.2.14 Power Loss

In event of a power outage, each controller shall assume a disabled status and outputs shall go to a user definable state. Upon restoration of power, DDC system shall perform an orderly restart, with sequencing of outputs, and restoration of control.

2.2.15 Program Transfer

Every Digital Controller in the DDC system shall be capable of being downloaded and uploaded to through the Building Network Controller.

2.2.16 Password Protection

Provide at least three levels of password protection to the DDC system permitting different levels of access to the system.

2.3 WORKSTATION

2.3.1 Workstation Software

Workstation software shall be recommended and supported by the DDC system manufacturer and configured to operate according to the DDC system manufacturer's specifications. Workstation software shall be resident in the workstation computer. Workstation software shall permit monitoring, modification, and troubleshooting of the DDC system. Workstation software shall permit modification of the controller database and control programs for any Building Network Controller or Digital Controller on the network. Operations shall be menu selected. Menu selections shall be made with a mouse.

- a. Menu System: Menu system shall allow an operator to select a particular function or access a particular screen through successive menu penetration.
- b. Controller Data Base Modification: The workstation software shall be an interface for performing capabilities specified in paragraph entitled "DDC Software" and available through direct connection of a computer to a digital controller. Database modification shall require only that an operator "fill in the blank" for that parameter on a screen requesting the information in plain language. Database modifications shall be automatically downloaded to the appropriate controllers at operator request.
- c. Program modification: For systems using a line-by-line programming language, provide an off-line text editor, similar to a BASIC program editor, permitting modification of controller resident control programs, For systems using block or object programming languages provide a capability for linking blocks/objects together to create new programs or modify existing programs. Program modifications shall be automatically downloaded to the appropriate controllers at operator request.

2.4 GRAPHIC DISPLAY (GRAPHICS) SOFTWARE

Provide web-based Graphic Displays (Graphics) viewable on browsers compatible with MS Internet Explorer 8.X or greater using an industry-standard file format such as HTML, BMP, JPEG, or GIF.

The intent of graphics software is to provide an ergonomic interface to the DDC system that encourages effective and efficient interaction with the system. Graphics software shall provide graphical representation of the building, the buildings mechanical systems, and the DDC system. The current value and point name of every I/O point (physical and virtual) shall be shown on at least one graphic and in its appropriate physical location relative to building and mechanical systems.

Provide graphics that closely follow the style of the control drawings in representing mechanical systems, sensors, controlled devices, and point names

- a. Graphic Title: Provide graphics with an identifying title visible when the graphic is being viewed and include building number with either location description for floor plans or system description.
- b. Dynamic Update: When the workstation is on-line with the control system, point data shall update dynamically on the graphic images.

- c. **Graphic Penetration:** Provide graphic penetration when the capability exists. For systems without graphic penetration, provide menu penetration for selection of individual graphics to give the same hierarchical affect provided by graphic penetration.
- d. **Graphic Types:** Graphic-based software shall have graphics of the building exterior, building section, floor plans, and mechanical systems. Provide the following graphics.
 - (1) **Base Graphic:** Show building on digital photograph of base with active pushpin link
 - (2) **Building Summary Graphic:** Show stacked floors for multi-level or multi-sectioned floor plans with appropriate section and floor name for each area.
 - (3) **Roof/Floor Plan Graphics:** Provide roof graphic and a single graphic for each floor, unless the graphic will contain more information than can reasonably be shown on a single graphic. Each heating or cooling zone within a floor plan shall have a zone name and/or room number and its current temperature displayed within the zone outline. Show each controlled variable in the zone. Show locations of thermostats and physical equipment and location of Building Network Controller. Graphics shall display active key plan and north directional arrows. Provide visual indication for each point that is in alarm.
 - (4) **Mechanical System Graphics:** Provide three-dimensional drawings to symbolize mechanical equipment; do not use line drawings. Show controlled or sensed mechanical equipment. Each graphic shall consist of a single mechanical system; examples are a graphic for an air handling unit, a graphic for a VAV box, a graphic for a heating water system, and a graphic for a chiller system. Exception would be for an exhaust fan interlocked to an air handling unit where exhaust fan shall be displayed on the air handling unit graphic. Place sensors and controlled devices associated with mechanical equipment in their appropriate locations. Place point name and point value adjacent to sensor or controlled device. Provide visual indication of each point in alarm. Condition, such as zone temperature, associated with the mechanical system shall be shown on the graphic. Point values shall update dynamically on the graphic. Link buttons shall be provided to access associated system graphics such as applicable legends. Access to the sequence of operation text shall be via Adobe Acrobat .pdf file format.
 - (5) **Miscellaneous Summary Graphics:** Provide summary tables as overview of equipment statuses or systems' critical temperatures or to simplify representation of data for common system types. Examples are multi-zone dampers.
- e. **Graphic Editing:** The full capabilities as afforded by the graphics software package shall be included for operator editing of graphics. Graphics may be created, deleted, and modified, and text added. Provide capability to store graphic symbols in a symbol directory and incorporate these symbols into graphics. A minimum of sixteen colors shall be available though for human engineering purposes the amount of colors shall be limited to 5 colors per screen.
- f. **Dynamic Point Editing:** Provide full editing capability for deleting, adding, and modifying dynamic points on graphics.

- g. Trending: Trend data shall be displayed graphically, with control variable and process variable plotted as functions of time on the same chart. Graphic display of trend data shall be a capability internal to the workstation software and not a capability resulting from download of trend data into a third-party spreadsheet program such as Excel, unless such transfer is automatic and transparent to the operator, and the third-party software is included with the workstation software package. At the operator's discretion trend data shall be plotted real time.

2.5 SENSORS AND INPUT HARDWARE

2.5.1 Resistance Temperature Detectors (RTDs)

Provide RTD sensors with 1000 ohm, or higher, platinum element that are compatible with the Digital Controllers. Sensors shall be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper. Temperature sensor accuracy shall be 0.1 percent (1 ohm) of expected ohms (1000 ohms) at 32 degrees F. Temperature sensor stability error over five years shall not exceed 0.25 degree F cumulative. Direct connection of RTDs to Digital Controllers, without transmitters, is preferred provided controller supports direct connection of RTDs. When RTDs are connected directly to the controller, keep lead resistance error to 0.25 degree F or less. Provide 3 wire-sensing circuits to not exceed the 0.25 degree F lead resistance error. Total error for a RTD circuit shall not exceed 0.5 degree F, which includes sensor error, lead resistance error or 4 to 20 milliampere transmitter error, and A/D conversion resolution error. Provide manufacturer documentation and the Contractor's engineering calculations which support the proposed RTD circuit will have a total error of 0.5 degree F or less for the specified application.

a. Wiring:

- (1) Provide 18 gage twisted and shielded pair cable for direct connected RTDs.
- (2) Provide 18 gage twisted and shielded pair cable for RTDs using 4 to 20 milliampere transmitters.

c. Transmitters: Provide 4 to 20 milliampere transmitters for RTDs where:

- (1) Digital Controllers do not support direct connection of RTDs to controllers; and
- (2) Digital Controllers do not meet temperature resolution requirement of 0.25 degree F.

2.5.1.1 Temperature Sensor Details

- a. Room: Conceal element behind protective cover matched to the room interior. Room temperature sensor shall have integral pushbutton, digital input to the controller for system override, and a setpoint adjustment, analog input to the controller and these features shall be implemented for each room temperature sensor. Override pushbutton shall be programmed as such that the associated equipment is enabled for an adjustable period in the event the button is pushed in order to place the systems in the occupied mode. Provide a connection to allow interrogation of the digital controller. Accuracy shall be +/-0.75 deg F for a range of +50 to +90 deg F for conditioned spaces and +/-1.0 deg F for a range of +30 to +130 deg F for unconditioned spaces.

- b. Duct Averaging Type: Continuous averaging RTDs for ductwork applications shall be 1 foot in length for each 4 square feet of ductwork cross-sectional area with a minimum length of 6 feet. Probe type duct sensors of one-foot length minimum are acceptable in ducts 12 feet square and less. Accuracy shall be +/-1.0 deg F for a range of +40 to +140 deg F.
- c. Pipe Immersion Type: Provide a minimum 3 inch long immersion sensor. Provide each sensor with a corresponding pipe mounted sensor well, unless otherwise indicated. Sensor wells shall be stainless steel when used in steel piping, brass when used in copper piping, or an appropriate material when immersed in a corrosive liquid (such as chlorinated water, glycol, etc.). Provide the sensor well with a heat-sensitive transfer agent between the exterior sensor surface and interior well surface.
- d. Outside Air Type: Provide the sensing element on the buildings north side with a protective sunshade to minimize solar effects. Mount element at least 3 inches from building outside wall. Sunshade shall not inhibit the flow of ambient air across the sensing element. Shade shall protect sensing element from snow, ice, and rain. Accuracy shall be +/-1.0 deg F for a range of +20 deg F to +120 deg F.

2.5.2 Transmitters

Provide transmitters with 4 to 20 mA or 0 to 10 VDC output linearly scaled to the temperature, pressure, or flow range being sensed. Transmitter shall be matched to the sensor, factory calibrated, and sealed. Total error shall not exceed 0.1 percent of 20 milliampere (0.02 milliampere) at any point across the 4 to 20-ma span. Supply voltage shall be 24 volts ac or dc. Transmitters shall have non-interactive offset and span adjustments. For temperature sensing, transmitter stability shall not exceed 0.05 degrees C a year.

2.5.2.1 Spans and Ranges

Transmitter spans or ranges shall be the following and shall be suitable for the application:

a. Temperature:

- (1) 50 degrees F span: Room, chilled water, cooling coil discharge air, return air sensors
- (2) 100 degrees F span: Outside air, hot water, heating coil discharge air, mixed air sensors
- (3) 200 degrees F span: High temperature hot water, heating hot water, chilled/hot water system sensors.

b. Pressure:

- (1) -0.25 to 0.25 inches water differential range: Room static pressure
- (2) 0 to 5 inches water differential range: Duct static pressure
- (3) 0 to 50 PSI differential: Water differential pressure

(4) 0 to 2.5 inches water differential range: Filter differential pressure

2.5.2.2 Relative Humidity Transmitters

Provide transmitters with an accuracy equal to plus or minus 3 percent from 0 to 90% scale, and less than one percent drift per year. Sensing elements shall be the polymer type.

2.5.2.3 Pressure Transmitters

Provide integral pressure transducer and transmitter. Output of pressure instrument shall be a 0 – 10 VDC signal proportional to the pressure span. Span shall be as specified. Accuracy shall be 1.0 percent. Linearity shall be 0.1 percent. Supply voltage shall be 24 V dc. Transmitter shall meet specified requirements.

2.5.3 Current Transducers

Provide current transducers to monitor the amperage of each motor or compressor. For chillers with multiple compressors provide a current transducer at the incoming power to the chiller unless otherwise specified. Current Sense Relays shall be used on motors of 3 HP or less.

2.5.4. Timed Local Override for Temporary Occupancy

Provide every HVAC system (unless otherwise noted) with a momentary contact temporary occupancy timers (either a standalone pushbutton that is labeled as to its function or a pushbutton integral to a thermostats or wall mounted temperature sensor) with override time set in controller software. Provide to override DDC time of day program and activate occupancy program for assigned units. Upon expiration of override time, the control system shall return to time-of-day program. Time interval for the length of operation shall be software adjustable and shall expire unless reset.

2.5.5 Electronic Airflow Measurement Stations and Transmitters

Provide Electronic Airflow monitoring Stations and Transmitters as follows:

- a. Station - Each station shall contain an array of velocity sensing elements and straightening vanes inside a flanged sheet metal casing. The velocity sensing elements shall be RTDs. The sensing elements shall be distributed across the duct cross section in the quantity and pattern set forth for measurements and instruments of ASHRAE 3 and SMACNA HVACTAB for the traversing of ducted air flows. The resistance to air flow through the airflow measurement station shall not exceed 0.08 inch water gage at an airflow of 2,000 fpm. Station construction shall be suitable for operation at airflow of up to 5,000 fpm over a temperature range of 40 to 120 degrees F, and accuracy shall be plus or minus 3 percent over a range of 125 to 2,500 fpm scaled to air volume.
- b. Each transmitter shall produce a linear, temperature compensated 4 to 20 mA dc, output corresponding to the required velocity pressure measurement. The transmitter shall be a 2-wire, loop powered device. The output error of the transmitter shall not exceed 0.5 percent of the calibrated measurement. The electronic transmitter shall be internal or external mounting within 10 feet of the flow sensor and shall include noninteracting zero and span adjustments. Device shall include local visual readout.

2.5.6 Vortex Shedding Flowmeter

The vortex shedding flowmeter shall produce an analog 0 – 10 VDC signal that is linearly proportional to the volumetric flow rate. The accuracy shall be within $\pm 0.8\%$ of the actual flow. The electronic transmitter for the vortex shedding flowmeter shall be internal or external mounting within 10 feet of the flow sensor and shall include noninteracting zero and span adjustments. Device shall include local visual readout. The flow meter body shall be made of austenitic stainless steel. The vortex shedding flowmeter body shall not require removal from the piping in order to replace the shedding sensor.

2.5.7 Magnetic Flowmeter

The magnetic flowmeter shall produce an analog 0 – 10 VDC signal that is linearly proportional to the volumetric flow rate. The accuracy shall be within $\pm 0.2\%$ of the actual flow from 10 to 100% full scale for velocities over 1 fps, repeatability at 0.25% full scale. Power consumption 30 watts or less, power requirement 120 VAC $\pm 10\%$. The unit shall utilize capacitively-coupled design, non-contacting electrodes and shall accurately measure the flow in partially full pipes. The electronic transmitter shall be internal or external mounting within 10 feet of the flow sensor and shall include non-interacting zero and span adjustments. Device shall include local visual readout.

2.5.8 Occupancy Sensors/Timers

Occupancy Timers shall be provided that are identical to those presently used. New timers shall be installed in existing locations.

2.6 OUTPUT HARDWARE

Show all control dampers on the control drawings. Indicate the blade configuration (parallel or opposed-blade), the actuator normal position, and whether it's two-position or modulating. Provide damper position feedback to indicate the damper status/position.

2.6.1 Dampers

Damper already exist on the HVAC units. Current pneumatic controls shall be removed and electric motor damper actuators installed.

2.6.2 Control Valves

Not Used.

2.6.2.1 Valve Assembly

Not Used.

2.6.2.2 Two-Way Valves

Not Used.

2.6.2.3 Three-Way Valves

Not Used.

2.6.2.4 Duct Coil and Terminal Unit Coil Valves

Not Used.

2.6.2.5 Valves for Chilled Water, Condenser Water and Glycol Service

Not Used.

2.6.2.6 Valves for Hot Water Service

Not Used.

2.6.2.7 Valves for High Temperature Hot Water Service

Not Used.

2.6.3 Actuators

Provide electric motor type spring return actuators on all control dampers and all control valves (so that, in the event of power failure, actuators shall fail safe in either the normally open or normally closed position as specified) except terminal VAV units, convectors, and unit heaters; unless indicated otherwise. Provide a minimum of one actuator for each damper.

Show on drawings the normal position of each actuator without power or control signal. Select normal position considering power loss, freezing, moisture damage, and smoke or fire transmission. Indicate power return actuators where necessary for actuator timing and process requirements. Indicate spring return for actuators where normal position, but not timing, is important. Spring return closed is often desirable for steam valves and outside air intake dampers. Whenever possible provide electric actuators for reduced maintenance, quality control, and DDC integration. However, pneumatic actuators may be preferable in unusual circumstances like explosion-proof areas. Existing pneumatic actuators may also have to remain in retrofits where costs prevent actuator replacement.

2.6.3.1 Electric Actuators

Provide direct drive electric actuators for all valve and damper control applications. Where pneumatics exists, replace at central and zone levels and where possible, remove all associated pneumatic piping. Otherwise, remove pneumatic piping as far back as possible (either to the nearest wall that the tubing is running through or against, or no less than 5 feet back from the device that the tubing was connected to) and permanently plug the pneumatic tubing. When operated at rated voltage, each actuator shall be capable of delivering the torque required for continuous uniform movement of the valve or damper and shall have internal end switches to limit travel, or shall withstand continuous stalling without damage. Actuators shall be quiet operating and function properly with range of 85 to 110 percent of line voltage. Provide gears of steel or copper alloy. Fiber or reinforced nylon gears may be used for torques less than 16 inch pounds. Provide hardened steel running shafts in sleeve bearing of copper alloy, hardened steel, nylon, or ball bearing. Provide proportioning actuators capable of stopping at all points in the cycle and starting in either direction, from any point. Actuators shall be equipped with a switch for reversing direction, and a button to disengage the clutch to allow manual adjustments. Provide the actuator with a hand crank for manual adjustments, as applicable. Equip valve actuators with a force-limiting device such as spring yield so that, when in a relaxed position, device shall maintain a

pressure on valve disc equivalent to system pressure at valve. Provide a power return operation adjustable up to 4 minutes with sufficient reserve power to fully stroke the valve once and hold in the desired FAIL SAFE position. Provide reversible shaded pole, split capacitor, synchronous, or stepper type electric motors. Each actuator shall have distinct markings indicating the full-open and full-closed position, and the points in-between.

2.6.4 Hand-Off-Automatic (HOA) Switches

Hand-Off-Automatic (HOA) switch shall be rated for a minimum of 600 VAC, 5 A. Dual auxiliary contacts shall be provided for the automatic position to provide sensing at the controller. Auxiliary contacts shall be rated at least 120 VAC, 1 A.

2.6.5 Output Switches

2.6.5.1 Control Relays

Field installed and DDC panel relays shall be double pole, double throw (DPDT), UL listed, with contacts rated to the application, indicator light, and enclosed in a dustproof enclosure. The indicator light shall be lit when coil is energized and is off when coil is not energized. Relays shall be socket type, plug into a fixed base, and be replaceable without need of tools or removing wiring.

2.6.5.2 Motor Starter Contactor

IEC form factor Contactors shall be used to control power to motors. These devices shall be DIN rail mount, have multiple poles that depend upon the application such as single phase verses three phase contactor, shall be controlled via the DDC using 24 VAC Coils, shall be rated for the inductive loading such as ½ hp vs. 5 hp motors and shall have suitable terminations for the incoming power and outgoing power wire sizes

2.7 ELECTRICAL POWER AND DISTRIBUTION

Provide a source of 120 volts , 60 Hz, single phase, two wire with ground to step down to 24 VAC which shall be used to power any new DDC equipment that is not able to be powered from existing sources.

Devices shall be UL listed or FM approved. Power output to all new shall be 24 VAC and shall be provided from the nearest existing power sources to the maximum extent feasible.

2.7.1 Transformers

Transformers shall conform to UL 506. Provide power to the primary side of the transformer from a dedicated circuit breaker. Add a new breaker if required at the nearest electrical panel with available spare capacity. Transformers for Digital Controllers shall be fed from the nearest distribution panel board or motor control center, using circuits provided for the purpose. Provide a fuse cutout on the secondary side of the transformer. Transformers shall be fused or current limiting and rated at 125% power consumption.

2.7.2 Surge Protection

Provide each Building network Controller and Digital Controller with surge and transient power protection. Surge and transient protection shall consist of the following devices, installed externally to the controllers.

2.7.2.1 Power Line Surge Protection

Surge suppressors shall be installed on all incoming AC power. Surge suppressor shall be rated by UL 1449, and have clamping voltage ratings below the following levels:

- a. Normal Mode (Line to Neutral): 350 Volts
- b. Common Mode (Line to Ground): 350 Volts

2.7.2.2 Telephone and Communication Line Surge Protection

Telephone and Communication Lines shall be protected from surges. Metal oxide varistor (MOV) protection, rated for the application, shall be installed at the equipment. Additional protection, gas tubes rated for the application, shall be installed within 3 feet of the building cable entrance or within 3 feet of the telephone company's network interface.

2.7.2.3 Sensor and Control Wiring Surge Protection

Controllers shall have sensor and control wiring surge protection with optical isolation, metal oxide varistors (MOV), or silicon avalanche devices. Fuses are not permitted for surge protection.

2.7.3 Wiring

Provide complete electric wiring for DDC System, including wiring to transformer primaries. Control circuit conductors which run in the same conduit as power circuit conductors shall have the same insulation level as power circuit conductors. Circuits operating at more than 100 Volts shall be in accordance with Section 16402, "Interior Distribution System." Circuits operating at 100 Volts or less shall be defined as low voltage and shall be run in rigid or flexible conduit, metallic tubing, metal raceways or wire trays, armored cable, or multi-conductor cable for outdoor usage.

For indoor use provide circuit and wiring protection as required by NFPA 70. Aluminum-sheathed cable or aluminum conduit may be used but shall not be buried in concrete. Protect exposed wiring from abuse and damage.

2.7.3.1 AC Control Wiring

- a. Control wiring for 24 V circuits shall be insulated copper 18 AWG minimum and shall be rated for 300 VAC service.
- b. Wiring for 120 V shall be 14 AWG minimum and shall be rated for 600 V service.

2.7.3.2 Analog Signal Wiring

Analog signal wiring for analog inputs and analog outputs shall be 18 AWG single or multiple twisted pair. Each cable shall be 100 percent shielded, and have 20 AWG drain wire. Exception is direct connect RTD wiring which shall be a single 18 AWG minimum-twisted pair, 100 percent shielded, and with 20 AWG drain wire. Each wire shall have insulation rated to 300 V ac. Cables

shall have an overall aluminum-polyester or tinned-copper (cable-shield tape), overall 20 AWG tinned copper cable drain wire, and overall cable insulation rated to 300 V ac. Install analog signal wiring in conduit separate from AC power circuits.

2.7.3.3 Digital Signal Wiring

Digital signal wiring for digital inputs and digital outputs shall be 18 AWG single twisted pair. Each cable shall be 100 percent shielded with 20 AWG drain wire. Each wire shall have insulation rated to 300 V ac. Cables shall have an overall aluminum-polyester or tinned-copper (cable-shield tape), overall 20 AWG tinned copper cable drain wire, and overall cable insulation rated to 300 V ac. Install digital signal wiring in conduit separate from AC power circuits.

2.7.3.4 Control Wiring Insulation Colors:

The outer insulation of the cable used for AC Control Wiring, Analog Signal wiring, Digital Signal Wiring and Communications/Network Wiring shall be color coded. The insulation of the signal wire of the Analog Signal wiring and Digital Signal Wiring shall match the color of the outer insulation of the cable. The colors of the insulation of shall be as follows:

- (1) Digital outputs: Violet
- (2) Digital inputs: Orange
- (3) Analog inputs: Yellow
- (4) Analog outputs: Tan
- (5) Network cable: Light Blue
- (6) CAT5e network cable (for connection to the Ethernet ports): Yellow
- (7) 24VAC power: Gray

Note – existing DDC wiring may not follow this color coding scheme and shall be left intact.

2.8 FIRE PROTECTION DEVICES

Provide smoke detectors in return and supply air ducts on downstream side of filters in accordance with NFPA 90A, except as otherwise indicated. Provide UL listed or FM approved detectors for duct installation.

2.8.1 Smoke Detectors

Provide duct smoke detectors in HVAC ducts in accordance with NFPA 72 and NFPA 90A, except as indicated otherwise. Smoke detector interlocks shall be hardwired to the MCC or thru the unit's internal packaged control board for direct shutdown. Each smoke detector shall be monitored and an alarm shall be generated upon detection of smoke. Provide UL listed or FM approved detectors, designed specifically for duct installation. Provide smoke detectors as follows:

- a. Provide duct-mounted supply air smoke detectors for each air-handling system with supply air capacity equal to or greater than 2000 cfm. Locate the detector downstream of the supply air fan, before the first branch connection.
- b. Provide duct-mounted return air smoke detectors for each air-handling system serving more than one story, and where the total return air capacity is equal to or greater than 15,000 cfm. Provide a detector at each story's return duct main, before its connection to the common return air duct. Also provide a detector at the return air inlet connection to the air handler, before any fresh air or recirculation connection.

2.8.2 Smoke Dampers and Combination Smoke/Fire Damper

Smoke damper and actuator assembly as required in accordance with NFPA 90A shall meet the Class II leakage requirements of UL 555S. Dampers shall be factory fabricated from galvanized steel or stainless steel with lubricated bearing, linkage, and seals to withstand temperatures from minus 20 to plus 250 degrees F. Provide seals that can be easily replaced. Combination smoke/fire dampers shall have UL 1.5 hour rating and shall be equipped with electric/thermal link which closes damper at 165 degrees F and then automatically resets after normal temperature is restored by cycling damper operator. Equip dampers with pneumatic or electric operators which close smoke dampers tightly when activated.

2.9 VARIABLE FREQUENCY DRIVES

Existing variable frequency drives (VFDs) as indicated on the system architecture drawing. The existing VFDs shall be modified to accept a RS=485/Modbus communication link. This may require addition of extra communications equipment to the VFDs.

2.9.1 VFD Quality Assurance

2.9.2 VFD Features

Existing VFDs have the following features:

- b. A local operator control keypad capable of:
 - (1) Remote/Local operator selection with password access.
 - (2) Run/Stop and manual speed commands.
 - (3) All programming functions.
 - (4) Scrolling through all display functions.
- c. Digital display capable of indicating:
 - (1) VFD status.
 - (2) Frequency.
 - (3) Motor RPM.

- (4) Phase current.
- (5) Fault diagnostics in descriptive text.
- (6) All programmed parameters.
- c. Standard PI loop controller with input terminal for controlled variable and parameter settings.
- d. User interface terminals for remote control of VFD speed, speed feedback, and an isolated form C SPDT relay, which energizes on a drive fault condition.
- e. An isolated form C SPDT auxiliary relay which energizes on a run command.
- f. A metal NEMA 1 enclosure for indoors, NEMA 4 with heater for outdoors.
- g. An adjustable carrier frequency with 16 KHz minimum upper limit.
- h. A built in or external line reactor with 3% minimum impedance to protect the VFDs DC buss capacitors and rectifier section diode
- i. Communications Port that is compatible with the installed network gateway equipment (RS-485 or MODBUS). This port shall be able to control all VFD internal parameters and shall read all VFD internal data including alarms and status as well as operating parameters.

2.9.3 Programmable Parameters

Existing VFDs include the following operator programmable parameters:

- a. Upper and lower limit frequency.
- b. Acceleration and Deceleration rate.
- c. Variable torque volts per Hertz curve.
- d. Starting voltage level.
- e. Starting frequency level.
- f. Display speed scaling.
- g. Enable/disable auto-restart feature.
- h. Enable/disable soft stall feature.
- i. Motor overload level.
- j. Motor stall level.
- k. Jump frequency and hysteresis band.

1. PWM carrier frequency.

2.9.4 Protective Features

VFDs already exist.

2.9.5 Minimum Operating Conditions

VFDs already exist.

2.9.6 Additional Features

Provide VFDs with the following additional features:

- a. communication interface port compatible with new digital controller protocol to include RS422/485 or MODBUS interface card with application software allowing monitoring and/or control of the VFD from an attached computer.

PART 3 EXECUTION

3.1 INSTALLATION

Prior to commencement of installation, the Contractor shall schedule meeting with the Owner to finalize controls design submittal for approval and ensure that the System Names and Point Names to be used in the DDC system database are in accordance with the Owner overall requirements. Contractor shall: Perform installation under supervision of competent technicians regularly employed in the installation of DDC systems. Provide components for a complete and operational DDC system.

3.1.1 Building Network Controller

Communication interfaces shall be provided for the Building Network Controller,] to allow connectivity to the via the closest local Switch which is located in the telecom room. The Building Network Controller shall be located within 300 feet of the Ethernet switch. The Contractor shall provide, install, and establish communications between the Building Network Controller, and the Internet servers, including the provision of Ethernet Standard Category 5 cables between the Building Network Controller and the designated termination at the Ethernet Switch. Successful communication of the DDC system with the Internet based system shall be demonstrated.

3.1.2 Digital Controllers

- a. Do not divide control of a single mechanical system such as an air handling unit, boiler, chiller, or terminal equipment between two or more controllers. A single controller shall manage control functions for a single mechanical system. It is permissible, however, to manage more than one mechanical system with a single controller.
- b. No multiplexing of points is allowed.
- c. Universal Programmable Controllers shall be specified for all boiler and chiller controllers regardless of the required point capacity.

- d. Controllers shall have I/O function as spare capacity to the maximum extend feasible. The panel I/O functions shall be furnished complete, with no changes or additions necessary to support implementation of spare functions. Output relays associated with digital signals shall be considered part of the I/O function, whether physically mounted in the enclosure or separately mounted. Implementation of spare points shall necessitate only providing the additional field sensor or control, field wiring including connection to the system, and point definition assignment by the operator. The panel shall contain all necessary I/O functions to connect to field sensors and control panels. I/O function operation shall be fully supervised to detect I/O function failures.

3.1.3 Nameplates and Wire Tags

- a. All HVAC equipment, controller cabinets (including Field Equipment Controller cabinets), sensors, control devices, relays, etc. are to be labeled with a minimum of 3” wide by 1” high WHITE laminated plastic nameplates with BLACK lettering and a minimum of ¼” high 5Gengraved, capitalized block lettering, backed with double-sided adhesive. Laminated plastic shall be 1/8” thick with black center core.
- b. Each nameplate shall identify the system and object name as applicable. HVAC equipment, controller cabinets, and Field Equipment Controller cabinets, shall be labeled using the system name of the HVAC system it is associated with. All physical I/O equipment devices (sensors, control devices, relays etc.) shall be labeled using the object name of the I/O it is associated with All physical I/O equipment devices (sensors, control devices, relays, etc.) not located within 5 feet of the associated HVAC equipment (such as supply air static pressure sensors, differential pressure sensors, relays, etc) shall be labeled with both the system and object names. Nameplates shall be placed on or near the physical I/O equipment device, and shall be placed in a visible location to aid in locating the device. Plastic nameplates for controllers and devices above the ceiling shall be mounted in a visible location (T-bar, wall adjacent to ceiling, etc.), as such, controllers in enclosures located above drop ceilings will require two nameplates. Prior approval is required for alternative methods of nameplate mounting.
- c. All Control wiring shall be labeled at both terminations utilizing printed labels with the object name of the physical I/O equipment device it is associated with, or the function it provides (24V AC, Network Comm., etc.). All controllers shall be properly labeled with the system name, and controller address, utilizing printed labels. The flip down cover on Universal programmable controllers shall be labeled with a printed list of the I/Os associated with the controller. All thermostats and space temperature sensors shall be labeled with both the system and object names, and if applicable, the system name of the primary system by which it is served (such as thermostats associated with VAV boxes where multiple air handlers serve the building). Handwritten labels are strictly prohibited.

3.1.4 Wiring Criteria

The Contractor shall install control wiring as required to meet the project specifications, the National Electrical Code, the National Electrical Safety Code, and all state and local codes. Unless specifically noted otherwise on the plans, the Owner requires the least expensive wiring installation that meets these specifications and codes within the following guidelines:

- a. In mechanical rooms and un-finished interior rooms, the wiring shall be run in EMT in exposed areas, unless noted otherwise.
- b. Under slab, in dirt or direct buried underground, schedule 40 PVC shall be used.
- c. Where subject to foot traffic or when cabling is run along roof surface, rigid conduit with threaded fittings shall be used.
- d. Whenever low voltage control cable is utilized without conduit, the low voltage control cable shall be plenum rated. Plenum rated cable shall be hung with bridle rings as required to prevent drooping. Laying of plenum rated cable on ceiling tiles for support shall be prohibited. Squeeze type connectors shall be utilized where plenum rated cable enters equipment enclosures. Use of plenum rated cable in areas where induction is anticipated such as near lighting ballasts, is not acceptable. In areas where induction producing devices are located, control wiring shall be run in conduit.
- e. Whenever EMT conduit is attached to a vibrating surface indoors, a short run of flexible conduit shall be utilized.
- f. Whenever EMT or rigid conduit is attached to a vibrating surface outdoors, a short run of flexible seal tight conduit shall be utilized.
- g. Compression type fittings shall be utilized with EMT. The use of setscrews shall not be permitted.
- h. Weather proof compression type fittings shall be utilized with EMT subject to damp or wet locations. The use of setscrews shall not be permitted.
- i. Power wiring (120 Volt, 60 Hz or 480 Volt) inside of the buildings shall be run in EMT.
- j. Power wiring (120 Volt, 60 Hz or 480 Volt) exposed outdoors shall be run in rigid conduit.
- k. Rigid or flexible conduit shall be terminated at all sensors and output devices.
- l. Fill ratio of conduit shall not exceed 40%.
- m. Plenum rated cable shall be suspended and properly secured and shall not have contact with ceiling tiles.
- n. Not used.
- o. Grounding: Ground controllers and cabinets to earth ground. Ground controller to a ground in accordance with Section 16402, "Interior Distribution System." Grounding of the green ac ground wire, at the breaker panel, alone is not adequate. Run metal conduit from controller panels to adequate building grounds. Ground sensor drain wire shields at controller end.
- p. Contractor is responsible for correcting all associated ground loop problems.

Note: Do not use existing control wiring. All control wiring shall be new including low voltage power. Do not run control wiring, Ethernet cable, or LON bus wiring in the same conduit with low voltage or high voltage wiring (voltage above 30VAC).

3.1.5 Temperature Sensors

Provide temperature sensors in locations to sense the appropriate condition. Provide sensor where they are easy to access and service without special tools. Calibrate sensors to accuracy specified. In no case will sensors designed for one application be installed for another application.

3.1.5.1 Room Temperature Sensors

Provide on interior walls to sense average room temperature conditions. Avoid locations that may cover the sensor by office furniture or where accurate room conditions may not be registered (near heat generating equipment). Room temperature sensors should not be mounted on exterior walls when other locations are available. Mount centerline of sensor at 5 feet above finished floor. Cut and patch or provide plate as required. Sensor shall be isolated from drafts due to wall penetrations.

3.1.5.2 Duct Temperature Sensors

- a. Provide sensors in ductwork in general locations as indicated. Select specific sensor location within duct to accurately sense appropriate air temperatures. Do not locate sensors in dead air spaces or positions obstructed by ducts or equipment. Install gaskets between the sensor housing and duct wall. Seal duct and insulation penetrations.
- b. Provide duct-averaging sensors to be used where stratification is likely to occur, typically for larger air ducts or in the mixing section of air handlers equipped with an economizer.
- c. String duct-averaging sensors between two rigid supports in a serpentine position to sense average conditions. Thermally isolate temperature-sensing elements from supports. Provide duct access doors to averaging sensors.
- d. Locate freeze protection sensors in appropriate locations to sense lowest temperatures, to avoid potential problems with air stratification.

3.1.5.3 Immersion Temperature Sensors

Provide thermo-wells for sensors measuring temperatures in liquid applications or pressure vessels. Locate wells to sense continuous flow conditions. Do not install wells using extension couplings. Where piping diameters are smaller than the length of the wells, provide wells in piping at elbows to effect proper flow across entire area of well. Wells shall not restrict flow area to less than 70 percent of pipe area. Increase piping size as required to avoid restriction. Provide thermo-wells with thermal transmission material within the well to speed the response of temperature measurement. Provide wells with sealing nuts to contain the thermal transmission material.

3.1.5.4 Outside Air Temperature Sensors

Provide outside air temperature sensor on north side of the building, away from exhaust hoods, air intakes and other areas that may affect temperature readings. Provide sunshields to protect outside air sensor from direct sunlight.

3.1.6 Damper Actuators

Actuators shall not be mounted in the air stream.

3.1.7 Thermometers

Not used.

3.1.8 Pressure Sensors

3.1.8.1 Differential Pressure

- a. General: Install pressure-sensing tips in locations to sense appropriate pressure conditions.
- b. Duct Static Pressure Sensing: Locate duct static pressure tip approximately two-thirds of distance from supply fan to end of duct with the greatest pressure drop.
- c. Pumping Proof with Differential Pressure Switches: Install high-pressure side between pump discharge and check valve.
- d. Filter differential Pressure Sensing: Install differential pressure sensors (analog) for tracking build-up and for the purposes of filter replacement.

3.1.9 Pressure Gages

Not used.

3.1.10 Vortex Shedding Flowmeters

The flowmeter shall be installed with its top above the pipeline in horizontal pipe run installations. The direction of flow shall be upward in vertical pipe run installations. The flowmeter shall be aligned to the direction of the flow, and shall be rigidly mounted and vibration free.

3.1.11 Control Drawings

- a. Post laminated copies of complete as-built control system drawings in each mechanical room and in each Controller cabinet. Post laminated copies of specific system's as-built control drawings in the associated Digital Controller cabinet.
- b. Provide 6 half-size hardcopy sets of as-built drawings to the activity.
- c. Provide 10 softcopies of as-built drawings, graphics, database files, and software on CD-ROM.

3.2 ADJUSTMENTS

Calibrate all sensors, instrumentation, and controls and verify the specified accuracy using test equipment with accuracies in compliance with NIST standards. Adjust controls and equipment to maintain conditions indicated, to perform functions indicated, and to operate in the sequence specified.

3.3 FIELD QUALITY CONTROL

3.3.1 General

- a. Demonstrate compliance of the heating, ventilating, and air conditioning control system with the contract documents. Furnish personnel, equipment, instrumentation, and supplies necessary to perform calibration and site testing. Ensure that tests are performed by competent employees of the DDC system installer or the DDC system manufacturer regularly employed in the testing and calibration of DDC systems.
- b. Testing will include the Contractor Field Tests and the Performance Verification Tests. Contractor Field Tests shall demonstrate proper calibration of input and output devices, and the operation of specific equipment. Performance Verification Tests shall ensure proper execution of the sequence of operation and proper tuning of control loops.
- c. Obtain approval of the plan for each phase of testing before beginning that phase of testing. Give the owner written notification of planned testing at least 45 days prior to test. Notification shall be accompanied by the proposed test procedures. In no case will the Contractor be allowed to start testing without written Owner approval of test procedures. The test procedures shall consist of detailed instructions for complete testing to prove performance of the heating, ventilating and air-conditioning system and digital control system. Test procedures shall include tests outlined in the following paragraphs.
- d. Before scheduling the Performance Verification Test, furnish the Contractor Field Test documentation and written certification to the Owner that the installed system has been calibrated, tested, and is ready for the performance verification test. Contractor shall schedule meeting with the Owner to review all documentation and test procedures. Do not start the performance verification test prior to meeting and receiving written permission from the Owner.
- e. Tests are subject to oversight and approval by the Owner. The testing shall not be run during scheduled seasonal off-periods of heating and cooling systems.

3.3.2 Test Reporting for Contractor Field Testing and Performance Verification Tests

- a. Document all tests with detailed test results. Explain in detail the nature of each failure and corrective action taken.
- b. During and after completion of the Contractor Field Tests, and again after the Performance Verification Tests, identify, determine causes, replace, repair or calibrate equipment that fails to meet the specification, and deliver a written report to the Owner.
- c. Provide a written report containing test documentation after the Contractor Field Tests and again after the Performance Verification Tests. Convene a test review meeting at the job site to present the results to the Owner. As part of this test review meeting, demonstrate by performing all portions of the field tests or performance verification test that each failure has been corrected. Based on the report and test review meeting, the Owner will determine either the restart point or successful completion of testing. Do not commence retesting until after receipt of written notification by the Owner. At the conclusion of retesting, assessment will be repeated.

- d. Any and all points selected by the Owner shall be proven to work end-to-end during PVT.

3.3.3 Contractor's Field Testing

- a. **Testing, Adjusting, and Commissioning:** After the Contractor has received written approval of the shop drawings and as specified, the Contractor will be authorized to proceed with the installation of the system equipment, hardware, and software. Once the installation has been completed, the Contractor shall test, adjust and commission each control loop and system; and shall verify proper operation of each item in the sequences of operation, including hardware and software. The Contractor shall calibrate field equipment, including control devices, adjust control parameters and logic (virtual) points including control loop set points, gain constants, and constraints, and verify data communications before the system is placed on-line. The Contractor shall calibrate each instrumentation device connected to the DDC system by making a comparison between the reading at the device and the display at the Workstation, using a standard at least twice as accurate as the device to be calibrated. The Contractor shall check each control point within the DDC system by making a comparison between the control command at the Workstation and field-controlled device. I/O function calibration checks shall include before and after calibration readings (deviation of reading from actual value as measured by a known calibration standard). Contractor shall utilize analog test instruments with calibration traceable to the National Institute of Standards and Technology, and shall provide calibration documentation as a part of the report. Analog test instrumentation shall be at least twice as accurate as the device being calibrated. For each analog and digital point being controlled by the DDC system, the Contractor shall command each point and verify its proper operation, and the proper operation of connected equipment such as fans, valves, and dampers. Where practicable, create the field conditions for change of state for digital inputs and verify proper reporting at the control system interface. The contractor shall deliver trend logs/graphs of all points showing to the Owner that stable control has been achieved. Points on common HVAC systems shall be trended simultaneously. One log shall be provided showing concurrent samples taken once a minute for a total of 4 hours. One log shall be provided showing concurrent samples taken once every 15 minutes, for a total of 48 hours. The Contractor shall verify operation of systems in the specified failure modes upon DDC system failure or loss of power, and verify that systems return to DDC system control automatically upon a resumption of DDC system operation or return of power. The Contractor shall deliver a report describing results of functional tests, diagnostics, and calibration including written certification to the Owner that the installed complete system has been calibrated, tested, and is ready to begin the PVT. The report shall include certification. The report shall also include a copy of the approved PVT Procedure.
- b. **System Inspection:** Observe the HVAC system in its shutdown condition. Check dampers and valves for proper normal positions. Document each position for the test report.
- c. **Calibration Accuracy and Operation of Input Test:** Verify correct calibration and operation of input instruments. For each sensor and transmitter, including those for temperature, pressure, relative humidity, and dew point inputs, record the reading at the sensor or transmitter location using calibrated test equipment. Record the output reading provided by that sensor or transmitter. Document each of these locations and output readings for the performance verification test report. The test equipment shall have been calibrated within one year of the date of use in the field. Test equipment calibration shall

be traceable to the measurement standards of the National Institute of Standards and Technology.

- d. Operation of Outputs Test: Check the operation of each output to verify correct operation. Command digital outputs on and off. Command analog outputs to minimum range, such as 4 mA, and maximum range, such as 20 mA, measure and record commanded and actual output values. Document each command and result for the test report.
- e. Actuator Range Adjustment Test: With the digital controller, apply a control signal to each actuator and verify that the actuator operates properly from its normal position to full range of stroke position. Record actual spring ranges and normal positions for all modulating control valves and dampers. Include documentation in the test report.
- f. Digital Controller Startup and Memory Test: Demonstrate that programming is not lost after a power failure, and Digital Controllers automatically resume proper control after a power failure.
- g. Application Software Operation Test: Test compliance of the application software for:
 - (i) The ability to demonstrate seamless communications with the existing Internet based Server, location to be determined, as well as direct connect via the Building Network Controller in the facility where the work is being accomplished.
 - (ii) Editing Control programs: Demonstrate the ability to edit the control program off line.
 - (iii) Reporting of alarm conditions: Cause alarm conditions for each alarm, and ensure that workstations receive the alarms.
 - (iv) Reporting trend and status reports: Demonstrate ability of software to receive and save trend and status reports.

3.3.3.1 Contractor Field Test Report

The contractor shall prepare a report including all pertinent data described above with the content and annotations as described below. Four (4) complete copies will be submitted for approval.

- a. Tab 1 - Engineering Review Checklists: Engineering Review Checklists shall be provided and shall list all Clarifications (including contract negotiated clarifications), Existing Conditions or deficiencies (ECRs), Requests for Information (RFIs) and Field Change Orders (FCOPs) pertaining to the individual building. Hardcopies of all RFIs with responses to be provided with the checklist sheet.
- b. Tab 2 & 3 - Redline Drawings: Contractor's Redline Drawings shall be marked up copies of approved drawings. Redline A/E Design Drawings shall also be provided with updated panel locations, thermostat locations, and wire runs. Tabs shall separate A/E Design (Tab 2) and Contractor's (Tab 3) drawings. Both Contractor's and A/E Design Redline Drawings shall include all changes made during construction such as but not limited to panel and thermostat locations, occupancy time schedules, sequences of operation, or changes to controller/device type and will show these changes on all drawings that apply.

References to directions given shall be noted (RFI) with all changes. Redline Drawings shall be legible and show description and date of revision and preparer's name.

- c. Tab 4 - Graphic Templates: Include hardcopies of graphic templates for each primary system with sample copies of typical graphics for systems that are repeated. Include floor plan graphics templates and any summary or legend graphics templates that are required.
- d. Tab 5 - Checkouts: Checkouts shall be provided for each system installed and/or networked. Checkouts shall be arranged by systems and shall include all hardware points of that system. States defined on I/O points shall be the engineering units for that point.
- e. Tab 6 - Calibration Certificates: Current Calibration Certificates shall be provided for all instruments used for calibration for the particular Building.
- f. Tab 7 - Software: Provide softcopies of all database and programming data. They shall be in a separate electronic folder labeled "Software Files". Provide a Hardcopy of the expanded software tree showing all building systems. Provide printouts of the I/O summary for all primary systems with sample copies of typical systems that are repeated (e.g. VAV Boxes, Fan Coil Units, etc.).
- g. Trends: Softcopies of Trends shall be provided for each system installed and/or networked. Trends shall be provided in Microsoft Excel format and show data in tabular and graphical form. Trends for every system shall include all hardware points and any software points that relate to Sequence of Operations. Actual setpoints (in addition to RM-TSET) shall be provided. Trends shall be provided in two separate electronic files. One file will show data over at least a 48hour period in 15 minute intervals. The second file shall show data over at least four hours in one-minute intervals. Trends for each file for all systems shall be accumulated at concurrent time periods.

If more than a single worksheet is required to show all points of a system, control and monitoring points that correspond to each other shall be provided on the same worksheet

During the one minute trending, the technician will manipulate inputs and setpoints to show control actions that verify all items in the sequence of operation. The technician will describe in detail what inputs or setpoints were changed in a note on the far right side cell in the system's trend worksheet. The cell used for the description will correspond to the time the change was made.

NOTE: All electronic data shall be provided on a single, inscribed/labeled CD in a pouch oriented so that the CD does not fall out of the CFT Book.

3.3.4 Test, Adjust, and Balance Support

The controls contractor shall coordinate with and provide on-site support to the test, adjust, and balance (TAB) personnel when applicable. This support shall include:

- a. On-site operation and manipulation of the control system during the testing and balancing.
- b. Control set point adjustments for balancing all relevant mechanical systems.
- c. Tuning control loops with set points and adjustments determined by the TAB personnel.

3.3.5 Performance Verification Test (PVT)

- a. The Contractor shall demonstrate that the completed DDC system complies with the contract requirements. Using approved test procedures, all physical and functional requirements of the project including communication requirements shall be demonstrated and shown. Contractor shall verify that each control function operates as described in the sequence of operation. The PVT as specified shall not be started until after receipt by the Contractor of written permission by the Owner, based on the Contractor's written report including certification of successful completion of Contractor Field Testing as specified, and upon successful completion of training as specified. Upon successful completion of the PVT, the Contractor shall deliver test reports and other documentation as specified to the Owner.
- b. The performance verification tests shall include verification that the control system maintains setpoints, that the system recovers properly following a power loss, that control loops are tuned, that sensors are calibrated, that the LON, RS-485/MODBUS, Ethernet communications are established and controllers are programmed to execute the sequences of operations, as required by the contract. Conduct the performance verification test during one week of continuous HVAC and DDC systems operation and before final acceptance of work.
- c. Demonstrate functionality of the new DDC system including graphics on the Contractor's portable workstation laptop computer and the Internet based computer (location to be determined) including functionality of temperature control, status points, and positions of dampers and valves. The Contractor shall provide the graphic templates on the Owner provided, Internet based, portable or fixed workstation during the test for this purpose.
- d. Demonstrate the functionality of the sequence of operations for randomly selected systems utilizing the graphics, testing as individual systems, or included in the sampling of multiple typical systems. In some cases, because of the type of controllers, it may be necessary to use non graphic means of control to directly access the programs to manipulate the data to demonstrate control.
- e. Panel Checkouts by the Owner shall be performed on all installed systems. The Contractor need only be present during Panel checkouts of systems included in the testing samples.
- f. When dealing with typical systems such as air handling units, etc., the Owner will select a random sample for testing, in the quantities tested shown in the table below. In the CFT report, the Contractor shall apply the table below to the systems on the project, and provide a list of the quantities of typical systems and the quantities of samples to be tested during the PVT.

Quantity of Typical Units	Units to be sampled
1	1
2-5	2
6-10	3

As a part of the sample unit checkout verification testing by the Contractor, the Contractor shall demonstrate calibration compliance for calibrated points, and all outputs shall be verified. Recalibration of sensors and adjustments of outputs during the test will only be allowed at the discretion of the Owner Representative. If a large amount of sensors and / or outputs prove to be out of calibration during testing, the Owner Representative may require more samples on additional systems, or may choose to suspend the testing.

3.4 TRAINING

Provide a training course schedule, syllabus, and training materials 14 days prior to the start of training. Furnish a qualified instructor to conduct training courses for designated personnel in the maintenance and operation of the HVAC and DDC system. Orient training to the specific system being installed under this contract. Use operation and maintenance manual as the primary instructional aid in contractor provided activity personnel training. Base training on the Operations and Maintenance manuals and a DDC training manual. Manuals shall be delivered for each trainee with two additional sets delivered for archiving at the project site. Training manuals shall include an agenda, defined objectives and a detailed description of the subject matter for each lesson. Furnish audio-visual equipment and all other training materials and supplies. A training day is defined as 8 hours of classroom or lab instruction, including two 15-minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. For guidance, the Contractor should assume the attendees will have a high school education and are familiar with HVAC systems. Provide a minimum of one training day.

3.5 COMMISSIONING

The Contractor shall be responsible for commissioning the DDC system as specified in the commissioning sections of the specification.

-- End of Section --

SECTION TABLE OF
CONTENTS

DIVISION 23 - HEATING, VENTILATING, AND AIR

CONDITIONING SECTION 23 00 00

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST
SYSTEMS

PART 1 GENERAL

- 1.1 REFERENCES
 - 1.1.1 CODES AND STANDARDS
- 1.2 SERVICE LABEL
- 1.3 SUBMITTALS
- 1.4 QUALITY ASSURANCE
 - 1.4.1 Prevention of Corrosion
 - 1.4.2 Asbestos Prohibition
 - 1.4.3 Ozone Depleting Substances Used as Refrigerants
 - 1.4.4 Detail Drawings
 - 1.4.5 Test Procedures
- 1.5 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

- 2.1 STANDARD PRODUCTS
- 2.2 IDENTIFICATION PLATES
- 2.3 EQUIPMENT GUARDS AND ACCESS
- 2.4 ELECTRICAL WORK
- 2.5 ANCHOR BOLTS
- 2.6 SEISMIC ANCHORAGE
- 2.7 PAINTING
- 2.8 INDOOR AIR QUALITY
- 2.9 AIR SYSTEMS EQUIPMENT
 - 2.9.1 Fans
 - 2.9.2 Coils
 - 2.9.3 Air Filters
- 2.10 AIR HANDLING UNITS
 - 2.10.1 Factory-Fabricated Air Handling Units
- 2.11 FACTORY PAINTING
- 2.12 SUPPLEMENTAL COMPONENTS/SERVICES
 - 2.12.1 Condensate Drain Lines
 - 2.12.2 Controls
 - 2.12.3 Humidifiers

PART 3 EXECUTION

- 3.1 EXAMINATION
- 3.2 INSTALLATION
 - 3.2.1 Condensate Drain Lines
- 3.3 TESTING, ADJUSTING, AND BALANCING
- 3.4 OPERATION AND MAINTENANCE
 - 3.4.1 Operation and Maintenance Manuals
 - 3.4.2 Operation and Maintenance Training

3.5 MAINTAINING ROOF WARRANTY

3.5.1 Cutting and patching

-- End of Section Table of Contents --

SECTION 23 00 00

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACOUSTICAL SOCIETY OF AMERICA (ASA)

ASA S12.51 (2002) Acoustics Determination of Sound Power Levels of Noise Sources using Sound Pressure Precision Method for Reverberation Rooms

AIR CONDITIONING CONTRACTORS OF AMERICA (ACCA)

ACCA Manual 4 (2001) Installation Techniques for Perimeter Heating & Cooling; 11th Edition

AIR MOVEMENT AND CONTROL ASSOCIATION

INTERNATIONAL (AMCA) AMCA 201 (2002) Fans and Systems

AMCA 210 (2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

AMCA 220 (2005) Test Methods for Air Curtain Units

AMCA 300 (2008) Reverberant Room Method for Sound Testing of Fans

AMCA 301 (2006; INT 2007; Errata 2008) Methods for Calculating Fan Sound Ratings from Laboratory Test Data

AMCA 500-D (1998) Laboratory Methods of Testing Dampers for Rating

AIR-CONDITIONING, HEATING AND REFRIGERATION INSTITUTE

(AHRI) AHRI 260 (2001; Addendum 2002) Sound Rating of Ducted Air Moving and Conditioning Equipment

AHRI 350 (2009) Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment

AHRI 410 (2001; Addendum 2002) Forced-Circulation Air-Cooling and Air-Heating Coils

AHRI 430 (2009) Central-Station Air-Handling Units

AHRI 440 (2008) Room Fan-Coils and Unit Ventilators

AHRI 880	(2008) Performance Rating of Air Terminals
AHRI 885	(2008) Procedure for Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets
AHRI DCAACP	(Online) Directory of Certified Applied Air-Conditioning Products
AHRI Guideline D	(1996) Application and Installation of Central Station Air-Handling Units

AMERICAN BEARING MANUFACTURERS ASSOCIATION (ABMA)

ABMA 11	(1990; R 1999) Load Ratings and Fatigue Life for Roller Bearings
ABMA 9	(1990; R 2008) Load Ratings and Fatigue Life for Ball Bearings

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2007; Std 15 Errata 2007, 2009, & Addenda a-i; Std 34 Errata 2007, 2008, Addenda a-v, x-ae) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
ASHRAE 52.2	(2007; Addenda b 2008; Errata 2009) Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
ASHRAE 62.1	(2007; Errata 2007; Errata 2008; Addenda a, b, e, f, h 2008; Errata 2009; Errata 2010) Ventilation for Acceptable Indoor Air Quality
ASHRAE 68	(1997) Laboratory Method of Testing to Determine the Sound Power in a Duct
ASHRAE 70	(2006) Method of Testing for Rating the Performance of Air Outlets and Inlets
ASHRAE 84	(2008) Method of Testing Air-to-Air Heat Exchangers
ASHRAE 90.1 - IP	(2007; Supplement 2008; Addenda r 2009) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 90.1 - SI	(2007; Supplement 2008; Errata 2009; Errata 2009; INT 1-3 2009) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASME INTERNATIONAL (ASME)

ASME A13.1 (2007) Scheme for the Identification of Piping Systems

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M (2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 167 (1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

ASTM A 53/A 53M (2007) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 924/A 924M (2009a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM B 117 (2009) Standing Practice for Operating Salt Spray (Fog) Apparatus

ASTM B 152/B 152M (2009) Standard Specification for Copper Sheet, Strip, Plate, and Rolled Bar

ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

ASTM B 209M (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

ASTM B 280 (2008) Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

ASTM B 766 (1986; R 2008) Standard Specification for Electrodeposited Coatings of Cadmium

ASTM C 1071 (2005e1) Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)

ASTM C 553 (2008) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

ASTM C 916 (1985; R 2007) Standard Specification for Adhesives for Duct Thermal Insulation

ASTM D 1654 (2008) Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

ASTM D 1785	(2006) Standard Specification for Poly (Vinyl Chloride) (PVC), Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2466	(2006) Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D 2564	(2004; R 2009e1) Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2855	(1996; R 2002) Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3359	(2009) Measuring Adhesion by Tape Test
ASTM D 520	(2000; R 2005) Zinc Dust Pigment
ASTM E 2016	(2006) Standard Specification for Industrial Woven Wire Cloth
ASTM E 84	(2010) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM F 1040	(1987; R 2007) Standard Specification for Filter Units, Air Conditioning, Viscous - Impingement and Dry Types, Replaceable

GREENGUARD ENVIRONMENTAL INSTITUTE (GEI)

GEI	Greenguard Standards for Low Emitting Products
-----	--

INSTITUTE OF ENVIRONMENTAL SCIENCES AND TECHNOLOGY

(IEST) IEST RP-CC-001.3	(1993) HEPA and ULPA Filters
-------------------------	------------------------------

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(1993; R 2001; R 2006) Enclosures
NEMA MG 1	(2009) Motors and Generators
NEMA MG 10	(2001; R 2007) Energy Management Guide for Selection and Use of Fixed Frequency Medium AC Squirrel-Cage Polyphase Induction Motors
NEMA MG 11	(1977; R 1997; R 2001; R 2007) Energy Management Guide for Selection and Use of Single Phase Motors

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2008; TIA 08-1) National Electrical Code
---------	---

NFPA 90A	(2009; Errata 09-1) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 96	(2008) Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

SCIENTIFIC CERTIFICATION SYSTEMS (SCS)

SCS	Scientific Certification Systems (SCS) Indoor Advantage
-----	---

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1143	(1985) HVAC Air Duct Leakage Test Manual, 1 st Edition
SMACNA 1403	(2008) Accepted Industry Practice for Industrial Duct Construction, 2nd Edition
SMACNA 1650	(1998; Addendum 1 R 2000) Seismic Restraint Manual Guidelines for Mechanical Systems, 2nd Edition
SMACNA 1819	(2002) Fire, Smoke and Radiation Damper Installation Guide for HVAC Systems, 5th Edition
SMACNA 1884	(2003) Fibrous Glass Duct Construction Standards, 7th Edition
SMACNA 1966	(2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 82	Protection of Stratospheric Ozone
-----------	-----------------------------------

UNDERWRITERS LABORATORIES (UL)

UL 181	(2005; R 2008) Factory-Made Air Ducts and Air Connectors
UL 1995	(2005; R 2009) Heating and Cooling Equipment
UL 214	(1997; Rev thru Aug 2001) Tests for Flame-Propagation of Fabrics and Films
UL 555	(2006; R 2010) Standard for Fire Dampers
UL 555S	(1999; R thru 2010) Smoke Dampers
UL 586	(2009) Standard for High-Efficiency Particulate, Air Filter Units
UL 6	(2007) Electrical Rigid Metal Conduit-Steel

UL 705	(2004; R 2004 thru 2009) Standard for Power Ventilators
UL 723	(2008) Test for Surface Burning Characteristics of Building Materials
UL 900	(2004; R 1995 thru 2009) Standard for Air Filter Units
UL 94	(1996; R thru 2009) Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
UL Bldg. Mat Dir	(2010) Building Materials Directory
UL Electrical Construction	(2009) Electrical Construction Equipment Directory
UL Fire Resistance	(2010) Fire Resistance Directory

1.1.1 CODES AND STANDARDS

All work and materials shall be in full accordance with Title 24 CCR and latest rules and regulations of the State Fire Marshall; the Safety Order of the division of Industrial Safety; the National Electrical Code; the California Plumbing Code; Local Building Codes; the California Mechanical Code, laws or regulations of bodies lawfully empowered and have jurisdiction over this project. Nothing in the plans or specifications is to be construed to permit work not conforming to these codes.

This Contractor shall obtain all permits, patent rights and licenses that are required for the performing of the work by all laws, ordinances, rules and regulations or orders of any office and/or body, shall give all notice necessary in connection therewith, and pay all fees relating thereto and all costs and expenses incurred on accounts thereof. No work shall be covered before inspection by the jurisdictional inspection and the Architect.

1.2 Service Labeling

Label equipment, including fans, air handlers, etc. with labels made of self-sticking, plastic film designed for permanent installation. Labels shall be in accordance with the typical examples below:

<u>SERVICE</u>	<u>DESIGNATION</u>	<u>LABEL AND TAG</u>
Air handling unit Number		AHU - [_____]
Exhaust Fan Number		EF - [_____]
VAV Box Number		VAV - [_____]

Identify similar services with different temperatures or pressures. Where pressures could exceed 125 pounds per square inch, gage, include the maximum system pressure in the label.

1.2 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item, that clearly show compliance with the project specifications.

a. Submittals:

See GREENBOOK and 2010 City Supplement; Section 2-5.3 for Shop Drawings and Submittals.

b. Substitutions:

See GREENBOOK and 2010 City Supplement, Section 4-1.6 for Substitutions.

Submit the following:

SD-02 Shop Drawings

Detail Drawings

SD-03 Product Data

Air Handling Units
Diagrams

SD-06 Test Reports

Performance Tests

SD-07 Certificates

Certification

SD-08 Manufacturer's Instructions

Manufacturer's Installation Instructions
Operation and Maintenance Training

SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals
Air Handling Units

1.4 QUALITY ASSURANCE

Except as otherwise specified, approval of materials and equipment is based on manufacturer's published data.

- a. Where materials and equipment are specified to conform to the standards of the Underwriters Laboratories, the label of or listing with reexamination in UL Bldg. Mat Dir, and UL 6 is acceptable as sufficient evidence that the items conform to Underwriters Laboratories requirements. In lieu of such label or listing, submit a written certificate from

any nationally recognized testing agency, adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the specified requirements. Outline methods of testing used by the specified agencies.

- b. Where materials or equipment are specified to be constructed or tested, or both, in accordance with the standards of the ASTM International (ASTM), the ASME International (ASME), or other standards, a manufacturer's certificate of compliance of each item is acceptable as proof of compliance.
- c. Conformance to such agency requirements does not relieve the item from compliance with other requirements of these specifications.

1.4.1 Prevention of Corrosion

Protect metallic materials against corrosion. Manufacturer shall provide rust-inhibiting treatment and standard finish for the equipment enclosures. Do not use aluminum in contact with earth, and where connected to dissimilar metal. Protect aluminum by approved fittings, barrier material, or treatment. Ferrous parts such as anchors, bolts, braces, boxes, bodies, clamps, fittings, guards, nuts, pins, rods, shims, thimbles, washers, and miscellaneous parts not of corrosion-resistant steel or nonferrous materials shall be hot-dip galvanized in accordance with

ASTM A 123/A 123M for exterior locations and cadmium-plated in conformance with ASTM B 766 for interior locations.

1.4.2 Asbestos Prohibition

Do not use asbestos and asbestos-containing products.

1.4.3 Ozone Depleting Substances Used as Refrigerants

Minimize releases of Ozone Depleting Substances (ODS) during repair, maintenance, servicing or disposal of appliances containing ODS's by complying with all applicable sections of 40 CFR 82 Part 82 Subpart F. Any person conducting repair, maintenance, servicing or disposal of appliances shall comply with the following:

- a. Do not knowingly vent or otherwise release into the environment, Class I or Class II substances used as a refrigerant.
- b. Do not open appliances without meeting the requirements of 40 CFR 82 Part 82.156 Subpart F, regarding required practices for evacuation and collection of refrigerant and 40 CFR 82 Part 82.158 Subpart F, regarding standards of recycling and recovery equipment.
- c. Only persons who comply with 40 CFR 82 Part 82.161 Subpart F, regarding technician certification, can conduct work on appliances containing refrigerant.

In addition, provide copies of all applicable certifications to the resident engineer at least 14 calendar days prior to initiating maintenance, repair, servicing, dismantling or disposal of appliances, including:

- a. Proof of Technician Certification
- b. Proof of Equipment Certification for recovery or recycling equipment.
- c. Proof of availability of certified recovery or recycling equipment.

1.4.4 Detail Drawings

Submit detail drawings showing equipment layout, including assembly and installation details and electrical connection diagrams. Include any information required to demonstrate that the system has been coordinated and functions properly as a unit on the drawings and show equipment relationship to other parts of the work, including clearances required for operation and maintenance. Submit drawings showing bolt-setting information, and foundation bolts for all equipment indicated or required to have concrete foundations. Submit function designation of the equipment and any other requirements specified throughout this Section with the shop drawings.

1.4.5 Test Procedures

Submit proposed test procedures and test schedules for the performance tests of systems, at least 2 weeks prior to the start of related testing.

1.5 DELIVERY, STORAGE, AND HANDLING

Protect stored equipment at the jobsite from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, cap or plug all pipes until installed.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide components and equipment that are "standard products" of a manufacturer regularly engaged in the manufacturing of products that are of a similar material, design and workmanship. "Standard products" is defined as being in satisfactory commercial or industrial use for 2 years before bid opening, including applications of components and equipment under similar circumstances and of similar size, satisfactorily completed by a product that is sold on the commercial market through advertisements, manufacturers' catalogs or brochures. Products having less than a 2-year field service records are acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests can be shown. Provide equipment items that are supported by a service organization. Where applicable, provide equipment that is an ENERGY STAR Qualified product or a Federal Energy Management Program (FEMP) designated product.

2.2 IDENTIFICATION PLATES

In addition to standard manufacturer's identification plates, provide engraved laminated phenolic identification plates for each piece of mechanical equipment. Identification plates are to designate the function of the equipment. Submit designation with the shop drawings. Identification plates shall be three layers, black-white-black, engraved to show white letters on black background. Letters shall be upper case. Identification plates 1-1/2-inches high and smaller shall be 1/16-inch thick, with engraved lettering 1/8-inch high; identification plates larger than 1-1/2-inches high shall be 1/8-inch thick, with engraved lettering of suitable height. Identification plates 1-1/2-inches high and larger shall have beveled edges. Install identification plates using a compatible adhesive.

2.3 EQUIPMENT GUARDS AND ACCESS

Fully enclose or guard belts, pulleys, chains, gears, couplings, projecting setscrews, keys, and other rotating parts exposed to personnel contact according to OSHA requirements. Properly

guard or cover with insulation of a type specified, high temperature equipment and piping exposed to contact by personnel or where it creates a potential fire hazard.

2.4 ELECTRICAL WORK

- a. Provide motors, controllers, integral disconnects, contactors, and controls with their respective pieces of equipment, except controllers indicated as part of motor control centers. Provide electrical equipment, including motors and wiring. Provide manual or automatic control and protective or signal devices required for the operation specified and control wiring required for controls and devices specified, but not shown. For packaged equipment, include manufacturer provided controllers with the required monitors and timed restart.
- b. For single-phase motors, provide high-efficiency type, fractional horsepower alternating-current motors, including motors that are part of a system, in accordance with NEMA MG 11. Integral size motors shall be the premium efficiency type in accordance with NEMA MG 1.
- c. For polyphase motors, provide squirrel-cage medium induction motors, including motors that are part of a system, and that meet the efficiency ratings for premium efficiency motors in accordance with NEMA MG 1. Select premium efficiency polyphase motors in accordance with NEMA MG 10.
- d. Provide motors in accordance with NEMA MG 1 and of sufficient size to drive the load at the specified capacity without exceeding the nameplate rating of the motor. Provide motors rated for continuous duty with the enclosure specified. Provide motor duty that allows for maximum frequency start-stop operation and minimum encountered interval between start and stop. Provide motor torque capable of accelerating the connected load within 20 seconds with 80 percent of the rated voltage maintained at motor terminals during one starting period. Provide motor starters complete with thermal overload protection and other necessary appurtenances. Fit motor bearings with grease supply fittings and grease relief to outside of the enclosure.

2.5 ANCHOR BOLTS

Provide anchor bolts for equipment placed on concrete equipment pads or on concrete slabs. Bolts to be of the size and number recommended by the equipment manufacturer and located by means of suitable templates. Installation of anchor bolts shall not degrade the surrounding concrete.

2.6 SEISMIC ANCHORAGE

Anchor equipment in accordance with applicable seismic criteria for the area and as defined in SMACNA 1650.

2.7 PAINTING

Paint equipment units in accordance with approved equipment manufacturer's standards unless specified otherwise. Field retouch only if approved. Otherwise, return equipment to the factory for refinishing.

2.8 INDOOR AIR QUALITY

Provide equipment and components that comply with the requirements of ASHRAE 62.1 unless more stringent requirements are specified herein.

2.9 AIR SYSTEMS EQUIPMENT

2.9.1 Fans

Test and rate fans according to AMCA 210. Install air-moving devices to minimize fan system effect. The sound power level of the fans shall not exceed 85 dBA when tested according to AMCA 300 and rated in accordance with AMCA 301. Provide all fans with an AMCA seal. Provide fan and motor assemblies with vibration-isolation supports or mountings as indicated. Use vibration-isolation units that are standard products with published loading ratings. Select each fan to produce the capacity required at the fan static pressure indicated. Provide sound power level as indicated. All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment. All fan assemblies shall employ solid steel fan shafts. Heavy-duty pillow block type, self-aligning, grease lubricated ball bearings shall be used. Bearings shall be sized to provide an L-50 life at 200,000 hours. The entire fan assembly shall be isolated from the fan bulkhead and mounted on spring isolators. Adjustable pitch V-belt drives with matching belts shall be provided. V-belt drives shall be selected at 1.5 times fan brake horsepower.

Fan motors shall be premium efficiency, heavy-duty, 1800 rpm, totally enclosed TEFC type with grease lubricated ball bearings. Motors shall be mounted on an adjustable base that provides for proper alignment and belt tension adjustment.

Fans shall be single or double width, airfoil centrifugal type. All fans shall be mounted using shafts and hubs with mating keyways. The backward curved airfoil fans shall be Class II construction and fabricated from heavy-gauge aluminum. Fan blades shall be continuously welded to the back plate and end rim.

Return Fans shall be provided with VFD and controls to maintain building pressurization.

2.9.2 Coils

The cooling coil section shall be installed in a draw-through configuration, upstream of the supply air fan to maximize dehumidification capabilities. Adjust the required sensible capacity if supply fan HP is higher than scheduled. A draw through submittal must clearly provide DX coil LAT, fan motor heat temperature rise, and unit LAT. The coil section shall be complete with factory piped cooling coil and sloped drain pan. Hinged access doors shall be provided on both sides of the section for access to the cooling coil and drain pan for inspection and cleaning.

Direct expansion (DX) cooling coils shall be fabricated of seamless 1/2" diameter high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. All units shall have two independent refrigerant circuits and shall use an interlaced coil circuiting that keeps the full coil face active at all load conditions.

All coils shall be factory leak tested with high-pressure air under water.

A stainless steel, positively sloped drain pan shall be provided with the cooling coil. The drain pan shall extend beyond the leaving side of the coil and underneath the cooling coil connections. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall be connected to a threaded drain connection extending through the unit base. Units with stacked cooling coils shall be provided with a secondary drain pan piped to the primary drain pan.

A modulating hot gas reheat coil shall be factory installed in the unit heat section.

A natural gas fired furnace shall be installed in the unit heat section. The heat exchanger shall include a type 430 stainless steel cylindrical primary combustion chamber, a type 430 stainless steel header, type 430 stainless steel secondary tubes and type 430 stainless steel turbulators. Carbon steel heat exchanger surfaces are not acceptable. The heat exchanger shall have a condensate drain. Clean out of the primary heat exchanger and secondary tubes shall be accomplished without removing casing panels or passing soot through the supply air passages. The furnace section shall be positioned downstream of the supply air fan.

The furnace shall be supplied with a forced draft burner capable of continuous modulation between 5% and 100% of rated capacity, without steps. The burner shall operate efficiently at all firing rates. The burner shall have proven open damper low-high-low pre-purge cycle, and proven low fire start. The combustion air control damper shall be in the closed position during the off cycle to reduce losses. The shutoff cock and test cock shall be fully ported ball valves.

The burner shall be specifically designed to burn natural gas and shall include a microprocessor based flame safeguard control, combustion air proving switch, pre-purge timer and spark ignition. The gas train shall include redundant gas valves, pressure regulator, shutoff cock, pilot gas valve, pilot pressure regulator, and pilot cock.

The gas burner shall be controlled by the factory installed main unit control system.

The burner shall be fired, tested and adjusted at the factory. Final adjustments shall be made in the field at initial start-up by a qualified service technician to verify that installation and operation of the burner is according to specifications.

2.9.3 Air Filters

Unit shall be provided with a draw-through filter section. The filter section shall be supplied complete with the filter rack as an integral part of the unit.

Pre-Filters: Filtration Group model Novapleat HC, 2" thick, MERV 8, pleated, panel filters shall be provided. Filters shall be constructed of 100% synthetic material that does not support microbial growth. Filters shall be of a metal-free construction to reduce its impact when land filled. Filters shall be accessible from both sides of the filter section.

Final Filters: Filtration Group model FP Mini-Pleat filters shall be provided. Minimum 12" deep, MERV 15, UL Std. 900. Cartridge filters shall consist of filter media permanently attached to a metal free frame and shall slide into a gasketed, extruded aluminum rack contained within the unit. The filter rack shall have secondary gasketed, hinged end panels to insure proper sealing. Filters shall be accessible from both sides of the filter section.

2.10 AIR HANDLING UNITS

2.10.1 Factory-Fabricated Air Handling Units

Provide single-zone blow-through type units as indicated.

Configuration: Fabricate as detailed on prints, including (as detailed on drawings):

- Return fan (except for RT-3).
- Economizer section.
- Pre-Filter and Final-Filter section.

- DX Cooling coil section (except for RT-3).
- Supply fan section.
- High-Turndown, Modulating Gas Furnace.
- Humidifier Section (as indicated).
- Hot Gas Reheat.
- Discharge plenum.
- Condensing unit section.

Physical dimensions of each air-handling unit shall be suitable to fit space allotted to the unit with the capacity indicated. Provide air-handling unit that is rated in accordance with AHRI 430 and AHRI certified for cooling.

2.10.1.1 Casings

Double-wall construction with 22 gauge solid galvanized steel liners shall be provided throughout, allowing no exposed insulation within the air stream. All cabinet insulation, except floor panels, shall be a nominal 2" thick, 1 ½ lb. density, R6.5, glass fiber. Floor panels shall be a minimum 1" thick, 3 lb. density, R4.2, glass fiber.

Exterior surfaces shall be constructed of pre-painted galvanized sheet metal. Paint finish shall include a base primer with a high quality, polyester resin topcoat of a neutral beige color. Finished surface to withstand a minimum 750-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance.

Service doors shall be provided on both sides of each section in order to provide user access to all unit components. Service doors shall be constructed of 17 gauge galvanized steel with a 22 gauge galvanized steel interior liner. All service doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system that is operated by a single, flush mounted handle. Removable panels, or doors secured by multiple, mechanical fasteners are not acceptable.

The unit base shall overhang the roof curb for positive water runoff and shall have a formed recess that seats on the roof curb gasket to provide a positive, weather tight seal. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.

2.10.1.2 Heating and Cooling Coils

Provide coils as specified in paragraph AIR SYSTEMS EQUIPMENT.

2.10.1.3 Air Filters

Provide air filters as specified in paragraph AIR SYSTEMS EQUIPMENT for types and thickness indicated.

2.10.1.4 Fans

Provide fans as specified in paragraph AIR SYSTEMS EQUIPMENT.

2.10.1.5 Access Sections and Filter/Mixing Boxes

Provide access sections where indicated and furnish with access doors as shown. Construct access sections and filter/mixing boxes in a manner identical to the remainder of the unit casing and equip with access doors. Design mixing boxes to minimize air stratification and to promote thorough mixing of the air streams.

2.11 FACTORY PAINTING

Factory paint new equipment, which are not of galvanized construction. Paint with a corrosion resisting paint finish according to ASTM A 123/A 123M or ASTM A 924/A 924M. Clean, phosphatize and coat internal and external ferrous metal surfaces with a paint finish which has been tested according to ASTM B 117, ASTM D 1654, and ASTM D 3359. Submit evidence of satisfactory paint performance for a minimum of 500 hours for units to be installed outdoors. Provide rating of failure at the scribe mark that is not less than 6, average creepage not greater than 1/8 inch. Provide rating of the inscribed area that is not less than 10, no failure. On unit constructed of galvanized steel that have been welded, provide a final shop docket of zinc-rich protective paint on exterior surfaces of welds or welds that have burned through from the interior according to ASTM D 520 Type I. Factory painting that has been damaged prior to acceptance by the resident engineer shall be field painted.

2.12 SUPPLEMENTAL COMPONENTS/SERVICES

2.12.1 Condensate Drain Lines

Provide and install condensate drainage for each item of equipment that generates condensate.

2.12.2 Controls

Each unit shall be equipped with a complete microprocessor based control system. The unit control system shall include all required temperature and pressure sensors, input/output boards, main microprocessor and operator interface. The unit control system shall perform all unit control functions including scheduling, unit diagnostics and safeties. All boards shall be individually replaceable for ease of service. All microprocessors, boards, and sensors shall be factory mounted, wired and tested.

The microprocessor shall be a stand-alone DDC controller not dependent on communications with any on-site or remote PC or master control panel. The microprocessor shall maintain existing set points and operate stand alone if the unit loses, either direct connect or network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

The main microprocessor shall support an RS-232 direct connection to a product service tool or a modem. A BACnet communications port shall be provided for direct communication into the BAS network.

All digital inputs and outputs shall be protected against damage from transients or wrong voltages. Each digital input and digital output shall be equipped with an LED for ease of service. All field wiring shall be terminated at a separate, clearly marked terminal strip.

The microprocessor memory shall be protected from all voltage fluctuations as well as any extended power failures. The microprocessor shall support an RS-232 direct connect from an IBM PC or 100% true compatible using manufacturers' software. The microprocessor shall maintain existing set points and operate stand alone if the rooftop loses, either direct connect or network communications.

The microprocessor shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to insure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.

Unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:

- Zone sensor with tenant override switch.
- #1 above plus a heating and cooling set point adjustment. (CAV-ZTC only)

The keypad/display character format shall be 40 characters x 8 lines. The character font shall be a 5 x 8 dot matrix. The display shall be a supertwist liquid crystal display (LCD) with black characters on yellow background providing high visibility. The display form shall be in plain English coded formats. Lookup tables are not acceptable.

All control settings shall be password protected from changes by unauthorized personnel.

The user interaction with the display shall provide the following information as a minimum:

- Supply, return, outdoor, and space air temperature
- Duct and building static pressure; the control contractor is responsible for providing and installing sensing tubes
- Supply fan and return fan status and airflow verification
- Supply and return VFD speed
- Outside air damper position and economizer mode
- Cooling and heating changeover status
- Occupied, unoccupied, and dirty filter status
- Date and time schedules
- Up to ten current alarms and twenty-five previous alarms with time and date
- The keypad shall provide the following set points as a minimum as required by selected unit options:
 - Supply, outdoor and space air temperature
 - Six control modes including off manual, auto, heat/cool, cool only, heat only, and fan only
 - Four occupancy modes including auto, occupied, unoccupied and bypass (tenant override with adjustable duration)
 - Control changeover based on return air temperature, outdoor air temperature, or space temperature
 - Primary cooling and heating set point temperature based on supply or space temperature
 - Night setback and setup space temperature
 - Cooling and heating control differential (or dead band)
 - Cooling and heating supply temperature reset options based on one of the following: Return air temperature, outdoor air temperature, space temperature, airflow, or external (1-5 VDC) signal
 - Reset schedule temperature
 - High supply, low supply, and high return air temperature alarm limits
 - Ambient compressor and heat lockout temperatures

- Compressor inter-stage timers duration
- Duct and building static pressure
- Return fan tracking (VaneTrol) settings that include minimum/maximum VFD speed with and without remote exhaust operation
- Minimum outdoor airflow reset based on external reset (1–5 VFD) percent of CFM capacity, and fixed outdoor damper position
- Minimum outdoor airflow reset based on Design Flow direct OA volume measurement, percent of CFM capacity, and fixed outdoor damper position
- Economizer changeover based on enthalpy, dry bulb or network signal
- Current time and date
- Occupied/unoccupied time schedules with allowances for holiday/event dates and duration
- Three types of service modes including timers normal (all time delays), timers fast (all time delays 20 seconds), and normal
- Tenant over-ride time Return air temperature
- Supply air temperature

Open Communications Protocol – The unit control system shall have the ability to communicate to an independent Building Management System (BMS) through a direct communication connection. The independent BMS system shall have access to [quantity from specification] “read only” variables and [quantity from specification] “read & write” variables. Communications shall not require field mounting of any additional sensors or devices at the unit. Multiple units within a common communications network shall require only a single Open Protocol Master (OPM) panel provided by the unit manufacturer.

The BMS system shall be capable of interacting with the individual rooftop controllers in the following ways:

- Monitor controller inputs, outputs, setpoints, parameters and alarms
- Set controller setpoints and parameters
- Clear alarms
- Reset the cooling discharge air temperature setpoint
- Reset the heating discharge air temperature setpoint
- Reset the duct static pressure setpoint
- Set the heat/cool changeover temperature
- Set the representative zone temperature

2.12.3 Humidifiers

Supply and install electric steam humidifier(s) of the electrode type, as indicated in the project plans, specifications and humidifier schedule. The humidifier(s) shall be of capacity and with the accessories listed in the humidifier schedule.

The humidifier(s) shall be usUL/ULc certified. The humidifier(s) shall also comply with ARI 640, “Standard for Commercial and Industrial Humidifiers”.

2.12.3.1 Type

The humidifier shall be of the self-contained, electronically controlled, self-generating electrode type, producing atmospheric steam in a plastic cylinder. The humidifier shall be a wall mounted Vapac, LE Series, or approved equal.

2.12.3.2 Cylinders/Electrodes

- 1) The humidifier shall produce steam at atmospheric pressure in a choice of fully interchangeable, disposable or cleanable polypropylene cylinders which material is recyclable.
- 2) The disposable cylinders shall be of the all-welded construction type incorporating specially designed electrodes.

2.12.3.3 Cabinet Construction

The humidifier cabinet shall have two separate sections to prevent water spillage or leakage from the mechanical to the electrical compartment. The cabinet shall be constructed from galvanized mild steel finished with a polyester powder coating for a higher corrosion resistance. The drain pan shall be constructed from 316 grade stainless steel for lifetime duty. The cabinet shall be ventilated through vents located on both side panels to suitably dissipate heat generated inside the cabinet. The cabinet door shall be mounted on hinges and include two positive close locks requiring a key to open. All components shall be fully accessible from the front of the cabinet, and only 3" side clearances shall be required for ventilation purposes.

2.12.3.4 Drain Pump

The humidifier shall include a drain pump to provide for more efficient cylinder drainage during normal drain cycle, better anti-foam protection and reduced scale clogging of the cylinder. The boiled water condition shall be controlled by means of periodic drain sequence to ensure the correct sediment concentration is being maintained. The drain circuit shall discharge through a drain trap vented to the steam cylinder compartment. Internal drain tempering shall ensure a drain water temperature below 140 °F (60 °C) to meet local codes. A single drain connection to the humidifier shall be required.

2.12.3.5 LED Indicator Panel

The humidifier shall incorporate a user-friendly LED indicator panel on the front door, showing operational status and fault diagnostics of the system.

The panel shall indicate the following Operation/Fault conditions, through color coded lights and comprehensive pictograms.

- Unit off
- Unit on line and operational
- Unit on standby
- Drain fault
- Feed fault
- Over current
- Service interval expired
- Service routine operational
- Service routine completed
- Constant output active.

2.12.3.6 Power Supply

The humidifier shall be constructed to accept 460 Volts, 3 Phase, 60-Hertz electrical power that shall enable the humidifier to deliver the nominal steam capacity. The humidifier shall be equipped with a multi-tap transformer, which can accept the whole range of voltages (208-600). The control circuit shall be 24 Volt A.C., powered from the internal primary transformer. The humidifier shall have coded terminal connection points for the wiring of power and control lines.

2.12.3.7 Controls

- 1) The humidifier shall be able to accept an externally generated control signal direct from a sensor or a BMS.
- 2) The humidifier shall have the capability to introduce safety interlocks from the air handling unit or duct. The following safety accessories shall be installed to prevent humidifier operation in adverse conditions.

Fan Interlock, Air Flow Switch, High Limit Hygrostat.

2.12.3.8 Feedwater

The feedwater piping shall incorporate a strainer and a flow restrictor to suit connections to water supply pressures in the range of 14.5 to 117 psi. The humidifier shall be supplied with a flexible hose having connectors on both ends for easy feedwater connection. The humidifier shall incorporate a fill cup with a 1" (25 mm) air gap on the water feed line to prevent back feed and contamination of the water supply line. The humidifier shall be able to accept different water qualities ranging from 80-1000 micromhos for conductivity and 50 to 500 ppm for hardness.

2.12.3.9 Steam Distributors

Steam distribution shall be accomplished using stainless steel, multi-pipe short absorption manifold.

Manifold header: The manifold header shall be constructed of type 304 stainless steel and installed at the bottom of the duct or air handler for a horizontal airflow installation. The header when mounted on supplied support brackets shall be sloped to ensure efficient condensate removal without the use of a condensate leg.

Dispersion tubes: The dispersion tubes shall be constructed of type 304 stainless steel. They shall be welded to the header, closely spaced and spanning the width of the air tunnel. The dispersion tubes spacing shall be optimized for the individual application to provide the best steam coverage, and the required absorption distance. Each tube shall contain a single row of holes facing the airflow for shorter absorption distances. The dispersion tubes shall be supplied with end support brackets for easy field installation.

Tube holes: Each hole shall be formed to extend tube material in a cylindrical shape inside of the tube to get the driest steam from the center of the tube without adding plastic or stainless steel nozzles. The spacing between holes shall be optimized, spanning the height of the tube and sized to ensure constant pressure inside every tube for even steam distribution.

Assembly: The short absorption manifold shall be shipped completely assembled at the factory for reduced field installation time.

2.12.3.10 Alphanumeric Display

The humidifier shall incorporate an alphanumeric display with a touch-sensitive keypad permanently mounted on the front door of the humidifier. The display shall allow password access to three levels of administration:

- User level
- Service level
- System design level

The following performance data shall be displayed;

- Space % R.H. (when using room/duct sensor only)
- Space T° (when using room/duct sensor only)
- System Output
- Control Signal Demand
- Total Power usage
- Run Hours
- Network Connection Status

2.12.3.11 Modulating Control

The humidifier shall be fully modulating with SCR control giving a turndown ratio of 12:1 and a range of operation from 8% to 100% of full capacity.

PART 3 EXECUTION

3.1 EXAMINATION

After becoming familiar with all details of the work, verify all dimensions in the field, and advise the resident engineer of any discrepancy before performing the work.

3.2 INSTALLATION

Install materials and equipment in accordance with the requirements of the contract drawings and approved manufacturer's installation instructions. Accomplish installation by workers skilled in this type of work.

3.2.1 Condensate Drain Lines

Provide water seals in the condensate drain from all units. Provide a depth of each seal of 2 inches plus the number of inches, measured in water gauge, of the total static pressure rating of the unit to which the drain is connected. Provide water seals that are constructed of 2 tees and an appropriate U-bend with the open end of each tee plugged. Provide pipe cap or plug cleanouts where indicated. Connect drains indicated to connect to the sanitary waste system using an indirect waste fitting.

3.3 TESTING, ADJUSTING, AND BALANCING

Begin testing, adjusting, and balancing only when the air supply and distribution, including controls, has been completed, with the exception of performance tests.

3.4 OPERATION AND MAINTENANCE

3.4.1 OPERATION AND MAINTENANCE MANUALS

Submit six manuals at least 2 weeks prior to field training. Submit Data Package 3 for the items/units listed under SD-10 Operation and Maintenance Data

3.4.2 Operation and Maintenance Training

Conduct a training course for the members of the operating staff as designated by the resident officer. Conduct field instruction that covers all of the items contained in the Operation and Maintenance Manuals as well as demonstrations of routine maintenance operations. Submit the proposed On-site Training schedule concurrently with the Operation and Maintenance Manuals and at least 14 days prior to conducting the training course.

3.5 MAINTAINING ROOF WARRANTY

Contractor shall comply with Johns Manville Roofing Systems requirements so as not to void the following existing roof warranty:

Guarantee No: ANB0981397
Johns Manville Roofing Systems
Term & Maximum Liability: 20 years, ND, \$0
Roof Spec: 4GIC 565 Squares
Flashing Spec: DFE-1LB
Insulation: ENRGY2 RFB

All work regarding alteration to the existing roof system; which includes, but not limited to capping, addressing roof penetration, etc., due to the work required on plans **36649-1-D** through **36649-21-D** must be performed by an approved Johns Manville Roofing contractor listed in the following Johns Manville website <http://www.specjm.com/commercial/roofing.asp>.

The work must follow Johns Manville roofing Systems installation requirements and Details shown on Appendix H. The work will be included under the existing Guarantee coverage for the remaining life of the original guarantee.

The contractor must contact Johns Manville Roofing Systems to obtain approval for the repairs they are planning to do. The approval must be documented and submitted to the City. A Johns Manville representative is not required to be on site during repairs.

The bidder must list the approved Johns Manville roofing contractor on the List of Subcontractors on the Bidding Document.

3.5.1 Cutting and Patching

Openings through fire rated walls for pipes and ducts shall be packed with impervious noncombustible materials to provide a tight fit. All duct penetrations through fire rated walls shall have a fire smoke damper with smoke detector and access panels.

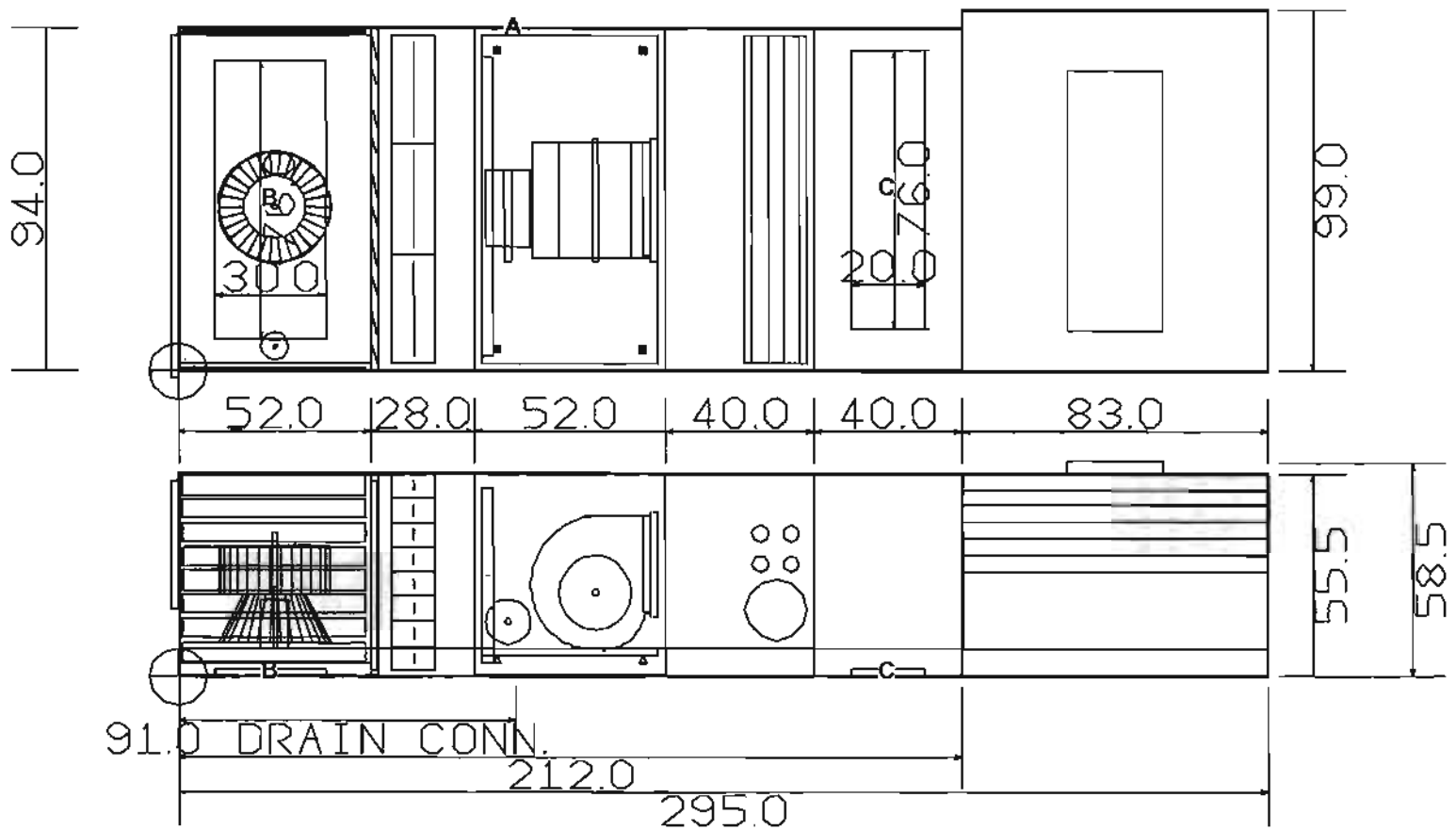
-- End of Section --

APPENDIX D

McQuay Air Conditioning Submittals

Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	182.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



VIEW: General Arrangement No Ends
 DRAWN: 16-September-2010 (16:31)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-1, 2
 MODEL: RPS030D



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 9/16/2010 4:44 PM

JOB NAME	ZXSG9B(RT000)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESPERSON	VAM
MODEL NUMBER	RPS030D	CUSTOMER	-
UNIT TAGGING	RT-1, 2	ROOFTOP VERSION	4.75

GENERAL DATA

Unit dimensions (HxWxL ins)	55.5 x 94.0 x 295.0
Unit weight (lbs)	7960
Approval listing	ETL/MEA - UL

7875 lbs

CASING DETAILS

Insulation	Nominal 2" thick, 1 1/2 lb. density fiberglass
Liners	Solid liner throughout
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	81.9
MROPD (amps)	100.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CU AHU
 84 23.8
 100 30

CONTROL DATA

Temperature controls	Space control - No comm card
Airflow controls	One space static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 2 - 6, 1 - 13
Capacity control	3 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	21.1
Compressor amps	1 - 23.1, 2 - 11.2

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	4.8
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	5 / 12
Fin material	Aluminum
Total capacity (Btu/hr)	356604**
Sensible capacity (Btu/hr)	301183
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	53.3 / 52.8
Face area (ft2)	27.0
Face velocity (ft/min)	444

DRAW-THRU

Rows / FPI	5 / 12
Fin material	Aluminum
Total capacity (Btu/hr)	356604**
Sensible capacity (Btu/hr)	301183
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	53.3 / 52.8
Face area (ft2)	27.0
Face velocity (ft/min)	444

BLOW-THRU



Refrigerant type R410A

MODULATING HOT GAS REHEAT

Rows / FPI 1 / 14
 Fin material Aluminum Micro-channel
 Total capacity (Btu/hr) 218115
 Sensible capacity (Btu/hr) 218115
 Entering db / wb (F) 53.3 / 52.8
 Leaving db / wb (F) 69.8 / 59.1
 Face area (ft2) 18
 Face velocity (ft/min) 656

FAN PERFORMANCE

Air volume (cfm) 12000
 Altitude (ft) 0
 Air modulation device None
 Fan diameter / type 20" / AF DWDI
 Fan speed (rpm) 2434
 Fan brake horsepower (HP) 13.4
 Motor size (HP) 15.0
 Motor amps 18.5
 Motor efficiency / type 91.7% /
 Drive service factor / type 150% / Variable
 Fan isolation Springs
 Fan section options None

SUPPLY

12000
 0
 None
 20" / AF DWDI
 2434
 13.4
 15.0
 18.5
 91.7% /
 150% / Variable
 Springs
 None

RETURN / EXHAUST

10200
 0
 Inverter
 30" / AF SWSI
 840
 2.9
 3.0
 4.1
 88.5% /
 150% / Fixed
 Springs
 None

HEATING PERFORMANCE

Type of heat Natural gas
 Model size (mbh) 250
 Heat exchanger Stainless steel primary, Stainless steel secondary
 EDB / LDB (F) 65.0 / 84.1
 Capacity (Btu/hr) 250000
 Capacity control 20-to-1 High turndown
 Gas pressure regulator Std. 0.5 psi
 Furnace combustion efficiency 80 %
 Air pressure drop (in WC) 0.18

AIR BLENDER

Type None

FILTER DATA

Filter efficiency / type No filter media
 Face area (ft2) 24
 Face velocity (ft/min) 500
 Filter qty / size (ins) 4 / 12.0 x 24.0 x 12.0
 4 / 24.0 x 24.0 x 12.0
 Energy recovery wheel filter qty/size None

DRAW-THRU

FINAL

PLENUM DATA

Outside air option
 Opening location
 Plenum options
 Smoke detector

RETURN

Economizer w/ actuator
 Bottom
 None
 None

DISCHARGE

-
 Bottom
 None
 Yes

BLANK ACCESS

Section length (ins)

DRAW-THRU

SPACER

BLOW-THRU

AIR PRESSURE DROPS (in WC)

SUPPLY

RETURN



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 9/16/2010 4:44 PM

External static pressure	1.00	0.50
Draw-thru filter	0.00	
Cooling	0.84	
HGRH coil	0.20	
Heating	0.18	
Total static	3.35	0.50

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	92	90	90	87	84	83	82
Unit discharge	91	87	81	82	76	70	62	54
Unit return	94	91	89	89	86	81	73	66

SHIPPING SECTION DETAILS

LENGTH

WEIGHT

Section 1	295.0	7960
-----------	-------	------

WARRANTY

PARTS

COMPRESSOR

HEAT EXCHANGER

Standard (yrs)	1	1	1
Extended (yrs)	None	None	None

NOTES

- 50 SQ FT 4" Rack
 - 52" SA Plenum
 - Adjust openings to fit Existing.
- Important Notice:

This unit may not meet ASHRAE Standard 90.1 - 2007 fan motor power limitations. If that code applies, alternate selections may be required.

The designer and installer must assure compliance with applicable codes. A component supplier cannot determine the brake horsepower ("BHP") for other motors in the air handling system.

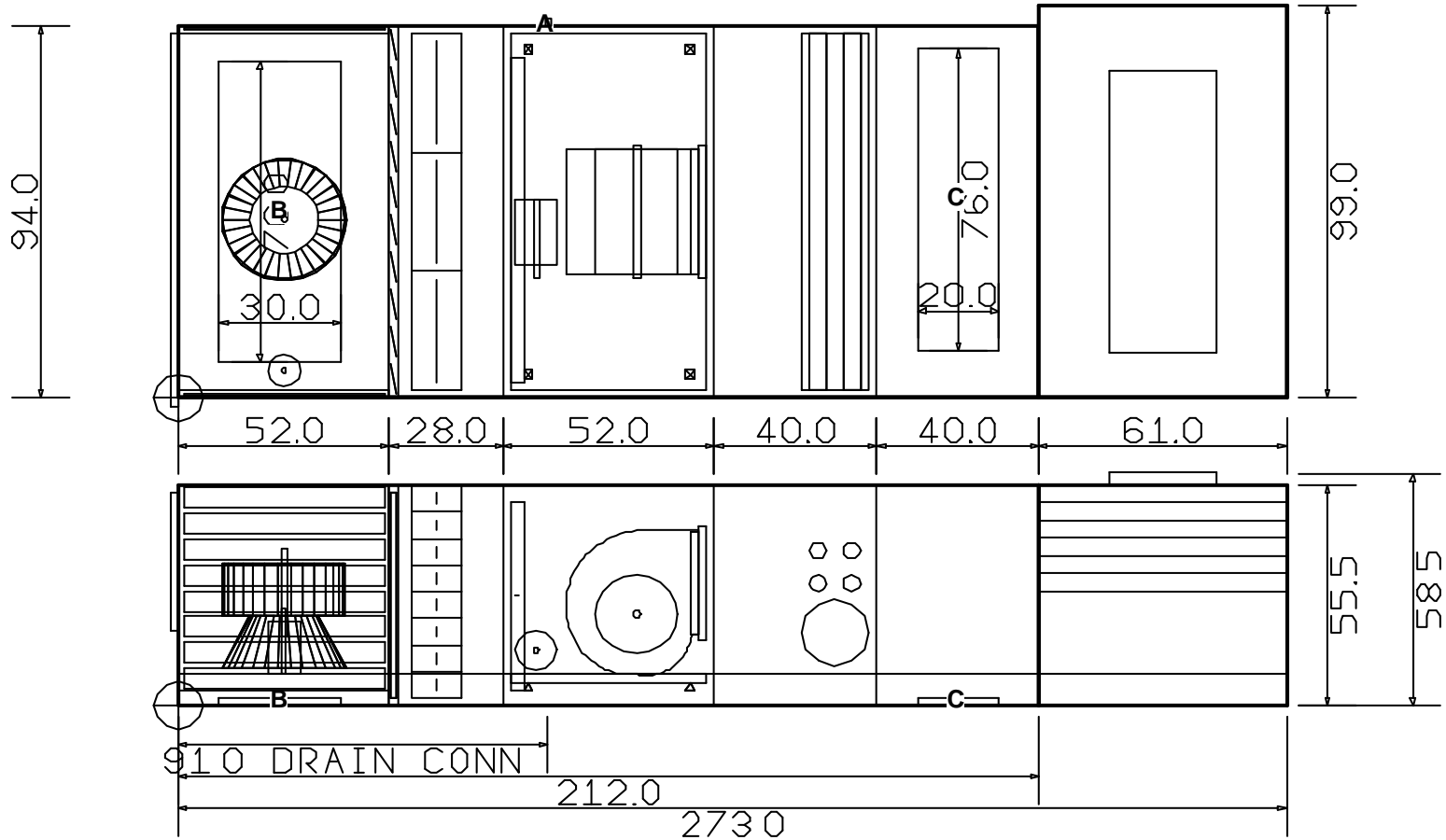
Before Approving this unit, determine whether ASHRAE Standard 90.1-2007 has been adopted in the specific jurisdiction or contract specifications in which the unit will be installed.

** Capacity shown is with Hot Gas Reheat option. The Capacity without Hot Gas Reheat will be reduced.

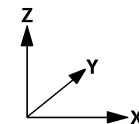


Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	182.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕

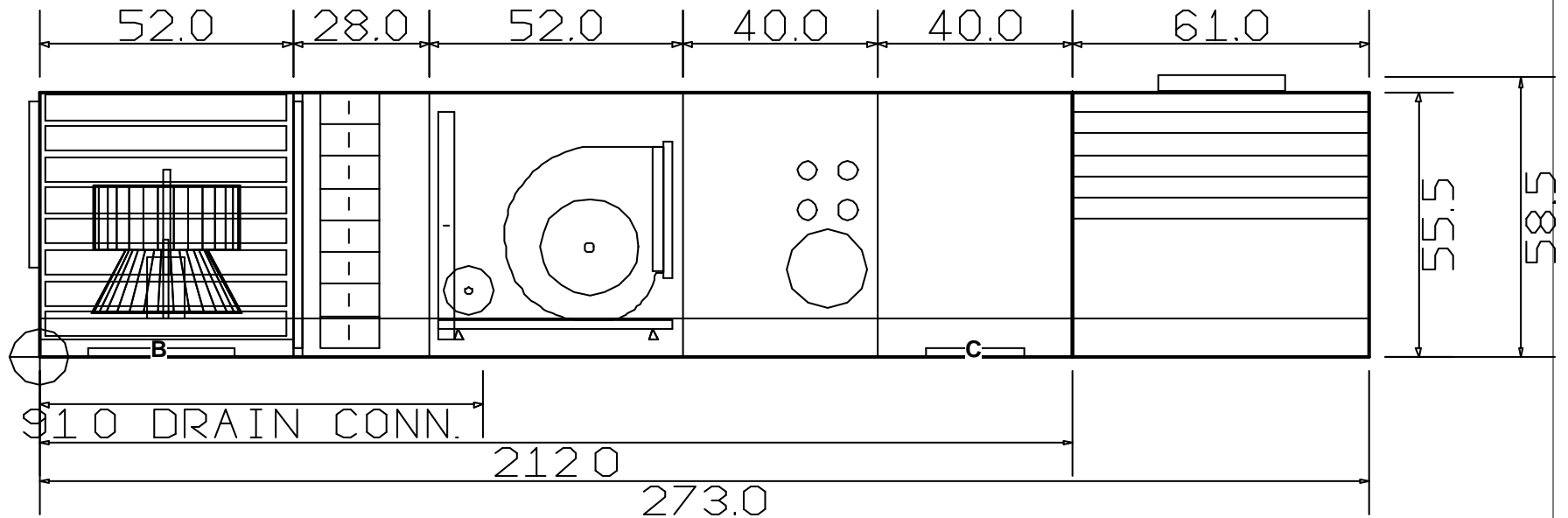


VIEW: General Arrangement No Ends
 DRAWN: 22-December-2010 (15:52)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-2 JJG
 MODEL: RPS025D



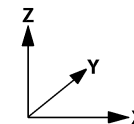
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	182.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



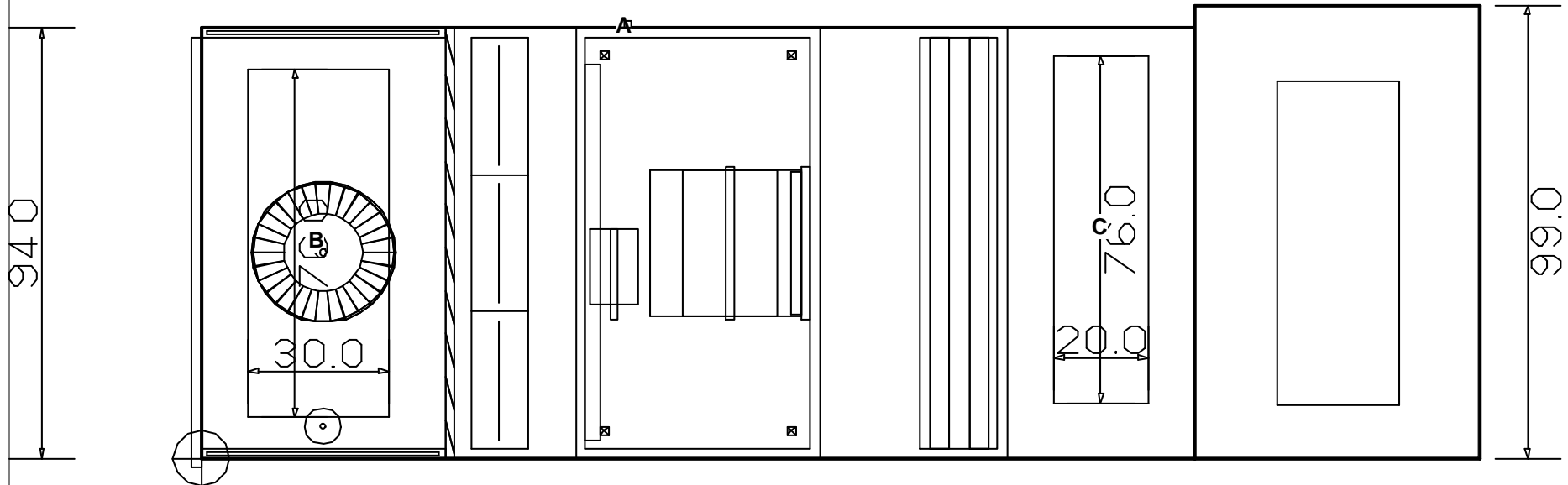
VIEW: Right Side
 DRAWN: 22-December-2010 (15:52)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-2 JJG
 MODEL: RPS025D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



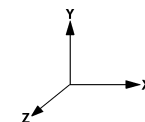
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	182.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



VIEW: Top
DRAWN: 22-December-2010 (15:52)
JOB NAME: Casa De Balboa (Teza)
UNIT TAGGING: RT-2 JJG
MODEL: RPS025D

Appendix D – McQuay Air Conditioning Submittals
Casa De Balboa HVAC Project



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:28 PM

JOB NAME	ZXSG9B(RT007)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESPERSON	VAM
MODEL NUMBER	RPS025D	CUSTOMER	-
UNIT TAGGING	RT-2 JJG	ROOFTOP VERSION	4.78

GENERAL DATA

Unit dimensions (HxWxL ins)	55.5 x 94.0 x 273.0
Unit weight (lbs)	7470
Approval listing	ETL/MEA - UL

CASING DETAILS

Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Liners	Solid liner throughout
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	65.1
MROPD (amps)	80.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CONTROL DATA

Temperature controls	Space control - No comm card
Airflow controls	One space static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 2 - 5.5, 1 - 11.4
Capacity control	3 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	19.8
Compressor amps	1 - 18.6, 2 - 10.6

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	2.3
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	5 / 10
Fin material	Aluminum
Total capacity (Btu/hr)	305584**
Sensible capacity (Btu/hr)	239334
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	51.3 / 50.7
Face area (ft ²)	27.0
Face velocity (ft/min)	323

DRAW-THRU**BLOW-THRU**

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:28 PM

Refrigerant type

R410A

MODULATING HOT GAS REHEAT

Rows / FPI 1 / 14
 Fin material Aluminum Micro-channel
 Total capacity (Btu/hr) 194804
 Sensible capacity (Btu/hr) 194804
 Entering db / wb (F) 51.3 / 50.7
 Leaving db / wb (F) 71.3 / 58.3
 Face area (ft²) 18
 Face velocity (ft/min) 478

FAN PERFORMANCE

Air volume (cfm)
 Altitude (ft)
 Air modulation device
 Fan diameter / type
 Fan speed (rpm)
 Fan brake horsepower (HP)
 Motor size (HP)
 Motor amps
 Motor efficiency / type
 Drive service factor / type
 Fan isolation
 Fan section options

SUPPLY

8750
 0
 Inverter
 20" / AF DWDI
 1925
 6.9
 10.0
 12.5
 90.2% /
 150% / Variable
 Springs
 None

RETURN / EXHAUST

8750
 0
 Inverter
 30" / AF SWSI
 741
 2.0
 3.0
 4.1
 88.5% /
 150% / Fixed
 Springs
 None

HEATING PERFORMANCE

Type of heat Natural gas
 Model size (mbh) 200
 Heat exchanger Stainless steel primary, Stainless steel secondary
 EDB / LDB (F) 65.0 / 86.0
 Capacity (Btu/hr) 200000
 Capacity control 20-to-1 High turndown
 Gas pressure regulator Std. 0.5 psi
 Furnace combustion efficiency 80 %
 Air pressure drop (in WC) 0.04

AIR BLENDER

Type None

FILTER DATA

Filter efficiency / type
 Face area (ft²)
 Face velocity (ft/min)
 Filter qty / size (ins)
 Energy recovery wheel filter qty/size

DRAW-THRU

No filter media
 24
 365
 4 / 12.0 x 24.0 x 12.0
 4 / 24.0 x 24.0 x 12.0
 None

FINAL**PLENUM DATA**

Outside air option
 Opening location
 Plenum options
 Smoke detector

RETURN

Economizer w/ actuator
 Bottom
 None
 None

DISCHARGE

-
 Bottom
 None
 Yes

BLANK ACCESS

Section length (ins)

DRAW-THRU**SPACER****BLOW-THRU****AIR PRESSURE DROPS (in WC)****SUPPLY****RETURN**

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:28 PM

External static pressure	1.00	0.50
Draw-thru filter	0.00	
Cooling	0.54	
HGRH coil	0.13	
Heating	0.04	
Total static	2.77	0.50

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	91	88	86	86	83	80	79
Unit discharge	84	80	77	72	69	63	55	47
Unit return	88	85	85	80	79	74	66	59

SHIPPING SECTION DETAILS

LENGTH

WEIGHT

Section 1	273.0	7470
-----------	-------	------

WARRANTY

PARTS

COMPRESSOR

HEAT EXCHANGER

Standard (yrs)	1	1	1
Extended (yrs)	None	None	None

NOTES

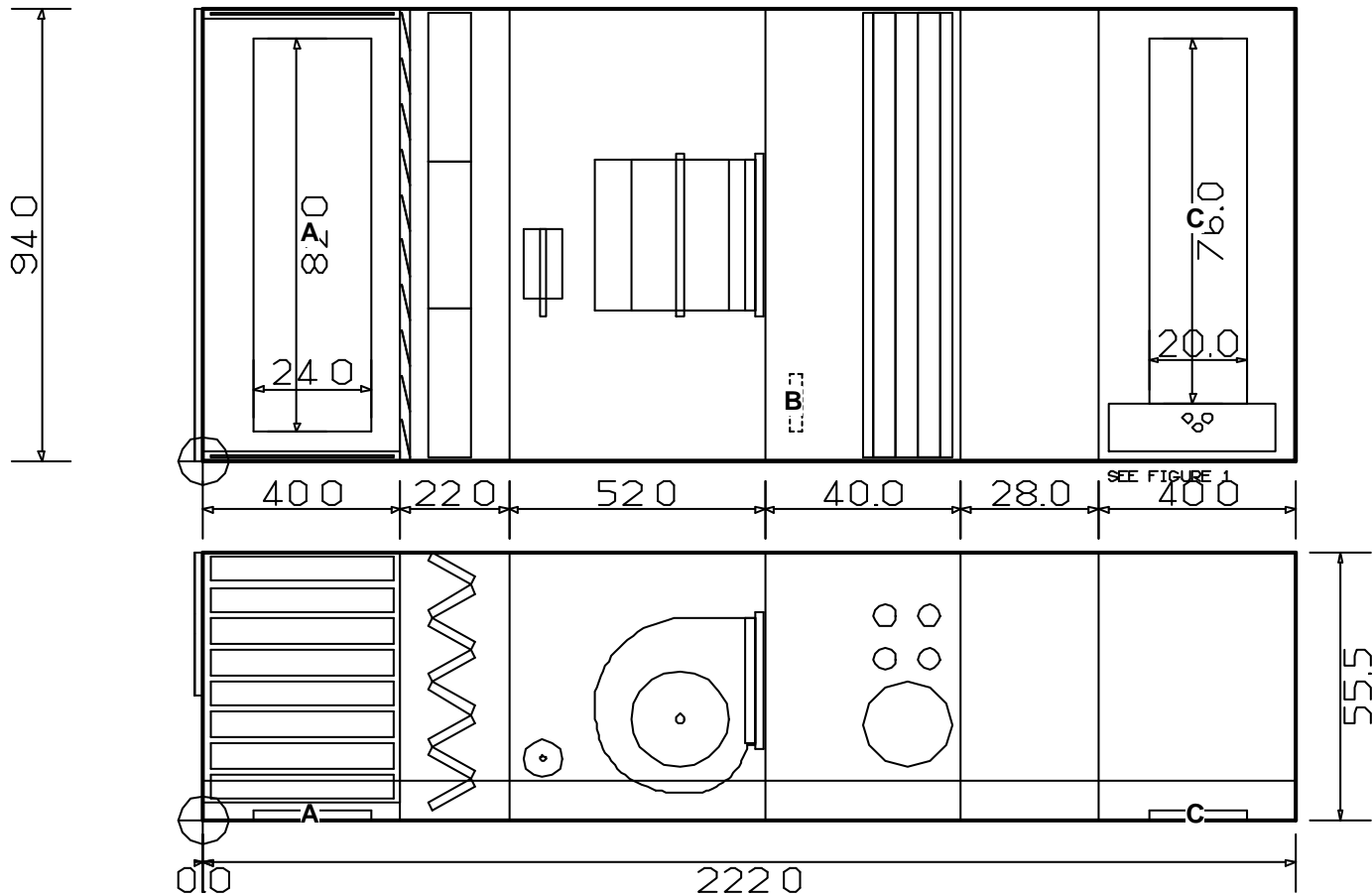
- 50 SQ FT 4" Rack
- 52" SA Plenum
- Adjust openings to fit Existing.

As a standalone component, unit meets or exceeds the 2009 requirements of ASHRAE 90.1 - 2007. The approving authority is responsible for compliance of multi-component building systems.

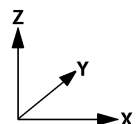
** Capacity shown is with Hot Gas Reheat option. The Capacity without Hot Gas Reheat will be reduced.

Opening	X	Y	Z	W(Width)	H(Height)
A Return air inlet	10.00	6.00	0.00	82.00	24.00
B Gas piping entrance	119.00	6.00	0.00	12.00	2.70
C Discharge air outlet	192.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕

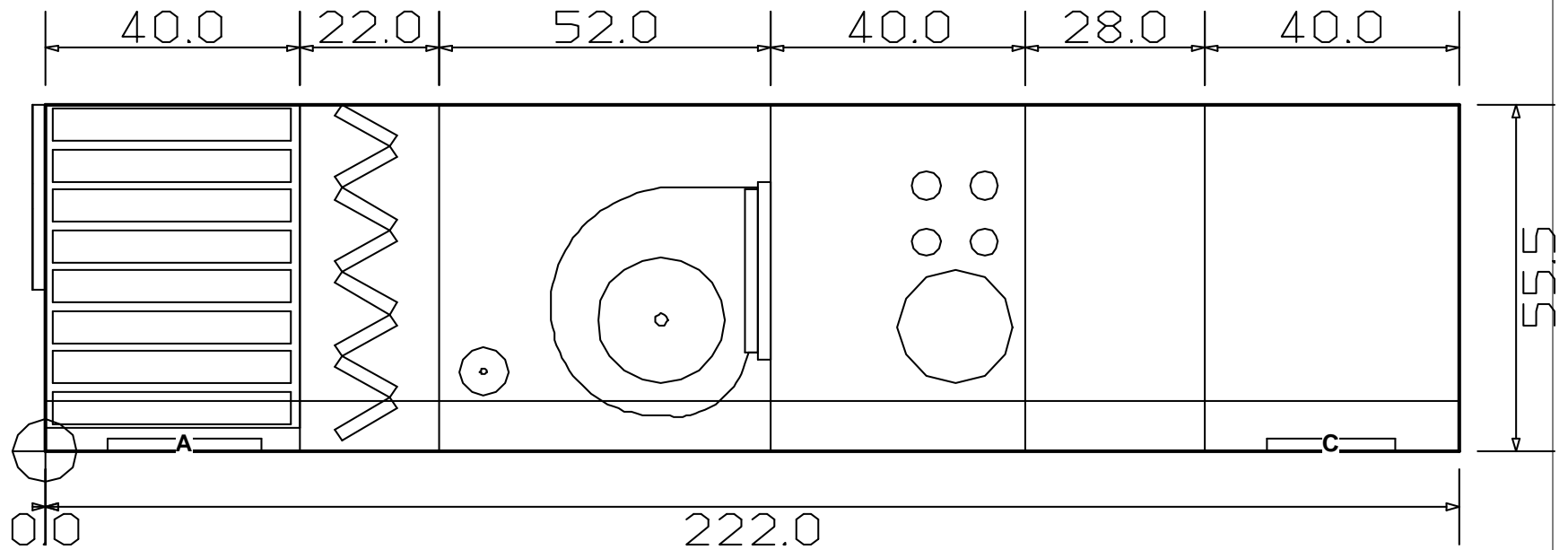


VIEW: General Arrangement No Ends
 DRAWN: 22-December-2010 (16:11)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-3 JJG
 MODEL: RDS800C



Opening	X	Y	Z	W(Width)	H(Height)
A Return air inlet	10.00	6.00	0.00	82.00	24.00
B Gas piping entrance	119.00	6.00	0.00	12.00	2.70
C Discharge air outlet	192.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕

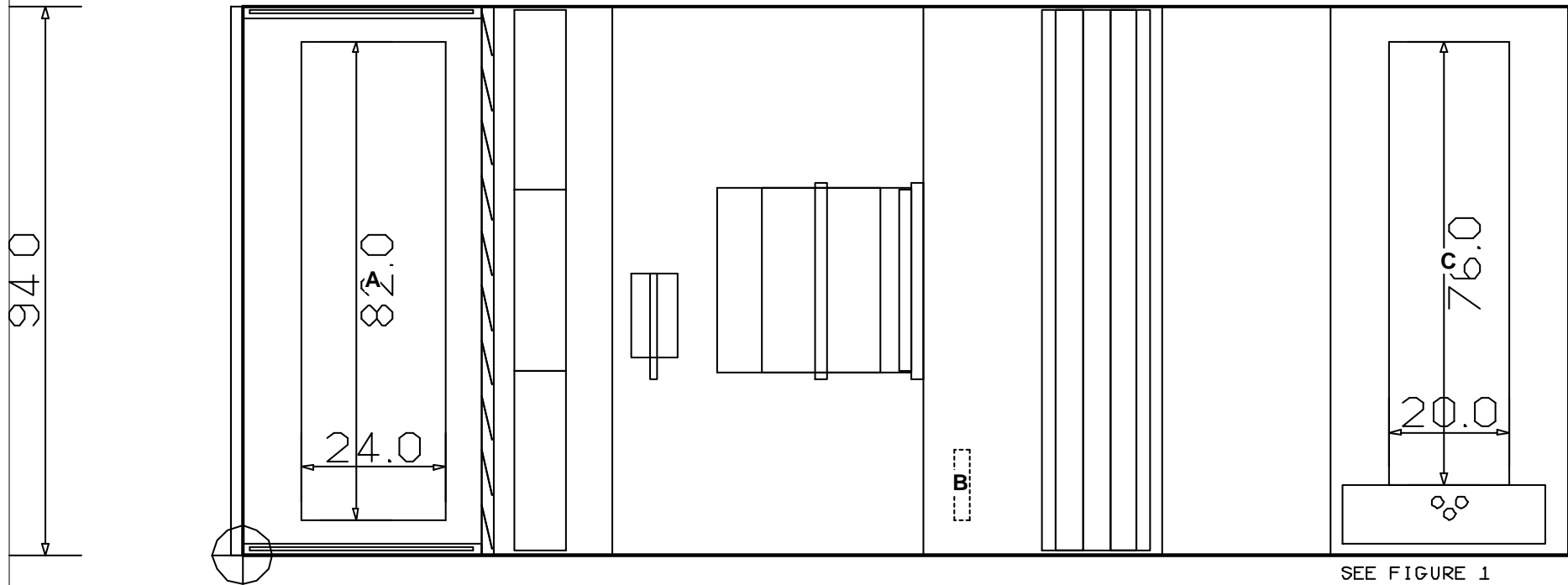


VIEW: Right Side
 DRAWN: 22-December-2010 (16:11)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-3 JJG
 MODEL: RDS800C



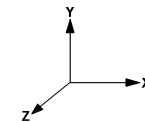
Opening	X	Y	Z	W(Width)	H(Height)
A Return air inlet	10.00	6.00	0.00	82.00	24.00
B Gas piping entrance	119.00	6.00	0.00	12.00	2.70
C Discharge air outlet	192.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



VIEW: Top
DRAWN: 22-December-2010 (16:11)
JOB NAME: Casa De Balboa (Teza)
UNIT TAGGING: RT-3 JJG
MODEL: RDS800C

Appendix D – McQuay Air Conditioning Submittals
Casa De Balboa HVAC Project



TECHNICAL DATA

Date Saved : 22/12/2010 16:11:00

JOB NAME	ZXSG9B(RH002)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESMAN	VAM
MODEL NUMBER	RDS800C	ENGINEER	-
UNIT TAGGING	RT-3 JJG	VERSION	4.67

SUPPLY		RETURN / EXHAUST	
Air volume	7500		s cfm
Altitude	0		ft
External static	1.00		ins WC
Total static	1.18		ins WC

CASING DETAILS	
Unit dimensions (H x W x L ins)	56 x 94 x 222
Unit weight (lbs)	5073
Exterior	Beige polyester paint exceeding ASTM B117 salt spray standard
Liner	Solid galvanized steel
Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Doors	Single lever access doors on both sides

ELECTRICAL DETAILS	
Unit voltage	460/60/3
MCA (amps)	8.1
MROPD (amps)	15.0
SCCR (kAIC)	22.0
Field connection	1 Thru-door disconnect
Control box location	

CONTROLS DETAILS	
Temperature controls	DAC - No comm card
Airflow controls	One duct static pressure sensor
Auxiliary controls	None
Starting options	Across the line

SPECIALS			
Special 28" blank section located between position G and K			
Static pressure	0.00	ins WC	Weight
			0.00 lbs

RETURN AIR SECTION			
Return air option	0-100% Economizer with barometric damper	Plenum options	None
Opening location	Bottom	Smoke detector	Supply air
Air pressure drop	0.05	ins WC	

FILTER SECTION			
Type	Angular	Face area	50.0 ft2
Efficiency	30 %	Air pressure drop	0.06 ins WC
Face velocity	150 fpm		



SUPPLY FAN SECTION					
Air volume	7500	cfm	Motor power	5.00	hp
Total static pressure	1.18	ins WC	Motor type	TEFC, Premium efficiency	
Fan type/Class	DWDI AF / Class II		Motor efficiency	Premium	
Fan wheel diameter	20.00	ins	Full load current	6.5	A
Brake horsepower	3.09	hp	Lock rotor current	48.0	A
Operating speed	1496.3	rpm	Drive ser. factor/Type	150% / Fixed pitch	
Air modulation	Inverter mounted in SAF section		Fan isolation	Spring w/ seismic snubbers	
DRIVES					
Fan sheave	1B5V70		Motor sheave	BK65H	
Number of belts	1		Belt	B44	

GAS HEAT					
Type	Natural gas		Model size	250	
EDB/LDB	65.0 / 95.6	F	Heat exchanger	Stainless steel primary, Stainless steel secondary	
Capacity	250000	Btu/h	Capacity control	20-to-1 High turndown	
Air pressure drop	0.07	ins WC	Gas pressure regulator	0.5	psi

ACCESS SECTION	
Section length (ins)	28.00

DISCHARGE PLENUM SECTION			
Opening location	Bottom	Smoke detector	Supply air
Plenum options	None	Air pressure drop	0.00 ins WC

NOTES	

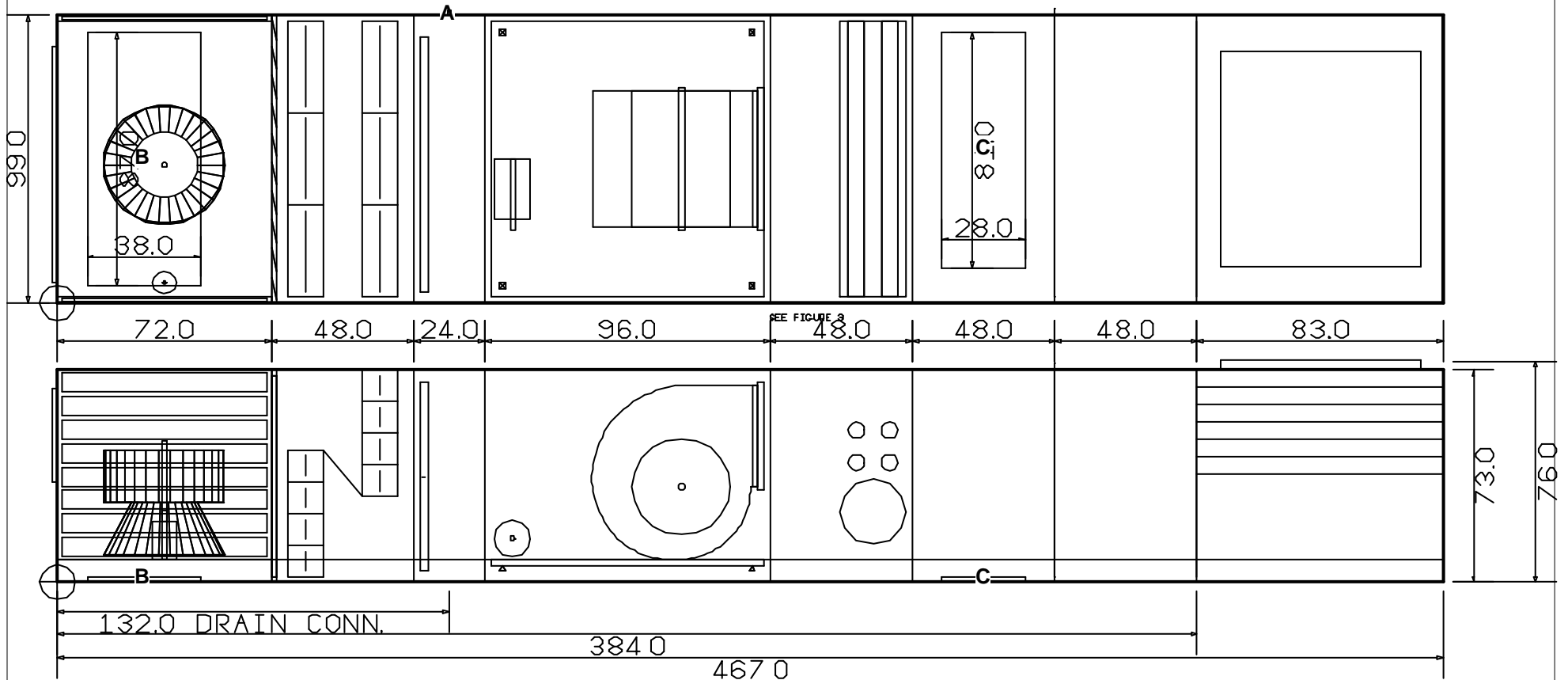
SHIPPING SECTION DETAILS		
	Length (inches)	Weight (lb)
Section 1	222.00	5073.00
TOTALS	222.00	5073.00

WARRANTY DETAILS		
	Parts	Heat Exchanger
Standard (yrs)	1	1
Extended (yrs)	0	0

UNIT SOUND	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	65	64	62	54	51	40	29	22
Unit discharge	80	76	73	68	65	59	51	43
Unit return	82	80	80	72	69	62	54	46

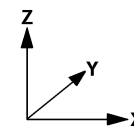
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	132.00	100.50	2.70	-	-
B Return air inlet	10.00	6.00	0.00	87.00	38.00
C Discharge air outlet	298.00	12.00	0.00	81.00	28.00

Dimensions measured from ⊕



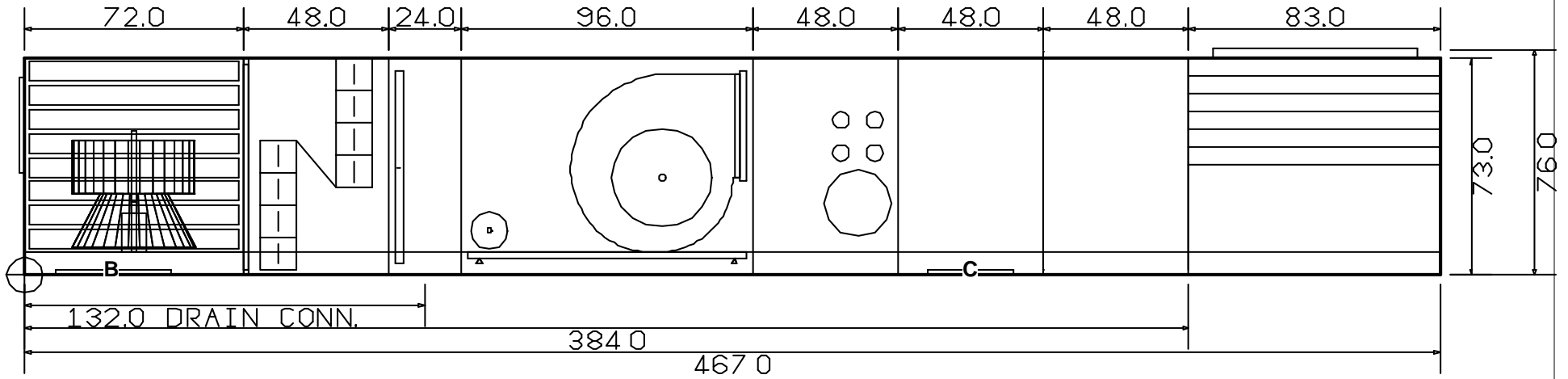
VIEW: General Arrangement No Ends
DRAWN: 22-December-2010 (15:53)
JOB NAME: Casa De Balboa (Teza)
UNIT TAGGING: RT-6 JJG
MODEL: RPS045D

Appendix D – McQuay Air Conditioning Submittals
Casa De Balboa HVAC Project



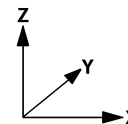
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	132.00	100.50	2.70	-	-
B Return air inlet	10.00	6.00	0.00	87.00	38.00
C Discharge air outlet	298.00	12.00	0.00	81.00	28.00

Dimensions measured from ⊕



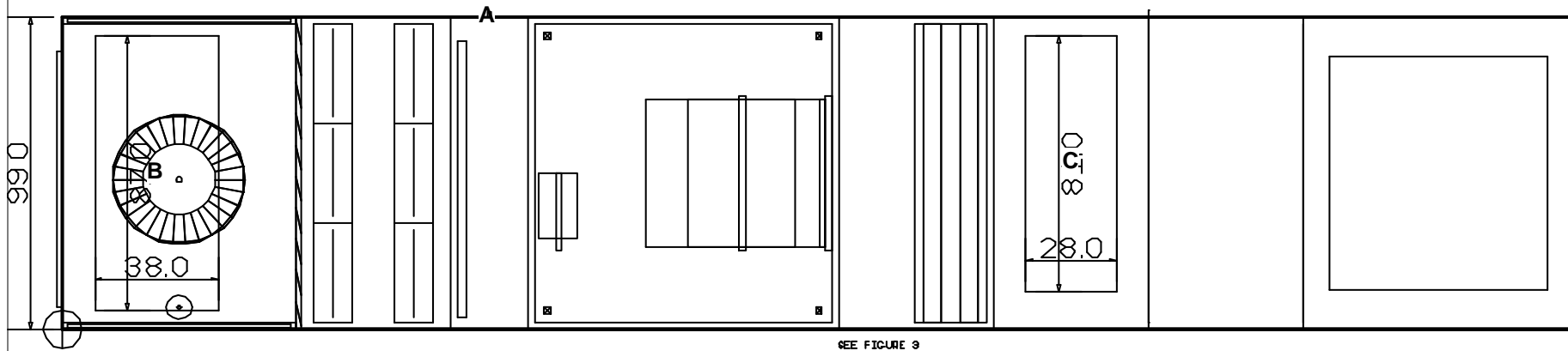
VIEW: Right Side
DRAWN: 22-December-2010 (15:53)
JOB NAME: Casa De Balboa (Teza)
UNIT TAGGING: RT-6 JJG
MODEL: RPS045D

Appendix D – McQuay Air Conditioning Submittals
Casa De Balboa HVAC Project



Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	132.00	100.50	2.70	-	-
B Return air inlet	10.00	6.00	0.00	87.00	38.00
C Discharge air outlet	298.00	12.00	0.00	81.00	28.00

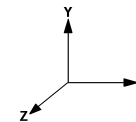
Dimensions measured from ⊕



SEE FIGURE 3

VIEW: Top
 DRAWN: 22-December-2010 (15:53)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-6 JJG
 MODEL: RPS045D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:30 PM

JOB NAME	ZXSG9B(RT009)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESPERSON	VAM
MODEL NUMBER	RPS045D	CUSTOMER	-
UNIT TAGGING	RT-6 JJG	ROOFTOP VERSION	4.78

GENERAL DATA

Unit dimensions (HxWxL ins)	73.0 x 99.0 x 467.0
Unit weight (lbs)	12204
Approval listing	ETL/MEA - UL

CASING DETAILS

Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Liners	Solid liner throughout
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	106.8
MROPD (amps)	125.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CONTROL DATA

Temperature controls	DAC - No comm card
Airflow controls	One duct static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 4 - 10
Capacity control	4 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	34.4
Compressor amps	4 - 17.9

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	4.5
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	4 / 10
Fin material	Aluminum
Total capacity (Btu/hr)	537028**
Sensible capacity (Btu/hr)	423660
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	52.1 / 51.3
Face area (ft ²)	39.5
Face velocity (ft/min)	405

DRAW-THRU**BLOW-THRU**

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:30 PM

Refrigerant type

R410A

MODULATING HOT GAS REHEAT

Rows / FPI 1 / 14
 Fin material Aluminum Micro-channel
 Total capacity (Btu/hr) 337401
 Sensible capacity (Btu/hr) 337401
 Entering db / wb (F) 52.1 / 51.3
 Leaving db / wb (F) 70.9 / 58.2
 Face area (ft²) 29
 Face velocity (ft/min) 552

FAN PERFORMANCE

Air volume (cfm)
 Altitude (ft)
 Air modulation device
 Fan diameter / type
 Fan speed (rpm)
 Fan brake horsepower (HP)
 Motor size (HP)
 Motor amps
 Motor efficiency / type
 Drive service factor / type
 Fan isolation
 Fan section options

SUPPLY

16000
 0
 Inverter
 33" / AF DWDI
 891
 9.6
 15.0
 18.5
 91.7% /
 150% / Fixed
 Springs w/ seismic restraint
 None

RETURN / EXHAUST

11900
 0
 Inverter
 40" / AF SWSI
 440
 1.7
 3.0
 4.1
 88.5% /
 150% / Fixed
 Springs w/ seismic restraint
 None

HEATING PERFORMANCE

Type of heat Natural gas
 Model size (mbh) 400
 Heat exchanger Stainless steel primary, Stainless steel secondary
 EDB / LDB (F) 65.0 / 87.9
 Capacity (Btu/hr) 400000
 Capacity control 20-to-1 High turndown
 Gas pressure regulator Std. 0.5 psi
 Furnace combustion efficiency 80 %
 Air pressure drop (in WC) 0.13

AIR BLENDER

Type None

FILTER DATA

Filter efficiency / type 95% / Cartridge
 Face area (ft²) 48
 Face velocity (ft/min) 333
 Filter qty / size (ins) 8 / 12.0 x 24.0 x 12.0
 8 / 24.0 x 24.0 x 12.0
 Energy recovery wheel filter qty/size None

DRAW-THRU**FINAL****PLENUM DATA**

Outside air option
 Opening location
 Plenum options
 Smoke detector

RETURN

Economizer w/ actuator
 Bottom
 None
 None

DISCHARGE

-
 Bottom
 None
 Yes

BLANK ACCESS

Section length (ins)

DRAW-THRU**SPACER****BLOW-THRU****AIR PRESSURE DROPS (in WC)****SUPPLY****RETURN**

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:30 PM

External static pressure	1.25	0.50
Draw-thru filter	0.50	
Cooling	0.38	
HGRH coil	0.16	
Heating	0.13	
Total static	2.67	0.50

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	94	91	89	89	86	83	82
Unit discharge	82	81	72	70	67	61	53	45
Unit return	84	83	76	74	70	61	51	42

SHIPPING SECTION DETAILS

LENGTH

WEIGHT

Section 1	467.0	12204
-----------	-------	-------

WARRANTY

PARTS

COMPRESSOR

HEAT EXCHANGER

Standard (yrs)	1	1	1
Extended (yrs)	None	None	None

NOTES

24" Section Out of Airstream

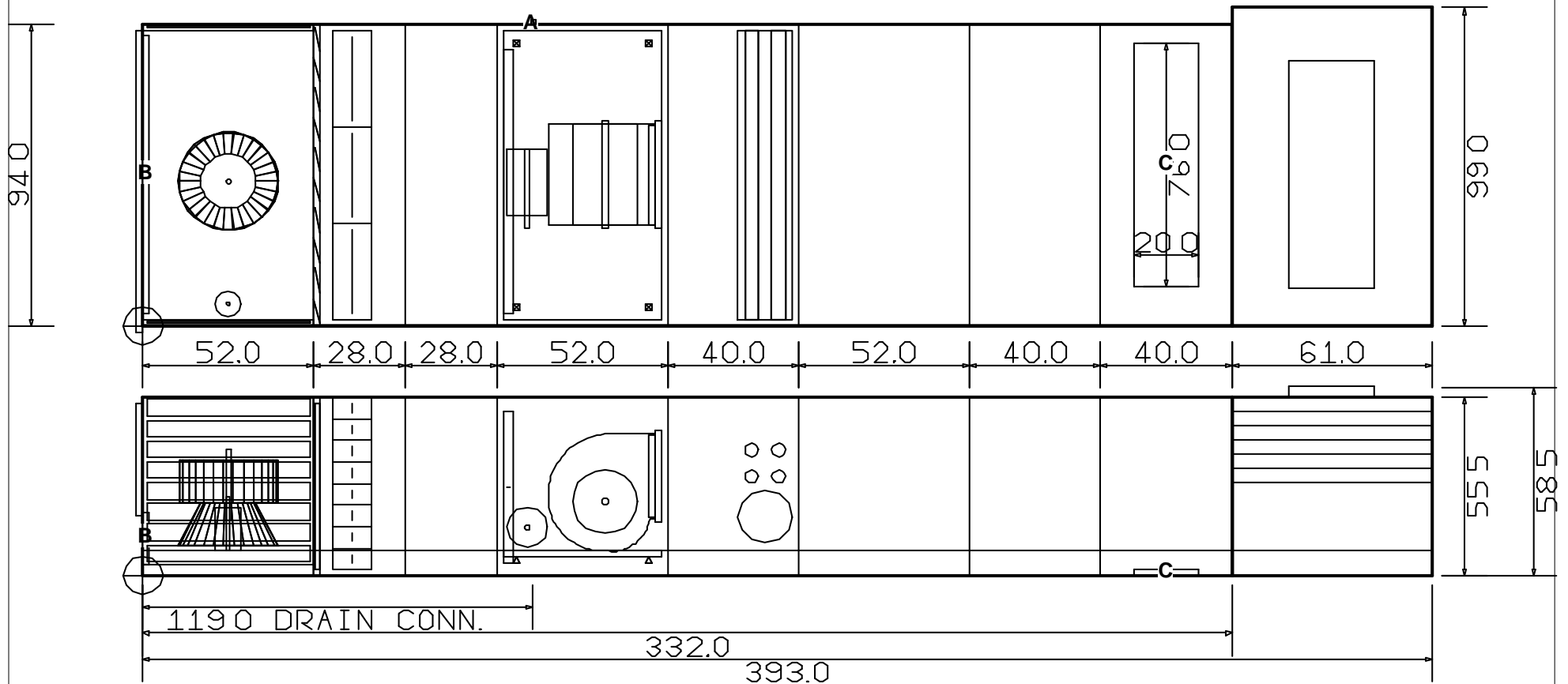
Special 48" blank section located between position K and L

As a standalone component, unit meets or exceeds the 2009 requirements of ASHRAE 90.1 - 2007. The approving authority is responsible for compliance of multi-component building systems.

** Capacity shown is with Hot Gas Reheat option. The Capacity without Hot Gas Reheat will be reduced.

Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	119.00	95.50	2.70	-	-
B Return air inlet	0.00	3.75	3.60	86.50	16.00
C Discharge air outlet	302.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕

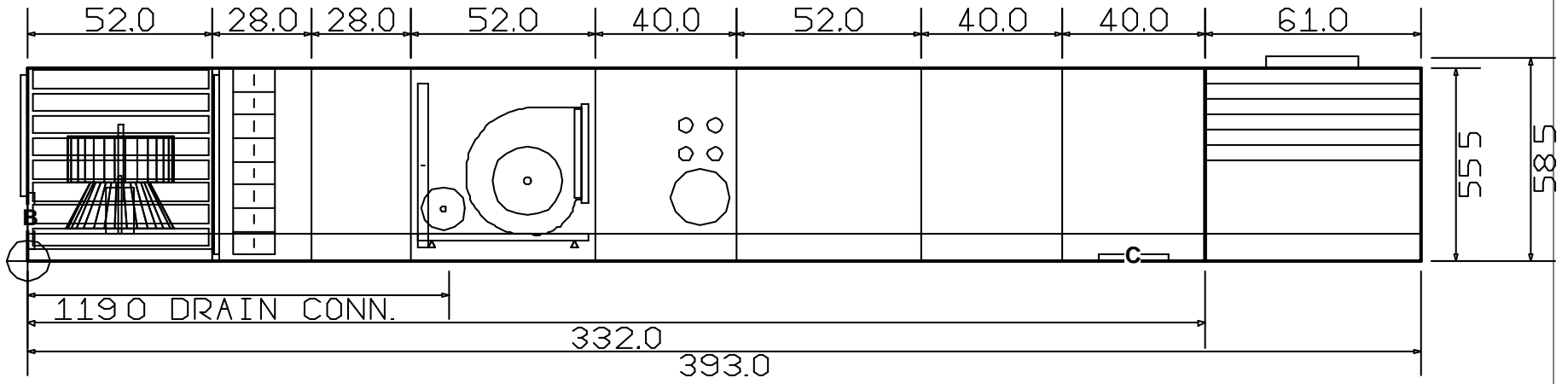


VIEW: General Arrangement No Ends
DRAWN: 22-December-2010 (15:53)
JOB NAME: Casa De Balboa (Teza)
UNIT TAGGING: RT-7 JJG
MODEL: RPS025D



Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	119.00	95.50	2.70	-	-
B Return air inlet	0.00	3.75	3.60	86.50	16.00
C Discharge air outlet	302.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕

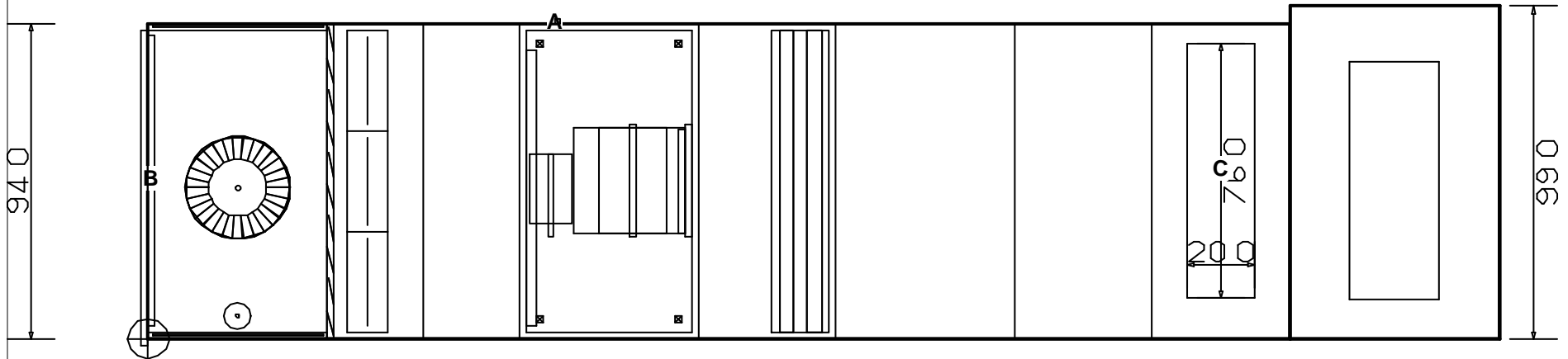


VIEW: Right Side
 DRAWN: 22-December-2010 (15:53)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-7 JJG
 MODEL: RPS025D



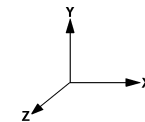
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	119.00	95.50	2.70	-	-
B Return air inlet	0.00	3.75	3.60	86.50	16.00
C Discharge air outlet	302.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



VIEW: Top
 DRAWN: 22-December-2010 (15:53)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-7 JJG
 MODEL: RPS025D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:31 PM

JOB NAME	ZXSG9B(RT010)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESPERSON	VAM
MODEL NUMBER	RPS025D	CUSTOMER	-
UNIT TAGGING	RT-7 JJG	ROOFTOP VERSION	4.78

GENERAL DATA

Unit dimensions (HxWxL ins)	55.5 x 94.0 x 393.0
Unit weight (lbs)	9158
Approval listing	ETL/MEA - UL

CASING DETAILS

Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Liners	Solid liner throughout
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	71.1
MROPD (amps)	80.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CONTROL DATA

Temperature controls	Space control - No comm card
Airflow controls	One space static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 2 - 5.5, 1 - 11.4
Capacity control	3 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	19.8
Compressor amps	1 - 18.6, 2 - 10.6

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	2.3
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	5 / 12
Fin material	Aluminum
Total capacity (Btu/hr)	315035**
Sensible capacity (Btu/hr)	259110
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	52.6 / 52.1
Face area (ft ²)	27.0
Face velocity (ft/min)	370

DRAW-THRU**BLOW-THRU**

Refrigerant type R410A

MODULATING HOT GAS REHEAT

Rows / FPI 1 / 14
 Fin material Aluminum Micro-channel
 Total capacity (Btu/hr) 200510
 Sensible capacity (Btu/hr) 200510
 Entering db / wb (F) 52.6 / 52.1
 Leaving db / wb (F) 70.5 / 58.7
 Face area (ft²) 18
 Face velocity (ft/min) 546

FAN PERFORMANCE

Air volume (cfm) 10000
 Altitude (ft) 0
 Air modulation device Inverter
 Fan diameter / type 20" / AF DWDI
 Fan speed (rpm) 2222
 Fan brake horsepower (HP) 10.6
 Motor size (HP) 15.0
 Motor amps 18.5
 Motor efficiency / type 91.7% /
 Drive service factor / type 150% / Variable
 Fan isolation Springs
 Fan section options None

SUPPLY

10000
 0
 Inverter
 20" / AF DWDI
 2222
 10.6
 15.0
 18.5
 91.7% /
 150% / Variable
 Springs
 None

RETURN / EXHAUST

7650
 0
 Inverter
 30" / AF SWSI
 704
 1.8
 3.0
 4.1
 88.5% /
 150% / Fixed
 Springs
 None

HEATING PERFORMANCE

Type of heat Natural gas
 Model size (mbh) 250
 Heat exchanger Stainless steel primary, Stainless steel secondary
 EDB / LDB (F) 65.0 / 87.9
 Capacity (Btu/hr) 250000
 Capacity control 20-to-1 High turndown
 Gas pressure regulator Std. 0.5 psi
 Furnace combustion efficiency 80 %
 Air pressure drop (in WC) 0.13

AIR BLENDER

Type None

FILTER DATA

Filter efficiency / type No filter media
 Face area (ft²) 24
 Face velocity (ft/min) 417
 Filter qty / size (ins) 4 / 12.0 x 24.0 x 12.0
 4 / 24.0 x 24.0 x 12.0
 Energy recovery wheel filter qty/size None

DRAW-THRU

No filter media
 24
 417
 4 / 12.0 x 24.0 x 12.0
 4 / 24.0 x 24.0 x 12.0
 None

FINAL

PLENUM DATA

Outside air option
 Opening location
 Plenum options
 Smoke detector

RETURN

Economizer w/ actuator
 Back
 None
 None

DISCHARGE

-
 Bottom
 None
 Yes

BLANK ACCESS

Section length (ins)

DRAW-THRU

SPACER

BLOW-THRU

52

AIR PRESSURE DROPS (in WC)

SUPPLY

RETURN

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:31 PM

External static pressure	1.25	0.50
Draw-thru filter	0.00	
Cooling	0.69	
HGRH coil	0.15	
Heating	0.13	
Total static	3.80	0.50

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	91	88	86	86	83	80	79
Unit discharge	87	83	80	75	72	66	58	50
Unit return	90	86	87	82	81	76	68	61

SHIPPING SECTION DETAILS

LENGTH

WEIGHT

Section 1	393.0	9158
-----------	-------	------

WARRANTY

PARTS

COMPRESSOR

HEAT EXCHANGER

Standard (yrs)	1	1	1
Extended (yrs)	None	None	None

NOTES

Special 28" blank section located between position B and D

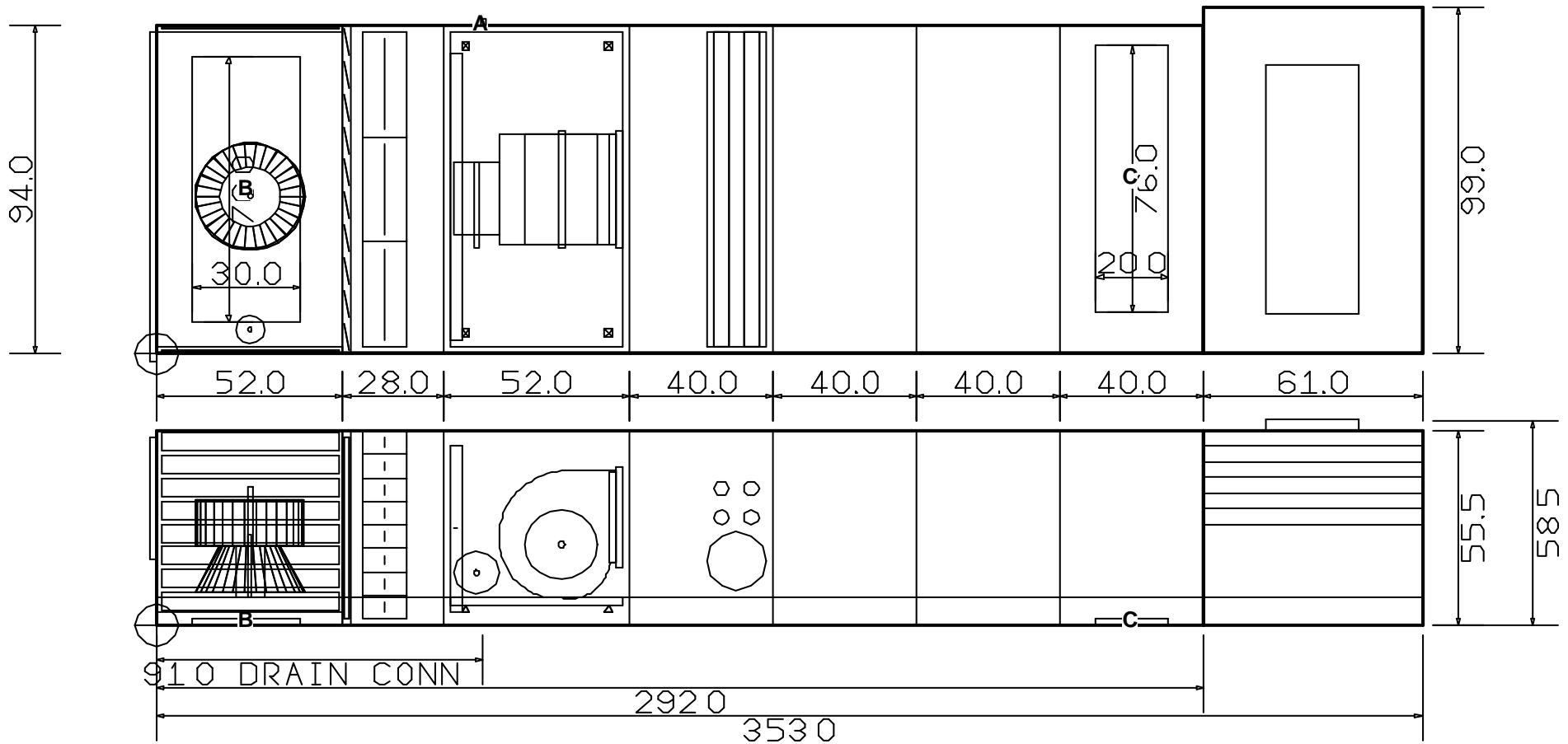
Special 40" blank section located between position H and K

As a standalone component, unit meets or exceeds the 2009 requirements of ASHRAE 90.1 - 2007. The approving authority is responsible for compliance of multi-component building systems.

** Capacity shown is with Hot Gas Reheat option. The Capacity without Hot Gas Reheat will be reduced.

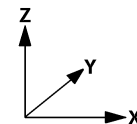
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	262.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



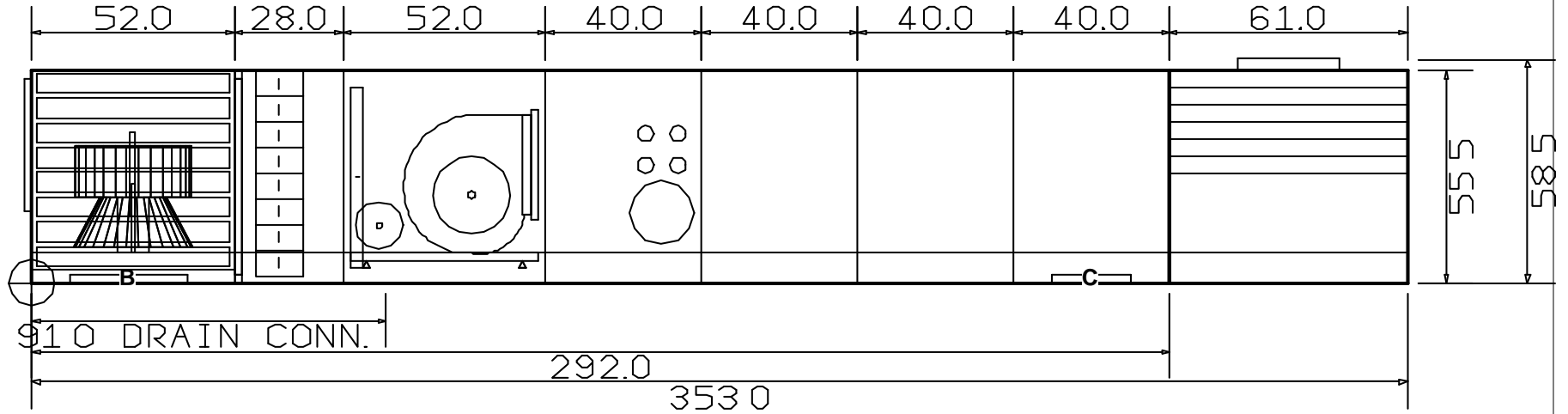
VIEW: General Arrangement No Ends
 DRAWN: 22-December-2010 (15:53)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-8 JJG
 MODEL: RPS025D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



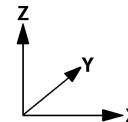
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	262.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



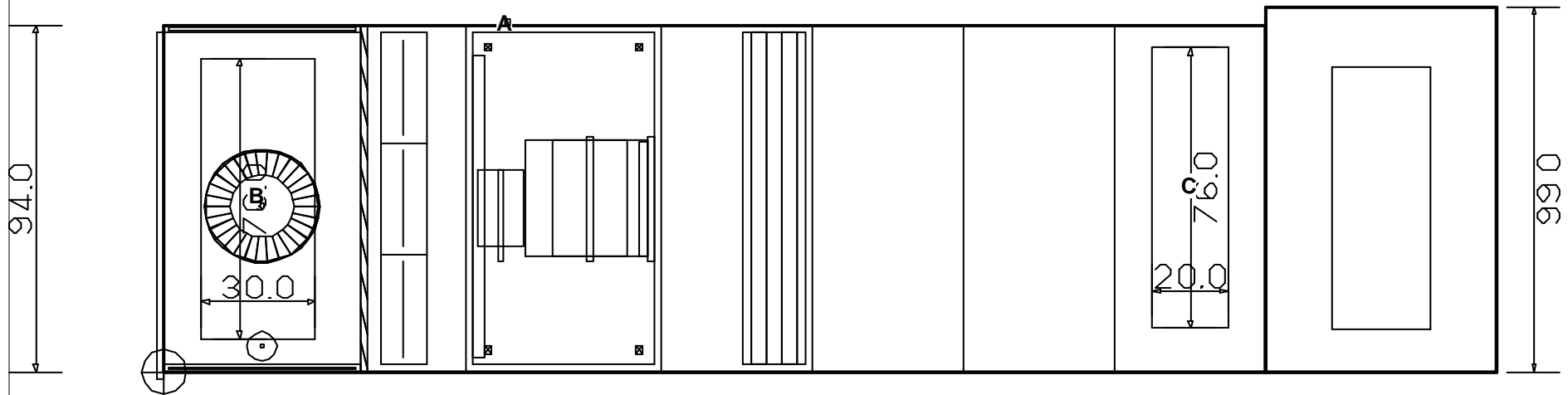
VIEW: Right Side
DRAWN: 22-December-2010 (15:53)
JOB NAME: Casa De Balboa (Teza)
UNIT TAGGING: RT-8 JJG
MODEL: RPS025D

Appendix D – McQuay Air Conditioning Submittals
Casa De Balboa HVAC Project

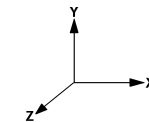


Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	262.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



VIEW: Top
 DRAWN: 22-December-2010 (15:53)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-8 JJG
 MODEL: RPS025D



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:32 PM

JOB NAME	ZXSG9B(RT011)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESPERSON	VAM
MODEL NUMBER	RPS025D	CUSTOMER	-
UNIT TAGGING	RT-8 JJG	ROOFTOP VERSION	4.78

GENERAL DATA

Unit dimensions (HxWxL ins)	55.5 x 94.0 x 353.0
Unit weight (lbs)	8655
Approval listing	ETL/MEA - UL

CASING DETAILS

Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Liners	Solid liner throughout
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	73.5
MROPD (amps)	90.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CONTROL DATA

Temperature controls	Space control - No comm card
Airflow controls	One space static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 2 - 5.5, 1 - 11.4
Capacity control	3 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	19.8
Compressor amps	1 - 18.6, 2 - 10.6

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	2.3
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	5 / 10
Fin material	Aluminum
Total capacity (Btu/hr)	314457**
Sensible capacity (Btu/hr)	263957
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	53.3 / 52.7
Face area (ft ²)	27.0
Face velocity (ft/min)	388

DRAW-THRU**BLOW-THRU**

Refrigerant type

R410A

MODULATING HOT GAS REHEAT

Rows / FPI 1 / 14
 Fin material Aluminum Micro-channel
 Total capacity (Btu/hr) 200114
 Sensible capacity (Btu/hr) 200114
 Entering db / wb (F) 53.3 / 52.7
 Leaving db / wb (F) 70.3 / 59.0
 Face area (ft²) 18
 Face velocity (ft/min) 574

FAN PERFORMANCE

Air volume (cfm)
 Altitude (ft)
 Air modulation device
 Fan diameter / type
 Fan speed (rpm)
 Fan brake horsepower (HP)
 Motor size (HP)
 Motor amps
 Motor efficiency / type
 Drive service factor / type
 Fan isolation
 Fan section options

SUPPLY

10500
 0
 Inverter
 20" / AF DWDI
 2215
 10.3
 15.0
 18.5
 91.7% /
 150% / Fixed
 Springs w/ seismic restraint
 None

RETURN / EXHAUST

11900
 0
 Inverter
 30" / AF SWSI
 960
 4.2
 5.0
 6.5
 88.5% /
 150% / Fixed
 Springs w/ seismic restraint
 None

HEATING PERFORMANCE

Type of heat Natural gas
 Model size (mbh) 200
 Heat exchanger Stainless steel primary, Stainless steel secondary
 EDB / LDB (F) 65.0 / 82.5
 Capacity (Btu/hr) 200000
 Capacity control 20-to-1 High turndown
 Gas pressure regulator Std. 0.5 psi
 Furnace combustion efficiency 80 %
 Air pressure drop (in WC) 0.06

AIR BLENDER

Type None

FILTER DATA

Filter efficiency / type
 Face area (ft²)
 Face velocity (ft/min)
 Filter qty / size (ins)
 Energy recovery wheel filter qty/size

DRAW-THRU

No filter media
 24
 438
 4 / 12.0 x 24.0 x 12.0
 4 / 24.0 x 24.0 x 12.0
 None

FINAL

PLENUM DATA

Outside air option
 Opening location
 Plenum options
 Smoke detector

RETURN

Economizer w/ actuator
 Bottom
 None
 None

DISCHARGE

-
 Bottom
 None
 Yes

BLANK ACCESS

Section length (ins)

DRAW-THRU

SPACER

BLOW-THRU

40

AIR PRESSURE DROPS (in WC)

SUPPLY

RETURN

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:32 PM

External static pressure	1.25	0.50
Draw-thru filter	0.00	
Cooling	0.64	
HGRH coil	0.16	
Heating	0.06	
Total static	3.20	0.50

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	91	88	86	86	83	80	79
Unit discharge	89	85	81	76	73	67	59	51
Unit return	92	90	89	85	84	79	71	64

SHIPPING SECTION DETAILS**LENGTH****WEIGHT**

Section 1	353.0	8655
-----------	-------	------

WARRANTY**PARTS****COMPRESSOR****HEAT EXCHANGER**

Standard (yrs)	1	1	1
Extended (yrs)	None	None	None

NOTES

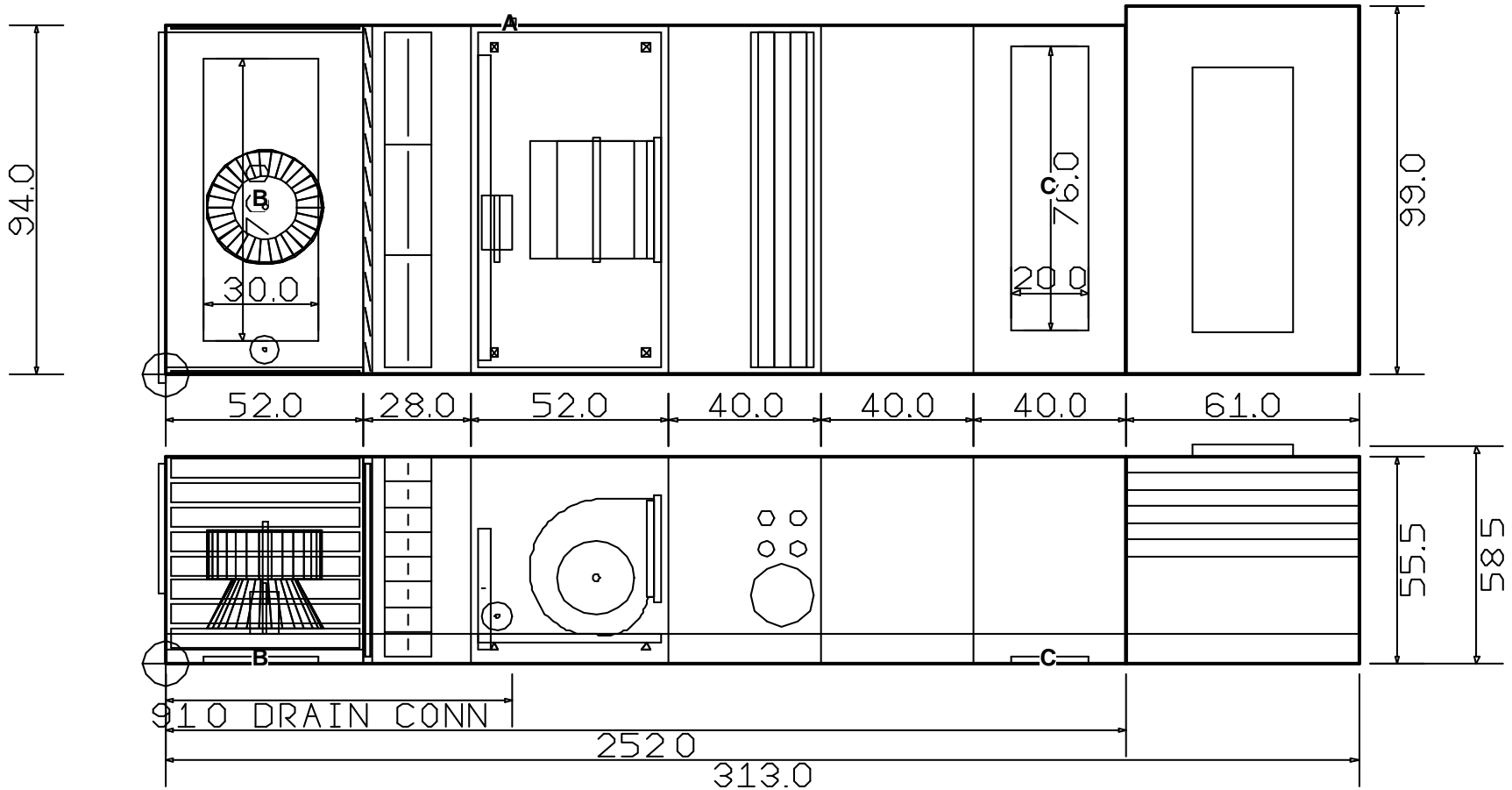
Special 40" blank section located between position H and K

As a standalone component, unit meets or exceeds the 2009 requirements of ASHRAE 90.1 - 2007. The approving authority is responsible for compliance of multi-component building systems.

** Capacity shown is with Hot Gas Reheat option. The Capacity without Hot Gas Reheat will be reduced.

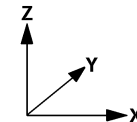
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	222.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



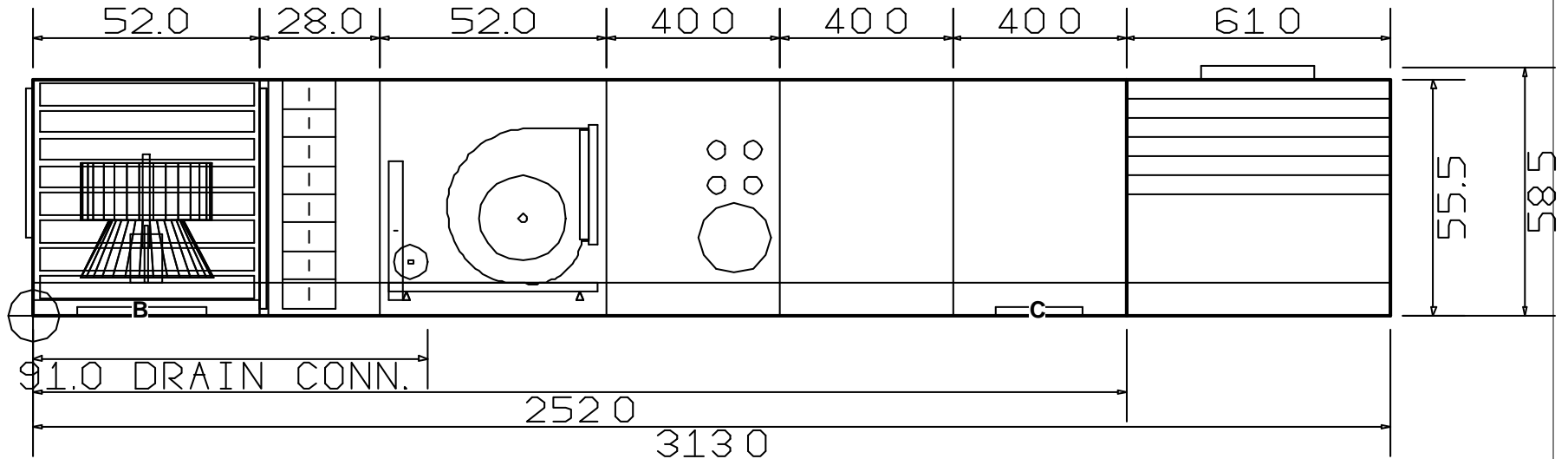
VIEW: General Arrangement No Ends
 DRAWN: 22-December-2010 (15:54)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-10 JJG
 MODEL: RPS015D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	222.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



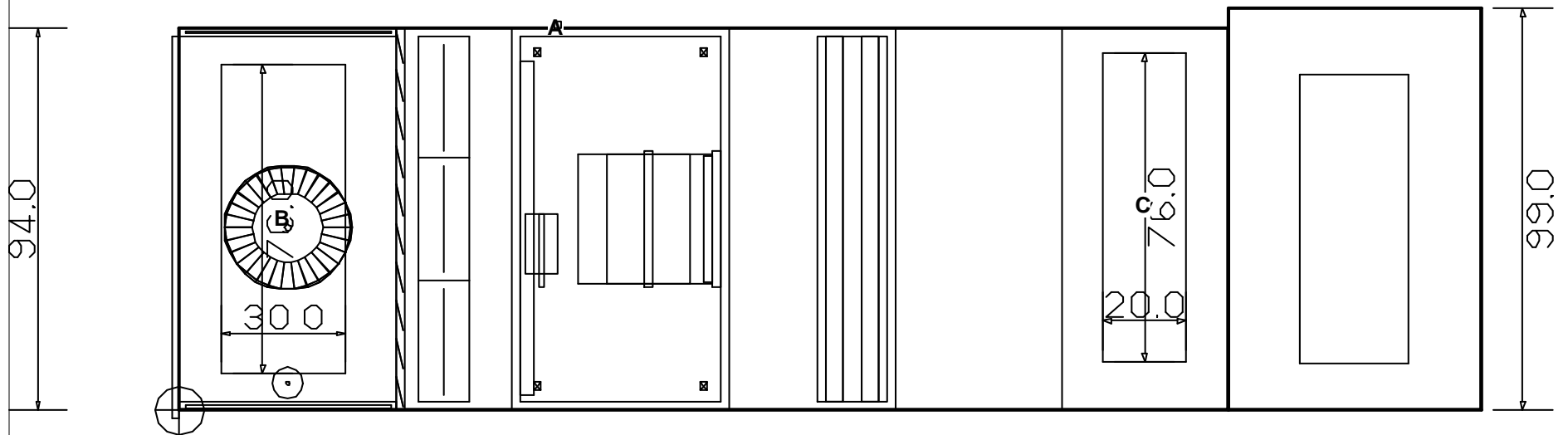
VIEW: Right Side
 DRAWN: 22-December-2010 (15:54)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-10 JJG
 MODEL: RPS015D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



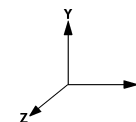
Opening	X	Y	Z	W(Width)	H(Height)
A Condensate drain connection (1.5 MPT)	91.00	95.50	2.70	-	-
B Return air inlet	10.00	9.00	0.00	76.00	30.00
C Discharge air outlet	222.00	12.00	0.00	76.00	20.00

Dimensions measured from ⊕



VIEW: Top
 DRAWN: 22-December-2010 (15:54)
 JOB NAME: Casa De Balboa (Teza)
 UNIT TAGGING: RT-10 JJG
 MODEL: RPS015D

Appendix D – McQuay Air Conditioning Submittals
 Casa De Balboa HVAC Project



McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:33 PM

JOB NAME	ZXSG9B(RT012)	REP. OFFICE	Climatec - San Diego
JOB DESCRIPTION	Casa De Balboa (Teza)	SALESPERSON	VAM
MODEL NUMBER	RPS015D	CUSTOMER	-
UNIT TAGGING	RT-10 JGG	ROOFTOP VERSION	4.78

GENERAL DATA

Unit dimensions (HxWxL ins)	55.5 x 94.0 x 313.0
Unit weight (lbs)	7784
Approval listing	ETL/MEA - UL

CASING DETAILS

Insulation	Nominal 2" thick, 1 ½lb. density fiberglass
Liners	Solid liner throughout
Drain pan	Stainless steel
Doors	Single lever access door on both sides of each air handling section.
Exterior	Beige polyester paint exceeding ASTM B117 salt spray test standard.

ELECTRICAL DATA

Unit voltage (V/Hz/P)	460/60/3
MCA (amps)	40.0
MROPD (amps)	50.0
SCCR (kAIC)	10.0
Field connection	One thru-door disconnect
Control box location	Discharge plenum

CONTROL DATA

Temperature controls	Space control - No comm card
Airflow controls	One space static pressure sensor
Auxiliary controls	None
Starting options	Across line

COMPRESSOR DATA

Type / quantity-size	Scroll / 2 - 7
Capacity control	2 Steps
Compressor isolation	Rubber in shear
Compressor kW (Total)	11.2
Compressor amps	2 - 12.2

CONDENSER DATA

Circuits / Rows / FPI	Microchannel
Fin material	Aluminum
Coil guards	Built in hail protection
Piping options	None
Ambient operation	Std. operation above 45F
Condenser kW (Total)	2.5
Condenser amps (Each)	2.0
Refrigerant type	R410A

COOLING PERFORMANCE

Rows / FPI	5 / 10
Fin material	Aluminum
Total capacity (Btu/hr)	197175**
Sensible capacity (Btu/hr)	155791
Ambient (F)	95.0 / 75.0
Entering db / wb (F)	76.3 / 63.0
Leaving db / wb (F)	51.5 / 51.0
Face area (ft ²)	18.5
Face velocity (ft/min)	311

DRAW-THRU**BLOW-THRU**

Refrigerant type R410A

MODULATING HOT GAS REHEAT

Rows / FPI 1 / 14
 Fin material Aluminum Micro-channel
 Total capacity (Btu/hr) 122280
 Sensible capacity (Btu/hr) 122280
 Entering db / wb (F) 51.5 / 51.0
 Leaving db / wb (F) 70.4 / 58.0
 Face area (ft²) 18
 Face velocity (ft/min) 314

FAN PERFORMANCE

Air volume (cfm)
 Altitude (ft)
 Air modulation device
 Fan diameter / type
 Fan speed (rpm)
 Fan brake horsepower (HP)
 Motor size (HP)
 Motor amps
 Motor efficiency / type
 Drive service factor / type
 Fan isolation
 Fan section options

SUPPLY

5750
 0
 Inverter
 20" / AF DWDI
 1582
 3.9
 5.0
 6.5
 88.5% /
 150% / Variable
 Springs
 None

RETURN / EXHAUST

5400
 0
 Inverter
 30" / AF SWSI
 541
 0.8
 1.5
 2.1
 85.5% /
 150% / Fixed
 Springs
 None

HEATING PERFORMANCE

Type of heat Natural gas
 Model size (mbh) 200
 Heat exchanger Stainless steel primary, Stainless steel secondary
 EDB / LDB (F) 65.0 / 96.9
 Capacity (Btu/hr) 200000
 Capacity control 20-to-1 High turndown
 Gas pressure regulator Std. 0.5 psi
 Furnace combustion efficiency 80 %
 Air pressure drop (in WC) 0.02

AIR BLENDER

Type None

FILTER DATA

Filter efficiency / type
 Face area (ft²)
 Face velocity (ft/min)
 Filter qty / size (ins)
 Energy recovery wheel filter qty/size

DRAW-THRU

No filter media
 24
 240
 4 / 12.0 x 24.0 x 12.0
 4 / 24.0 x 24.0 x 12.0
 None

FINAL

PLENUM DATA

Outside air option
 Opening location
 Plenum options
 Smoke detector

RETURN

Economizer w/ actuator
 Bottom
 None
 None

DISCHARGE

-
 Bottom
 None
 Yes

BLANK ACCESS

Section length (ins)

DRAW-THRU

SPACER

BLOW-THRU

AIR PRESSURE DROPS (in WC)

SUPPLY

RETURN

McQUAY PACKAGED ROOFTOP UNIT

Date saved : 12/22/2010 4:33 PM

External static pressure	1.25	0.50
Draw-thru filter	0.00	
Cooling	0.52	
HGRH coil	0.07	
Heating	0.02	
Total static	2.88	0.50

UNIT SOUND

Standard condenser fan

	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
Radiated	-	91	88	86	86	81	79	78
Unit discharge	78	74	71	66	63	57	49	41
Unit return	81	77	78	73	72	67	59	52

SHIPPING SECTION DETAILS

LENGTH

WEIGHT

Section 1	313.0	7784
-----------	-------	------

WARRANTY

PARTS

COMPRESSOR

HEAT EXCHANGER

Standard (yrs)	1	1	1
Extended (yrs)	None	None	None

NOTES

Special 40" blank section located between position G and K

As a standalone component, unit meets or exceeds the 2009 requirements of ASHRAE 90.1 - 2007. The approving authority is responsible for compliance of multi-component building systems.

** Capacity shown is with Hot Gas Reheat option. The Capacity without Hot Gas Reheat will be reduced.

APPENDIX E

Electrode Steam Humidifiers Cut Sheet

Vapac[®]



LE Series

Electrode Steam Humidifiers

Electrode Steam Humidifiers

The Company

For over 35 years, Vapac has been designing, manufacturing and specializing in high quality solutions for indoor air humidification needs. As a world leader in humidification technologies, reliable, efficient and high-quality humidifiers have been manufactured and shipped to over 45 countries. Vapac offers its expertise in a wide range of long lasting high quality electrode, resistance and gas-fired steam humidifiers. Vapac sets the standard with a new generation of electrode atmospheric steam humidifiers for various applications. The LE Series has been designed with benefits for the installer, operator and owner.

The Principle

Electrode steam humidifiers use the conductivity of potable water to boil it and produce clean atmospheric steam. Each humidifier includes one or more plastic cylinders containing a pair of electrodes and mesh assembly.

● LEP Close Control Model - SSR Modulation

Vapac's unique Pulsed Energy control provides infinitely variable steam output from 8% up to 100% of capacity by electronically switching power to the electrodes. The LE Series Pulsed Energy (LEP) can be used in close tolerance applications where the need to accurately follow the system dynamics and humidification load profile is a requirement.

● LE Comfort Control Model - Modulation or On/Off

Ideally suited where there is a need to maintain humidification level within given tolerances, but where a brief delay in response, as the system adjusts to changing humidification demands, is acceptable. The VapaNet Water Level modulation is designed to meet these requirements, incorporating an intelligent combination of Feeding, Boiling and Draining to minimize wastage of water and energy. Water Level control technology gives a performance turndown of between 20% and 100% of nominal humidifier capacity.



Appendix E – Electrode Steam Humidifiers – Cut Sheet
Casa De Balboa HVAC Project

The Advantage

The new LE Series electrode boiler steam humidifier offers superior quality with reliable trouble-free operation. The steam output is controlled by the water level inside the cylinder, as the electrodes get coated with minerals, the water level is raised to use up clean electrode and ensure full and uninterrupted steam production at all times. When the cylinder is full of minerals, it is easily removed to be cleaned or replaced. The VapaNet controller automatically adapts to most water conditions, various cylinder configurations are offered to optimize cylinder life in special applications.

The Benefits

Low Cost And Easy Maintenance

The low cost disposable cylinder in Vapac's electrode steam humidifier can be changed in minutes, reducing the downtime associated with cleaning the humidifier. This way, the maintenance can be performed by non qualified personnel. It eliminates the need for a backup unit and cuts down on costly maintenance associated with other systems.

Exclusive Pulsed Energy Control

Vapac's LE-P Version is the only electrode steam humidifier offered with full SSR control giving it a turn down to 8 % of full capacity and the most precise electrode steam humidity control.

Standard Water Level Control Modulation

Vapac's base LE Version of electrode humidifier controls the water level via contactors, giving good humidity control in non critical applications and a turn down to 20 % of full capacity.

Drain Pump Advantage

As opposed to more commonly used gravity fed solenoid valves, all Vapac humidifiers use a heavy duty drain pump to minimize the risk of blockage due to sediment build up and hot water wasted to drain. It also ensures precise control of the water level within the cylinder which is critical to offering long cylinder life and gives the LE Series VapaNet controller the ability to eliminate foaming water conditions.

Foam Protection

The VapaNet control system reduces the onset of foaming by introducing corrective pumped drain cycles to maintain steam production with very little interruption. This integrated feature part of all Vapac humidifiers increases the time between each maintenance interval and maximizes the cylinder life.

Internal Drain Water Tempering

The internal drain water tempering capabilities of the LE Series eliminates the need for expensive external drain water tempering devices. When drains are performed during normal operation, the VapaNet controller ensures the drain water temperature is below 140 °F (60 °C) to meet local codes.



Choice Of Cylinders

Vapac's electrode steam humidifier come standard with a disposable cylinder but is also available with a cleanable cylinder as an option (left). This makes it easy for maintenance personnel to remove the scale collecting at the bottom of the humidifier cylinder and so extend the operational life of a cylinder. In Vapac humidifiers, disposable and cleanable cylinders are fully interchangeable.

● All Components Fully Accessible From The Front

The ventilated, front opening, steel cabinet with hinged doors provides total access for cylinder change and servicing. An internally separated electrical section maintains a clear demarcation between electrical and mechanical sections for end user safety.

● Corrosion Resistant Hinged Doors and Locks

On top of having a unique frontal access to all components, all cabinet doors are hinged to facilitate access in the unit, eliminate the possibility of door misplacement and ensure the safety of the people surrounding the unit in addition, incorporates two locks for safety purposes..

● Stainless Steel Drain Pan

For corrosion free operation throughout the life of the humidifier, the drain pan of all Vapac humidifiers is constructed of Stainless Steel. In addition, the drain pan includes an overflow to drain and a 1"(24.5mm) lip eliminating possible water spillage on the floor.

● VapaNet Control System

The exclusive VapaNet software control system, ensures a simple and user friendly operator-to-humidifier interface throughout all Vapac products. At a glance, the front mounted LED indicator display clearly shows the operational state of the humidifier. Easy to read symbols make interpretation clear and precise. Initial set up on site is also simple; plug in jumpers, select water type and input control signal, and all other operations are pre-set at the factory. Commissioning could not be easier. Here are some of the unique parameters that can be displayed with the Vapac humidifier optional alphanumeric display:

- Space RH
- Space Temp
- System output
- Control signal demand
- Total power used by the unit
- Run hours
- Network connections status



● Primary/Secondary Facility

VapaNet allows for a maximum of 10 cylinders to communicate within a Primary/Secondary system with an interconnecting two-core cable. Maximum duty 992 lbs/hr (450 kg/h). The primary would be a fully modulating humidifier (LE XXX P) and the secondary would be On/Off (LE XXX) controlled.

● LON Works™ Compatible

VapaNet systems have the ability to communicate with any Building Management System incorporating the LON™ open system protocol as well as other Vapac products to create a seamless network of control.

● Run and Alarm Interface

Remote Indications as volt-free contacts are Standard to show Run and/or Alarm conditions.

● Choice Of Operating Voltages

Vapac LE Series can operate using 208-600V with 1 or 3 phase power supply (see technical data).

● Code Compliance

All models are certified by UL Underwriter Laboratories for USA and Canada.

Appendix E – Electrode Steam Humidifiers – Cut Sheet
Casa De Balboa HVAC Project



The Accessories



● Steam Distributors

For introducing steam coming from the electrode steam humidifier into a duct system, stainless steel steam distributors can be used. They come in different length and capacity for all your application needs. Multiple distributors or the VAPASORB steam manifold can be used when a shorter absorption distance is required.

● Room Distribution Unit

When there is no duct system, a room distribution unit (RDU) can be used for direct steam injection in the space to humidify. The RDU comes complete with its own fan and safety circuitry for fast steam dispersion in the room.

● Controls

The humidifier can be controlled directly from either a duct or room mounted humidity sensor, supplied by Vapac, or an external signal by others. All models can be operated from a potentiometric signal, a LON™ network signal or from any of six standard voltage/amperage analogue signals. Safety interlocks for fan operation, airflow switches, high limit humidistat, or any other safety device can also be used allowing the humidifier to operate as one with the dynamics of the air conditioning system.

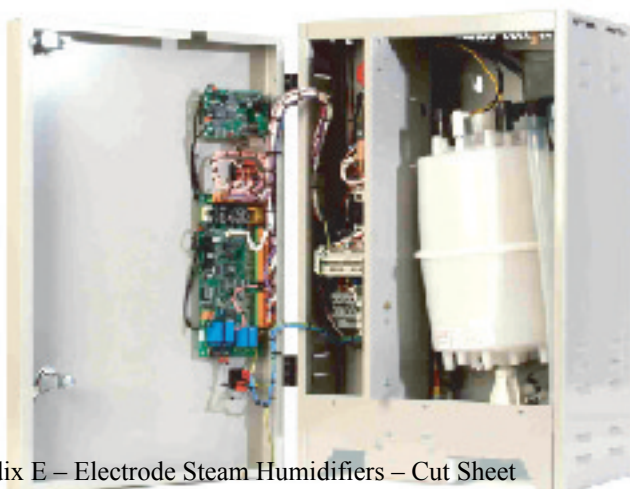
● Alphanumeric Display

The Alphanumeric Display can be factory fitted to the cabinet as a permanent installation or supplied as a de-mountable accessory which can be installed remotely from the plant or as a temporary plug-in device to aid service and troubleshooting.

● Communication Cable

A 10 ft (3 m) cable complete with compatible plugs is available for primary/secondary control connection. Extension to a maximum length of 328 ft (100 m) is possible.

The Unit



Vapac®

**"Delivering
Quality
Humidification"**

LE Series - Technical Data

LE Model	Nominal Capacity lb/hr (kg/hr)	Full Load Current (A)						Power (kW)
		208V/1Ph	240V/1Ph	208V/3Ph	240V/3Ph	480V/3Ph	600V/3Ph	
LE11-S	11 [05]	19	17					4
LE11-A				11	10	5	4	4
LE20-S	20 [09]	34	30					7
LE20-A				20	17	9	7	7
LE40-A	40 [18]			39	34	17	14	13
LE66-L	66 [30]			65	57			23
LE66-H						29	23	23
LE100-A	100 [45]			98	85	43	34	34
LE121-H	121 [55]					52	42	42
LE132-L	132 [60]			130	114			45
LE132-H						57	45	45
LE196-A	196 [90]			196	170	86	68	67
LE242-H	242 [110]					104	84	84

LE Model	Steam Outlet		Overall Dimensions			Weight	
	Qty.	Dim.	Height	Width	Depth	Dry lb. (kg)	Wet lb. (kg)
LE11-S	1	1 3/8" (35 mm)	26.6" (675 mm)	16.9" (430 mm)	12.8" (326 mm)	75 (34)	106 (48)
LE11-A						75 (34)	106 (48)
LE20-S						78 (35)	110 (50)
LE20-A						78 (35)	110 (50)
LE40-A						80 (36)	120 (55)
LE66-L		2 1/8" (54 mm)	31.9" (810 mm)	20.5" (520 mm)	16.6" (421 mm)	88 (40)	147 (67)
LE66-H						86 (39)	131 (60)
LE100-A						88 (40)	147 (67)
LE121-H						88 (40)	147 (67)
LE132-L						164 (75)	281 (128)
LE132-H	2		39.0" (990 mm)		160 (73)	276 (125)	
LE196-A					164 (75)	281 (128)	
LE242-H					164 (75)	281 (128)	

Room Distribution Unit (RDU)

LE Model	RDU Model	Full Load Current (mA)	Overall Dimensions		
			Height	Width	Depth
LE11-S	RDU05LE	210	8.0" (204 mm)	16.9" (430 mm)	10.67" (271 mm)
LE11-A					
LE20-S					
LE20-A	RDU09LE	315			
LE40-A	RDU18LE	315			
LE66-L	RDU30L	525	8.0" (204 mm)	24.0" (602 mm)	14.4" (366 mm)
LE66-H					
LE100-A	RDU45LE	735	14.2" (361mm)	33.1" (841mm)	14.4" (366mm)
LE132-L	2 Remote mounted RDU30L				
LE132-H					
LE196-A	2 Remote mounted RDU45LE				

LE Series Notes :

- Standard models use water level control technology for ON/OFF or modulating operation (20-100%)
- All models are available with keypad display. Add a -D to your desired model number. (Example: LE40-DA)
- All models except LE121-H, LE242-H are available with Pulsed Energy control (8-100%) for full SSR modulation. Add a -P to your desired model number. (Ex: LE40-PA or LE40-PDA)
- All data based on 60 Hz power supply

Water Supply :

- Hardness: 50-500 ppm
- Conductivity: 80-1000 µS; PH 7.3 to 8.0; Silica 0 ppm
- Water Temperature: 34°F (1°C) to 86°F (30°C).
- Supply water pressure: 22-116 psig (1.5-8 bar)
- Feedwater connection: 3/4" NPT female both ends of supplied flexible hose connection

Operating Limits :

- Ambient Air Temperature 41°F (5°C) to 95°F (35°C)
- Duct Pressure -2.4" w.c. (-0.6 kPa) to +8" w.c. (+2 kPa)

Vapac Humidification
9501, rue de l'Innovation
Montreal, Quebec
H1J 2X9
Phone: (514) 352 0406
Fax: (514) 352 4568

www.vapac.com

The manufacturer reserves the right to change the design or specification of the equipment described in this brochure without prior notice. Vapac is an internationally registered trademark. Vapac equipment is covered by international patents.

Appendix E - Electrode Steam Humidifiers - Cut Sheet

Casa De Balboa HVAC Project

APPENDIX F
Structural Calculations



CONNECTION OF (E) CURB TO (E) FRAMING

SIMPLE HIGHER SETS OR LOAN ARE RES'D PER CURRENT CODE, VERIFY (E) CONNECTIONS ARE ABLE TO RESIST FORCES.

FROM ORIG. CALC PACKAGE, $V_{MAX} = 4579 \text{ lb}$
 $UPLIFT_{MAX} = 0$

FOR #12 SWS @ 12ga

$$U_{req}/conn = 705 \text{ lb/connection} \quad (ER. 4943)$$

$$\# \text{ SWS REQ'D} = \frac{4579}{705} = 6.5$$

USE 4/SIDE (2 SIDES // w/ FOUR BOLTS TO RESIST)



FOR 1/8" WELLS

$$L_{reqd} = \frac{(4579) \sqrt{2} (2)}{.6 (70000) (.125)} = 2.5"$$

MIN 2" / SIDE
 (4" RESIST LOAD
 EQ. DIR)

FOR 3/8" Ø MB

$$\# \text{ BOLTS req'd} = \frac{4579}{.3 (36000) (.11 \text{ in}^2)} = 3.85$$

MIN 3 BOLTS / SIDE
 (6 TO RESIST LOAD)

APPENDIX G

Building Energy Analysis Report

BUILDING ENERGY ANALYSIS REPORT

PROJECT:

Casa de Balboa - HVAC Project

San Diego, CA 92101

Project Designer:

Teza Design

San Diego, CA 92101

Report Prepared by:

Tarkan Altay

Teza Design

233 A Street Ste. 1103

San Diego, CA 92101

(619) 955-6834

Job Number:

Date:

7/18/2011

The EnergyPro computer program has been used to perform the calculations summarized in this compliance report. This program has approval and is authorized by the California Energy Commission for use with both the Residential and Nonresidential 2008 Building Energy Efficiency Standards.

This program developed by EnergySoft, LLC – www.energysoft.com.

TABLE OF CONTENTS

Cover Page	1
Table of Contents	2
Form MECH-1-C Certificate of Compliance	3
Form MECH-2-C Air & Water System Requirements	11
Form MECH-3-C Mechanical Ventilation	14
Form MECH-4-C HVAC Misc. Prescriptive Requirements	16
Form MECH-MM Mechanical Mandatory Measures	23

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST

(Part 1 of 5)

MECH-1C

Project Name <i>Casa de Balboa - HVAC Project</i>		Date <i>7/18/2011</i>	
Project Address <i>San Diego</i>	Climate Zone <i>7</i>	Total Cond. Floor Area <i>86,299</i>	Addition Floor Area <i>n/a</i>

GENERAL INFORMATION

Building Type:	<input checked="" type="checkbox"/> Nonresidential	<input type="checkbox"/> High-Rise Residential	<input type="checkbox"/> Hotel/Motel Guest Room
	<input type="checkbox"/> Schools (Public School)	<input type="checkbox"/> Relocatable Public School Bldg.	<input checked="" type="checkbox"/> Conditioned Spaces
			<input type="checkbox"/> Unconditioned Spaces (affidavit)
Phase of Construction:	<input type="checkbox"/> New Construction	<input type="checkbox"/> Addition	<input type="checkbox"/> Alteration
Approach of Compliance:	<input type="checkbox"/> Component	<input type="checkbox"/> Overall Envelope TDV Energy	<input type="checkbox"/> Unconditioned (file affidavit)
Front Orientation: N, E, S, W or in Degrees:	<i>0 deg</i>		

HVAC SYSTEM DETAILS

FIELD INSPECTION ENERGY CHECKLIST

Equipment ²	Inspection Criteria	Meets Criteria or Requirements	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>520,941 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% TE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>525,735 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>10.3 EER</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Conditioned / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

FIELD INSPECTION ENERGY CHECKLIST

Equipment ²	Inspection Criteria	Meets Criteria or Requirements	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 2</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>205,194 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% TE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>346,560 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>10.0 EER</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Attic, Ceiling Ins, vented / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

1. If the Actual installed equipment performance efficiency and capacity is less than the Proposed (from the energy compliance submittal or from the building plans) the responsible party shall resubmit energy compliance to include the new changes.
2. For additional detailed discrepancy use Page 2 of the Inspection Checklist Form. Compliance fails if a Fail box is checked.
3. Indicate Equipment Type: Gas (Pkg or, Split), VAV, HP (Pkg or split), Hydronic, PTAC, or other.

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST

(Part 1 of 5)

MECH-1C

Project Name <i>Casa de Balboa - HVAC Project</i>		Date <i>7/18/2011</i>	
Project Address <i>San Diego</i>	Climate Zone <i>7</i>	Total Cond. Floor Area <i>86,299</i>	Addition Floor Area <i>n/a</i>

GENERAL INFORMATION

Building Type:	<input checked="" type="checkbox"/> Nonresidential	<input type="checkbox"/> High-Rise Residential	<input type="checkbox"/> Hotel/Motel Guest Room
	<input type="checkbox"/> Schools (Public School)	<input type="checkbox"/> Relocatable Public School Bldg.	<input checked="" type="checkbox"/> Conditioned Spaces
			<input type="checkbox"/> Unconditioned Spaces (affidavit)
Phase of Construction:	<input type="checkbox"/> New Construction	<input type="checkbox"/> Addition	<input type="checkbox"/> Alteration
Approach of Compliance:	<input type="checkbox"/> Component	<input type="checkbox"/> Overall Envelope TDV Energy	<input type="checkbox"/> Unconditioned (file affidavit)
Front Orientation: N, E, S, W or in Degrees:	<i>0 deg</i>		

HVAC SYSTEM DETAILS

FIELD INSPECTION ENERGY CHECKLIST

Equipment ²	Inspection Criteria	Meets Criteria or Requirements	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 3</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>306,117 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% TE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>292,801 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>n/a</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Attic, Ceiling Ins, vented / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

FIELD INSPECTION ENERGY CHECKLIST

Equipment ²	Inspection Criteria	Meets Criteria or Requirements	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 6</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>572,411 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% TE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>752,122 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>10.4 EER</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Conditioned / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

1. If the Actual installed equipment performance efficiency and capacity is less than the Proposed (from the energy compliance submittal or from the building plans) the responsible party shall resubmit energy compliance to include the new changes.
2. For additional detailed discrepancy use Page 2 of the Inspection Checklist Form. Compliance fails if a Fail box is checked.
3. Indicate Equipment Type: Gas (Pkg or, Split), VAV, HP (Pkg or split), Hydronic, PTAC, or other.

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST

(Part 1 of 5)

MECH-1C

Project Name <i>Casa de Balboa - HVAC Project</i>		Date <i>7/18/2011</i>	
Project Address <i>San Diego</i>	Climate Zone <i>7</i>	Total Cond. Floor Area <i>86,299</i>	Addition Floor Area <i>n/a</i>

GENERAL INFORMATION

Building Type:	<input checked="" type="checkbox"/> Nonresidential	<input type="checkbox"/> High-Rise Residential	<input type="checkbox"/> Hotel/Motel Guest Room
	<input type="checkbox"/> Schools (Public School)	<input type="checkbox"/> Relocatable Public School Bldg.	<input checked="" type="checkbox"/> Conditioned Spaces
			<input type="checkbox"/> Unconditioned Spaces (affidavit)
Phase of Construction:	<input type="checkbox"/> New Construction	<input type="checkbox"/> Addition	<input type="checkbox"/> Alteration
Approach of Compliance:	<input type="checkbox"/> Component	<input type="checkbox"/> Overall Envelope TDV Energy	<input type="checkbox"/> Unconditioned (file affidavit)
Front Orientation: N, E, S, W or in Degrees:	<i>0 deg</i>		

HVAC SYSTEM DETAILS

FIELD INSPECTION ENERGY CHECKLIST

Equipment ²	Inspection Criteria	Meets Criteria or Requirements	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 7</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>293,283 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% TE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>405,821 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>10.0 EER</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Attic, Ceiling Ins, vented / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

FIELD INSPECTION ENERGY CHECKLIST

Equipment ²	Inspection Criteria	Meets Criteria or Requirements	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 8</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>232,908 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% AFUE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>460,832 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>10.0 EER</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Conditioned / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

1. If the Actual installed equipment performance efficiency and capacity is less than the Proposed (from the energy compliance submittal or from the building plans) the responsible party shall resubmit energy compliance to include the new changes.
2. For additional detailed discrepancy use Page 2 of the Inspection Checklist Form. Compliance fails if a Fail box is checked.
3. Indicate Equipment Type: Gas (Pkg or, Split), VAV, HP (Pkg or split), Hydronic, PTAC, or other.

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST

(Part 1 of 5)

MECH-1C

Project Name <i>Casa de Balboa - HVAC Project</i>		Date <i>7/18/2011</i>	
Project Address <i>San Diego</i>	Climate Zone <i>7</i>	Total Cond. Floor Area <i>86,299</i>	Addition Floor Area <i>n/a</i>

GENERAL INFORMATION

Building Type:	<input checked="" type="checkbox"/> Nonresidential	<input type="checkbox"/> High-Rise Residential	<input type="checkbox"/> Hotel/Motel Guest Room
	<input type="checkbox"/> Schools (Public School)	<input type="checkbox"/> Relocatable Public School Bldg.	<input checked="" type="checkbox"/> Conditioned Spaces
			<input type="checkbox"/> Unconditioned Spaces (affidavit)
Phase of Construction:	<input type="checkbox"/> New Construction	<input type="checkbox"/> Addition	<input type="checkbox"/> Alteration
Approach of Compliance:	<input type="checkbox"/> Component	<input type="checkbox"/> Overall Envelope TDV Energy	<input type="checkbox"/> Unconditioned (file affidavit)
Front Orientation: N, E, S, W or in Degrees:	<i>0 deg</i>		

HVAC SYSTEM DETAILS

Equipment ²	Inspection Criteria	FIELD INSPECTION ENERGY CHECKLIST	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)	<i>RT - 10</i>	<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :	<i>Packaged DX</i>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems	<i>1</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹	<i>144,118 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹	<i>82% AFUE</i>	<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹	<i>218,664 Btu/hr</i>	<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹	<i>11.1 EER</i>	<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value	<i>Attic, Ceiling Ins, vented / 8.0</i>	<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS	<i>No</i>	<input type="checkbox"/>	<input type="checkbox"/>
Economizer	<i>Diff. Enth (Integrated)</i>	<input type="checkbox"/>	<input type="checkbox"/>
Thermostat	<i>Setback Required</i>	<input type="checkbox"/>	<input type="checkbox"/>
Fan Control	<i>Constant Volume</i>	<input type="checkbox"/>	<input type="checkbox"/>

Equipment ²	Inspection Criteria	FIELD INSPECTION ENERGY CHECKLIST	
		Pass	Fail – Describe Reason ²
Item or System Tags (i.e. AC-1, RTU-1, HP-1)		<input type="checkbox"/>	<input type="checkbox"/>
Equipment Type ³ :		<input type="checkbox"/>	<input type="checkbox"/>
Number of Systems		<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Heating Capacity ¹		<input type="checkbox"/>	<input type="checkbox"/>
Minimum Heating Efficiency ¹		<input type="checkbox"/>	<input type="checkbox"/>
Max Allowed Cooling Capacity ¹		<input type="checkbox"/>	<input type="checkbox"/>
Cooling Efficiency ¹		<input type="checkbox"/>	<input type="checkbox"/>
Duct Location/ R-Value		<input type="checkbox"/>	<input type="checkbox"/>
When duct testing is required, submit MECH-4A & MECH-4-HERS		<input type="checkbox"/>	<input type="checkbox"/>
Economizer		<input type="checkbox"/>	<input type="checkbox"/>
Thermostat		<input type="checkbox"/>	<input type="checkbox"/>
Fan Control		<input type="checkbox"/>	<input type="checkbox"/>

1. If the Actual installed equipment performance efficiency and capacity is less than the Proposed (from the energy compliance submittal or from the building plans) the responsible party shall resubmit energy compliance to include the new changes.
2. For additional detailed discrepancy use Page 2 of the Inspection Checklist Form. Compliance fails if a Fail box is checked.
3. Indicate Equipment Type: Gas (Pkg or, Split), VAV, HP (Pkg or split), Hydronic, PTAC, or other.

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 3 of 5) MECH-1C

Project Name

Casa de Balboa - HVAC Project

Date

7/18/2011

Required Acceptance Tests

Designer:

This form is to be used by the designer and attached to the plans. Listed below are all the acceptance tests for mechanical systems. The designer is required to check the applicable boxes by all acceptance tests that apply and listed all equipment that requires an acceptance test. If all equipment of a certain type requires a test, list the equipment description and the number of systems. The NA number designates the Section in the Appendix of the Nonresidential Reference Appendices Manual that describes the test. Since this form will be part of the plans, completion of this section will allow the responsible party to budget for the scope of work appropriately.

Building Departments:

Systems Acceptance: Before occupancy permit is granted for a newly constructed building or space, or a new space-conditioning system serving a building or space is operated for normal use, all control devices serving the building or space shall be certified as meeting the Acceptance Requirements for Code Compliance.

Systems Acceptance: Before occupancy permit is granted. All newly installed HVAC equipment must be tested using the Acceptance Requirements.


The MECH-1C form is not considered a completed form and is not to be accepted by the building department unless the correct boxes are checked. The equipment requiring testing, person performing the test (Example: HVAC installer, TAB contractor, controls contractor, PE in charge of project) and what Acceptance test must be conducted. The following checked-off forms are required for **ALL** newly installed equipment. In addition a Certificate of Acceptance forms shall be submitted to the building department that certifies plans, specifications, installation, certificates, and operating and maintenance information meet the requirements of §10-103(b) and Title-24 Part 6. The building inspector must receive the properly filled out and signed forms before the building can receive final occupancy.

TEST DESCRIPTION	MECH-2A	MECH-3A	MECH-4A	MECH-5A	MECH-6A	MECH-7A	MECH-8A	MECH-9A	MECH-10A	MECH-11A	
Equipment Requiring Testing or Verification	Qty.	MECH-2A	MECH-3A	MECH-4A	MECH-5A	MECH-6A	MECH-7A	MECH-8A	MECH-9A	MECH-10A	MECH-11A
RT-1	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
RT-2	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
RT-3	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
RT-6	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
RT-7	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
RT-8	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
RT-10	1	Outdoor Ventilation For VAV & CAV <input checked="" type="checkbox"/>	Constant Volume & Single-Zone Unitary <input checked="" type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input checked="" type="checkbox"/>	Demand Control Ventilation DCV <input checked="" type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>
		Outdoor Ventilation For VAV & CAV <input type="checkbox"/>	Constant Volume & Single-Zone Unitary <input type="checkbox"/>	Air Distribution Ducts <input type="checkbox"/>	Economizer Controls <input type="checkbox"/>	Demand Control Ventilation DCV <input type="checkbox"/>	Supply Fan VAV <input type="checkbox"/>	Valve Leakage Test <input type="checkbox"/>	Supply Water Temp. Reset <input type="checkbox"/>	Hydronic System Variable Flow Control <input type="checkbox"/>	Automatic Demand Shed Control <input type="checkbox"/>

CERTIFICATE OF COMPLIANCE

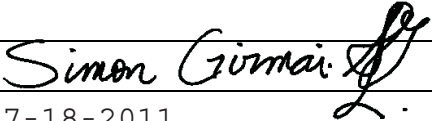
(Part 5 of 5)

MECH-1C

Project Name <i>Casa de Balboa - HVAC Project</i>		Date <i>7/18/2011</i>
Documentation Author's Declaration Statement		Signature 
I certify that this Certificate of Compliance documentation is accurate and complete.		
Name <i>Tarkan Altay</i>	Signature	
Company <i>Teza Design</i>	Date <i>7/18/2011</i>	
Address <i>233 A Street Ste. 1103</i>	CEA # CEPE #	
City/State/Zip <i>San Diego, CA 92101</i>	Phone <i>(619) 955-6834</i>	

The Principal Mechanical Designer's Declaration Statement

- I am eligible under Division 3 of the California Business and Professions Code to accept responsibility for the mechanical design.
- This Certificate of Compliance identifies the mechanical features and performance specifications required for compliance with Title-24, Parts 1 and 6 of the California Code of Regulations.
- The design features represented on this Certificate of Compliance are consistent with the information provided to document this design on the other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

Name <i>Simon Girmai</i>	Signature 
Company <i>Teza Design</i>	Date <i>7-18-2011</i>
Address <i>233 A Street, suite 1103</i>	License # <i>M 31559</i>
City/State/Zip <i>San Diego, CA 92101</i>	Phone <i>619 955 6834</i>

Mandatory Measures

Indicate location on building plans of Note Block for Mandatory Measures _____

MECHANICAL COMPLIANCE FORMS & WORKSHEETS (check box if worksheet is included)

For detailed instructions on the use of this and all Energy Efficiency Standards compliance forms, please refer to the 2008 Nonresidential Manual. Note: The Enforcement Agency may require all forms to be incorporated onto the building plans.

- | | | |
|-------------------------------------|---------|---|
| <input checked="" type="checkbox"/> | MECH-1C | Certificate of Compliance. Required on plans for all submittals. |
| <input checked="" type="checkbox"/> | MECH-2C | Mechanical Equipment Summary is required for all submittals. |
| <input checked="" type="checkbox"/> | MECH-3C | Mechanical Ventilation and Reheat is required for all submittals with mechanical ventilation. |
| <input checked="" type="checkbox"/> | MECH-4C | Fan Power Consumption is required for all prescriptive submittals. |

AIR SYSTEM REQUIREMENTS

(Part 1 of 2)

MECH-2C

Project Name <i>Casa de Balboa - HVAC Project</i>	Date <i>7/18/2011</i>
--	--------------------------

Item or System Tags (i.e. AC-1, RTU-1, HP-1)	Indicate Air Systems Type (Central, Single Zone, Package, VAV, or etc...)			
		RT - 1	RT - 2	RT - 3
Number of Systems		1	1	1

MANDATORY MEASURES	Indicate Page Reference on Plans or Schedule and indicate the applicable exception(s)			
	T-24 Sections			
Heating Equipment Efficiency	112(a)	82% TE	82% TE	82% TE
Cooling Equipment Efficiency	112(a)	10.3 EER	10.0 EER	n/a
HVAC Heat Pump Thermostat	112(b), 112(c)	n/a	n/a	n/a
Furnace Controls/Thermostat	112(c), 115(a)	Required	Required	Required
Natural Ventilation	121(b)	No	No	No
Mechanical Ventilation	121(b)	7,090 cfm	2,046 cfm	1,533 cfm
VAV Minimum Position Control	121(c)	No	No	No
Demand Control Ventilation	121(c)	Yes	Yes	Yes
Time Control	122(e)	Programmable Switch	Programmable Switch	Programmable Switch
Setback and Setup Control	122(e)	Setback Required	Setback Required	Setback Required
Outdoor Damper Control	122(f)	Auto	Auto	Auto
Isolation Zones	122(g)	n/a	n/a	n/a
Pipe Insulation	123			
Duct Location/ R-value	124	Conditioned / 8.0	Attic, Ceiling Ins, vented / 8.0	Attic, Ceiling Ins, vented / 8.0

PRESCRIPTIVE MEASURES

Calculated Design Heating Load	144(a & b)	520,941 Btu/hr	205,194 Btu/hr	306,117 Btu/hr
Proposed Heating Capacity	144(a & b)	250,000 Btu/hr	250,000 Btu/hr	250,000 Btu/hr
Calculated Design Cooling Load	144(a & b)	368,015 Btu/hr	242,592 Btu/hr	204,961 Btu/hr
Proposed Cooling Capacity	144(a & b)	320,646 Btu/hr	252,817 Btu/hr	0 Btu/hr
Fan Control	144(c)	Constant Volume	Constant Volume	Constant Volume
DP Sensor Location	144(c)			
Supply Pressure Reset (DDC only)	144(c)	Yes	Yes	Yes
Simultaneous Heat/Cool	144(d)	No	No	No
Economizer	144(e)	Diff. Enth (Integrated)	Diff. Enth (Integrated)	Diff. Enth (Integrated)
Heat Air Supply Reset	144(f)	Constant Temp	Constant Temp	Constant Temp
Cool Air Supply Reset	144(f)	Constant Temp	Constant Temp	Constant Temp
Electric Resistance Heating ¹	144(g)			
Air Cooled Chiller Limitation	144(i)			
Duct Leakage Sealing. If Yes, a MECH-4-A must be submitted	144(k)	No	No	No

1. Total installed capacity (MBtu/hr) of all electric heat on this project exclusive of electric auxiliary heat for heat pumps. If electric heat is used explain which exception(s) to §144(g) apply.

AIR SYSTEM REQUIREMENTS

(Part 1 of 2)

MECH-2C

Project Name <i>Casa de Balboa - HVAC Project</i>	Date <i>7/18/2011</i>
--	--------------------------

Item or System Tags (i.e. AC-1, RTU-1, HP-1)	Indicate Air Systems Type (Central, Single Zone, Package, VAV, or etc...)			
		RT - 6	RT - 7	RT - 8
Number of Systems		1	1	1

MANDATORY MEASURES	Indicate Page Reference on Plans or Schedule and indicate the applicable exception(s)			
	T-24 Sections			
Heating Equipment Efficiency	112(a)	82% TE	82% TE	82% AFUE
Cooling Equipment Efficiency	112(a)	10.4 EER	10.0 EER	10.0 EER
HVAC Heat Pump Thermostat	112(b), 112(c)	n/a	n/a	n/a
Furnace Controls/Thermostat	112(c), 115(a)	Required	Required	n/a
Natural Ventilation	121(b)	No	No	No
Mechanical Ventilation	121(b)	5,626 cfm	2,875 cfm	3,155 cfm
VAV Minimum Position Control	121(c)	No	No	No
Demand Control Ventilation	121(c)	Yes	Yes	No
Time Control	122(e)	Programmable Switch	Programmable Switch	Programmable Switch
Setback and Setup Control	122(e)	Setback Required	Setback Required	Setback Required
Outdoor Damper Control	122(f)	Auto	Auto	Auto
Isolation Zones	122(g)	n/a	n/a	n/a
Pipe Insulation	123			
Duct Location/ R-value	124	Conditioned / 8.0	Attic, Ceiling Ins, vented / 8.0	Conditioned / 8.0

PRESCRIPTIVE MEASURES

Calculated Design Heating Load	144(a & b)	572,411 Btu/hr	293,283 Btu/hr	232,908 Btu/hr
Proposed Heating Capacity	144(a & b)	400,000 Btu/hr	250,000 Btu/hr	200,000 Btu/hr
Calculated Design Cooling Load	144(a & b)	526,486 Btu/hr	284,075 Btu/hr	322,583 Btu/hr
Proposed Cooling Capacity	144(a & b)	425,664 Btu/hr	271,209 Btu/hr	313,964 Btu/hr
Fan Control	144(c)	Constant Volume	Constant Volume	Constant Volume
DP Sensor Location	144(c)			
Supply Pressure Reset (DDC only)	144(c)	Yes	Yes	Yes
Simultaneous Heat/Cool	144(d)	No	No	No
Economizer	144(e)	Diff. Enth (Integrated)	Diff. Enth (Integrated)	Diff. Enth (Integrated)
Heat Air Supply Reset	144(f)	Constant Temp	Constant Temp	Constant Temp
Cool Air Supply Reset	144(f)	Constant Temp	Constant Temp	Constant Temp
Electric Resistance Heating ¹	144(g)			
Air Cooled Chiller Limitation	144(i)			
Duct Leakage Sealing. If Yes, a MECH-4-A must be submitted	144(k)	No	No	No

1. Total installed capacity (MBtu/hr) of all electric heat on this project exclusive of electric auxiliary heat for heat pumps. If electric heat is used explain which exception(s) to §144(g) apply.

AIR SYSTEM REQUIREMENTS

(Part 1 of 2)

MECH-2C

Project Name <i>Casa de Balboa - HVAC Project</i>	Date <i>7/18/2011</i>
--	--------------------------

Item or System Tags (i.e. AC-1, RTU-1, HP-1)	Indicate Air Systems Type (Central, Single Zone, Package, VAV, or etc...)		
		<i>RT - 10</i>	
Number of Systems		<i>1</i>	

MANDATORY MEASURES	Indicate Page Reference on Plans or Schedule and indicate the applicable exception(s)		
	T-24 Sections		
Heating Equipment Efficiency	112(a)	<i>82% AFUE</i>	
Cooling Equipment Efficiency	112(a)	<i>11.1 EER</i>	
HVAC Heat Pump Thermostat	112(b), 112(c)	<i>n/a</i>	
Furnace Controls/Thermostat	112(c), 115(a)	<i>n/a</i>	
Natural Ventilation	121(b)	<i>No</i>	
Mechanical Ventilation	121(b)	<i>1,298 cfm</i>	
VAV Minimum Position Control	121(c)	<i>No</i>	
Demand Control Ventilation	121(c)	<i>Yes</i>	
Time Control	122(e)	<i>Programmable Switch</i>	
Setback and Setup Control	122(e)	<i>Setback Required</i>	
Outdoor Damper Control	122(f)	<i>Auto</i>	
Isolation Zones	122(g)	<i>n/a</i>	
Pipe Insulation	123		
Duct Location/ R-value	124	<i>Attic, Ceiling Ins, vented / 8.0</i>	

PRESCRIPTIVE MEASURES

Calculated Design Heating Load	144(a & b)	<i>144,118 Btu/hr</i>	
Proposed Heating Capacity	144(a & b)	<i>200,000 Btu/hr</i>	
Calculated Design Cooling Load	144(a & b)	<i>153,065 Btu/hr</i>	
Proposed Cooling Capacity	144(a & b)	<i>164,229 Btu/hr</i>	
Fan Control	144(c)	<i>Constant Volume</i>	
DP Sensor Location	144(c)		
Supply Pressure Reset (DDC only)	144(c)	<i>Yes</i>	
Simultaneous Heat/Cool	144(d)	<i>No</i>	
Economizer	144(e)	<i>Diff. Enth (Integrated)</i>	
Heat Air Supply Reset	144(f)	<i>Constant Temp</i>	
Cool Air Supply Reset	144(f)	<i>Constant Temp</i>	
Electric Resistance Heating ¹	144(g)		
Air Cooled Chiller Limitation	144(i)		
Duct Leakage Sealing. If Yes, a MECH-4-A must be submitted	144(k)	<i>No</i>	

1. Total installed capacity (MBtu/hr) of all electric heat on this project exclusive of electric auxiliary heat for heat pumps. If electric heat is used explain which exception(s) to §144(g) apply.

MECHANICAL VENTILATION AND REHEAT

MECH-3C

Project Name

Casa de Balboa - HVAC Project

Date

7/18/2011

MECHANICAL VENTILATION (\$121(b)2)													REHEAT LIMITATION (\$144(d))			
AREA BASIS													VAV MINIMUM			
A	B	C	D	E	F	G	H	I	J	K	L	M	N			
Zone/System	Condition Area (ft ²)	CFM per ft ²	Min CFM By Area B X C	Number Of People	CFM per Person	Min CFM by Occupant E X F	REQ'D V.A. Max of D or G	Design Ventilation Air CFM	50% of Design Zone Supply CFM	B X 0.4 CFM / ft ²	Max. of Columns H, J, K, 300 CFM	Design Minimum Air Setpoint	Transfer Air			
Conditioned Zone	9,414	0.50	4,707	94.1	40.0	3,766	4,707	3,766					941			
Zone 4	1,965	0.50	983	19.7	40.0	786	983	786					197			
Zone 5	1,957	0.50	979	19.6	40.0	783	979	783					196			
Zone 3	2,101	0.50	1,051	21.0	40.0	840	1,051	840					210			
Zone 17	2,289	0.50	1,145	22.9	40.0	916	1,145	916					229			
RT - 1						Total	8,863	7,090								
Zone 18	2,339	0.25	585	17.6	28.2	496	585	496					88			
Zone 2	1,924	0.15	289	19.2	25.0	481	481	481								
Zone 1	321	0.15	48				48	48								
Zone 19	749	0.15	112				112	112								
Zone 6	2,458	0.15	369	24.6	19.3	474	474	474								
Zone 10	440	0.15	66				66	66								
Zone 9	929	0.38	353	11.2	16.3	182	353	182					171			
Zone 8	486	0.15	73				73	73								
Zone 7	225	0.50	113				113	113								
Totals																Column I Total Design Ventilation Air

C	Minimum ventilation rate per Section §121, Table 121-A.
E	Based on fixed seat or the greater of the expected number of occupants and 50% of the CBC occupant load for egress purposes for spaces without fixed seating.
H	Required Ventilation Air (REQ'D V.A.) is the larger of the ventilation rates calculated on an AREA BASIS or OCCUPANCY BASIS (Column D or G).
I	Must be greater than or equal to H, or use Transfer Air (column N) to make up the difference.
J	Design fan supply CFM (Fan CFM) x 50%; or the design zone outdoor airflow rate per §121.
K	Condition area (ft ²) x 0.4 CFM / ft ² ; or
L	Maximum of Columns H, J, K, or 300 CFM
M	This must be less than or equal to Column L and greater than or equal to the sum of Columns H plus N.
N	Transfer Air must be provided where the Required Ventilation Air (Column H) is greater than the Design Minimum Air (Column M). Where required, transfer air must be greater than or equal to the difference between the Required Ventilation Air (Column H) and the Design Minimum Air (Column M), Column H minus M.

MECHANICAL VENTILATION AND REHEAT

MECH-3C

Project Name

Casa de Balboa - HVAC Project

Date

7/18/2011

MECHANICAL VENTILATION (\$121(b)2)										REHEAT LIMITATION (\$144(d))				
AREA BASIS					OCCUPANCY BASIS					VAV MINIMUM				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	
Zone/System	Condition Area (ft ²)	CFM per ft ²	Min CFM By Area B X C	Number Of People	CFM per Person	Min CFM by Occupant E X F	REQ'D V.A. Max of D or G	Design Ventilation Air CFM	50% of Design Zone Supply CFM	B X 0.4 CFM / ft ²	Max. of Columns H, J, K, 300 CFM	Design Minimum Air Setpoint	Transfer Air	
RT - 2						Total	2,306	2,046						
Zone-1	10,005	0.15	1,501			Total	1,501	1,533						
RT - 3						Total	1,501	1,533						
Zone-1	22,921	0.30	6,876	739.7	7.6	5,626	6,876	5,626					1,250	
RT - 6						Total	6,876	5,626						
Zone-1	5,137	0.50	2,569	73.9	15.6	1,152	2,569	1,152					1,416	
Zone-2	428	0.15	64				64	64						
Zone-3	598	0.15	90				90	90						
Zone-4	1,420	0.15	213				213	213						
Zone-5	7,168	0.15	1,075	148.4	9.1	1,356	1,356	1,356						
RT - 7						Total	4,291	2,875						
Zone-1	6,309	0.50	3,155				3,155	3,155						
RT - 8						Total	3,155	3,155						
Zone-1	4,716	0.15	707				707	1,298						
RT - 10						Total	707	1,298						
				Totals										
Column I Total Design Ventilation Air														

C	Minimum ventilation rate per Section §121, Table 121-A.
E	Based on fixed seat or the greater of the expected number of occupants and 50% of the CBC occupant load for egress purposes for spaces without fixed seating.
H	Required Ventilation Air (REQ'D V.A.) is the larger of the ventilation rates calculated on an AREA BASIS or OCCUPANCY BASIS (Column D or G).
I	Must be greater than or equal to H, or use Transfer Air (column N) to make up the difference.
J	Design fan supply CFM (Fan CFM) x 50%; or the design zone outdoor airflow rate per §121.
K	Condition area (ft ²) x 0.4 CFM / ft ² ; or
L	Maximum of Columns H, J, K, or 300 CFM
M	This must be less than or equal to Column L and greater than or equal to the sum of Columns H plus N.
N	Transfer Air must be provided where the Required Ventilation Air (Column H) is greater than the Design Minimum Air (Column M). Where required, transfer air must be greater than or equal to the difference between the Required Ventilation Air (Column H) and the Design Minimum Air (Column M), Column H minus M.

FAN POWER CONSUMPTION

MECH-4C

Project Name *Casa de Balboa - HVAC Project* Date *7/18/2011*

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A Fan Description	B Design Brake HP	C		D	E Number of Fans	F Peak Watts B X E X 746 / (C X D)
		Efficiency		Drive		
		Motor	Drive			
Supply Fan	9.000	91.0 %	98.0 %		1.0	7,529
Return Fan	2.000	86.5 %	98.0 %		1.0	1,760

TOTALS AND ADJUSTMENTS

FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUMN F)	9,289
	2) SUPPLY DESIGN AIRFLOW (CFM)	12,500
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)	W/CFM
	4) SP _a	
	5) SP _f	
B) Calculate Fan Adjustment and enter on line 6.	6) Fan Adjustment = 1-(SP _a - 1) / SP _f	
C) Calculate Adjusted Fan Power Index and enter on Row 7	7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹	0.743 W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

FAN POWER CONSUMPTION

MECH-4C

Project Name <i>Casa de Balboa - HVAC Project</i>	Date <i>7/18/2011</i>
--	--------------------------

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A	B	C	D	E	F
Fan Description	Design Brake HP	Efficiency		Number of Fans	Peak Watts B X E X 746 / (C X D)
		Motor	Drive		
Supply Fan	6.900	89.5 %	98.0 %	1.0	5,869
Return Fan	2.000	86.5 %	98.0 %	1.0	1,760

TOTALS AND ADJUSTMENTS		
FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUM F)	7,629
	2) SUPPLY DESIGN AIRFLOW (CFM)	8,750
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)	W/CFM
	4) SP _a	
	5) SP _f	
B) Calculate Fan Adjustment and enter on line 6.	6) Fan Adjustment = 1 - (SP _a - 1) / SP _f	
C) Calculate Adjusted Fan Power Index and enter on Row 7	7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹	0.872 W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

FAN POWER CONSUMPTION

MECH-4C

Project Name <i>Casa de Balboa - HVAC Project</i>	Date 7/18/2011
--	-------------------

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A	B	C	D	E	F
Fan Description	Design Brake HP	Efficiency		Number of Fans	Peak Watts B X E X 746 / (C X D)
		Motor	Drive		
<i>Supply Fan</i>	3.100	89.5 %	98.0 %	1.0	2,637

TOTALS AND ADJUSTMENTS

FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1)	TOTAL FAN SYSTEM POWER (WATTS, SUM COLUM F)		2,637
	2)	SUPPLY DESIGN AIRFLOW (CFM)		7,500
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3)	TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)		W/CFM
	4)	SP _a		
	5)	SP _f		
B) Calculate Fan Adjustment and enter on line 6.	6)	Fan Adjustment = 1-(SP _a - 1) / SP _f		
C) Calculate Adjusted Fan Power Index and enter on Row 7	7)	ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹		0.352 W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

FAN POWER CONSUMPTION

MECH-4C

Project Name: *Casa de Balboa - HVAC Project* Date: *7/18/2011*

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A Fan Description	B Design Brake HP	C		D	E Number of Fans	F Peak Watts B X E X 746 / (C X D)
		Efficiency				
		Motor	Drive			
<i>Supply Fan</i>	<i>9.600</i>	<i>91.0 %</i>	<i>98.0 %</i>		<i>1.0</i>	<i>8,031</i>
<i>Return Fan</i>	<i>1.700</i>	<i>86.5 %</i>	<i>98.0 %</i>		<i>1.0</i>	<i>1,496</i>

TOTALS AND ADJUSTMENTS

FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUM F)	<i>9,527</i>
	2) SUPPLY DESIGN AIRFLOW (CFM)	<i>16,000</i>
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)	<i>W/CFM</i>
	4) SP _a	
	5) SP _f	
B) Calculate Fan Adjustment and enter on line 6.	6) Fan Adjustment = 1 - (SP _a - 1) / SP _f	
C) Calculate Adjusted Fan Power Index and enter on Row 7	7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹	<i>0.595 W/CFM</i>

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

FAN POWER CONSUMPTION

MECH-4C

Project Name <i>Casa de Balboa - HVAC Project</i>	Date <i>7/18/2011</i>
--	--------------------------

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A	B	C	D	E	F
Fan Description	Design Brake HP	Efficiency		Number of Fans	Peak Watts B X E X 746 / (C X D)
		Motor	Drive		
<i>Supply Fan</i>	<i>10.600</i>	<i>91.7 %</i>	<i>98.0 %</i>	<i>1.0</i>	<i>8,799</i>
<i>Return Fan</i>	<i>1.800</i>	<i>86.5 %</i>	<i>98.0 %</i>	<i>1.0</i>	<i>1,584</i>

TOTALS AND ADJUSTMENTS		
FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUM F)	<i>10,383</i>
	2) SUPPLY DESIGN AIRFLOW (CFM)	<i>10,000</i>
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)	W/CFM
	4) SP _a	
	5) SP _f	
B) Calculate Fan Adjustment and enter on line 6.	6) Fan Adjustment = 1-(SP _a - 1) / SP _f	
C) Calculate Adjusted Fan Power Index and enter on Row 7	7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹	<i>1.038</i> W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

FAN POWER CONSUMPTION

MECH-4C

Project Name: *Casa de Balboa - HVAC Project* Date: *7/18/2011*

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A	B	C	D	E	F
Fan Description	Design Brake HP	Efficiency		Number of Fans	Peak Watts B X E X 746 / (C X D)
		Motor	Drive		
<i>Supply Fan</i>	<i>10.300</i>	<i>91.7 %</i>	<i>98.0 %</i>	<i>1.0</i>	<i>8,550</i>
<i>Return Fan</i>	<i>1.700</i>	<i>86.5 %</i>	<i>98.0 %</i>	<i>1.0</i>	<i>1,496</i>

TOTALS AND ADJUSTMENTS

FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUMN F)	10,046
	2) SUPPLY DESIGN AIRFLOW (CFM)	10,500
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)	W/CFM
	4) SP _a	
	5) SP _f	
B) Calculate Fan Adjustment and enter on line 6.	6) Fan Adjustment = 1-(SP _a - 1) / SP _f	
C) Calculate Adjusted Fan Power Index and enter on Row 7	7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹	0.957 W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

FAN POWER CONSUMPTION

MECH-4C

Project Name

Casa de Balboa - HVAC Project

Date

7/18/2011

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Air Volume (CAV) Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach. See **Power Consumption of fan §144(c)**.

A Fan Description	B Design Brake HP	C		D	E Number of Fans	F Peak Watts B X E X 746 / (C X D)
		Efficiency				
		Motor	Drive			
Supply Fan	3.900	89.5 %	98.0 %		1.0	3,317
Return Fan	0.800	77.0 %	98.0 %		1.0	791

TOTALS AND ADJUSTMENTS

FILTER PRESSURE ADJUSTMENT Equation 144-A in §144(c) of the Energy Standards.	1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUM F)	4,108
	2) SUPPLY DESIGN AIRFLOW (CFM)	5,750
A) If filter pressure drop (SP _a) is greater than 1 inch W. C. or 245 Pascal then enter SP _a on line 4. Enter Total Fan pressure drop across the fan (SP _f) on Line 5.	3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)	W/CFM
	4) SP _a	
	5) SP _f	
B) Calculate Fan Adjustment and enter on line 6.	6) Fan Adjustment = 1-(SP _a - 1) / SP _f	
C) Calculate Adjusted Fan Power Index and enter on Row 7	7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6) ¹	0.714 W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/CFM for Constant Volume systems or 1.25 W/CFM for VAV systems.

MECHANICAL MANDATORY MEASURES: NONRESIDENTIAL	MECH-MM
--	----------------

Project Name <i>Casa de Balboa - HVAC Project</i>	Date <i>7/18/2011</i>
--	--------------------------

Equipment and System Efficiencies
--

- | | |
|----------|--|
| §111: | Any appliance for which there is a California standard established in the Appliance Efficiency Regulations will comply with the applicable standard. |
| §115(a): | Fan type central furnaces shall not have a pilot light. |
| §123: | Piping, except that conveying fluids at temperatures between 60 and 105 degrees Fahrenheit, or within HVAC equipment, shall be insulated in accordance with Standards Section 123. |
| §124: | Air handling duct systems shall be installed and insulated in compliance with Sections 601, 602, 603, 604, and 605 of the CMC Standards. |

Controls

- | | |
|------------|--|
| §122(e): | Each space conditioning system shall be installed with one of the following: |
| 1A. | Each space conditioning system serving building types such as offices and manufacturing facilities (and all others not explicitly exempt from the requirements of Section 112 (d)) shall be installed with an automatic time switch with an accessible manual override that allows operation of the system during off-hours for up to 4 hours. The time switch shall be capable of programming different schedules for weekdays and weekends and have program backup capabilities that prevent the loss of the device's program and time setting for at least 10 hours if power is interrupted; or |
| 1B. | An occupancy sensor to control the operating period of the system; or |
| 1C. | A 4-hour timer that can be manually operated to control the operating period of the system. |
| 2. | Each space conditioning system shall be installed with controls that temporarily restart and temporarily operate the system as required to maintain a setback heating and/or a setup cooling thermostat setpoint. |
| §122(g): | Each space conditioning system serving multiple zones with a combined conditioned floor area more than 25,000 square feet shall be provided with isolation zones. Each zone: shall not exceed 25,000 square feet; shall be provided with isolation devices, such as valves or dampers that allow the supply of heating or cooling to be setback or shut off independently of other isolation areas; and shall be controlled by a time control device as described above. |
| §122(c): | Thermostats shall have numeric setpoints in degrees Fahrenheit (F) and adjustable setpoint stops accessible only to authorized personnel. |
| §122(b): | Heat pumps shall be installed with controls to prevent electric resistance supplementary heater operation when the heating load can be met by the heat pump alone |
| §122(a&b): | Each space conditioning system shall be controlled by an individual thermostat that responds to temperature within the zone. Where used to control heating, the control shall be adjustable down to 55 degrees F or lower. For cooling, the control shall be adjustable up to 85 degrees F or higher. Where used for both heating and cooling, the control shall be capable of providing a deadband of at least 5 degrees F within which the supply of heating and cooling is shut off or reduced to a minimum. |

Ventilation

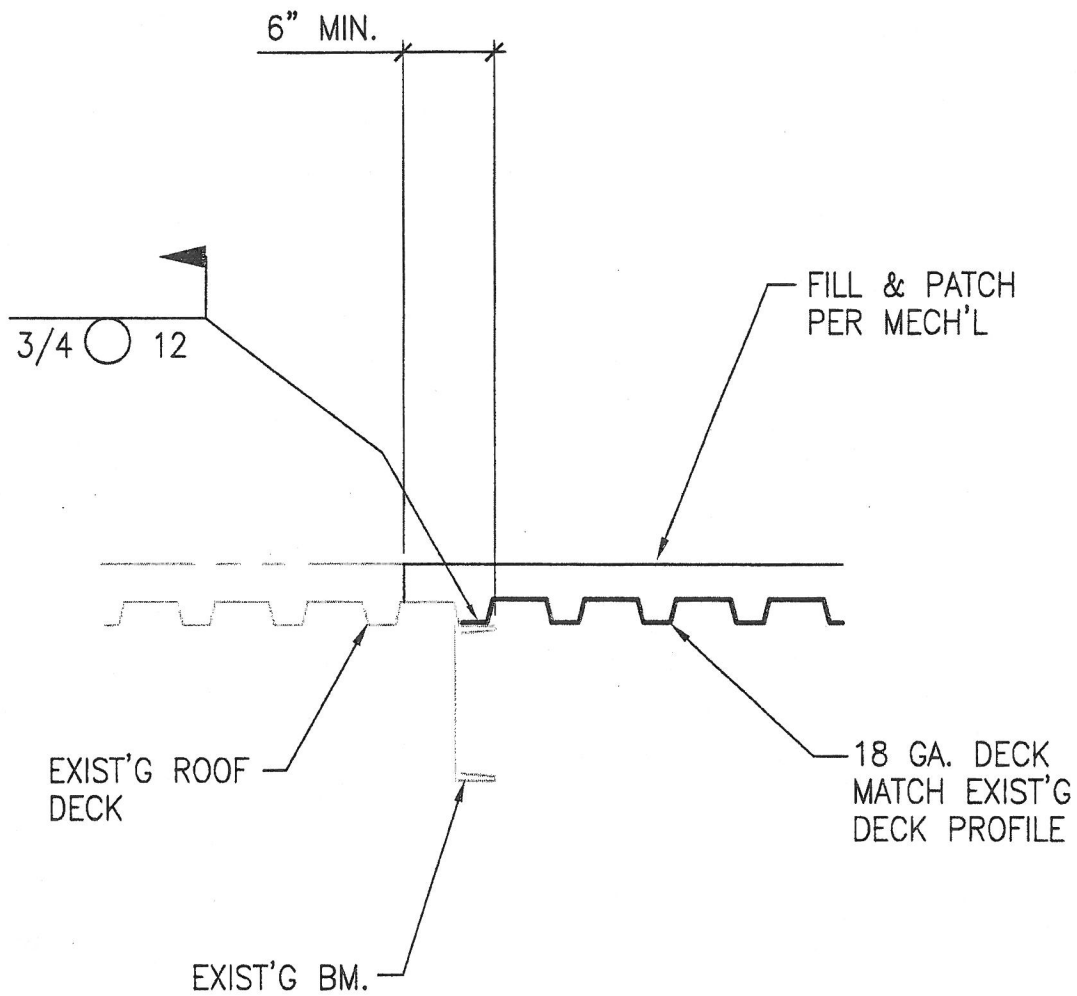
- | | |
|----------|---|
| §121(e): | Controls shall be provided to allow outside air dampers or devices to be operated at the ventilation rates as specified on these plans. |
| §122(f): | All gravity ventilating systems shall be provided with automatic or readily accessible manually operated dampers in all openings to the outside, except for combustion air openings. |
| §121(f): | Ventilation System Acceptance. Before an occupancy permit is granted for a newly constructed building or space, or a new ventilating system serving a building or space is operated for normal use, all ventilation systems serving the building or space shall be certified as meeting the Acceptance Requirements for Code Compliance |

Service Water Heating Systems

- | | |
|---------|--|
| §113(c) | Installation |
| 3. | Temperature controls for public lavatories. The controls shall limit the outlet Temperature to 110° F. |
| 2. | Circulating service water-heating systems shall have a control capable of automatically turning off the circulating pump when hot water is not required. |

APPENDIX H

Orion's Structural Details and Johns Manville Details



PARALLEL (5'-0" SQ. MAX. OPEN'G)

CASA DE BALBOA

SAN DIEGO, CA



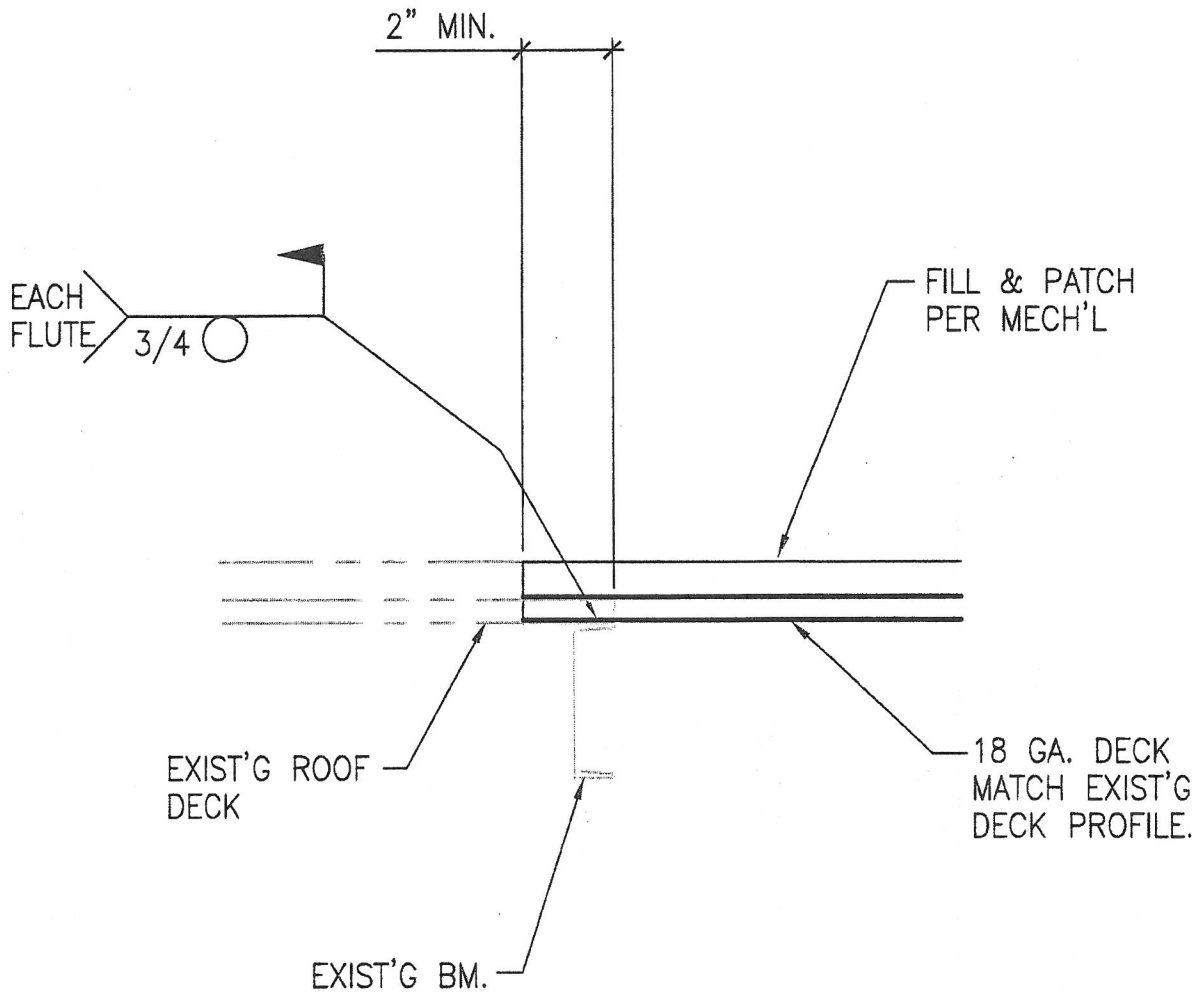
ORION
Structural Engineering, Inc.

12257 OLD POMERADO RD., SUITE A
POWAY CA 92064
PHONE (602) 670 1074
FAX (602) 670 1076

DATE

ISSUE

DET-01



PERPENDICULAR (5'-0" SQ. MAX. OPEN'G.)

CASA DE BALBOA
SAN DIEGO, CA



ORION
Structural Engineering, Inc.

12257 OLD POMERADO RD., SUITE A
POWAY CA 92064
PHONE (606) 670 1874
FAX (606) 670 1876

DATE

ISSUE

DET-02

Two-Ply Cold Process Modified Bitumen Mineral-Surfaced Roofing System. For use over JM insulation, approved decks or other approved insulations on inclines up to 3" per ft (250 mm/m).

Materials per 100 ft² (9.29 m²) of roof area

Primer (if required): JM Concrete Primer 1 gal (3.8 l)

Base Felts:

DynaBase, DynaPly, DynaLastic 180 S, GlasBase Plus or PermaPly 28 1 layer

Cap: ♦

2CID-CA—DynaKap or DynaKap FR
 2FID-CA—DynaGlas, DynaGlas FR or DynaGlas 30 FR*
 2PID-CA—DynaLastic 180, DynaLastic 180 FR, DynaLastic 250 or DynaLastic 250 FR 1 layer

* DynaGlas 30 FR must be used in conjunction with DynaBase, DynaLastic 180 S or DynaPly only.

Approximate installed weight: 100 - 210 lb (45 - 95 kg).

General

This specification is for use over any type of approved structural deck which is not nailable and which provides a suitable surface to receive the roof. Poured and precast concrete decks require priming with JM Concrete Primer prior to application of cold application adhesive.

This specification is also for use over JM roof insulations, or other approved roof insulations which are not nailable and which provide a suitable surface to receive the roof. Specific written approval is required for any roof insulation that is not supplied by JM. Insulation should be installed in accordance with the appropriate JM insulation specification detailed in the JM Commercial/Industrial Roofing Systems Manual. This specification can also be used in certain re-roofing situations. Refer to the "Re-roofing" section of the JM Commercial/Industrial Roofing Systems Manual. This specification is not to be used directly over gypsum, either poured or precast, or lightweight, insulating concrete decks or fills.

Design and installation of the deck and/or roof substrate must result in the roof draining freely, to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable and will not be eligible for a JM Peak Advantage Guarantee.

Flashings

Flashing details can be found in Section 3 of the JM Commercial/Industrial Roofing Systems Manual.

Application

On roof decks with slopes up to ½" per ft (41 mm/m), the roofing felts and modified bitumen sheets may be installed either perpendicular or parallel to the roof incline.

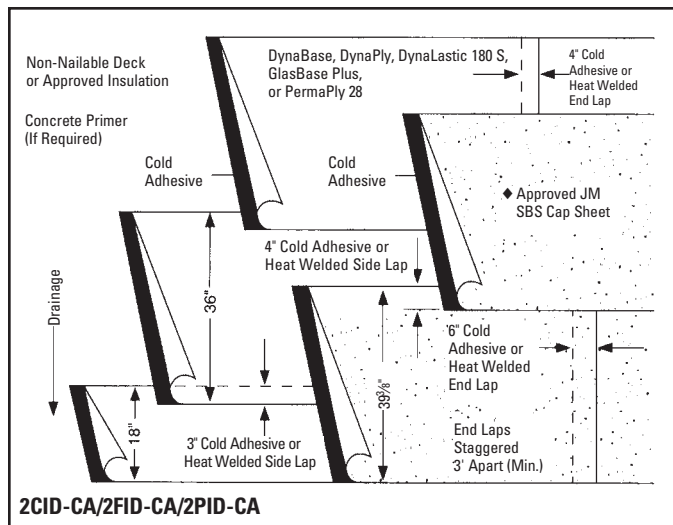
Roll an 18" (457 mm) wide piece of one of the base felts listed into a full coating of MBR Cold Application Adhesive or MBR Bonding Adhesive. The remaining felts are to be applied full width, in the same manner. End and side laps can be done in one of the following ways:

- A) Use MBR Cold Application Adhesive or MBR Bonding Adhesive on the 3" (76 mm) side and 6" (152 mm) end lap. **Or...**
- B) Use a hot air gun or torch on the 3" (76 mm) side and 6" (152 mm) end lap. All laps must be rolled with a 3" (76 mm) rounded edge roller. A ⅛" to ⅜" (3 mm to 10 mm) bleedout of SBS compound shall be visible at the edge of all seams. All laps must be checked for good adhesion.

Cap sheet application is accomplished in one of the following ways:

- A) Apply a full width piece of one of the cap sheets listed into a full coating of MBR Cold Application Adhesive or MBR Bonding Adhesive. Subsequent sheets are to be applied in the same manner, with 4" (102 mm) side and 6" (152 mm) end laps over the preceding sheets.

Or...



- B) Prepare the 6" (152 mm) end lap by removing all loose granules. Heat and embed all remaining granules with a hot air gun or torch. Apply heat to the 3" (76 mm) side and 6" (152 mm) end lap making sure both have a good compound flow to adhere the two surfaces. All laps must be rolled with a 3" (76 mm) rounded edge roller. A ⅛" to ⅜" (3 mm to 10 mm) bleedout of SBS compound shall be visible at the edge of all seams. All laps must be checked for good adhesion.

Subsequent sheets are to be applied in the same manner.

Application of JM SBS modified bitumen products may require the use of a hot air gun or torch. Improper use of these materials and application equipment can result in severe burns, and/or other physical injury, as well as damage to property. In order to prevent these situations the mechanic must install the materials using the techniques recommended by JM and those found in "A Guide to Safety: Torch-On Modified Bitumens" available from the Asphalt Roofing Manufacturers Association. These techniques have been endorsed by the National Roofing Contractors Association and the United Union of Roofers, Waterproofers and Allied Workers.

Note: When using metric- and English-sized base and cap sheets in the same system, care must be taken to avoid lap over lap configurations.

Base sheets and cap sheets with polyester reinforcement must be allowed to relax in an unrolled position prior to installation.

For cold weather application techniques, refer to Paragraph 24.0 of Section 3d.

Steep Slope Requirements

Special procedures are required on inclines over ½" per ft (41 mm/m). Refer to Paragraph 21.0 of Section 3d.

Surfacing

No additional surfacing is required.

* Trumbull is a registered trademark of Owens Corning.

Refer to the Material Safety Data Sheet and product label prior to using this product.

Two-Ply Heat-Welded Modified Bitumen Mineral-Surfaced Roofing System. For use over Johns Manville (JM) insulation, approved decks or other approved insulations on inclines up to 6" per ft (500 mm/m).

Materials per 100 ft² (9.29 m²) of roof area

Primer (if required): JM Concrete Primer 1 gal (3.8 l)

Base Felts:

DynaWeld Base 1 layer

Cap Sheet Options:

DynaWeld Cap FR or DynaClad* 1 layer

* DynaClad cannot be used for a membrane on any roof that will have significant foot traffic.

General

This specification is for use over any type of approved structural deck which is not nailable and which provides a suitable surface to receive the roof. Poured and precast concrete decks require priming with JM Concrete Primer prior to application of the first heat welded modified bitumen ply. This specification is not to be used over poured or precast gypsum decks, lightweight insulating concrete decks or fills without JM insulation.

This specification is also for use over JM roof insulations, or other approved roof insulations which are not nailable and which provide a suitable surface to receive the roof. Specific written approval is required for any roof insulation that is not supplied by JM. Insulation should be installed in accordance with the appropriate JM insulation specification detailed in the JM Commercial/Industrial Roofing Systems Manual. This specification can also be used in certain re-roofing situations. Refer to the "Re-roofing" section of the JM Commercial/Industrial Roofing Systems Manual.

For heat-weld application directly to the insulation, the top layer of insulation must be JM DuraBoard™. Design and installation of the deck and/or roof substrate must result in the roof draining freely, to outlets numerous enough and so located as to remove water promptly and completely. Areas where water ponds for more than 24 hours are unacceptable and will not be eligible for a JM Peak Advantage Guarantee.

Note: All general instructions contained in the current JM Commercial/Industrial Roofing Systems Manual shall be considered part of this specification.

Flashings

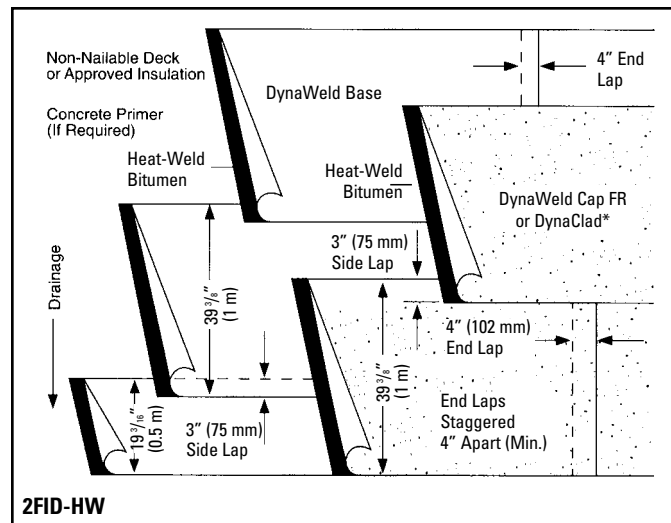
Flashing details can be found in Section 3 of the JM Commercial/Industrial Roofing Systems Manual.

Application

On roof decks with slopes up to 1½" per foot (124 mm/m), the roofing felts and modified bitumen sheets may be installed either perpendicular or parallel to the roof incline.

Heat weld a 19⅜" (502 mm) wide piece of one of the base plies listed. The remaining plies are to be applied full width, with 3" (75 mm) side and 4" (102 mm) end laps over the preceding sheets.

Heat weld a full width piece of one of the cap sheets listed over the installed base felt. Subsequent sheets are to be applied in the same manner, with 4" (102 mm) side laps and 4" (102 mm) end laps over the preceding sheet.



Apply all sheets so that they are firmly and uniformly set, without voids. Using a propane torch, apply the flame to the surface of the coiled portion of the roll. Torch across the full width of the roll and along the lap area. As the surface is heated, it will develop a sheen and the burnoff will disappear. The generation of smoke is an indication that the material is being overheated. Repeat the operation with subsequent rolls, maintaining proper side laps and end laps. A healthy compound flow will simplify seaming the laps. This is done by keeping the flame directed at the adhered ply and in front of the roll. At the end laps, soften the bitumen by heating the granule surface with the torch. When the granules start to sink into the bitumen, stop torching and with a hot trowel, embed the granules into the bitumen. All laps must be checked for good adhesion.

Preparation of the 4" (102 mm) lap of DynaClad requires the removal of 4" (102 mm) of metal surfacing, creating the selvage edge. Next, apply heat to the lap that is being seamed, making sure there is a compound flow to adhere the two surfaces. All laps must be checked for good adhesion.

For special precautions for heat-weld applications, see Paragraph 31.0 of Section 3d of the JM Commercial/Industrial Roofing Systems Manual.

For cold weather application techniques, refer to Paragraph 24.0 of Section 3d of the JM Commercial/Industrial Roofing Systems Manual.

Surfacing

No additional surfacing is required.

Steep Slope Requirements

Special procedures are required on incline over ½" per foot (41 mm/m). Refer to Paragraph 21.0 of Section 3d of the JM Commercial/Industrial Roofing Systems Manual.

Refer to the Material Safety Data Sheet and product label prior to using this product.

APPENDIX I

Sample City Invoice

City of San Diego, Field Engineering Div., 9485 Aero Drive, SD CA 92123						Contractor's Name:					
Project Name:						Contractor's Address:					
SAP No. (WBS/IO/CC)											
City Purchase Order No.						Contractor's Phone #:			Invoice No.		
Resident Engineer (RE):						Contractor's Fax #:			Invoice Date:		
RE Phone#:			RE Fax#:			Contact Name:			Billing Period:		
Item #	Item Description	Contract Authorization				Previous Estimate		This Estimate		Totals to Date	
		Unit	Qty	Price	Extension	%/QTY	Amount	% / QTY	Amount	% / QTY	Amount
1	2 Parallel 4" PVC C900	LF	1,380	\$34.00	\$46,920.00						
2	48" Primary Steel Casing	LF	500	\$1,000.00	\$500,000.00						
3	2 Parallel 12" Secondary Steel	LF	1,120	\$53.00	\$59,360.00						
4	Construction and Rehab of PS 49	LS	1	\$150,000.00	\$150,000.00						
5	Demo	LS	1	\$14,000.00	\$14,000.00						
6	Install 6' High Chain Link Fence	LS	1	\$5,600.00	\$5,600.00						
7	General Site Restoration	LS	1	\$3,700.00	\$3,700.00						
8	10" Gravity Sewer	LF	10	\$292.00	\$2,920.00						
9	4" Blow Off Valves	EA	2	\$9,800.00	\$19,600.00						
10	Bonds	LS	1	\$16,000.00	\$16,000.00						
11	Field Orders	AL	1	80,000	\$80,000.00						
11.1	Field Order 1	LS	5,500	\$1.00	\$5,500.00						
11.2	Field Order 2	LS	7,500	\$1.00	\$7,500.00						
11.3	Field Order 3	LS	10,000	\$1.00	\$10,000.00						
11.4	Field Order 4	LS	6,500	\$1.00	\$6,500.00						
12	Certified Payroll	LS	1	\$1,400.00	\$1,400.00						
CHANGE ORDERS											
Change Order 1			4,890								
Items 1-4					\$11,250.00						
Item 5-Deduct Bid Item 3		LF	120	-\$53.00	(\$6,360.00)						
Change Order 2			160,480								
Items 1-3					\$95,000.00						
Item 4 Deduct Bid Item 1		LF	380	-\$340.00	(\$12,920.00)						
Item 5-Encrease bid Item 9		LF	8	\$9,800.00	\$78,400.00						
Change Order 3 (Close Out)			-121,500								
Item 1 Deduct Bid Item 3			53	-500.00	(\$26,500.00)						
Item 2 Deduct Bid Item 4		LS	-1	45,000.00	(\$45,000.00)						
Items 3-9			1	-50,500.00	(\$50,500.00)						
SUMMARY								Total This	\$ -	Total Billed	\$0.00
A. Original Contract Amount						Retention and/or Escrow Payment Schedule					
B. Approved Change Order 1 Thru 3						Total Retention Required as of this billing					
C. Total Authorized Amount (A+B)						Previous Retention Withheld in PO or in Escrow					
D. Total Billed to Date						Add'l Amt to Withhold in PO/Transfer in Escrow:					
E. Less Total Retention (5% of D)						Amt to Release to Contractor from PO/Escrow:					
F. Less Total Previous Payments											
G. Payment Due Less Retention						Contractor Signature and Date:					
H. Remaining Authorized Amount											

APPENDIX J

Asbestos and Lead Report

CITY of SAN DIEGO

4317 6671

WORK REQUEST FOR ASBESTOS & LEAD MANAGEMENT PROGRAM

Department: E&CP Dept#: 545 Division: AEF
 Work Requested By: Custiso Goodrich MS#: 992A Phone/Fax: 619-333-4633
 Facility Name/Address: Casa De Balboa HVAC San Diego Historical Center, H-Pass Park, 1649 El Prado Suite #3, San Diego, CA 92101
 Facility #: 000628 Age of Facility: 1949/30 of 1999 Plans Attached? YES NO Target Start: Dec 2011
 Description of Proposed Work (explain detail of work as well as where in facility):
HVAC removal/upgrade

Have internal order or WBS # opened to ALMP for labor cost. ALMP cost center 2113110012; fund 100500; revenue mat 424071. The following accounting tags are for laboratory, abatement, and/or other NPI. Request estimate if needed.

Accounting Numbers:	2113.110012	400624	512114	8-00939
	Cost Center	Fund	GE #	WBS/Invoice Code

I have the authority to authorize ALMP to bill hourly inspection labor and laboratory expenses to the accounting numbers above for work related to this project.

Signature: [Signature] Title: Associate Civil Engineer
 Point Name: Custiso R. Goodrich Obj. Analyst Name: Alicia Belen
 Send completed form to: **ASBESTOS & LEAD MANAGEMENT PROGRAM - 9601 Ridgeway Court, Suite 310, San Diego, CA 92123 or MS 1103-A or Fax (619)402-5085**

FOR OFFICE USE ONLY

Date Received: 10/19/11 Inspector: Benji Blumberg
 Records/Inspection Information: _____

Impact on Project: Asbestos was identified in the matrix located on the oldest square ducting on the roof. Our "as-needed" abatement contractor can be used to abate/demolish ducting. ALMP will provide an estimate to complete the work. Please see attached memo of 10/5/11.

William B. Blumberg 10-19-11 [Signature] 10/19/11
 ASBESTOS & LEAD PROGRAM INSPECTOR DATE ASBESTOS & LEAD PROGRAM MANAGER DATE

CS-2064 (R) (Rev. February 2010)

APPENDIX K

Commissioning of HVAC Systems

SECTION TABLE OF CONTENTS

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 23 08 00.00 10

COMMISSIONING OF HVAC SYSTEMS

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DEFINITIONS
- 1.3 SYSTEM DESCRIPTION
 - 1.3.1 General
- 1.4 Commissioning Firm
- 1.5 Commissioning Specialist
 - 1.5.1 General
 - 1.5.2 Responsibilities
- 1.6 SEQUENCING AND SCHEDULING

PART 2 EXECUTION

- 2.1 COMMISSIONING TEAM AND TEST FORMS AND CHECKLISTS
- 2.2 TESTS
 - 2.2.1 Pre-Functional Performance Test Checklists
 - 2.2.2 Functional Performance Tests
- 2.3 COMMISSIONING REPORT

-- End of Section Table of Contents --

SECTION 23 08 00.00 10

COMMISSIONING OF HVAC SYSTEMS
01/08

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASSOCIATED AIR BALANCE COUNCIL (AABC) COMMISSIONING GROUP – ACG

ACG (2005) Commissioning Guideline

NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB)

NEBB Commissioning Standard (2009) Procedural Standards for Whole Building Systems Commissioning of New Construction; 3rd Edition

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1429 (1994) HVAC Systems Commissioning Manual, 1st Edition

U.S. GREEN BUILDING COUNCIL (USGBC)

LEED (2002; R 2005) Leadership in Energy and Environmental Design(tm) Green Building Rating System for New Construction (LEED-NC)

TESTING, ADJUSTING AND BALANCING BUREAU

TABB

1.2 DEFINITIONS

In some instances, terminology differs between the Contract and the Commissioning Standard primarily because the intent of this Section is to use the industry standards specified, along with additional requirements listed herein to produce optimal results. The following table of similar terms is provided for clarification only. Contract requirements take precedent over the corresponding ACG, NEBB, or TABB requirements where differences exist.

SIMILAR TERMS

<u>Contract Term</u>	<u>ACG</u>	<u>NEBB</u>	<u>TABB</u>
<u>SIMILAR TERMS</u> Commissioning Standard	ACG Commissioning Guideline	Procedural Standards for Building Systems Commissioning	SMACNA HVAC Commissioning Guideline
Commissioning Specialist	ACG Certified Commissioning Agent	NEBB Qualified Commissioning Administrator	TABB Certified Commissioning Supervisor

1.3 SYSTEM DESCRIPTION

1.3.1 General

Perform Commissioning in accordance with the requirements of the standard under which the Commissioning Firm's qualifications are approved, i.e., ACG Commissioning Guideline, NEBB Commissioning Standard, or SMACNA 1429 unless otherwise stated herein. Consider mandatory all recommendations and suggested practices contained in the Commissioning Standard. Use the Commissioning Standard for all aspects of Commissioning, including qualifications for the Commissioning Firm and Specialist and calibration of Commissioning instruments. Where the instrument manufacturer calibration recommendations are more stringent than those listed in the Commissioning Standard, the manufacturer's recommendations shall be adhered to. All quality assurance provisions of the Commissioning Standard such as performance guarantees shall be part of this contract. For systems or system components not covered in the Commissioning Standard, Commissioning procedures shall be developed by the Commissioning Specialist. Where new procedures, requirements, etc., applicable to the Contract requirements have been published or adopted by the body responsible for the Commissioning Standard used (ACG, NEBB, or TABB), the requirements and recommendations contained in these procedures and requirements shall be considered mandatory.

1.4 COMMISSIONING FIRM

Submit certification of the proposed Commissioning Firm's qualifications to perform the duties specified herein and in other related Sections, no later than 21 days after the Notice to Proceed. Include in the documentation the date that the Certification was initially granted and the date when the current Certification expires. The firm is either a member of ACG or certified by the NEBB or the TABB and certified in all categories and functions where measurements or performance are specified on the plans and specifications. Any lapses in Certification of the proposed Commissioning Firm or disciplinary action taken by ACG, NEBB, or TABB against the proposed Commissioning Firm shall be described in detail. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the firm loses subject certification during this period, immediately notify the Contracting Officer and submit another Commissioning Firm for approval. Any firm that has been the subject of disciplinary action by the ACG, the NEBB, or the TABB within the five years preceding Contract Award is not eligible to perform any duties related to the HVAC systems, including Commissioning. All work specified in this Section and in other related Sections to be performed by the Commissioning Firm shall be considered invalid if the Commissioning Firm loses its certification prior to Contract completion and must be performed by an approved successor. These Commissioning services are to assist the prime Contractor in performing the quality oversight for which it is responsible. The Commissioning Firm shall be a subcontractor of the prime Contractor and shall be financially and corporately independent of all other sub-Contractors. The Commissioning Firm shall report to and be paid by the prime Contractor.

1.5 COMMISSIONING SPECIALIST

1.5.1 General

Submit certification of the proposed Commissioning Specialist's qualifications to perform the duties specified herein and in other related Sections, no later than 21 days after the Notice to Proceed. The documentation shall include the date that the Certification was initially granted and the date when the current Certification expires. The Commissioning Specialist shall be an ACG Certified Commissioning Agent, a NEBB Qualified Commissioning Administrator, or a TABB Certified Commissioning Supervisor and shall be an employee of the approved Commissioning Firm. Any lapses in Certification of the proposed Commissioning Specialist or disciplinary action taken by ACG, NEBB, or TABB against the proposed Commissioning Specialist shall be described in detail. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason,

the Commissioning Specialist loses subject certification during this period, immediately notify the Contracting Officer and submit another Commissioning Specialist for approval. Any individual that has been the subject of disciplinary action by the ACG, the NEBB, or the TABB within the five years preceding Contract Award is not eligible to perform any duties related to the HVAC systems, including Commissioning. All work specified in this Section and in other related Sections performed by the Commissioning Specialist shall be considered invalid if the Commissioning Specialist loses certification prior to Contract completion and must be performed by the approved successor.

1.5.2 Responsibilities

Perform all Commissioning work specified herein and in related sections under the direct guidance of the Commissioning Specialist. The Commissioning Specialist shall prepare, no later than 28 days after the approval of the Commissioning Specialist, the Commissioning Plan which will be a comprehensive schedule and will include all submittal requirements for procedures, notifications, reports and the Commissioning Report. After approval of the Commissioning Plan, revise the Contract NAS schedule to reflect the schedule requirements in the Commissioning Plan.

1.6 SEQUENCING AND SCHEDULING

Begin the work described in this Section only after all work required in related Sections has been successfully completed, and all test and inspection reports and operation and maintenance manuals required in these Sections have been submitted and approved. Pre-Functional Performance Test Checklists shall be performed at appropriate times during the construction phase of the Contract.

PART 2 EXECUTION

2.1 COMMISSIONING TEAM AND TEST FORMS AND CHECKLISTS

Designate Contractor team members to participate in the Pre-Functional Performance Test Checklists and the Functional Performance Tests specified herein. The team members shall be as follows:

Designation	Function
A	Contractor's Commissioning Specialist
M	Contractor's Mechanical Representative
E	Contractor's Electrical Representative
T	Contractor's Testing, Adjusting, and Balancing (TAB) Specialist
C	Contractor's Controls Representative
O	City of San Diego Representative

Appendix A shall be completed by the commissioning team. Acceptance by each commissioning team member of each Pre- Functional Performance Test Checklist item shall be indicated by initials and date unless an "X" is shown indicating that participation by that individual is not required. Acceptance by each commissioning team member of each functional performance test item shall be indicated by signature and date.

2.2 TESTS

Perform the pre-functional performance test checklists and functional performance tests in a manner that essentially duplicates the checking, testing, and inspection methods established in the related Sections. Where checking, testing, and inspection methods are not specified in other Sections, establish methods which will provide the information required. Testing and verification required by this section shall be performed during the Commissioning phase. Requirements in related Sections are independent from the requirements of this Section and shall not be used to satisfy any of the requirements specified in this Section. Provide all materials, services, and labor required to perform the pre-functional performance tests checks and functional performance tests. A functional performance test shall be aborted if any system deficiency prevents the successful completion of the test or if any participating non-City commissioning team member of which participation is specified is not present for the test.

2.2.1 Pre-Functional Performance Test Checklists

Perform Pre-Functional Performance Test Checklists, for the items indicated in Appendix A, at least 28 days prior to the start of Pre-Functional Performance Test Checks. Correct and re-inspect deficiencies discovered during these checks in accordance with the applicable contract requirements. Submit the schedule for the test checks at least 14 days prior to the start of Pre-Functional Performance Test Checks.

2.2.2 Functional Performance Tests

Submit test procedures at least 28 days prior to the start of Functional Performance Tests. Submit the schedule for the tests at least 14 days prior to the start of Functional Performance Tests. Tests shall prove all modes of the sequences of operation, and shall verify all other relevant contract requirements. Begin Tests with equipment or components and progress through subsystems to complete systems. Upon failure of any Functional Performance Test item, correct all deficiencies in accordance with the applicable contract requirements. The item shall then be retested until it has been completed with no errors.

2.3 COMMISSIONING REPORT

Submit the Commissioning Report, no later than 14 days after completion of Functional Performance Tests, consisting of completed Pre-Functional Performance Test Checklists and completed Functional Performance Tests organized by system and by subsystem and submitted as one package. The Commissioning Report shall also include all HVAC systems test reports, inspection reports (Preparatory, Initial and Follow-up inspections), start-up reports, TAB report, TAB verification report, Controls start-up test reports and Controls Performance Verification Test (PVT) report. The results of failed tests shall be included along with a description of the corrective action taken.

APPENDIX A

PRE-FUNCTIONAL PERFORMANCE TEST CHECKLISTS

Pre-Functional Performance Test Checklist - Multizone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	A	M	E	T	C	O
Installation						
a. Inspection and access doors are operable and sealed.		X		X		
b. Condensate drainage is unobstructed. (Visually verify pan drains completely by pouring a cup of water into drain pan.)		X		X	X	
c. Fan belt adjusted.	___	X		X		

Electrical	A	M	E	T	C	O
a. Power available to unit disconnect.	X			X	X	
b. Power available to unit control panel.	X			X	X	
c. Proper motor rotation verified.	X			X		
d. Verify that power disconnect is located within sight of the unit it controls.	X			X	X	
e. Power available to electric heating coil.		X		X	X	

Coils	A	M	E	T	C	O
a. Refrigerant piping properly connected.		X	X	X		

Controls	A	M	E	T	C	O
a. Control valves/actuators properly installed.		X	X	X		
b. Control valves/actuators operable.		X	X	X		
c. O/A dampers/actuators properly installed.		X	X	X		
d. O/A dampers/actuators operable.		X	X	X		

Pre-Functional Performance Test Checklist - Multizone Air Handling Unit
(cont)

e. Zone dampers/actuators properly installed & dampers leak checked.	X	X	X			
f. Zone dampers/actuators operable.	X	X	X			
Testing, Adjusting, and Balancing (TAB)	A	M	E	T	C	O
a. Construction filters removed and replaced.		X	X			
b. TAB report approved.		X	X		X	

Pre-Functional Performance Test Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item	A	M	E	T	C	O
Installation						
a. Inspection and access doors are operable and sealed.		X		X		
b. Condensate drainage is unobstructed. (Visually verify drainage by pouring a cup of water into drain pan.)		X	X	X		
c. Fan belt adjusted.		X		X		
Electrical						
a. Power available to unit disconnect.	X			X	X	
b. Power available to unit control panel.	X			X	X	
c. Proper motor rotation verified.	X			X		
d. Verify that power disconnect is located within sight of the unit it controls.	X			X	X	
e. Power available to electric heating coil.		X		X	X	
Coils						
a. Refrigerant piping properly connected.			X	X	X	

—

Pre-Functional Performance Test Checklist - Variable Volume Air Handling Unit

Controls	A	M	E	T	C	O
a. Control valves/actuators properly installed.						
b. Control valves/actuators operable.						
c. Dampers/actuators properly installed.						
d. Dampers/actuators operable.						
e. Verify proper location, installation and calibration of duct static pressure sensor.						
f. Fan air volume controller operable.						
g. Air handler controls system operational.						
 Testing, Adjusting, and Balancing (TAB)						
a. Construction filters removed and replaced.						
	X					
b. TAB report approved.	X	X				

Pre-Functional Performance Test Checklist - VAV Terminal

For VAV Terminal: [_____]

Checklist Item	A	M	E	T	C	O
Installation						
a. Reheat coil connected to hot water pipe.		X			X	
b. Electric reheat coil connected to local disconnect.	X			X		
Controls						
a. Cooling only VAV terminal controls set.	X	X	X			
b. Cooling only VAV controls verified.	X	X	X			
c. Reheat VAV terminal controls set.	X	X	X			
d. Reheat terminal/coil controls verified.	X	X	X			
Testing, Adjusting, and Balancing (TAB)						
a. TAB report approved.		X		X		

Pre-Functional Performance Test Checklist - DX Air Cooled Condensing Unit

For Condensing Unit: [_____]

Checklist Item	A	M	E	T	C	O
Installation						
a. Check condenser fans for proper rotation.		X		X		
Electrical						
a. Power available to unit disconnect.	X			X	X	
b. Power available to unit control panel.	X			X		
c. Verify that power disconnect is located within sight of the unit it controls	X			X		
Controls						
a. Unit safety/protection devices tested.		X	X			
b. Control system and interlocks installed.		X	X			
c. Control system and interlocks operational.		X	X			

Pre-Functional Performance Test Checklist - Exhaust Fan

For Exhaust Fan: [_____]

Checklist Item

Installation	A	M	E	T	C	O
a. Fan belt adjusted.		X		X		
Electrical	A	M	E	T	C	O
a. Power available to fan disconnect.		X				
b. Proper motor rotation verified.				X		
c. Verify that power disconnect is located within sight of the unit it controls.					X	
Controls	A	M	E	T	C	O
a. Control interlocks properly installed.		X				
b. Control interlocks operable.		X				
c. Dampers/actuators properly installed.		X				
d. Dampers/actuators operable.		X				
e. Verify proper location and installation of thermostat.						X
Testing, Adjusting, and Balancing (TAB)	A	M	E	T	C	O
a. TAB Report approved.		X		X		

Pre-Functional Performance Test Checklist - HVAC System Controls

For HVAC System: [_____]

Checklist Item

Installation	A	M	E	T	C	O
a. Layout of control panel matches drawings.		X	X			
b. Framed instructions mounted in or near control panel.		X	X			
c. Components properly labeled (on inside and outside of panel).		X	X			
d. Control components piped and/or wired to each labeled terminal strip.		X	X			
e. EMCS connection made to each labeled terminal strip as shown.		X	X			
f. Control wiring and tubing labeled at all terminations, splices, and junctions.		X	X			
Main Power and Control Air						
a. 120 volt AC power available to panel.		X				
b. 138 kPa gauge/20 psig compressed air available to panel.		X				
Testing, Adjusting, and Balancing (TAB)	A	M	E	T	C	O
a. TAB Report submitted.		X		X		

Pre-Functional Performance Test Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

Checklist Item

Installation	A	M	E	T	C	O
a. Inspection and access doors are operable and sealed.		X		X		
b. Condensate drainage is unobstructed.		X	X	X		
c. Fan belt adjusted.		X		X		
Electrical	A	M	E	T	C	O
a. Power available to unit disconnect.			X	X		
b. Power available to unit control panel.		X				
c. Proper motor rotation verified.			X			
d. Verify that power disconnect is located within sight of the unit it controls.		X				
e. Power available to electric heating coil.		X				
Coils	A	M	E	T	C	O
a. Chilled water piping properly connected.		X				
b. Refrigerant piping properly connected.		X	X	X		
c. Hot water piping properly connected.		X				
d. Steam and condensate piping properly connected.		X	X	X		
Controls	A	M	E	T	C	O
a. Control valves/actuators properly installed.		X				
b. Control valves/actuators operable.		X				
c. Dampers/actuators properly installed.		X				
d. Dampers/actuators operable.		X				
e. Verify proper location and installation of thermostat.		X				

Testing, Adjusting, and Balancing (TAB)

A M E T C O

a. TAB Report approved.

X X

Functional Performance Test - Cooling Tower [_____]

1. Demonstrate operation of the cooling tower in accordance with specification and the following:
 - a. Activate cooling tower fan start using control system command. This should first start condenser water pump, establish flow, delay fan start, as specified, to equalize flow in distribution basin and sump. Verify fan start after timed delay. _____
 - b. After chiller startup, control system should modulate bypass valve and two-speed fan motor to maintain condenser water set point. Verify function of bypass valve under varying loads. _____
 - c. Verify cooling tower interlock with chiller.
 - d. Verify makeup water float valve is functioning. _____
 - e. Activate chemical treatment feed valve, verify makeup of chemical treatment system, pump, and controls.
 - f. Record the following:
Entering water temperature _____ deg CF
Leaving water temperature: _____ deg CF
Measured water flow: _____ L/sgpm
Entering air wet bulb temperature: _____ deg CF
2. Compare results with test results from cooling tower specification test.
3.
 - a. Stop all building cooling equipment so that cooling tower pumps stop. Observe tower for at least 15 minutes and verify no overflow occurs _____.
 - b. Start cooling tower pumps in hand and observe pumps for air binding/cavitations, none allowed _____.
4. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Commissioning Specialist _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's TAB Representative _____

Contractor's Controls Representative _____

City of San Diego Representative _____

Functional Performance Test Checklist (cont)- VAV Terminals

c. Parallel Fan powered VAV boxes:

- (1) Verify VAV box responses to call for heating via set point adjustment. Change from cooling set point to heating set point. Verify cooling damper closes to minimum position, blower fan energizes according to sequence of operation, and upon further drop in space temperature, heating coil activation.

With heating water system in operation providing design supply hot water temperature record the following:

Design HW supply temperature _____ deg CF
Actual HW supply temperature _____ deg CF
AHU supply air temperature _____ deg CF
VAV supply air temperature _____ deg CF
Calculate coil capacity and compare to design:
Design _____ WBTU/hr Actual _____ WBTU/hr

- (2) Check primary air damper maximum/minimum flow settings and compare to actual measured flows.

	Setting	Measured	Design	
Maximum flow	[_____]	[_____]	[_____]	L/scfm
Minimum flow	[_____]	[_____]	[_____]	L/scfm

- (3) Check blower fan flow. [_____] L/scfm

- (4) Verify free operation of fan backdraft damper (insure no primary air is being discharged into plenum space).
-

d. Series Fan Powered VAV boxes

- (1) Ensure VAV fan starts prior to AHU fan
- (2) Verify VAV box response to sensor call for heating via set point adjustment. Change from cooling set point to heating set point. Verify cooling damper closes to minimum position and upon further drop in space temperature, heating coil activation. With heating water system and boiler in operation providing design supply hot water temperature record the following:

Design HW supply temperature _____ deg CF
Actual HW supply temperature _____ deg CF
AHU supply air temperature _____ deg CF
VAV supply air temperature _____ deg CF
Calculate coil capacity and compare to design:
Design _____ WBTU/hr Actual _____ WBTU/hr

- (3) Check primary air damper maximum/minimum flow settings and compare to actual measured flows.

	Setting	Measured	Design	
Maximum flow	[_____]	[_____]	[_____]	L/scfm
Minimum flow	[_____]	[_____]	[_____]	L/scfm

Functional Performance Test Checklist - Variable Volume Air Handling Unit

For Air Handling Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of air handling unit in accordance with specification including the following:
 - a. Ensure that a slight negative pressure exists on inboard side of the outside air dampers throughout the operation of the dampers. Modulate OA, RA, and EA dampers from fully open to fully closed positions _____.
 - b. The following shall be verified [supply fan operating][supply and return fans operating] mode is initiated:
 - (1) All dampers in normal position prior to fan start _____.
 - (2) All valves in normal position prior to fan start _____.
 - (3) System safeties allow start if safety conditions are met. _____
 - (4) VAV fan controller shall "soft-start" fan. _____
 - (5) Modulate all VAV boxes to minimum air flow and verify that the static pressure does not exceed the high static pressure shutdown setpoint _____.
 - (6) Return all VAV boxes to auto _____.
 - c. Occupied mode of operation - economizer de-energized. _____
 - (1) Outside air damper at minimum position. _____
 - (2) Return air damper open. _____
 - (3) Relief air damper at minimum position. _____
 - (4) Chilled water control valve modulating to maintain leaving air temperature set point. Setpoint ____deg CF Actual ____deg CF
 - (5) Fan VAV controller receiving signal from duct static pressure sensor and modulating fan to maintain supply duct static pressure set point. Setpoint _kPa inches-wg Actual ____kPa inches-wg
 - d. Occupied mode of operation - economizer energized.
 - (1) Outside air damper modulated to maintain mixed air temperature set point. Setpoint ____deg CF, Actual ____deg CF, Outside air damper position ____%.
 - (2) Relief air damper modulates with outside air damper according to sequence of operation. Relief air damper position _____%.
 - (3) Chilled water control valve modulating to maintain leaving air temperature set point. Setpoint _____deg CF Actual ____deg CF
 - (4) Hot water control valve modulating to maintain leaving air temperature set point. Setpoint ____deg CF Actual _deg CF

Functional Performance Test Checklist (cont) - Variable Volume Air Handling Unit

- (5) Fan VAV controller receives signal from duct static pressure sensor and modulates fan to maintain supply duct static pressure set point. Setpoint kPa inches-wg_Actual kPa inches-wg
- e. Unoccupied mode of operation
- (1) Observe fan starts when space temperature calls for heating and/or cooling. Note: This does not apply to series boxes.
- (2) All dampers in normal position.
- (3) Verify space temperature is maintained as specified in sequence of operation.____
- f. The following shall be verified when the [supply fan off][supply and return fans off] mode is initiated:
- (1) All dampers in normal position._____
- (2) All valves in normal position._____
- (3) Fan de-energizes._____
- g. Verify the chilled water coil control valve operation by setting all VAV's to maximum and minimum cooling.
- Max Cooling
- Supply air temp. deg CF Verify cooling valve operation_____.
- Min cooling
- Supply air temp. deg CF Verify cooling valve operation_____.
- h. Verify safety shut down initiated by low temperature protection thermostat.
- i. Verify occupancy schedule is programmed into time clock/UMCS_____.
2. Certification: We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Commissioning Specialist _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's TAB Representative _____

Contractor's Controls Representative _____

City of San Diego Representative _____

Functional Performance Test Checklist - Single Zone Air Handling Unit

For Air Handling Unit: [_____]

1. Functional Performance Test: Contractor shall verify operation of air handling unit in accordance with specification including the following:

a. Ensure that a slight negative pressure exists on inboard side of the outside air dampers throughout the operation of the dampers. Modulate OA, RA, and EA dampers from fully open to fully closed positions.

a. The following shall be verified when the [supply fan operating] [supply and return fans operating] mode is initiated:

(1) All dampers in normal position prior to fan start_____.

(2) All valves in normal position prior to fan start_____.

(3) System safeties allow start if safety conditions are met._____

b. Occupied mode of operation - economizer de-energized._____

(1) Outside air damper at minimum position._____

(2) Return air damper open._____

(3) Relief air damper at minimum position._____

(4) Chilled water control valve modulating to maintain space cooling temperature set point. Setpoint_____deg CF Actual _____deg CF

(5) Hot water control valve modulating to maintain space heating temperature set point input from outside air temperature controller.

c. Occupied mode of operation - economizer energized.

(1) Outside air damper modulated to maintain mixed air temperature set point.
Setpoint _____deg CF Actual _____deg CF _____O/A damper position _____%
Return Air Temperature _____deg CF Outside Air
Temperature _____deg CF

(2) Relief air damper modulates with outside air damper according to sequence of operation. Relief air damper position _____%

(3) Chilled water control valve modulating to maintain space cooling temperature set point.

Setpoint _____deg CF Actual _____deg CF Return sensor overrides to normal operation.

d. Unoccupied mode of operation.

(1) Observe fan starts when space temperature calls for heating/cooling _

(2) All dampers in normal position.

(3) Verify low limit space temperature is maintained as specified in sequence of operation.

Functional Performance Test Checklist (cont) - Single Zone Air Handling Unit

- e. The following shall be verified when the supply and return fans off:
 - (1) All dampers in normal position. _____
 - (2) All valves in normal position. _____
 - (3) Fan de-energizes. _____
 - f. Verify cooling coil and heating coil operation by varying thermostat set point from cooling set point to heating set point and returning to cooling set point ____.
 - g. Verify safety shut down initiated by low temperature protection thermostat _____.
 - h. Verify occupancy schedule is programmed into time clock/UMCS _____.
2. Certification: _____ We the undersigned have witnessed the above functional performance tests and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Commissioning Specialist _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's TAB Representative _____

Contractor's Controls Representative _____

City of San Diego Representative _____

Functional Performance Test Checklist - HVAC Controls

For HVAC System: [_____]

The Contracting Officer will select HVAC control systems to undergo functional performance testing. The number of systems shall not exceed 10 percent. Perform this test simultaneously with FPT for AHU or other controlled equipment.

1. Functional Performance Test: Contractor shall verify operation of HVAC controls by performing the Performance Verification Test {PVT} test for that system. Contractor to provide blank PVT test procedures previously done by the controls Contractor.
2. Verify interlock with UMCS system_____.
3. Verify all required I/O points function from the UMCS system_____.
4. Certification: We the undersigned have witnessed the Performance Verification Test and certify that the item tested has met the performance requirements in this section of the specifications.

Signature and Date

Contractor's Commissioning Specialist _____

Contractor's Mechanical Representative _____

Contractor's Electrical Representative _____

Contractor's TAB Representative _____

Contractor's Controls Representative _____

City of San Diego Representative _____

APPENDIX L

Thermal Insulation For Mechanical Systems

SECTION TABLE OF CONTENTS
DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING
SECTION 23 07 00
THERMAL INSULATION FOR MECHANICAL SYSTEMS
11/09

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 SYSTEM DESCRIPTION
 - 1.2.1 General
 - 1.2.2 Surface Burning Characteristics
 - 1.2.3 Recycled Materials
- 1.3 SUBMITTALS
- 1.4 QUALITY ASSURANCE
- 1.5 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

- 2.1 STANDARD PRODUCTS
- 2.2 MATERIALS
 - 2.2.1 Adhesives
 - 2.2.1.1 Acoustical Lining Insulation Adhesive
 - 2.2.1.2 Mineral Fiber Insulation Cement
 - 2.2.1.3 Lagging Adhesive
 - 2.2.2 Contact Adhesive
- 2.3 DUCT INSULATION SYSTEMS
 - 2.3.1 Duct Insulation
 - 2.3.1.1 Blanket Insulation
 - 2.3.2 Duct Insulation Jackets
 - 2.3.2.1 All-Purpose Jacket
 - 2.3.2.2 Metal Jackets
 - 2.3.2.3 Vapor Barrier/Weatherproofing Jacket
 - 2.3.3 Weatherproof Duct Insulation

PART 3 EXECUTION

- 3.1 APPLICATION - GENERAL
 - 3.1.1 Installation
 - 3.1.2 Firestopping
- 3.2 DUCT INSULATION SYSTEMS INSTALLATION
 - 3.2.1 Duct Insulation Thickness
 - 3.2.2 Insulation and Vapor Retarder/Vapor Barrier for Cold Air Duct
 - 3.2.2.1 Installation on Concealed Duct
 - 3.2.2.2 Installation on Exposed Duct Work
 - 3.2.3 Insulation for Warm Air Duct
 - 3.2.3.1 Installation on Concealed Duct
 - 3.2.3.2 Installation on Exposed Duct
 - 3.2.4 Ducts Handling Air for Dual Purpose
 - 3.2.5 Insulation for Evaporative Cooling Duct
 - 3.2.6 Duct Test Holes
 - 3.2.7 Duct Exposed to Weather

- 3.2.7.1 Installation
- 3.2.7.2 Round Duct
- 3.2.7.3 Fittings
- 3.2.7.4 Rectangular Ducts

-- End of Section Table of Contents --

SECTION 23 07 00

THERMAL INSULATION FOR MECHANICAL SYSTEMS
11/09

PART 1 GENERAL

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. At the discretion of the City, the manufacturer of any material supplied will be required to furnish test reports pertaining to any of the tests necessary to assure compliance with the standard or standards referenced in this specification.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-
CONDITIONING ENGINEERS (ASHRAE)

ASHRAE 90.1 - IP	(2007; Supplement 2008; Errata 2009; Errata 2009; INT 1-3 2009) Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE 90.2	(2007) Energy Efficient Design of Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM A 167	(1999; R 2009) Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 240/A 240M	(2009c) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
ASTM A 580/A 580M	(2008) Standard Specification for Stainless Steel Wire
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 1136	(2009) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
ASTM C 1290	(2006e1) Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts
ASTM C 195	(2007) Standard Specification for Mineral Fiber Thermal Insulating Cement
ASTM C 449	(2007) Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement

ASTM C 533	(2009) Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 534/C 534M	(2008) Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 552	(2007) Standard Specification for Cellular Glass Thermal Insulation
ASTM C 553	(2008) Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 591	(2009) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 612	(2009) Mineral Fiber Block and Board Thermal Insulation
ASTM C 647	(2008) Properties and Tests of Mastics and Coating Finishes for Thermal Insulation
ASTM C 795	(2008) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
ASTM C 916	(1985; R 2007) Standard Specification for Adhesives for Duct Thermal Insulation
ASTM C 920	(2008) Standard Specification for Elastomeric Joint Sealants
ASTM C 921	(2009) Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
ASTM D 774/D 774M	(1997; R 2007) Bursting Strength of Paper
ASTM D 882	(2009) Tensile Properties of Thin Plastic Sheeting
ASTM E 2231	(2009) Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics
ASTM E 84	(2009c) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E 96/E 96M	(2005) Standard Test Methods for Water Vapor Transmission of Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 255	(2005; Errata 06-1) Standard Method of Test of Surface Burning Characteristics of Building Materials
NFPA 90A	(2009; Errata 09-1) Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 90B	(2009) Standard for the Installation of Warm Air Heating and Air Conditioning Systems
NFPA 96	(2008) Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-3316	(1990; Rev C; Am 2) Adhesives, Fire-Resistant, Thermal Insulation
------------	---

UNDERWRITERS LABORATORIES (UL)

UL 723	(2008) Standard for Test for Surface Burning Characteristics of Building Materials
--------	--

1.2 SYSTEM DESCRIPTION

1.2.1 General

Provide field-applied insulation and accessories on mechanical systems as specified herein; factory-applied insulation is specified under the Field applied insulation materials required for use on City-furnished items as listed in the SPECIAL CONTRACT REQUIREMENTS shall be furnished and installed by the Contractor.

1.2.2 Surface Burning Characteristics

Unless otherwise specified, insulation shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Flame spread, and smoke developed indexes, shall be determined by ASTM E 84, NFPA 255 or UL 723. Insulation shall be tested in the same density and installed thickness as the material to be used in the actual construction. Test specimens shall be prepared and mounted according to ASTM E 2231. Insulation materials located exterior to the building perimeter are not required to be fire rated.

1.2.3 Recycled Materials

Provide thermal insulation containing recycled materials to the extent practicable, provided that the materials meets all other requirements of this section. The minimum recycled material content of the following insulation are:

- Rock Wool - 75 percent slag of weight
- Fiberglass - 20-25 percent glass cullet by weight

Rigid Foam - 9 percent recovered material

1.3 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item, that clearly show compliance with the project specifications.

a. Submittals:

See GREENBOOK and 2010 City Supplement, Section 2-5.3 for Shop Drawings and Submittals.

b. Substitutions:

See GREENBOOK and 2010 City Supplement, Section 4-1.6 for Substitutions.

SD-03 Product Data

A complete list of materials, including manufacturer's descriptive technical literature, performance data, catalog cuts, and installation instructions. The product number, k-value, thickness and furnished accessories including adhesives, sealants and jackets for each mechanical system requiring insulation shall be included. The product data must be copywriter, have an identifying or publication number, and shall have been published prior to the issuance date of this solicitation. Materials furnished under this section of the specification shall be submitted together in a booklet.

Duct Insulation Display Sections: Display sample sections for rigid and flexible duct insulation used on the job. A temporary covering shall be used to enclose and protect display sections for duct insulation exposed to weather.

SD-08 Manufacturer's Instructions

Submit a booklet containing manufacturer's published installation instructions for the insulation systems. The instructions must be copywritten, have an identifying or publication number, and shall have been published prior to the issuance date of this solicitation.

1.4 QUALITY ASSURANCE

Qualified installers shall have successfully completed three or more similar type jobs within the last 5 years.

1.5 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered in the manufacturer's unopened containers. Materials delivered and placed in storage shall be provided with protection from weather, humidity, dirt, dust and other contaminants. The Contracting Officer may reject insulation material and supplies that become dirty, dusty, wet, or contaminated by some other means. Packages or standard containers of insulation, jacket material, cements, adhesives, and coatings delivered for use, and samples required for approval shall have manufacturer's stamp or label attached giving the name of the manufacturer and brand, and a description of the material. Insulation packages and containers shall be asbestos free.

PART 2 PRODUCTS

2.1 STANDARD PRODUCTS

Provide materials which are the standard products of manufacturers regularly engaged in the manufacture of such products and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Provide insulation systems in accordance with the approved MICA National Insulation Standards plates as supplemented by this specification. Provide field-applied insulation for heating, ventilating, and cooling (HVAC) air distribution systems and piping systems which are located within, on, under, and adjacent to buildings; and for plumbing systems.

2.2 MATERIALS

Provide insulation that meets or exceed the requirements of ASHRAE 90.2. Insulation exterior shall be cleanable, grease resistant, non-flaking and non-peeling. Materials shall be compatible and shall not contribute to corrosion, soften, or otherwise attack surfaces to which applied in either wet or dry state. Materials to be used on stainless steel surfaces shall meet ASTM C 795 requirements. Materials shall be asbestos free and conform to the following:

2.2.1 Adhesives

2.2.1.1 Acoustical Lining Insulation Adhesive

Adhesive shall be a nonflammable, fire-resistant adhesive conforming to ASTM C 916, Type I.

2.2.1.2 Mineral Fiber Insulation Cement

Cement shall be in accordance with ASTM C 195.

2.2.1.3 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. Lagging adhesives shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Adhesive shall be MIL-A-3316, Class 1, pigmented white and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation.

2.2.2 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprene based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on metal to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried

adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 212 degrees F. The dried adhesive shall be nonflammable and fire resistant. Natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation shall be used to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern must remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

2.3 DUCT INSULATION SYSTEMS

2.3.1 Duct Insulation

Provide factory-applied cellular glass polyisocyanurate or phenolic foam elastomeric insulation. Provide factory applied elastomeric closed cell or phenolic foam insulation according to manufacturer's recommendations for insulation with insulation manufacturer's standard reinforced fire-retardant vapor barrier, with identification of installed thermal resistance (R) value and out-of-package R value.

Blanket flexible mineral fiber insulation conforming to ASTM C 553, Type 1, Class B-3, 3/4 pcf nominal, 2.0 inches thick or Type II up to 250 degrees F. Also ASTM C 1290 Type III may be used.

2.3.2 Duct Insulation Jackets

2.3.2.1 All-Purpose Jacket

Provide insulation with insulation manufacturer's standard reinforced fire-retardant jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jacket with a white surface suitable for field painting.

2.3.2.2 Metal Jackets

- a. Aluminum Jackets: ASTM B 209, Temper H14, minimum thickness of 27 gauge (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside dimension 8 inches and larger. Provide corrugated surface jackets for jacket outside dimension 8 inches and larger. Provide stainless steel bands, minimum width of 1/2 inch.
- b. Stainless Steel Jackets: ASTM A 167 or ASTM A 240/A 240M; Type 304, minimum thickness of 33 gauge (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 1/2 inch.

2.3.2.3 Vapor Barrier/Weatherproofing Jacket

Vapor barrier/weatherproofing jacket shall be laminated self-adhesive minimum 2 mils adhesive, 3 mils embossed less than 0.0000 permeability, greater than 3 ply, standard grade, silver, white, black and embossed or greater than 8 ply minimum 2.9 mils adhesive, heavy duty white or natural.

2.3.3 Weatherproof Duct Insulation

Provide ASTM C 591 Type I, polyurethane or polyisocyanate board insulation, minimum density of 1.7 pcf, and weatherproofing as specified in manufacturer's instruction.

PART 3 EXECUTION

3.1 APPLICATION - GENERAL

Insulation shall only be applied to unheated and uncooled. The insulation shall not pull apart after a one hour period; any insulation found to pull apart after one hour, shall be replaced.

3.1.1 Installation

Except as otherwise specified, material shall be installed in accordance with the manufacturer's written instructions. Insulation materials shall not be applied until tests specified in other sections of this specification are completed. Material such as rust, scale, dirt and moisture shall be removed from surfaces to receive insulation. Insulation shall be kept clean and dry. Insulation shall not be removed from its shipping containers until the day it is ready to use and shall be returned to like containers or equally protected from dirt and moisture at the end of each workday. Insulation that becomes dirty shall be thoroughly cleaned prior to use. If insulation becomes wet or if cleaning does not restore the surfaces to like new condition, the insulation will be rejected, and shall be immediately removed from the jobsite. Joints shall be staggered on multi layer insulation. Mineral fiber thermal insulating cement shall be mixed with demineralized water when used on stainless steel surfaces.

3.1.2 Firestopping

The protection of ducts at point of passage through firewalls must be in accordance with NFPA 90A and/or NFPA 90B. All other penetrations, such as piping, conduit, and wiring, through firewalls must be protected with a material or system of the same hourly rating that is listed by UL, FM, or a NRTL.

3.2 DUCT INSULATION SYSTEMS INSTALLATION

Except for oven hood exhaust duct insulation, corner angles shall be installed on external corners of insulation on ductwork in exposed finished spaces before covering with jacket. Duct insulation shall be omitted on exposed supply and return ducts in air conditioned spaces where the difference between supply air temperature and room air temperature is less than 15 degrees F unless otherwise shown. Air conditioned spaces shall be defined as those spaces directly supplied with cooled conditioned air or provided with a cooling device such as a fan-coil unit and heated conditioned air or provided with a heating device such as a unit heater, radiator or convector.

3.2.1 Duct Insulation Thickness

Duct insulation thickness shall be in accordance with Table 4.

Table 4 - Minimum Duct Insulation (inches)

Cold Air Ducts	2.0
Relief Ducts	1.5
Fresh Air Intake Ducts	1.5
Warm Air Ducts	2.0
Relief Ducts	1.5
Fresh Air Intake Ducts	1.5

3.2.2 Insulation and Vapor Retarder/Vapor Barrier for Cold Air Duct

Insulation and vapor retarder/vapor barrier shall be provided for the following cold air ducts and associated equipment.

- a. Supply ducts.
- b. Return air ducts.
- c. Relief ducts.
- d. Flexible run-outs (field-insulated).
- e. Plenums.
- f. Duct-mounted coil casings.
- g. Coil headers and return bends.
- h. Coil casings.
- i. Fresh air intake ducts.
- j. Filter boxes.
- k. Mixing boxes (field-insulated).
- l. Supply fans (field-insulated).
- m. Site-erected air conditioner casings.
- n. Ducts exposed to weather.
- o. Combustion air intake ducts.

Insulation for rectangular ducts shall be flexible type where concealed, minimum density 3/4 pcf, and rigid type where exposed, minimum density 3 pcf. Insulation for both concealed or exposed round/oval ducts shall be flexible type, minimum density 3/4 pcf or a semi rigid board, minimum density 3 pcf, formed or fabricated to a tight fit, edges beveled and joints tightly butted and staggered. Insulation for all exposed ducts shall be provided with either a white, paint-able, factory-applied Type I jacket or a field applied vapor retarder/vapor barrier jacket coating finish as specified, the total field applied dry film thickness shall be approximately 1/16 inch. Insulation on all concealed duct shall be provided with a factory-applied Type I or II vapor retarder/vapor barrier jacket. Duct insulation shall be continuous through sleeves and prepared openings except firewall penetrations. Duct insulation terminating at fire dampers, shall be continuous over the damper collar and retaining angle of fire dampers, which are exposed to unconditioned air and which may be prone to condensate formation. Duct insulation and vapor retarder/vapor barrier shall cover the collar, neck, and any un-insulated surfaces of diffusers, registers and grills. Vapor retarder/vapor barrier materials shall be applied to form a complete unbroken vapor seal over the insulation. Sheet Metal Duct shall be sealed in accordance with Section 23 00 00 AIR SUPPLY, DISTRIBUTION, VENTILATION, and EXHAUST SYSTEM.

3.2.2.1 Installation on Concealed Duct

- a. For rectangular, oval or round ducts, flexible insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.
- b. For rectangular and oval ducts, 24 inches and larger insulation shall be additionally secured to bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.
- c. For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 16 inch centers and not more than 16 inches from duct corners.
- d. Insulation shall be impaled on the mechanical fasteners self stick pins where used and shall be pressed thoroughly into the adhesive. Care shall be taken to ensure vapor retarder/vapor barrier jacket joints overlap 2 inches. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type duct hangers.
- e. Where mechanical fasteners are used, self-locking washers shall be installed and the pin trimmed and bent over.
- f. Jacket overlaps shall be secured with staples and tape as necessary to ensure a secure seal. Staples, tape and seams shall be coated with a brush coat of vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate minimum 2 mils adhesive, 3 mils embossed - less than 0.0000 perm adhesive tape.
- g. Breaks in the jacket material shall be covered with patches of the same material as the vapor retarder jacket. The patches shall extend not less than 2 inches beyond the break or penetration in all directions and shall be secured with tape and staples. Staples and tape joints shall be sealed with a brush coat of vapor retarder coating or PVDC adhesive tape or greater than 3 ply laminate minimum 2 mils adhesive, 3 mils embossed - less than 0.0000 perm adhesive tape.

- h. At jacket penetrations such as hangers, thermometers, and damper operating rods, voids in the insulation shall be filled and the penetration sealed with a brush coat of vapor retarder coating or PVDC adhesive tape greater than 3 ply laminate minimum 2 mils adhesive, 3 mils embossed - less than 0.0000 perm adhesive tape.
- i. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish or tape with a brush coat of vapor retarder coating. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.
- j. Where insulation standoff brackets occur, insulation shall be extended under the bracket and the jacket terminated at the bracket.

3.2.2.2 Installation on Exposed Duct Work

- a. For rectangular ducts, rigid insulation shall be secured to the duct by mechanical fasteners on all four sides of the duct, spaced not more than 12 inches apart and not more than 3 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger. One row shall be provided for each side of duct less than 12 inches. Mechanical fasteners shall be as corrosion resistant as G60 coated galvanized steel, and shall indefinitely sustain a 50 lb tensile dead load test perpendicular to the duct wall.
- b. Duct insulation shall be formed with minimum jacket seams. Each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projections is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over. Vapor retarder/barrier jacket shall be continuous across seams, reinforcing, and projections. When height of projections is greater than the insulation thickness, insulation and jacket shall be carried over. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors.
- c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and the pin trimmed and bent over.
- d. Joints in the insulation jacket shall be sealed with a 4 inch wide strip of tape. Tape seams shall be sealed with a brush coat of vapor retarder coating.
- e. Breaks and ribs or standing seam penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with tape and stapled. Staples and joints shall be sealed with a brush coat of vapor retarder coating.
- f. At jacket penetrations such as hangers, thermometers, and damper operating rods, the voids in the insulation shall be filled and the penetrations sealed with a brush coat of vapor retarder coating.
- g. Insulation terminations and pin punctures shall be sealed and flashed with a reinforced vapor retarder coating finish. The coating shall overlap the adjoining insulation and un-insulated surface 2 inches. Pin puncture coatings shall extend 2 inches from the puncture in all directions.

- h. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation with minimum density of 3/4 pcf, attached as in accordance with MICA standards.

3.2.3 Insulation for Warm Air Duct

Insulation and vapor barrier shall be provided for the following warm air ducts and associated equipment:

- a. Supply ducts.
- b. Return air ducts.
- c. Relief air ducts
- d. Flexible run-outs (field insulated).
- e. Plenums.
- f. Duct-mounted coil casings.
- g. Coil-headers and return bends.
- h. Coil casings.
- i. Fresh air intake ducts.
- j. Filter boxes.
- k. Mixing boxes.
- l. Supply fans.
- m. Site-erected air conditioner casings.
- n. Ducts exposed to weather.

Insulation for rectangular ducts shall be flexible type where concealed, and rigid type where exposed. Insulation on exposed ducts shall be provided with a white, paint-able, factory-applied Type II jacket, or finished with adhesive finish. Flexible type insulation shall be used for round ducts, with a factory-applied Type II jacket. Insulation on concealed duct shall be provided with a factory-applied Type II jacket. Adhesive finish where indicated to be used shall be accomplished by applying two coats of adhesive with a layer of glass cloth embedded between the coats. The total dry film thickness shall be approximately 1/16 inch. Duct insulation shall be continuous through sleeves and prepared openings. Duct insulation shall terminate at fire dampers and flexible connections.

3.2.3.1 Installation on Concealed Duct

- a. For rectangular, oval and round ducts, insulation shall be attached by applying adhesive around the entire perimeter of the duct in 6 inch wide strips on 12 inch centers.

- b. For rectangular and oval ducts 24 inches and larger, insulation shall be secured to the bottom of ducts by the use of mechanical fasteners. Fasteners shall be spaced on 18 inch centers and not more than 18 inches from duct corner.
- c. For rectangular, oval and round ducts, mechanical fasteners shall be provided on sides of duct risers for all duct sizes. Fasteners shall be spaced on 18 inch centers and not more than 18 inches from duct corners.
- d. The insulation shall be impaled on the mechanical fasteners where used. The insulation shall not be compressed to a thickness less than that specified. Insulation shall be carried over standing seams and trapeze-type hangers.
- e. Self-locking washers shall be installed where mechanical fasteners are used and the pin trimmed and bent over.
- f. Insulation jacket shall overlap not less than 2 inches at joints and the lap shall be secured and stapled on 4 inch centers.

3.2.3.2 Installation on Exposed Duct

- a. For rectangular ducts, the rigid insulation shall be secured to the duct by the use of mechanical fasteners on all four sides of the duct, spaced not more than 16 inches apart and not more than 6 inches from the edges of the insulation joints. A minimum of two rows of fasteners shall be provided for each side of duct 12 inches and larger and a minimum of one row for each side of duct less than 12 inches.
- b. Duct insulation with factory-applied jacket shall be formed with minimum jacket seams, and each piece of rigid insulation shall be fastened to the duct using mechanical fasteners. When the height of projection is less than the insulation thickness, insulation shall be brought up to standing seams, reinforcing, and other vertical projections and shall not be carried over the projection. Jacket shall be continuous across seams, reinforcing, and projections. Where the height of projections is greater than the insulation thickness, insulation and jacket shall be carried over the projection.
- c. Insulation shall be impaled on the fasteners; self-locking washers shall be installed and pin trimmed and bent over.
- d. Joints on jacketed insulation shall be sealed with a 4 inch wide strip of tape and brushed with vapor retarder coating.
- e. Breaks and penetrations in the jacket material shall be covered with a patch of the same material as the jacket. Patches shall extend not less than 2 inches beyond the break or penetration and shall be secured with adhesive and stapled.
- f. Insulation terminations and pin punctures shall be sealed with tape and brushed with vapor retarder coating.
- g. Oval and round ducts, flexible type, shall be insulated with factory Type I jacket insulation, minimum density of 3/4 pcf attached by staples spaced not more than 16 inches and not more than 6 inches from the degrees of joints. Joints shall be sealed in accordance with item "d." above.

3.2.4 Ducts Handling Air for Dual Purpose

For air handling ducts for dual purpose below and above 60 degrees F, ducts shall be insulated as specified for cold air duct.

3.2.5 Insulation for Evaporative Cooling Duct

Evaporative cooling supply duct located in spaces not evaporatively cooled, shall be insulated. Material and installation requirements shall be as specified for duct insulation for warm air duct.

3.2.6 Duct Test Holes

After duct systems have been tested, adjusted, and balanced, breaks in the insulation and jacket shall be repaired in accordance with the applicable section of this specification for the type of duct insulation to be repaired.

3.2.7 Duct Exposed to Weather

3.2.7.1 Installation

Ducts exposed to weather shall be insulated and finished as specified for the applicable service for exposed duct inside the building. After the above is accomplished, the insulation shall then be further finished as detailed in the following subparagraphs.

3.2.7.2 Round Duct

Laminated self-adhesive minimum 2 mils adhesive, 3 mils embossed vapor barrier/weatherproofing jacket - Less than 0.0000 permeability, greater than 3 ply, standard grade, silver, white, black and embossed or greater than 8 ply, heavy duty, white and natural membrane shall be applied overlapping material by 3 inches no bands or caulking needed - see manufacturer's recommended installation instructions. Aluminum jacket with factory applied moisture retarder shall be applied with the joints lapped not less than 3 inches and secured with bands located at circumferential laps and at not more than 12 inch intervals throughout. Horizontal joints shall lap down to shed water and located at 4 or 8 o'clock position. Joints shall be sealed with caulking to prevent moisture penetration. Where jacketing abuts an un-insulated surface, joints shall be sealed with caulking.

3.2.7.3 Fittings

Fittings and other irregular shapes shall be finished as specified for rectangular ducts.

3.2.7.4 Rectangular Ducts

Two coats of weather barrier mastic reinforced with fabric or mesh for outdoor application shall be applied to the entire surface. Each coat of weatherproof mastic shall be 1/16 inch minimum thickness. The exterior shall be a metal jacketing applied for mechanical abuse and weather protection, and secured with screws.

-- End of Section --

APPENDIX M

Metal Ducts

SECTION TABLE OF CONTENTS

DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 23 31 13.00 40

METAL DUCTS

02/09

PART 1 GENERAL

- 1.1 REFERENCES
- 1.2 DESIGN REQUIREMENTS
- 1.3 SUBMITTALS
- 1.4 GENERAL REQUIREMENTS
- 1.5 DRAWINGS

PART 2 PRODUCTS

- 2.1 MATERIALS
 - 2.1.1 Galvanized Steel Ductwork Materials
- 2.2 COMPONENTS
 - 2.2.1 Round Sheet Metal Duct Fittings
 - 2.2.2 Reinforcement
 - 2.2.3 Fittings
 - 2.2.4 Turning Vanes
 - 2.2.5 Flexible Connectors For Sheet Metal
 - 2.2.6 Duct Hangers
 - 2.2.7 Mill-Rolled Reinforcing And Supporting Materials
 - 2.2.8 Flexible Duct Materials
 - 2.2.9 Manual Volume Dampers

PART 3 EXECUTION

- 3.1 PREPARATION
- 3.2 INSTALLATION
- 3.3 APPLICATION
 - 3.3.1 Low Pressure Sheet Metal Ducts
 - 3.3.1.1 Longitudinal Duct Seams
 - 3.3.1.2 Flexible Duct Joints
 - 3.3.1.3 Square Elbows
 - 3.3.1.4 Radius Elbows
 - 3.3.1.5 Outlets, Inlets, And Duct Branches
 - 3.3.1.6 Duct Transitions
 - 3.3.1.7 Branch Connections
 - 3.3.1.8 Flexible Connectors for Sheet Metal
 - 3.3.2 Rectangular Sheet Metal Ducts
 - 3.3.2.1 Medium-Pressure Gages, Joints, And Reinforcement
 - 3.3.3 Round Sheet Metal Ducts
 - 3.3.3.1 Duct Gages, Joints, And Reinforcement
 - 3.3.3.2 Duct Transitions

- 3.3.4 Transverse Reinforcement Joints
- 3.3.5 Radius Elbows
- 3.3.6 Duct Supports
- 3.3.7 Flexible Connectors For Steel Metal

3.3.8 Openings In Roofs And Walls

3.4 FIELD QUALITY CONTROL

3.4.1 Ductwork Leakage Tests

3.5 DUCTWORK CLEANING PROVISIONS

3.6 OPERATION AND MAINTENANCE

SECTION 23 31 13
METAL DUCTS
02/09

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2005) Steel Construction Manual
ANSI/AISC 360	(2005) Specification for Structural Steel Buildings, with Commentary

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ASHRAE EQUIP IP HDBK	(2008) Handbook, HVAC Systems and Equipment (IP Edition)
ASHRAE FUN IP	(2009) Fundamentals Handbook, I-P Edition

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 653/A 653M	(2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 924/A 924M	(2009a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 90A	(2009; Errata 09-1) Standard for the Installation of Air Conditioning and Ventilating Systems
----------	---

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

SMACNA 1966	(2005) HVAC Duct Construction Standards Metal and Flexible, 3rd Edition
-------------	---

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS 2480

(2009) Phosphate Treatment, Paint, Base

UNDERWRITERS LABORATORIES (UL)

UL 181

(2005; R 2005 thru 2008) Standard for Factory-Made Air Ducts and Air Connectors

1.2 DESIGN REQUIREMENTS

AIR SUPPLY, DISTRIBUTION, VENTILATION, AND EXHAUST SYSTEMS apply to work specified in this section.

VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT applies to work in this section.

1.3 SUBMITTALS

Submit detailed and annotated manufacturer's data, drawings, and specification sheets for each item, that clearly show compliance with the project specifications.

a. Submittals:

See GREENBOOK and 2010 City Supplement, Section 2-5.3 for Shop Drawings and Submittals.

b. Substitutions:

See GREENBOOK and 2010 City Supplement, Section 4-1.6 for Substitutions.

1.4 GENERAL REQUIREMENTS

Submit Records of Existing Conditions consisting of the results of Contractor's survey of work area conditions and features of existing structures and facilities within and adjacent to the jobsite. Commencement of work constitutes acceptance of existing conditions.

Include the manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site information within Material, Equipment, and Fixture Lists.

1.5 DRAWINGS

Provide mark up to plans 36649-D with current factual information including deviations from, and amendments to, the drawings and concealed or visible changes in the work. Label drawings "As-Built".

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Galvanized Steel Ductwork Materials

Galvanized steel ductwork sheet metal shall be carbon steel, of lock-forming quality, hot-dip galvanized, with regular spangle-type zinc coating, conforming to ASTM A 924/A 924M and ASTM A 653/A 653M, Designation G90. Treat duct surfaces to be painted by phosphatizing.

Conform to ASHRAE EQUIP IP HDBK, Chapter 16, ASHRAE FUN IP, Chapter 32 and SMACNA 1966 for sheet metal gages and reinforcement thickness.

Low pressure ductwork minimum standards are as follows:

MINIMUM SHEET METAL GAGE	
DUCT WIDT INCHES	GAGE
0 – 12	26
13 – 30	24
31 – 60	22

2.2 COMPONENTS

2.2.1 Round Sheet Metal Duct Fittings

Shop fabricate fittings.

Manufacture as separate fittings, not as tap collars welded or brazed into duct sections.

Submit for approval offset configurations.

Miter elbows shall be two-piece type for angles less than 31 degrees, three-piece type for angles 31 through 60 degrees, and five-piece type for angles 61 through 90 degrees. Centerline radius of elbows shall be 1-1/2 times fitting cross section diameter.

Crosses, increasers, reducers, reducing tees, and 90-degree tees shall be conical type.

Cutouts in fitting body shall be equal to branch tap dimension or, where smaller, excess material shall be flared and rolled into smooth radius nozzle configuration.

2.2.2 Reinforcement

Support inner liners of both duct and fittings by metal spacers welded in position to maintain spacing and concentricity.

2.2.3 Fittings

Make divided flow fittings as separate fittings, not tap collars into duct sections, with the following construction requirements:

Sound, airtight, continuous welds at intersection of fitting body and tap

Tap liner securely welded to inner liner, with weld spacing not to exceed 3 inches

Pack insulation around the branch tap area for complete cavity filling.

Carefully fit branch connection to cutout openings in inner liner without spaces for air erosion of insulation and without sharp projections that cause noise and airflow disturbance.

Continuously braze seams in the pressure shell of fittings. Protect galvanized areas that have been damaged by welding with manufacturer's standard corrosion-resistant coating.

Submit for approval offset configurations.

Elbows shall be two-piece type for angles through 35 degrees, three-piece type for angles 36 through 71 degrees, and five-piece type for angles 72 through 90 degrees.

Crosses, increasers, reducers, reducing tees, and 90-degree tees shall be conical type.

2.2.4 Turning Vanes

Turning vanes shall be double-wall type, commercially manufactured for high-velocity system service.

2.2.5 Flexible Connectors

For Sheet Metal

Connectors shall be UL listed, 30-ounce per square foot, waterproof, fire-retardant, airtight, woven fibrous-glass cloth, double coated with chloroprene. Clear width, not including clamping section, shall be 6 to 8 inches.

2.2.6 Duct Hangers

Duct hangers in contact with galvanized duct surfaces shall be galvanized black carbon steel painted with inorganic zinc.

2.2.7 Mill-Rolled Reinforcing And Supporting Materials

Mill-rolled structural steel shall conform to ASTM A 36/A 36M and, whenever in contact with sheet metal ducting, shall be galvanized in accordance with ASTM A 123/A 123M.

Equivalent strength, proprietary-design, rolled-steel structural support systems may be submitted for approval in lieu of mill-rolled structural steel.

2.2.8 Flexible Duct Materials

Flexible duct connectors shall be in accordance with UL 181, Class 1 material and shall comply with NFPA 90A.

Wire-reinforced duct shall consist of a minimum 1 pound/cubic foot density fibrous glass bonded to and supported by corrosion-protected spring helix. Vapor barrier shall be a mil minimum, film. Duct shall be bendable without damage through 180 degrees with an inside bend radius not greater than two duct diameters. Minimum wall thickness shall be inch. Thermal conductivity shall be not greater than 0.23 Btu per hour per square foot per degrees F at 75 degrees F mean. Permeance shall be not greater than 0.10 perm. Working pressure range shall be from minus 2 inch wg to plus 1 ½ inches wg. Working temperature shall range from minus 20 to plus 250 degrees F. Minimum sustained velocity without delamination shall be 2,400 fpm. Materials shall conform to NFPA 90A.

2.2.9 Gravity Backdraft And Relief Dampers

Frame shall be constructed of not less than 1-1/2- by 4 inch reinforced 16-gage galvanized carbon steel. Frames and mullions shall be solidly secured in place and sealed with elastomer caulking against air bypass.

Maximum blade width shall be 9 inches, and maximum blade length shall be 36 inches. 14-gage 6063 alloy aluminum. Blades shall be provided with mechanically retained seals and 90-degree limit stops.

Dampers used for relief service shall have blades linked together to open not less than 30 degrees on 0.05 inch wg differential pressure.

Shaft bearings shall be graphite-impregnated nylon.

Counterbalanced dampers shall be equipped with fixed or adjustable counterbalancing weights.

Gravity backdraft dampers in sizes 18 by 18 inches or smaller, when furnished integral with air moving equipment, may be equipment manufacturer's standard construction.

PART 3 EXECUTION

3.1 PREPARATION

Provide sheet metal construction in accordance with the recommendations for best practices in ASHRAE EQUIP IP HDBK, Chapter 16, SMACNA 1966, NFPA 90A, and ASHRAE FUN IP, Chapter 32.

Where construction methods for certain items are not described in the referenced standards or herein, perform the work in accordance with recommendations for best practice defined in ASHRAE EQUIP IP HDBK.

Clean free of oil, grease, and deleterious substances sheet metal surfaces to be painted and surfaces to which adhesives are to be applied.

Duct strength shall be adequate to prevent failure under service pressure or vacuum created by fast closure of duct devices. Provide leaktight, automatic relief devices.

Supplementary steel shall be designed and fabricated in accordance with ANSI/AISC 360 and AISC 325.

3.2 INSTALLATION

Fabricate airtight and include reinforcements, bracing, supports, framing, gasketing, sealing, and fastening to provide rigid construction and freedom from vibration, airflow-induced motion and noise, and excessive deflection at specified maximum system air pressure and velocity.

Enclose dampers located behind architectural intake or exhaust louvers by a rigid sheet metal collar and sealed to building construction with elastomers for complete air tightness.

Provide offsets and transformations as required to avoid interference with the building construction, piping, or equipment.

Wherever ducts pass through firewalls or through walls or floors dividing conditioned spaces from unconditioned spaces, provide a flanged segment in that surface during surface construction.

Clean free of oil, grease, and deleterious substances sheet metal surfaces to be painted or surfaces to which adhesives will be applied.

Where interiors of ducting may be viewed through air diffusion devices, construct the viewed interior with sheet metal and paint flat black.

Make plenum anchorage provisions, sheet metal joints, and other areas airtight and watertight by calking mating galvanized steel and concrete surfaces with a two-component elastomer.

3.3 APPLICATION

3.3.1 Low Pressure Sheet Metal Ducts

Weld angle iron frames at corners and ends, whenever possible. Angle iron reinforcements shall be riveted or welded to ducts not more than 6 inches on center, with not less than two points of attachment. Spot welding, where used, shall be 3 inches on center.

Standard seam joints shall be sealed with an elastomer compound to comply with SMACNA 1966 Seal Class A, B or C as applicable.

Crossbreaking shall be limited to 4 feet and shall be provided on all ducts 8 inches wide and wider. Bead reinforcement shall be provided in lieu of crossbreaking where panel popping may occur. Where rigid insulation will be applied, crossbreaking is not required.

3.3.1.1 Longitudinal Duct Seams

Corner seams shall be Pittsburgh lock.

3.3.1.2 Flexible Duct Joints

Joints between flexible duct without sheet metal collars and round metal ductwork connections shall be made by trimming the ends, coating the inside of the flexible duct for a distance equal to depth of insertion with elastomer calk, and by securing with sheet metal screws or binding with a strap clamp.

3.3.1.3 Square Elbows

Provide double-vane duct turns in accordance with SMACNA 1966.

3.3.1.4 Radius Elbows

Conform to SMACNA 1966 for radius elbows. Provide an inside radius equal to the width of the duct. Where installation conditions preclude use of standard elbows, the inside radius may be reduced to a minimum of 0.25 times duct width and install turning vanes in accordance with the following schedule.

RADIUS OF TURNING WIDTH OF ELBOWS VANES IN PERCENT OF DUCT WIDTH			
<u>INCHES</u>	<u>VANE NO. 1</u>	<u>VANE NO. 2</u>	<u>VANE NO. 3</u>
0 Up to 16	56	--	--
17 to 48	43	73	--
49 & over	37	55	83

Where two elbows are placed together in the same plane in ducts 30 inches wide and larger, the guide vanes shall be continuous through both elbows rather than spaced in accordance with above schedule.

3.3.1.5 Outlets, Inlets, And Duct Branches

Install branches, inlets, and outlets so that air turbulence will be reduced to a minimum and air volume properly apportioned.

3.3.1.6 Duct Transitions

Where the shape of a duct changes, the angle of the side of the transition piece shall not exceed 15 degrees from the straight run of duct connected thereto.

Where equipment is installed in ductwork, the angle of the side of the transition piece from the straight run of duct connected thereto shall not exceed 15 degrees on the upstream side of the equipment and 22-1/2 degrees on the downstream side of the equipment.

3.3.1.7 Branch Connections

Construct radius tap-ins in accordance with SMACNA 1966.

3.3.1.8 Flexible Connectors for Sheet Metal

Air handling equipment, ducts crossing building expansion joints, and fan inlets and outlets shall be connected to upstream and downstream components by treated woven-cloth connectors.

Connectors shall be installed only after system fans are operative, and vibration isolation mountings have been adjusted. When system fans are operating, connectors shall be free of wrinkle caused by misalignment or fan reaction. Width of surface shall be curvilinear.

3.3.2 Rectangular Sheet Metal Ducts

3.3.2.1 Medium-Pressure Gages, Joints, and Reinforcement

Minimum sheet metal gages, joints, and reinforcements between joints shall be in accordance with ASHRAE EQUIP IP HDBK, Chapter 16, ASHRAE FUN IP, Chapter 32 and SMACNA 1966.

Sheet metal minimum thickness, transverse reinforcement between joints, and joints of ducts shall be in accordance with the following:

LONGEST SIDE INCHES	SHEET METAL GAGE ALL SIDES	COMPANION ANGLE INCHES	REINFORCEMENT ANGLES INCHES, 24 INCHES ON CENTER MAXIMUM (BACK TO BACK)
97 to 108	16	2 by 2 by 1/8, two tie rods along angle	Two 2 by 2 by 1/8, two tie rods along angle
109 to 132	16	2 by 2 by 3/16, two tie rods along angle	Two 2 by 2 by 3/16, two tie rods along angle
133 and longer	14	2 by 2 by 3/16, with tie rods every 48 inches 48 inches	Two 2 by 2 by 3/16, with tie rods every

3.3.3 Round Sheet Metal Ducts

3.3.3.1 Duct Gages, Joints, And Reinforcement

Sheet metal minimum thickness, joints, and reinforcement between joints shall be in accordance with ASHRAE EQUIP IP HDBK, Chapter 16, ASHRAE FUN IP, Chapter 32 and SMACNA 1966.

Longitudinal duct joint shall be manufactured by machine, with spiral lockseams to and including 60 inch diameters, and to dimensional tolerances compatible with fittings provided.

Ducts shall have supplemental girth angle supports, tack welded to duct. Girth angles shall be located as follows:

<u>DIAMETER, INCHES</u>	<u>REINFORCEMENT-MAXIMUM SPACING, INCHES</u>
25 to 36	1-1/4 by 1-1/4, 1/8 thick, 72 inches on center
37 to 50	1-1/4 by 1-1/4, 1/8 thick, 60 inches on center
51 to 60	1-1/2 by 1-1/2, 1/8 thick, 48 inches on center

Draw band girth joints are not acceptable.

Slip joints shall be made up by coating the male fitting with elastomer sealing materials, exercising care to prevent mastic from entering fitting bore, leaving only a thin annular mastic line exposed internally. Sheet metal screws shall be used to make assembly rigid, not less than four screws per joint, maximum spacing 6 inches. Pop rivets shall not be used. All joints shall be taped and heat sealed.

Bolt heads and nuts shall be hex-shaped, 5/16 inch diameter for ducts up to 50 inch diameter, and 3/8 inch diameter for 51 inch diameter ducts and larger.

3.3.3.2 Duct Transitions

Where the shape of a duct changes, the angle of the side of the transition piece shall not exceed 15 degrees from the straight run of duct connected thereto.

Where equipment is installed in ductwork, the angle of the side of the transition piece from the straight run of duct connected thereto shall not exceed 15 degrees on the upstream side of the equipment and 22-1/2 degrees on the downstream side of the equipment.

3.3.4 Transverse Reinforcement Joints

Transverse reinforcements shall be spot welded 4 inches on center. Transverse reinforcement shall be welded at all corners to form continuous frames.

3.3.5 Radius Elbows

Fabricate elbow proportions and radius elbows in accordance with ASHRAE EQUIP IP HDBK, Chapter 16, ASHRAE FUN IP, Chapter 32 and SMACNA 1966.

3.3.6 Duct Supports

Install duct support in accordance with ASHRAE EQUIP IP HDBK, Chapter 16, ASHRAE FUN IP, Chapter 32 and SMACNA 1966. Duct hangers shall meet the minimum size specified in ASHRAE EQUIP IP HDBK, Chapter 16, ASHRAE FUN IP, Chapter 32 and SMACNA 1966. Provide two hangers where necessary to eliminate sway. Support attachment to duct surfaces, shall be by solid rivet 4 inches on center.

Selection of hanging system shall be at the Contractor's option, and shall take into account the location and precedence of work under other sections, interferences of various piping and electrical conduit, equipment, building configuration, structural and safety factor requirements, vibration, and imposed loads under normal and abnormal service conditions. Support sizes, configurations, and spacing's are given to show the minimal type of supporting components required. If installed loads are excessive for the specified hanger spacing, hangers, and accessories hanger spacing shall be reduced. After system startup, any duct support device which, due to length, configuration, or size, vibrates or causes possible failure of a member, shall be replaced or the condition shall otherwise be alleviated. Special care shall be exercised to preclude cascade-type failures.

Hanger rods, angles, and straps shall be attached to beam clamps. Concrete inserts, masonry anchors, and fasteners shall be approved for the application.

Hardened high-carbon spring-steel fasteners fitted onto beams and miscellaneous structural steel are acceptable upon prior approval of each proposed application and upon field demonstration of conformance to specification requirements. Fasteners shall be made from steel conforming to AISI Type 1055 1070, treated and finished in conformance with SAE AMS 2480, Type Z zinc phosphate base, Class 2 supplementary treatment. A 72-hour load-carrying capacity shall be verified by a certified independent laboratory.

Hanger spacing shall provide a 20-to-1 safety factor for supported load.

Maximum load supported by any two fasteners shall be 100 pounds.

Friction rod assemblies are not acceptable.

Where support from metal deck systems is involved, support requirements shall be coordinated with installation of metal deck.

Ductwork and equipment shall not be hung from roof deck, piping, or other ducts or equipment. Maximum span between any two points shall be 10 feet, with lesser spans as required by duct assemblies, interferences, and permitted loads imposed.

There shall be not less than one set of hangers for each point of support. Hangers shall be installed on both sides of all duct turns, branch fittings, and transitions.

Hangers shall be sufficiently cross braced to eliminate sway vertically and laterally.

Rectangular ducts up to 36 inches shall be supported by strap-type hangers attached at not less than three places to not less than two duct surfaces in different planes.

Perforated strap hangers are not acceptable.

Rectangular ducting, 36 inches and larger, shall be supported by trapeze hangers. Ducts situated in unconditioned areas and required to have insulation with a vapor-sealed facing shall be supported on trapeze hangers. Hangers shall be spaced far enough out from the side of the duct to permit the duct insulation to be placed on the duct inside the trapeze. Duct hangers shall not penetrate the vapor-sealed facing.

Where trapeze hangers are used, the bottom of the duct shall be supported on angles sized as follows:

<u>WIDTH OF DUCT, INCHES</u>	<u>MINIMUM BOTTOM ANGLE SIZE, INCHES</u>
30 and smaller	1-1/4 by 1-1/4 by 1/8
31 to 48	1-1/2 by 1-1/2 by 1/8
49 to 72	1-1/2 by 1-1/2 by 3/16
73 to 96	2 by 2 by 1/4
97 and wider	3 by 3 by 1/4

Where ductwork system contains heavy equipment, excluding air-diffusion devices and single-leaf dampers, such equipment shall be hung independently of the ductwork by means of rods or angles of sizes adequate to support the load.

Ducting, when supported from roof purlins, shall not be supported at points greater than one-sixth of the purlin span from the roof truss. Load per hanger shall not exceed 400 pounds when support is from a single purlin or 800 pounds when hanger load is applied halfway between purlins by means of auxiliary support steel provided under this section. When support is not halfway between purlins, the allowable hanger load shall be the product of 400 times the inverse ratio of the longest distance to purlin-to-purlin spacing.

When the hanger load exceeds the above limits, provide reinforcing of purlin(s) or additional support beam(s). When an additional beam is used, the beam shall bear on the top chord of the roof trusses, and bearing shall be over gusset plates of top chord. Beam shall be stabilized by connection to roof purlin along bottom flange.

Purlins used for supporting fire-protection sprinkler mains, electrical lighting fixtures, electrical power ducts, or cable trays shall be considered fully loaded, and supplemental reinforcing or auxiliary support steel shall be provided for these purlins.

3.3.7 Flexible Connectors For Steel Metal

Air-handling equipment, ducts crossing building expansion joints, and fan inlets and outlets shall be connected to upstream and downstream components by treated woven-cloth connectors.

Install connectors only after system fans are operative and all vibration isolation mountings have been adjusted. When system fans are operating, connectors shall be free of wrinkles caused by misalignment or fan reaction. Width of surface shall be curvilinear.

3.3.8 Openings In Roofs And Walls

Building openings are fixed and provide equipment to suit.

3.4 FIELD QUALITY CONTROL

Ductwork Leakage Tests

Contractor shall conduct complete leakage test of new ductwork (TESTING, ADJUSTING, AND BALANCING FOR HVAC). Tests shall be performed prior to installing ductwork insulation.

3.5 DUCTWORK CLEANING PROVISIONS

Open ducting shall be protected from construction dust and debris in a manner approved by the Contracting Officer. Dirty assembled ducting shall be cleaned by subjecting all main and branch interior surfaces to airstreams moving at velocities two times specified working velocities, at static pressures within maximum ratings. This may be accomplished by: filter-equipped portable blowers which remain the Contractor's property; wheel-mounted, compressed-air operated perimeter lances which direct the compressed air and which are pulled in the direction of normal airflow; and other means approved by the Contracting Officer. Compressed air used for cleaning ducting shall be water- and oil- free. After construction is complete, and prior to acceptance of the work, construction dust and debris shall be removed from exterior surfaces.

3.6 OPERATION AND MAINTENANCE

Operation and Maintenance Manuals shall be consistent with manufacturer's standard brochures, schematics, printed instructions, general operating procedures and safety precautions.

-- End of Section --

APPENDIX N

Bridge Inspection Report for Pepper Canyon Bridge



DEPARTMENT OF TRANSPORTATION
Structure Maintenance & Investigations

Bridge Number : 57C0648
Facility Carried: SPACE THEATER WAY
Location : 0.1 MI WILY OF FAU S230
City : SAN DIEGO
Inspection Date : 03/03/2010

Bridge Inspection Report

Inspection Type

Routine	FC	Underwater	Special	Other
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

STRUCTURE NAME: PEPPER CANYON

CONSTRUCTION INFORMATION

Year Built : 1972	Skew (degrees): 0
Year Widened: N/A	No. of Joints : 3
Length (m) : 33.5	No. of Hinges : 0

Structure Description: Two simple spans with PC/PS concrete "T" beam girders (4) with CIP RC deck supported on two RC cantilever abutments and one RC column (2) bent, all supported on RC spread footings.

Span Configuration : (E) 2 @ 16.5 m (W) c/c

LOAD CAPACITY AND RATINGS

Design Live Load: MS-18+MOD OR HS-20+MOD

Inventory Rating: 32.4 metric tonnes

Operating Rating: 54.1 metric tonnes

Permit Rating : P P P P P

Posting Load : Type 3: Legal

Calculation Method: NO RATING ANALYSIS

Calculation Method: NO RATING ANALYSIS

Type 3S2: Legal

Type 3-3: Legal

DESCRIPTION ON STRUCTURE

Deck X-Section: (S) 0.3 m br, 7.3 m, 0.3 m br (N)

Total Width: 8.0 m

Net Width: 7.3 m

No. of Lanes: 2

Rail Description: Concrete Railing

Rail Code : 1000

Min. Vertical Clearance: Unimpaired

DESCRIPTION UNDER STRUCTURE

Channel Description: Natural, well defined.

CONDITION TEXT

REVISIONS

Smart flag 359 was added (State 2).

CONDITION OF STRUCTURE

There are minor map cracking through out the deck

The type A joint seals are dry and peeled off the gaps at all joints.

There is rust form on the steel handrail.

There are three small spalls (200mm x 100mm x 12mm) at southeast corner of concrete barrier with rebars exposed.

There are several rusted rebars exposed under soffit of overhang on both sides.

There are about three to four concrete segregations and unsound concrete on the north face of the north column; and spall 150 X 150 X 40 mm with rebar exposed and corroded.

Printed on: Monday 04/26/2010 02:34 PM

57C0648/AAAF/18141

CONDITION TEXT

CHANNEL/WATERWAY INVESTIGATION

The channel was dry at time of inspection, no scour is visible and no underwater investigation is necessary.

<u>ELEMENT INSPECTION RATINGS</u>									
F#Elem	Element Description	Env	Total Units Qty	Qty in each Condition State					
				St. 1	St. 2	St. 3	St. 4	St. 5	
101 12	Concrete Deck - Bare	3	268 sq.m.	0	268	0	0	0	0
101 109	P/S Conc Open Girder/Beam	3	134 m.	134	0	0	0	0	0
101 205	Reinforced Conc Column or Pile Extension	3	2 ea.	1	0	1	0	0	0
101 215	Reinforced Conc Abutment	3	16 m.	16	0	0	0	0	0
101 234	Reinforced Conc Cap	3	8 m.	8	0	0	0	0	0
101 301	Pourable Joint Seal	2	24 m.	0	24	0	0	0	0
101 312	Enclosed/Concealed Bearing	3	1 ea.	1	0	0	0	0	0
101 333	Other Bridge Railing	3	79 m.	78	1	0	0	0	0
101 359	Soffit of Concrete Deck or Slab	2	1 ea.	0	1	0	0	0	0

WORK RECOMMENDATIONS

RecDate: 01/25/2006 EstCost: Remove concrete segregations and unsound
 Action : Sub-Patch spalls StrTarget: 2 YEARS concrete on the north face of the north
 Work By: LOCAL AGENCY DistTarget: column and patch back.
 Status : PROPOSED EA:

RecDate: 01/25/2006 EstCost: Clean out and replace all joint seals.
 Action : Joints-Replace StrTarget: 2 YEARS
 Work By: LOCAL AGENCY DistTarget:
 Status : PROPOSED EA:

Inspected By : M.Zolfaghari/A.Shenouda

A. Shenouda
 Registered Civil Engineer



STRUCTURE INVENTORY AND APPRAISAL REPORT

***** IDENTIFICATION *****

(1) STATE NAME- CALIFORNIA 069
 (8) STRUCTURE NUMBER 57C0648
 (5) INVENTORY ROUTE(ON/UNDER)- ON 150000000
 (2) HIGHWAY AGENCY DISTRICT 11
 (3) COUNTY CODE 073 (4) PLACE CODE 66000
 (6) FEATURE INTERSECTED- PEPPER CANYON
 (7) FACILITY CARRIED- SPACE THEATER WAY
 (9) LOCATION- 0.1 MI WILY OF FAU S230
 (11) MILEPOINT/KILOMETERPOINT 0
 (12) BASE HIGHWAY NETWORK- NOT ON NET 0
 (13) LRS INVENTORY ROUTE & SUBROUTE
 (16) LATITUDE 32 DEG 43 MIN 44 SEC
 (17) LONGITUDE 117 DEG 08 MIN 45 SEC
 (98) BORDER BRIDGE STATE CODE % SHARE %
 (99) BORDER BRIDGE STRUCTURE NUMBER

***** STRUCTURE TYPE AND MATERIAL *****

(43) STRUCTURE TYPE MAIN:MATERIAL- PRESTRESS CONC
 TYPE- TEE BEAM CODE 504
 (44) STRUCTURE TYPE APPR:MATERIAL- OTHER/NA
 TYPE- OTHER/NA CODE 000
 (45) NUMBER OF SPANS IN MAIN UNIT 2
 (46) NUMBER OF APPROACH SPANS 0
 (107) DECK STRUCTURE TYPE- CIP CONCRETE CODE 1
 (108) WEARING SURFACE / PROTECTIVE SYSTEM:
 A) TYPE OF WEARING SURFACE- NONE CODE 0
 B) TYPE OF MEMBRANE- NONE CODE 0
 C) TYPE OF DECK PROTECTION- NONE CODE 0

***** AGE AND SERVICE *****

(27) YEAR BUILT 1972
 (106) YEAR RECONSTRUCTED 0000
 (42) TYPE OF SERVICE: ON- HIGHWAY 1
 UNDER- WATERWAY 5
 (28) LANES:ON STRUCTURE 02 UNDER STRUCTURE 00
 (29) AVERAGE DAILY TRAFFIC 500
 (30) YEAR OF ADT 1998 (109) TRUCK ADT 2 %
 (19) BYPASS, DETOUR LENGTH 199 KM

***** GEOMETRIC DATA *****

(48) LENGTH OF MAXIMUM SPAN 16.5 M
 (49) STRUCTURE LENGTH 33.5 M
 (50) CURB OR SIDEWALK: LEFT 0.0 M RIGHT 0.0 M
 (51) BRIDGE ROADWAY WIDTH CURB TO CURB 7.3 M
 (52) DECK WIDTH OUT TO OUT 8.0 M
 (32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 5.8 M
 (33) BRIDGE MEDIAN- NO MEDIAN 0
 (34) SKEW 0 DEG (35) STRUCTURE FLARED NO
 (10) INVENTORY ROUTE MIN VERT CLEAR 99.99 M
 (47) INVENTORY ROUTE TOTAL HORIZ CLEAR 7.3 M
 (53) MIN VERT CLEAR OVER BRIDGE RDWY 99.99 M
 (54) MIN VERT UNDERCLEAR REF- NOT H/RR 0.00 M
 (55) MIN LAT UNDERCLEAR RT REF- NOT H/RR 0.0 M
 (56) MIN LAT UNDERCLEAR LT 0.0 M

***** NAVIGATION DATA *****

(38) NAVIGATION CONTROL- NO CONTROL CODE 0
 (111) PIER PROTECTION- CODE
 (39) NAVIGATION VERTICAL CLEARANCE 0.0 M
 (116) VERT-LIFT BRIDGE NAV MIN VERT CLEAR M
 (40) NAVIGATION HORIZONTAL CLEARANCE 0.0 M

***** SUFFICIENCY RATING = 75.6

STATUS
 HEALTH INDEX 93.2
 PAINT CONDITION INDEX = N/A

***** CLASSIFICATION ***** CODE

(112) NBIS BRIDGE LENGTH- YES Y
 (104) HIGHWAY SYSTEM- NOT ON NHS 0
 (26) FUNCTIONAL CLASS- LOCAL URBAN 19
 (100) DEFENSE HIGHWAY- NOT STRAHNET 0
 (101) PARALLEL STRUCTURE- NONE EXISTS N
 (102) DIRECTION OF TRAFFIC- 2 WAY 2
 (103) TEMPORARY STRUCTURE-
 (105) FED.LANDS HWY- NOT APPLICABLE 0
 (110) DESIGNATED NATIONAL NETWORK - NOT ON NET 0
 (20) TOLL- ON FREE ROAD 3
 (21) MAINTAIN- CITY OR MUNICIPAL HIGHWAY AGENCY 04
 (22) OWNER- CITY OR MUNICIPAL HIGHWAY AGENCY 04
 (37) HISTORICAL SIGNIFICANCE- NOT ELIGIBLE 5

***** CONDITION ***** CODE

(58) DECK 5
 (59) SUPERSTRUCTURE 8
 (60) SUBSTRUCTURE 7
 (61) CHANNEL & CHANNEL PROTECTION 8
 (62) CULVERTS N

***** LOAD RATING AND POSTING ***** CODE

(31) DESIGN LOAD- MS-18+MOD OR HS-20+MOD 6
 (63) OPERATING RATING METHOD- NO RATING ANALYSIS 5
 (64) OPERATING RATING- 54.1
 (65) INVENTORY RATING METHOD- NO RATING ANALYSIS 5
 (66) INVENTORY RATING- 32.4
 (70) BRIDGE POSTING- EQUAL TO OR ABOVE LEGAL LOADS 5
 (41) STRUCTURE OPEN, POSTED OR CLOSED- A
 DESCRIPTION- OPEN, NO RESTRICTION

***** APPRAISAL ***** CODE

(67) STRUCTURAL EVALUATION 7
 (68) DECK GEOMETRY 4
 (69) UNDERCLEARANCES, VERTICAL & HORIZONTAL N
 (71) WATER ADEQUACY 8
 (72) APPROACH ROADWAY ALIGNMENT 8
 (36) TRAFFIC SAFETY FEATURES 1000
 (113) SCOUR CRITICAL BRIDGES 9

***** PROPOSED IMPROVEMENTS *****

(75) TYPE OF WORK- CODE
 (76) LENGTH OF STRUCTURE IMPROVEMENT M
 (94) BRIDGE IMPROVEMENT COST
 (95) ROADWAY IMPROVEMENT COST
 (96) TOTAL PROJECT COST
 (97) YEAR OF IMPROVEMENT COST ESTIMATE
 (114) FUTURE ADT 629
 (115) YEAR OF FUTURE ADT 2029

***** INSPECTIONS *****

(90) INSPECTION DATE 03/10 (91) FREQUENCY 24 MO
 (92) CRITICAL FEATURE INSPECTION: (93) CFI DATE
 A) FRACTURE CRIT DETAIL- NO MO A)
 B) UNDERWATER INSP- NO MO B)
 C) OTHER SPECIAL INSP- NO MO C)

01/14/12 CW

City of San Diego

CONTRACTOR'S NAME: Paradigm Mechanical Corp.
 ADDRESS: 1050 Pioneer Way Ste H El Cajon CA 92020
 TELEPHONE NO.: (619) 456-4562 FAX NO.: (619) 456-4754
 CITY CONTACT: Coselyn Goodrich, 600 B Street, Suite 500 San Diego CA 92101, MS. 908A
CGoodrich@sandiego.gov Ph (619) 533-4633 Fax (619) 533-5476
 BD/LJI/DS

CONTRACT DOCUMENTS



FOR

CASA DE BALBOA HVAC PROJECT

VOLUME 2 OF 2

BID NO.:	<u>K-12-5196-DBB-3-B</u>
SAP NO. (WBS/IO/CC):	<u>B-00939</u>
CLIENT DEPARTMENT:	<u>1914</u>
COUNCIL DISTRICT:	<u>3</u>
PROJECT TYPE:	<u>BS</u>

THIS CONTRACT IS SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM.

THIS BIDDING DOCUMENT TO BE SUBMITTED IN ITS ENTIRETY REFER TO INVITATION TO BIDS FOR TIME, DATE, AND LOCATION

TABLE OF CONTENTS

Volume 2 - Bidding Documents

The following forms must be completed in their entirety and submitted with the Bid. Include the form(s) even if the information does not apply. Where the information does not apply write in N/A. Failure to include any of the forms may cause the Bid to be deemed **non-responsive**. If you are uncertain or have any questions about any required information, contact the City no later than 14 days prior to Bid due date.

<u>DESCRIPTION</u>	<u>PAGE NUMBER</u>
1. Bid/Proposal	3 - 5
2. Bid Bond.....	6
3. Non-Collusion Affidavit to be executed by Bidder and Submitted with Bid under 23 USC 112 and PCC 7106	7
4. Contractors Certification of Pending Actions.....	8
5. Equal Benefits Ordinance Certification of Compliance	9
6. Proposal (Bid).....	10 - 11
7. Form AA35 - List of Subcontractors	12
8. Form AA40 - Named Equipment/Material Supplier List	13

BIDDING DOCUMENTS

PROPOSAL

Bidder's General Information

To the City of San Diego:

Pursuant to "Invitation to Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

IF A SOLE OWNER OR SOLE CONTRACTOR SIGN HERE: N/A

- (1) Name under which business is conducted _____
- (2) Signature (Given and surname) of proprietor _____
- (3) Place of Business (Street & Number) _____
- (4) City and State _____ Zip Code _____
- (5) Telephone No. _____ Facsimile No. _____

IF A PARTNERSHIP, SIGN HERE: N/A

- (1) Name under which business is conducted _____
- (2) Name of each member of partnership [indicate character of each partner, general or special (limited):

BIDDING DOCUMENTS

(3) Signature (Note: Signature must be made by a general partner)

Full Name and Character of partner

(4) Place of Business (Street & Number) _____
(5) City and State _____ Zip Code _____
(6) Telephone No. _____ Facsimile No. _____

IF A CORPORATION, SIGN HERE:

(1) Name under which business is conducted Paradigm Mechanical Corp.

(2) Signature, with official title of officer authorized to sign for the corporation:

Melinda Dicharry
(Signature)

Melinda Dicharry
(Printed Name)

President
(Title of Officer)

(Impress Corporate Seal Here)

(3) Incorporated under the laws of the State of California
(4) Place of Business (Street & Number) 1050 Pioneer Way Ste H
(5) City and State El Cajon CA Zip Code 92020
(6) Telephone No. (619) 456-4562 Facsimile No. (619) 456-4754

THE FOLLOWING SECTIONS MUST BE FILLED IN BY ALL PROPOSERS:

In accordance with the "INVITATION TO BIDS", the bidder holds a California State Contractor's license for the following classification(s) to perform the work described in these specifications:

LICENSE CLASSIFICATION C20

LICENSE NO. 947497 EXPIRES May 31, 2014

This license classification must also be shown on the front of the bid envelope. Failure to show license classification on the bid envelope may cause return of the bid unopened.

TAX IDENTIFICATION NUMBER (TIN): 27-1975577

E-Mail Address: melinda @ pmecontracting.com

BIDDING DOCUMENTS

CONTRACTORS CERTIFICATION OF PENDING ACTIONS

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of all instances within the past ten years where a complaint was filed or pending against the Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

CHECK ONE BOX ONLY.

- The undersigned certifies that within the past 10 years the Bidder has NOT been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers.
- The undersigned certifies that within the past ten years the Bidder has been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers. A description of the status or resolution of that complaint, including any remedial action taken and the applicable dates is as follows:

Contractor Name Paradigm Mechanical Corp.

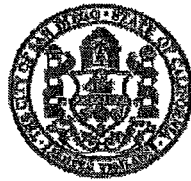
Certified By Melinda Dicharry Title President
Name

Melinda Dicharry Date 6-13-2012
Signature

USE ADDITIONAL FORMS AS NECESSARY

BIDDING DOCUMENTS

**EQUAL BENEFITS ORDINANCE
CERTIFICATION OF COMPLIANCE**



For additional information, contact:

CITY OF SAN DIEGO

EQUAL BENEFITS PROGRAM

202 C Street, MS 9A, San Diego, CA 92101

Phone (619) 533-3948 Fax (619) 533-3220

COMPANY INFORMATION

Company Name: <u>Paradigm Mechanical Corp.</u>	Contact Name: <u>Melinda Dicharry</u>
Company Address: <u>1050 Pioneer Way Ste H</u>	Contact Phone: <u>(619) 436-4562</u>
<u>El Cajon CA 92020</u>	Contact Email: <u>melinda@pmcontracting.co</u>

CONTRACT INFORMATION

Contract Title: <u>Casa de Balboa HVAC Project</u>	Start Date: <u>6/13/12</u>
Contract Number (if no number, state location): <u>K-12-5196-DBB-3-B</u>	End Date: <u>12/13/12</u>

SUMMARY OF EQUAL BENEFITS ORDINANCE REQUIREMENTS

The Equal Benefits Ordinance [EBO] requires the City to enter into contracts only with contractors who certify they will provide and maintain equal benefits as defined in SDMC §22.4302 for the duration of the contract. To comply:

- Contractor shall offer equal benefits to employees with spouses and employees with domestic partners.
 - Benefits include health, dental, vision insurance; pension/401(k) plans; bereavement, family, parental leave; discounts, child care; travel/relocation expenses; employee assistance programs; credit union membership; or any other benefit.
 - Any benefit not offer an employee with a spouse, is not required to be offered to an employee with a domestic partner.
- Contractor shall post notice of firm's equal benefits policy in the workplace and notify employees at time of hire and during open enrollment periods.
- Contractor shall allow City access to records, when requested, to confirm compliance with EBO requirements.
- Contractor shall submit *EBO Certification of Compliance*, signed under penalty of perjury, prior to award of contract.

NOTE: This summary is provided for convenience. Full text of the EBO and Rules Implementing the EBO are available at www.sandiego.gov/administration.

CONTRACTOR EQUAL BENEFITS ORDINANCE CERTIFICATION

Please indicate your firm's compliance status with the EBO. The City may request supporting documentation.

- I affirm **compliance** with the EBO because my firm (*contractor must select one reason*):
- Provides equal benefits to spouses and domestic partners.
 - Provides no benefits to spouses or domestic partners.
 - Has no employees.
 - Has collective bargaining agreement(s) in place prior to January 1, 2011, that has not been renewed or expired.
- I request the City's approval to pay affected employees a cash equivalent in lieu of equal benefits and verify my firm made a reasonable effort but is not able to provide equal benefits upon contract award. I agree to notify employees of the availability of a cash equivalent for benefits available to spouses but not domestic partners and to continue to make every reasonable effort to extend all available benefits to domestic partners.

It is unlawful for any contractor to knowingly submit any false information to the City regarding equal benefits or cash equivalent associated with the execution, award, amendment, or administration of any contract. [San Diego Municipal Code §22.4307(a)]

Under penalty of perjury under laws of the State of California, I certify the above information is true and correct. I further certify that my firm understands the requirements of the Equal Benefits Ordinance and will provide and maintain equal benefits for the duration of the contract or pay a cash equivalent if authorized by the City.

<u>Melinda Dicharry, President</u>	<u>Melinda Dicharry</u>	<u>6/13/2012</u>
Name/Title of Signatory	Signature	Date

FOR OFFICIAL CITY USE ONLY

Receipt Date:	EBO Analyst:	<input type="checkbox"/> Approved	<input type="checkbox"/> Not Approved – Reason:
---------------	--------------	-----------------------------------	---

rev 02/15/2011

BIDDING DOCUMENTS

PROPOSAL (BID)

The Bidder agrees to the construction of **Casa De Balboa HVAC Project**, for the City of San Diego, in accordance with these contract documents for the prices listed below. The Bidder guarantees the Contract Price for a period of 120 days (90 days for federally funded contracts and contracts valued at \$500,000 or less) from the date of Bid opening to Award of the Contract. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent e.g., bond and insurance.

Item	Quantity	Unit	NAICS	Payment Reference	Description	Unit Price	Extension
BASE BID							
1	1	LS	238220	2-4.1	Bonds (Payment and Performance)	 	\$16,000.00
2	1	LS	238220	9-3.1	Upgrade of HVAC System	 	\$829,000.00
3	1	LS	238220	7-16.3	Exclusive Community Liaison Services	 	\$1,000.00
4	1	AL		7-5.3	Building Permits	 	\$2,000.00
5	1	AL		9-3.5	Field Orders	 	\$30,000.00
ESTIMATED TOTAL BASE BID:							\$888,000.00

TOTAL BID PRICE FOR BID (Items 1 through 5 inclusive) amount written in words:

Eight hundred eighty-eight thousand dollars and zero cents

The Bid shall contain an acknowledgment of receipt of all addenda, the numbers of which shall be filled in on this Bid form.

List the Addenda received and being acknowledged: A, B

If an addendum or addenda has been issued by the City and not noted as being received by the Bidder, the Bid shall be rejected as being **non-responsive**.

BIDDING DOCUMENTS

The names of all persons interested in the foregoing proposal as principals are as follows:

Melinda Dicharry, Secretary, treasurer, president

IMPORTANT NOTICE: If Bidder or other interested person is a corporation, state secretary, treasurer, and manager thereof; if a co-partnership, state true name of firm, also names of all individual co-partners composing firm; if Bidder or other interested person is an individual, state first and last names in full.

Bidder: Paradigm Mechanical Corp.

Title: President

Business Address: 1050 Pioneer Way Ste H El Cajon CA 92020

Place of Business: San Diego County - 1050 Pioneer Way Ste H El Cajon CA 92020

Place of Residence: San Diego County - 9036 Willowgrove Pl Santee CA 92071

Signature: Melinda Dicharry

NOTES

- A. The City shall determine the low Bid based on the Base Bid alone.
- B. Prices and notations shall be in ink or typewritten. All corrections (which have been initiated by the Bidder using erasures, strike out, line out, or "white-out") shall be typed or written in with ink adjacent thereto, and shall be initialed in ink by the person signing the bid proposal.
- C. Failure to initial all corrections made in the bidding documents shall cause the Bid to be rejected as **non-responsive** and ineligible for further consideration.
- D. Blank spaces must be filled in, using figures. Bidder's failure to submit a price for any Bid item that requires the Bidder to submit a price shall render the Bid **non-responsive** and shall be cause for its rejection.
- E. Unit prices shall be entered for all unit price items. Unit prices shall not exceed two (2) decimal places. If the Unit prices entered exceed two (2) decimal places, the City will only use the first two digits after the decimal points without rounding up or down.
- F. All extensions of the unit prices bid will be subject to verification by the City. In the case of inconsistency or conflict between the product of the Quantity x Unit Price and the Extension, the product shall govern.
- G. In the case of inconsistency or conflict, between the sums of the Extensions with the estimated total Bid, the sum of the Extensions shall govern.
- H. Bids shall not contain any recapitulation of the Work. Conditional Bids will be rejected as being **non-responsive**. Alternative proposals will not be considered unless called for.

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS pg 1 of 2

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB [ⓐ]	WHERE CERTIFIED [ⓐ]	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>American Air Balance Co Inc.</u> Address: <u>4721 E. Hunter Ave</u> City: <u>Anaheim</u> State: <u>CA</u> Zip: <u>92807</u> Phone: <u>(714) 693-3700</u>	Constructor	Test and Balance	4,650.00	NONE	N/A	N/A
Name: <u>APreman Roofing Inc.</u> Address: <u>1133 W. Morena Blvd</u> City: <u>San Diego</u> State: <u>CA</u> Zip: <u>92110</u> Phone: <u>(619) 276-1700</u>	constructor	Roofing	5,218.00	NONE	N/A	N/A
Name: <u>PCS Contracting Inc.</u> Address: <u>461 Vernon Way</u> City: <u>El Cajon</u> State: <u>CA</u> Zip: <u>92020</u> Phone: <u>(619) 440-4054</u>	constructor	Electrical	44,000.00	NONE	NONE N/A	N/A

ⓐ As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local Business Enterprise | ELBE |
| Certified Small Local Business Enterprise | SLBE | Small Disadvantaged Business | SDB |
| Woman-Owned Small Business | WoSB | HUBZone Business | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB | | |

ⓑ As appropriate, Bidder shall indicate if Subcontractor is certified by:

- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | San Diego Regional Minority Supplier Diversity Council | SRMSDC |
| State of California's Department of General Services | CADoGS | City of Los Angeles | LA |
| State of California | CA | U.S. Small Business Administration | SBA |

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

LIST OF SUBCONTRACTORS

pg 2 of 2

In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act", Division 2, Part 1, Chapter 4 of the Public Contract Code, the Bidder shall list below the name and address of each Subcontractor who will perform work, labor, render services or specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also list below the portion of the work which will be done by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement shall result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors that Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED	CHECK IF JOINT VENTURE PARTNERSHIP
Name: <u>Climatec, Inc.</u> Address: <u>13715 Stowe Dr.</u> City: <u>Poway</u> State: <u>CA</u> Zip: <u>92064</u> Phone: <u>(858) 391-7000</u>	Constructor	Controls + Equipment	565,000.00	NONE	N/A	N/A
Name: <u>Bob's Crane Service</u> Address: <u>12101 Highway 67</u> City: <u>Lakeside</u> State: <u>CA</u> Zip: <u>92040</u> Phone: <u>(619) 443-5887</u>	Constructor	Crane Service	8,000.00	NONE	N/A	N/A
Name: <u>Paradigm Mechanical Corp.</u> Address: <u>1050 Pioneer Way Ste H</u> City: <u>El Cajon</u> State: <u>CA</u> Zip: <u>92020</u> Phone: <u>(619) 456-4562</u>	Constructor	Sheetmetal Installation	20,000.00	WBE DBE SLBE	CPUC City of S.D.	N/A

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local Business Enterprise | ELBE |
| Certified Small Local Business Enterprise | SLBE | Small Disadvantaged Business | SDB |
| Woman-Owned Small Business | WoSB | HUBZone Business | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB | | |

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | San Diego Regional Minority Supplier Diversity Council | SRMSDC |
| State of California's Department of General Services | CADoGS | City of Los Angeles | LA |
| State of California | CA | U.S. Small Business Administration | SBA |

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

N/A

The Bidder seeking the recognition of equipment, materials, or supplies obtained from Suppliers towards achieving any mandatory, voluntary, or both subcontracting participation percentages shall list the Supplier(s) on the Named Equipment/Material Supplier List. The Named Equipment/Material Supplier List, at a minimum, shall have the name, locations (City) and the **DOLLAR VALUE** of the Suppliers. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for such materials and supplies unless vendor manufactures or substantially alters materials and supplies in which case 100% will be credited. The Bidder is to indicate (Yes/No) whether listed firm is a supplier or manufacturer. In calculating the subcontractor participation percentages, vendors/suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage, Suppliers will receive 60% credit of the listed **DOLLAR VALUE**, whereas manufacturers will receive 100% credit. If no indication provided, listed firm will be credited at 60% of the listed **DOLLAR VALUE** for purposes of calculating the subcontractor participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB	WHERE CERTIFIED
Name: <u>N/A</u> Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						
Name: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____						

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

- | | | | |
|---|--------|--|---------|
| Certified Minority Business Enterprise | MBE | Certified Woman Business Enterprise | WBE |
| Certified Disadvantaged Business Enterprise | DBE | Certified Disabled Veteran Business Enterprise | DVBE |
| Other Business Enterprise | OBE | Certified Emerging Local Business Enterprise | ELBE |
| Certified Small Local Business Enterprise | SLBE | Small Disadvantaged Business | SDB |
| Woman-Owned Small Business | WoSB | HUBZone Business | HUBZone |
| Service-Disabled Veteran Owned Small Business | SDVOSB | | |

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

- | | | | |
|--|--------|--|----------|
| City of San Diego | CITY | State of California Department of Transportation | CALTRANS |
| California Public Utilities Commission | CPUC | San Diego Regional Minority Supplier Diversity Council | SRMSDC |
| State of California's Department of General Services | CADoGS | City of Los Angeles | LA |
| State of California | CA | U.S. Small Business Administration | SBA |

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification (except for OBE, SLBE and ELBE).

BIDDING DOCUMENTS

THIS PROPOSAL MUST BE NOTARIZED BELOW:

I certify, under penalty of perjury, that the representations made herein regarding my State Contractor's license number, classification and expiration date are true and correct.

Signature Melinda D'Chamny Title President

SUBSCRIBED AND SWORN TO BEFORE ME, THIS _____ DAY OF _____, 20____.

Notary Public in and for the County of _____, State of _____

~~_____
(NOTARIAL SEAL)~~

See Attached

BID BOND

KNOW ALL MEN BY THESE PRESENTS,

That Paradigm Mechanical Corp. as Principal, and
Capitol Indemnity Corporation as Surety, are

held and firmly bound unto City of San Diego

hereinafter called "OWNER," in the sum of **10% OF THE TOTAL BID AMOUNT** for the payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, said Principal has submitted a Bid to said OWNER to perform the WORK required under the bidding schedule(s) of the OWNER's Contract Documents entitled _____

Casa De Balboa HVAC Project

NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in the manner required in the "Invitation to Bids" enters into a written Agreement on the form of agreement bound with said Contract Documents, furnishes the required certificates of insurance, and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 11th day of June, 2012

Paradigm Mechanical Corp.
(Principal)

(SEAL) Capitol Indemnity Corporation (SEAL)
(Surety)

By: Melinda Dichany, President
(Signature)

By: [Signature]
(Signature) Anne Wright
Attorney-in-Fact

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA

County of San Diego }

On June 11, 2012

Date

before me,

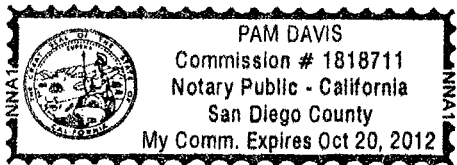
Pam Davis, Notary Public

Here Insert Name and Title of the Officer

personally appeared Anne Wright

Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he~~/she/~~they~~ executed the same in ~~his~~/her/~~their~~ authorized capacity(ies), and that by ~~his~~/her/~~their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.



Place Notary Seal Above

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

Witness my hand and official seal.

Signature

Signature of Notary Public Pam Davis

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: _____

Document Date: _____

Number of Pages: _____

Signer(s) Other Than Named Above: _____

Capacity(ies) Claimed by Signer(s)

Signer's Name: _____

- Individual
- Corporate Officer — Title(s): _____
- Partner — Limited General
- Attorney in Fact
- Trustee
- Guardian or Conservator
- Other: _____

RIGHT THUMBPRINT OF SIGNER

Top of thumb here

Signer Is Representing: _____

Signer's Name: _____

- Individual
- Corporate Officer — Title(s): _____
- Partner — Limited General
- Attorney in Fact
- Trustee
- Guardian or Conservator
- Other: _____

RIGHT THUMBPRINT OF SIGNER

Top of thumb here

Signer Is Representing: _____

CAPITOL INDEMNITY CORPORATION
POWER OF ATTORNEY

60076943

KNOW ALL MEN BY THESE PRESENTS, That the CAPITOL INDEMNITY CORPORATION, a corporation of the State of Wisconsin, having its principal offices in the City of Middleton, Wisconsin, does make, constitute and appoint

-----CYNDI BEILMAN; ANNE WRIGHT; DANA MICHAELIS-----

its true and lawful Attorney(s)-in-fact, to make, execute, seal and deliver for and on its behalf, as surety, and as its act and deed, any and all bonds, undertakings and contracts of suretyship, provided that no bond or undertaking or contract of suretyship executed under this authority shall exceed in amount the sum of

-----ALL WRITTEN INSTRUMENTS IN AN AMOUNT NOT TO EXCEED: \$20,000,000.00-----

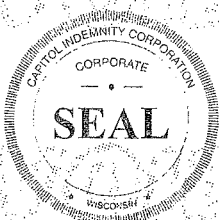
This Power of Attorney is granted and is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of CAPITOL INDEMNITY CORPORATION at a meeting duly called and held on the 15th day of May, 2002.

"RESOLVED, that the President, Executive Vice President, Vice President, Secretary or Treasurer, acting individually or otherwise, be and they hereby are granted the power and authorization to appoint by a Power of Attorney for the purposes only of executing and attesting bonds and undertakings, and other writings obligatory in the nature thereof, one or more resident vice-presidents, assistant secretaries and attorney(s)-in-fact, each appointee to have the powers and duties usual to such offices to the business of this company; the signature of such officers and seal of the Company may be affixed to any such power of attorney or to any certificate relating thereto, by facsimile, and any such power of attorney or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the Company, and any such power so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking or other writing obligatory in the nature thereof to which it is attached. Any such appointment may be revoked, for cause, or without cause, by any of said officers, at any time."

IN WITNESS WHEREOF, the CAPITOL INDEMNITY CORPORATION has caused these presents to be signed by its officer undersigned and its corporate seal to be hereto affixed duly attested, this 2nd day of May, 2011.

Attest:

Richard W. Allen III
Richard W. Allen III
President
Surety & Fidelity Operations



CAPITOL INDEMNITY CORPORATION
David F. Pauly
David F. Pauly
CEO & President

STATE OF WISCONSIN } S.S.:
COUNTY OF DANE

On the 2nd day of May, 2011 before me personally came David F. Pauly, to me known, who being by me duly sworn, did depose and say: that he resides in the County of Dane, State of Wisconsin; that he is President of CAPITOL INDEMNITY CORPORATION, the corporation described herein and which executed the above instrument; that he knows the seal of the said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.



Daniel W. Krueger
Daniel W. Krueger
Notary Public, Dane Co., WI
My Commission Is Permanent

STATE OF WISCONSIN } S.S.:
COUNTY OF DANE

I, the undersigned, duly elected to the office stated below, now the incumbent in CAPITOL INDEMNITY CORPORATION, a Wisconsin Corporation, authorized to make this certificate. DO HEREBY CERTIFY that the foregoing attached Power of Attorney remains in full force and has not been revoked; and furthermore, that the Resolution of the Board of Directors, set forth in the Power of Attorney is now in force.

Signed and sealed at the City of Middleton, State of Wisconsin this 11th day of June, 2012.



Alan S. Ogilvie
Alan S. Ogilvie
Secretary

THIS DOCUMENT IS NOT VALID UNLESS PRINTED ON GRAY SHADED BACKGROUND WITH A RED SERIAL NUMBER IN THE UPPER RIGHT HAND CORNER. IF YOU HAVE ANY QUESTIONS CONCERNING THE AUTHENTICITY OF THIS DOCUMENT CALL 800-475-4450.

BIDDING DOCUMENTS

NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23 USC 112 AND PCC 7106

State of California)
County of San Diego) ss.

Melinda Dicharry, being first duly sworn, deposes and says that he or she is President of the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

Signed: Melinda Dicharry
Title: President

Subscribed and sworn to before me this day of ,20

Notary Public

See Attached

(SEAL)

State of California
County of San Diego

Subscribed and sworn to (or affirmed) before me on this 13
day of June, 2012, by Melinda D'harvey,

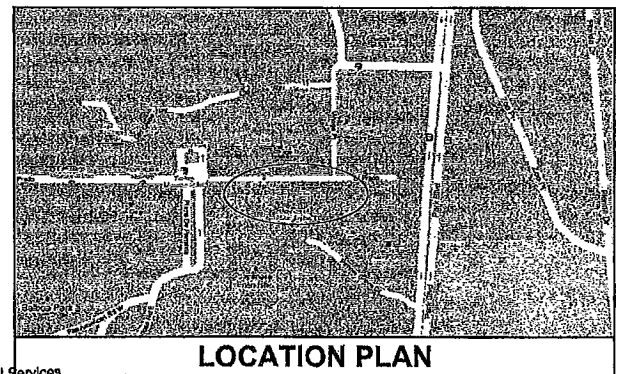
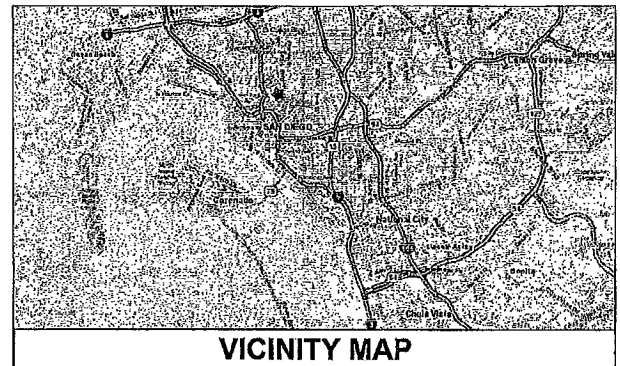
proved to me on the basis of satisfactory evidence to be the
person(s) who appeared before me.



(Seal)

Signature [Handwritten Signature]

CITY OF SAN DIEGO CASA DE BALBOA HVAC PROJECT



GENERAL NOTES

- THE CONTRACTOR SHALL REVIEW EXISTING CONDITIONS ON THE SITE DURING THE BIDDING. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS PRIOR TO STARTING WORK.
- THE CONTRACTOR SHALL COORDINATE AND VERIFY SIZES AND LOCATIONS OF MECHANICAL EQUIPMENT AND PIPING.
- INSULATION MATERIALS SHALL MEET THE CALIFORNIA QUALITY STANDARDS PER SECTION 118 ENERGY EFFICIENCY STANDARDS (E.E.S.)
- UNLESS OTHERWISE SHOWN OR NOTED, ALL PHASES OF WORK ARE TO CONFORM TO THE MINIMUM STANDARDS OF 2007 CALIFORNIA MECHANICAL CODE AND CALIFORNIA PLUMBING CODE.
- NOTES AND DETAILS ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL NOTES AND TYPICAL DETAILS.
- THE CONTRACTOR SHALL, AT HIS OWN EXPENSE; DESIGN, CONSTRUCT AND MAINTAIN ALL SAFETY DEVICES AND SHALL BE SOLELY RESPONSIBLE FOR CONFORMING ALL LOCAL, STATE AND FEDERAL SAFETY AND HEALTH STANDARDS, LAWS AND REGULATIONS.
- PIPES, DUCTS, SLEEVES, OPENINGS, POCKETS, CHASES, BLOCK-OUTS, ETC. SHALL NOT BE PLACED IN SLABS, BEAMS, GIRDERS, COLUMNS, WALLS, FOUNDATIONS UNLESS SPECIFICALLY DETAILED ON THE DRAWINGS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING PATCHING OF WALLS AND FLOORS, INCLUDING ALL SAW CUTTING AND CORE DRILLING.
- GOOD HOUSEKEEPING SHALL MAINTAIN AT ALL TIMES. ACCUMULATION OF COMBUSTIBLE WASTE MATERIALS IN THE BUILDING SHALL NOT BE ALLOWED. C.F.C. 902.4/DEPARTMENT POLICY.
- PROVIDE SMOKE DETECTORS IN MAIN SUPPLY AIR DUCTS OF AIR MOVING SYSTEMS EXCEEDING 2000 CFM PER SECTION 609.0 CMC.
- ALL PIPING AND DUCTWORK SHALL BE INSULATED CONSISTENT WITH THE REQUIREMENTS OF SECTIONS 118, 123, 124 TITLE 24 ENERGY STANDARDS AND TABLE 6-6A AND 6-8B OF CMC.
- ALL HVAC SYSTEMS SHALL MEET THE CONTROL REQUIREMENTS PER SECTION 112 AND 122 E.E.S.
- ALL HVAC EQUIPMENT AND APPLIANCES SHALL MEET THE REQUIREMENTS PER SECTION 111-113, 115, 120-124 TITLE 24 ENERGY STANDARDS.
- CONTRACTOR IS TO ENSURE THAT THE PROPOSED EQUIPMENT HEIGHT DO NOT COMPROMISE THE HISTORIC VIEW OF CASA DE BALBOA BUILDING. EQUIPMENT SHALL NOT BE VISIBLE FROM THE STREET VIEW AND WILL UTILIZE THE EXISTING CURB. SEE SHEET M-2

DRAWING INDEX

G-1 - TITLE SHEET
 MO.1 - MECHANICAL SCHEDULE AND NOTES
 M-1 - MECHANICAL ROOF DEMOLITION PLAN
 M-2 - MECHANICAL ROOF PROPOSED PLAN
 M-3 - RT-1&2 SEPARATION PLAN - DEMO
 M-4 - RT-1&2 SEPARATION PLAN - NEW
 M-5 - MECHANICAL GROUND FLOOR ZONING
 M-6 - MECHANICAL MAIN FLOOR ZONING
 M-7 - MECHANICAL MEZZANINE LEVEL ZONING
 M-8 - MECHANICAL DETAILS
 M-9 - IP SYSTEM ARCHITECTURE
 M-10 - ROOF TOP UNIT CONTROL ARCHITECTURE
 M-11 - TITLE-24 COMPLIANCE
 M-12 - EXISTING STRUCTURAL ROOF FRAMING
 EQ.1 - LEGEND ABBREVI. & GENERAL NOTES
 E-1 - ELECTRICAL ROOF PLAN - DEMO
 E-2 - ELECTRICAL ROOF PLAN -PROPOSED
 E-3 - SINGLE LINE DIAGRAM - DEMO
 E-4 - SINGLE LINE DIAGRAM - REVISED
 E-5 - SCHEDULE & DETAILS
 E-6 - SCHEDULES

SCOPE OF WORK

REPLACE CITY MAINTAINED 7 ROOF MOUNTED HVAC UNITS CONSISTING OF AIR COOLED CONDENSING UNITS, REFRIGRANT COILS, FILTER BANKS AND AIR HANDLERS. (RT-1, RT-2, RT-3, RT-6, RT-7, RT-8, RT-10) ALL NEW ROOF TOP UNITS WILL BE INSTALLED ON THE EXACT SAME LOCATION OF THE EXISTING ONES.

REPLACE ALL CITY OWNED EXHAUST FANS (TOTAL OF 10 EXHAUST FANS).

MODIFY EXISTING DUCTWORK TO PROVIDE ADEQUATE AIR SUPPLY AND TO MEET FRESH AIR REQUIREMENTS.

ENSURE IF ELECTRICAL WIRES AND DISCONNECTS ARE SUFFICIENT. PROVIDE APPROPRIATE SIZE FOR NEW ROOF TOP HVAC UNITS. CONNECT EXISTING GAS PIPES TO THE NEW ROOF TOP HVAC UNITS WITH APPROPRIATE SIZE AND CAPACITY.

ABBREVIATION / SYMBOLS

SYMBOL	ABBREVI.	DESCRIPTION
	BHP	BRAKE HORSE POWER
	BTUH	BRITISH THERMAL UNITS P/ HOUR
	CFM	CUBIC FEET PER MIN
	'F	DEGREE FAHRENHEIT
	DB	DRY BULB
	EPF	EFFICIENCY
	EAT	ENTERING AIR TEMPERATURE
	EF	EXHAUST FAN
	(E)	EXISTING
	ESP	EXTERNAL STATIO PRESSURE
	"W.C.	INCHES OF WATER COLUMN
	LAT	LEAVING AIR TEMPERATURE
	MCC	MINIMUM CIRCUIT CAPACITY
	RPM	REVOLUTIONS PER MINUTE
	RTU	ROOF TOP UNIT
	SEER	SEASONAL ENERGY EFFICIENCY
	MBH	THOUSAND BTU
	V/ø/HZ	VOLTS/PHASE/CYCLES
	W	WATTS
	WB	WET BULB
		EXHAUST AIR RISE
		RETURN AIR RISE
		SUPPLY AIR RISE
	AHU	AIR HANDLING UNIT
	MZ	MULTI ZONE
	ET	EXPANSION TANK
	AS	AIR SEPERATOR
		DEMOLITION
	SA	SUPPLY AIR
	TYP	TYPICAL

APPLICABLE CODES

CBC - 2007 CALIFORNIA BUILDING CODE
 CPC - 2007 CALIFORNIA PLUMBING CODE
 CMC - 2007 CALIFORNIA MECHANICAL CODE
 SAN DIEGO MUNICIPAL CODE 2008

PLAN SUBMITTAL DATE 12/23/2010.
 EVALUATION WILL BE PERFORMED BY 2007 CODES.

DISCIPLINE CODE

G GENERAL
 D DEMOLITION
 M MECHANICAL
 E ELECTRICAL
 S STRUCTURAL

EQUIPMENT TAGS

Equipment Abbreviation
 Equipment Number

PROJECT DATA

SITE ADDRESS : 1849 EL PRADO BALBOA PARK,
 SAN DIEGO, CA 92101
 OCCUPANCY : GROUP A-3
 TYPE OF CONSTRUCTION : TYPE III

GENERAL NOTES (Cont.)

15. The communication controller for the humidifiers shall be provided by the roof top units' manufacturer.

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS. I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN

Simon Girma
 ENGINEERS NAME: DATE:

I DO HEREBY CERTIFY THAT THE STRUCTURE(S) OR MODIFICATION TO EXISTING STRUCTURE(S) SHOWN ON THESE PLANS DO NOT REQUIRE FEDERAL AVIATION ADMINISTRATION NOTIFICATION BECAUSE PER SECTION 77.15 (A) OF TITLE 14 OF THE CODE OF FEDERAL REGULATIONS CFR PART 77, NOTIFICATION IS NOT REQUIRED.

16. Any existing systems including the VAV boxes that are currently connected to the existing DDC control shall be reconnected to the new DDC and be operational.

DISMANTLED MECHANICAL EQUIPMENT

Any alterations, additions, modifications, demolition, or relocation must be reviewed by Plan-Historic staff for consistency with IDMG Sections 143.0216, 143.0217 and 143.0231. Failure to receive Plan-Historic staff approval will result in consequences that may include, but are not limited to, fines, a stop work order, a Site Development Permit, restoration work, and cancellation of the MHP Act property tax reduction, if applicable. These plans have been approved.

ANY CHANGES TO THE APPROVED PLANS MUST BE REVIEWED AND APPROVED BY PLAN-HISTORIC STAFF PRIOR TO THE PLAN CHANGES BEING CARRIED OUT.

Reviewer Name: *K. Spawco* Date: *10/4/10*
 HRS Sht. # *PTB 228708* Date: *10/4/10*
 HVAC on roof in location of existing will not exceed parapet height.

Development Services
 Fire Plan Review & Inspection
 Garry Allert, Date: *9/29/11*

Inspections Required
 See these items on
 Inspection Record Card
 No field inspections required
 Call (619) 446-6440 to
 schedule inspection
 (website - PC-APP)

TAMMY BUI
 STAMP
 PIS 228708

SPECS. NO. 5196 G-1

**PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT**

TITLE SHEET, LEGEND AND NOTES

CITY OF SAN DIEGO, CALIFORNIA		H.B.S. B-00939	
SHEET 1 OF 21 SHEETS		PROJECT 228708	
APPROVED FOR CITY ENGINEER	DATE	PROJECT MANAGER	DATE
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	TEZA		
AS-BUILTS			
CONTRACTOR	DATE STARTED	CONTROL CERTIFICATION	
INSPECTOR	DATE COMPLETED	206-1719	
		6280407-184844	
		NAD83 COORDINATE	
		36649- 1-D	

CONSTRUCTION CHANGE / ADDENDUM

CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.

CONSULTANT

TEZA
 Teza Design
 Consulting & Engineering
 1015 Alameda, Suite 210, San Diego, CA 92101
 Phone: (619) 591-0211 Fax: (619) 591-7700

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE



**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT

ROOF TOP UNITS RTU

TAG	MANUFACTURER	MODEL #	NOM. COOLING CAPACITY(TONS)	COOLING CAPACITY			EER	EAT (°F)		LAT (°F)		SUPPLY FAN DATA					RETURN FAN DATA			HEATING CAPACITY (GAS FIRED)				ELECTRIC DATA			WEIGHT (LBS)	REMARKS	
				TOTAL (MBH)	SENSIBLE (MBH)	REF		DB	WB	DB	WB	CFM	OSA	CFM	S.P.(W.C.)	EFF%	HP	CFM	TSP	BHP	HP	TOTAL CAPACITY (MBH)	EAT (°F)	LAT (°F)	EFF%	V/O/A2			MCA (A)
RTU-1	*McQUAY	RPS030D	29.7	356.6	301.2	R410A	10.3	80	67	57.6	52.1	12,000	7,100	3.35	91.7	15	4,900	0.5	0.7	3.0	250	65	84.1	80	460/60/3	81.9	100	7960	①②③④⑤⑥⑦
RTU-2	*McQUAY	RPS025D	25.5	305.6	239.4	R410A	10.0	77	65	53.4	53.0	8,750	2,050	2.77	90.2	12.5	6,700	0.5	1.2	3.0	200	65	86	80	460/60/3	65.1	80	7470	①②④⑤⑥⑦
RTU-3	*McQUAY	RAH047C	-	-	-	-	-	-	-	-	-	7,500	1,550	1.18	PREMIUM	5	5,950	-	-	-	250	65	96.5	80	460/60/3	8.1	15	5073	①②④⑥⑦
RTU-6	*McQUAY	RPS045D	44.8	537	423.6	R410A	10.4	78	67	56.3	55.6	16,000	5,700	2.67	91.7	15	10,300	0.5	1.4	3.0	400	65	87.9	80	460/60/3	106.8	125	12204	①②④⑤⑥⑦
RTU-7	*McQUAY	RPS025D	26.3	315.4	259.1	R410A	10.0	77	66	55.8	55.4	10,000	3,000	3.8	90.2	15	7,000	0.5	1.3	3.0	250	65	87.9	80	460/60/3	71.1	80	9158	①②③④⑤⑥⑦
RTU-8	*McQUAY	RPS025D	26.2	314.5	264	R410A	10.0	78	66	56.5	56.0	10,500	3,250	3.2	91.7	15	7,250	0.5	1.3	2.0	200	65	82.5	80	460/60/3	73.5	90	8655	①②③④⑤⑥⑦
RTU-10	*McQUAY	RPS015D	16.4	197.2	155.8	R410A	11.1	77	65	53.6	53.2	5,750	1,300	2.88	90.2	5	4,450	0.5	0.7	2.0	200	65	96.9	80	460/60/3	40	50	8032	①②③④⑤⑥⑦

* OR APPROVED EQUAL

REMARKS:

- ① - PROVIDE STAINLESS STEEL HEAT EXCHANGER.
- PROVIDE COPPER COILS AND FINS ON EVAPORATOR COILS.
- PROVIDE ELECTRO FIN COATED ALUMINUM MICRO-CHANNEL ON CONDENSER COIL.
- PROVIDE ZONE SENSORS AND HUMIDITY SENSORS WITH ASSOCIATED WIRING.
- PROVIDE VFD DRIVES FOR BOTH SUPPLY AND RETURN FANS.
- ② - PROVIDE SMOKE DETECTOR ON SUPPLY MAIN DUCTS.
- ③ - PROVIDE ELECTRODE STEAM HUMIDIFIER.
- ④ - PROVIDE FILTER BANKS MINIMUM OF MERV-15.
- ⑤ - PROVIDE INTEGRATED ENTHALPHY ECONOMIZER WITH POWER EXHAUST.
- ⑥ - COMMUNICATION CONTROLLER TO BE PROVIDED BY RTU MANUFACTURER.
- ⑦ - PROVIDE NEW SIEMENS APOGEE, OR APPROVED EQUAL, EMS CONTROLLER IN REPLACEMENT OF EXISTING SIEMENS 600 DDC PANEL.
- INSTALL NEW SIEMENS APOGEE, OR APPROVED EQUAL, CONTROL SYSTEM AND CONNECT TO NEW ROOF TOP UNITS (RT-1, RT-2, RT-3, RT-6, RT-7, RT-8, RT-10) AS WELL AS ALL OTHER EXISTING TERMINAL UNITS SERVING THE BUILDING THAT ARE BEING CONTROLLED BY THE EXISTING SIEMENS 600 PANEL.

NOTE:
LISTED WEIGHT DOES NOT INCLUDE CURB.

HUMIDIFIER SCHEDULE

MARK	MFGR & MODEL	CAPACITY (LB/HR)	DIMENSIONS (IN.)	LOAD (AMPS)	WEIGHT (LBS)	VOLTS/HZ/PH	REMARKS
H-1	*VAPAC LE-100A	100	31.9X20.5X16.6	43	147	460/60/3	-PROVIDE ELECTRODE STEAM TYPE HUMIDIFIER -COMMUNICATION CONTROLLER TO BE PROVIDED BY RTU MANUFACTURER.

* OR APPROVED EQUAL

GENERAL NOTES:

1. ALL DRAWINGS AND SPECIFICATIONS ARE TO BE CONSIDERED PART OF THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REVIEW AND COORDINATION OF ALL DRAWINGS PRIOR TO ANY CONSTRUCTION, INCLUDING ELECTRICAL, AND MECHANICAL. ANY APPARENT DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF ENGINEER PRIOR TO START OF CONSTRUCTION SO A CLARIFICATION MAY BE ISSUED. ANY WORK PERFORMED IN CONFLICT WITH THE CONTRACT DOCUMENTS OR ANY CODE REQUIREMENT SHALL BE CORRECTED BY THE CONTRACTOR AT HIS OWN EXPENSE AND AT NO EXPENSE TO THE OWNER.
2. PIPING AND CONDUIT, AS SHOWN ON DRAWINGS, IS SCHEMATIC AND SHALL BE FABRICATED AND INSTALLED BASED ON ACTUAL FIELD MEASUREMENT. COORDINATE WITH OTHER TRADES AS REQUIRED.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION AND PROVIDE REPAIR OF ADJACENT EXISTING SURFACES, AREAS, AND PROPERTY THAT MAY BE DAMAGED AS A RESULT OF ANY DEMOLITION AND/OR NEW WORK.
4. HANDLE, STORE AND INSTALL ALL EQUIPMENT PER MANUFACTURER'S INSTRUCTIONS.
5. SEISMIC: ALL PIPES, EQUIPMENT AND CONDUITS SHALL BE SUPPORTED AND BRACED PER SMACNA GUIDELINES FOR SEISMIC RESTRAINTS OF MECHANICAL SYSTEM AND PLUMBING PIPING SYSTEMS.
6. ALL WORK SHALL BE IN ACCORDANCE WITH CITY CODES, CALIFORNIA ENERGY CONSERVATION STANDARDS, TITLE - 24, AND ALL OTHER APPLICABLE CODES.
7. REMOVE EXISTING ZONE SENSORS, HUMIDITY SENSORS AND THERMOSTATS WITH ASSOCIATED WIRING. INSTALL NEW ZONE SENSORS AND HUMIDITY SENSORS WITH ASSOCIATED WIRING IN THE SPACES WITHIN THE BUILDING AND CONNECT TO THE NEW ROOF TOP UNITS AS WELL AS THE NEW ENERGY MANAGEMENT SYSTEM.

SPEC. NO. 5196

MO.1

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

MECHANICAL SCHEDULES AND NOTES

CITY OF SAN DIEGO, CALIFORNIA SHEET 2 OF 21 SHEETS		W.B.S. B-00839 PROJECT 228708
DATE: 5/11/12		PROJECT MANAGER: <i>[Signature]</i>
DESCRIPTION	BY	APPROVED
ORIGINAL	REZA	
DATE		
FILMED		
CONTRACTOR: _____		DATE STARTED: _____
INSPECTOR: _____		DATE COMPLETED: _____
		36649-2 -D

CONSULTANT



SCALE: HORIZONTAL NO SCALE
VERTICAL NO SCALE

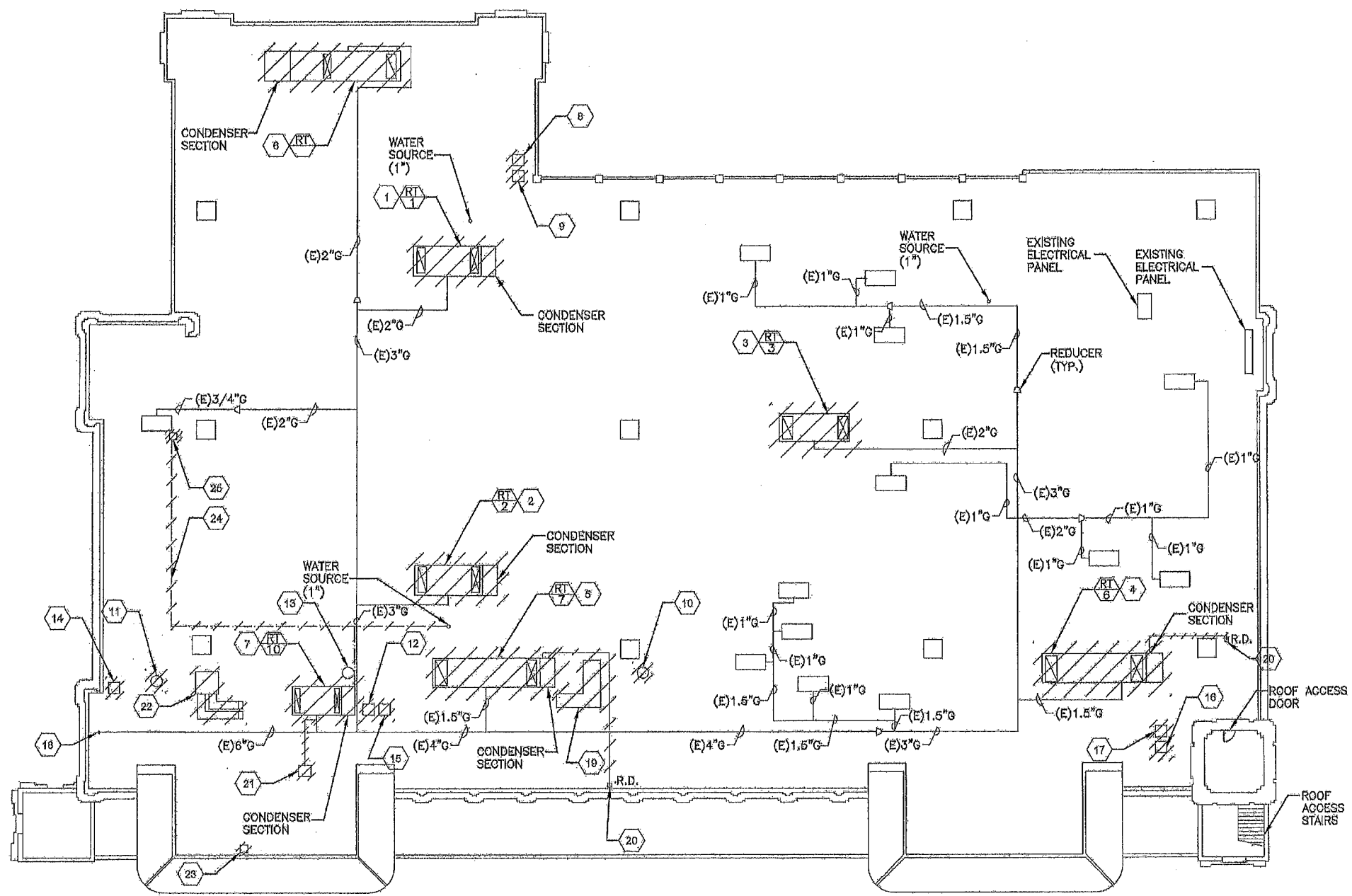


CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



- DEMOLITION NOTES**
- 1 EXISTING ROOF TOP UNIT-1 TO BE REMOVED. (APPROX. WEIGHT 7875 LBS)
 - 2 EXISTING ROOF TOP UNIT-2 TO BE REMOVED. (APPROX. WEIGHT 7875 LBS)
 - 3 EXISTING ROOF TOP UNIT-3 TO BE REMOVED. (APPROX. WEIGHT 6075 LBS)
 - 4 EXISTING ROOF TOP UNIT-6 TO BE REMOVED. (APPROX. WEIGHT 14950 LBS)
 - 5 EXISTING ROOF TOP UNIT-7 TO BE REMOVED. (APPROX. WEIGHT 13750 LBS)
 - 6 EXISTING ROOF TOP UNIT-8 TO BE REMOVED. (APPROX. WEIGHT 11000 LBS)
 - 7 EXISTING ROOF TOP UNIT-10 TO BE REMOVED. REMOVE EXISTING HUMIDIFIER. (APPROX. WEIGHT 7025 LBS)
 - 8 EXISTING EXHAUST FAN-1 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 9 EXISTING EXHAUST FAN-2 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 10 EXISTING EXHAUST FAN-3 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 11 EXISTING EXHAUST FAN-4 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 12 EXISTING EXHAUST FAN-5 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 13 EXISTING EXHAUST FAN-6 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 14 EXISTING EXHAUST FAN-7 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 15 EXISTING EXHAUST FAN-8 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 16 EXISTING EXHAUST FAN-9 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 17 EXISTING EXHAUST FAN-10 MOTOR AND BELT TO BE REMOVED. HOUSING AND CURB TO REMAIN.
 - 18 REMOVE EXISTING MAIN GAS SHUT-OFF VALVE.
 - 19 REMOVE AND DISPOSE EXISTING ROOF TOP UNIT. AFTER REMOVAL OF EXISTING UNIT, ALL PENETRATIONS SHALL BE CAPPED AND REPAIRED TO MATCH EXISTING ROOF, REFER TO GENERAL NOTES.
 - 20 REMOVE EXISTING CONDENSATE DRAIN PIPING TO THE EXISTING ROOF DRAIN CONNECTION.
 - 21 REMOVE EXISTING BOILER AND ASSOCIATED HOT WATER SUPPLY AND RETURN PIPING. COLD WATER PIPE SHALL BE GAPPED IN PLACE.
 - 22 REMOVE AND DISPOSE EXISTING ROOF TOP UNIT. AFTER REMOVAL OF EXISTING UNIT, ALL PENETRATIONS SHALL BE CAPPED AND REPAIRED TO MATCH EXISTING ROOF. REFER TO GENERAL NOTES 1 AND 2 INSTALLATION PROCEDURE.
 - 23 REMOVE AND DISPOSE THE DEBRIS FROM THE ROOF.
 - 24 REMOVE HORIZONTAL COLD WATER PIPING ON ROOF.
 - 25 REMOVE ABANDONED HUMIDIFIER.

- GENERAL NOTES**
- 1- CONTRACTOR SHALL COORDINATE WITH CITY OF SAN DIEGO RESIDENT ENGINEER TO RETAIN THE ROOF WARRANTY.
 - 2- CONTRACTOR SHALL USE MATCHING STEEL DECK TO CLOSE THE OPENINGS BY FASTENING TO THE ORIGINAL ROOF DECK. INFILL THE ROOF OPENINGS WITH ENERGY 3 ISO INSULATION, THEN COVER THE INSULATION WITH 1/2" DURABOARD, INSTALL JOHNS MANVILLE APPROVED COLD PROCESS OR HEAT WELDED ROOF SYSTEM AND TIE INTO THE EXISTING ROOF. REFER TO SPECIFICATION NUMBER 5196 VOLUME 1 APPENDIX H FOR JOHNS MANVILLE DETAILS AND ORION'S STRUCTURAL DETAILS "DET-01" AND "DET-02".
 - 3- PRIOR TO THE REMOVAL OF THE EQUIPMENT, THE CITY OF SAN DIEGO RESIDENT ENGINEER SHALL BE NOTIFIED TO VERIFY THE WEIGHTS AND LOCATIONS OF THE EQUIPMENT.

MECHANICAL ROOF DEMOLITION PLAN
1/16" = 1'-0" (1-102)



SPEC. NO. 5196 M-1

**PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT**

MECHANICAL ROOF DEMOLITION PLAN			
CITY OF SAN DIEGO, CALIFORNIA		W.P.S. B-00939	
SHEET 3 OF 21 SHEETS		PROJECT# 228708	
DATE: 11/19/11		PROJECT MANAGER: [Signature]	
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	REZA	[Signature]	[Date]
AS-BUILT			
CONTRACTOR:	DATE STARTED:	36649-3-D	
INSPECTOR:	DATE COMPLETED:		

CONSULTANT

EZA Teza Design
Consulting & Mechanical Engineering
225 A Street, Suite 201, San Diego, CA 92101
Phone: 619.594.8887 Fax: 619.594.8879

SCALE: HORIZONTAL NO SCALE
VERTICAL NO SCALE

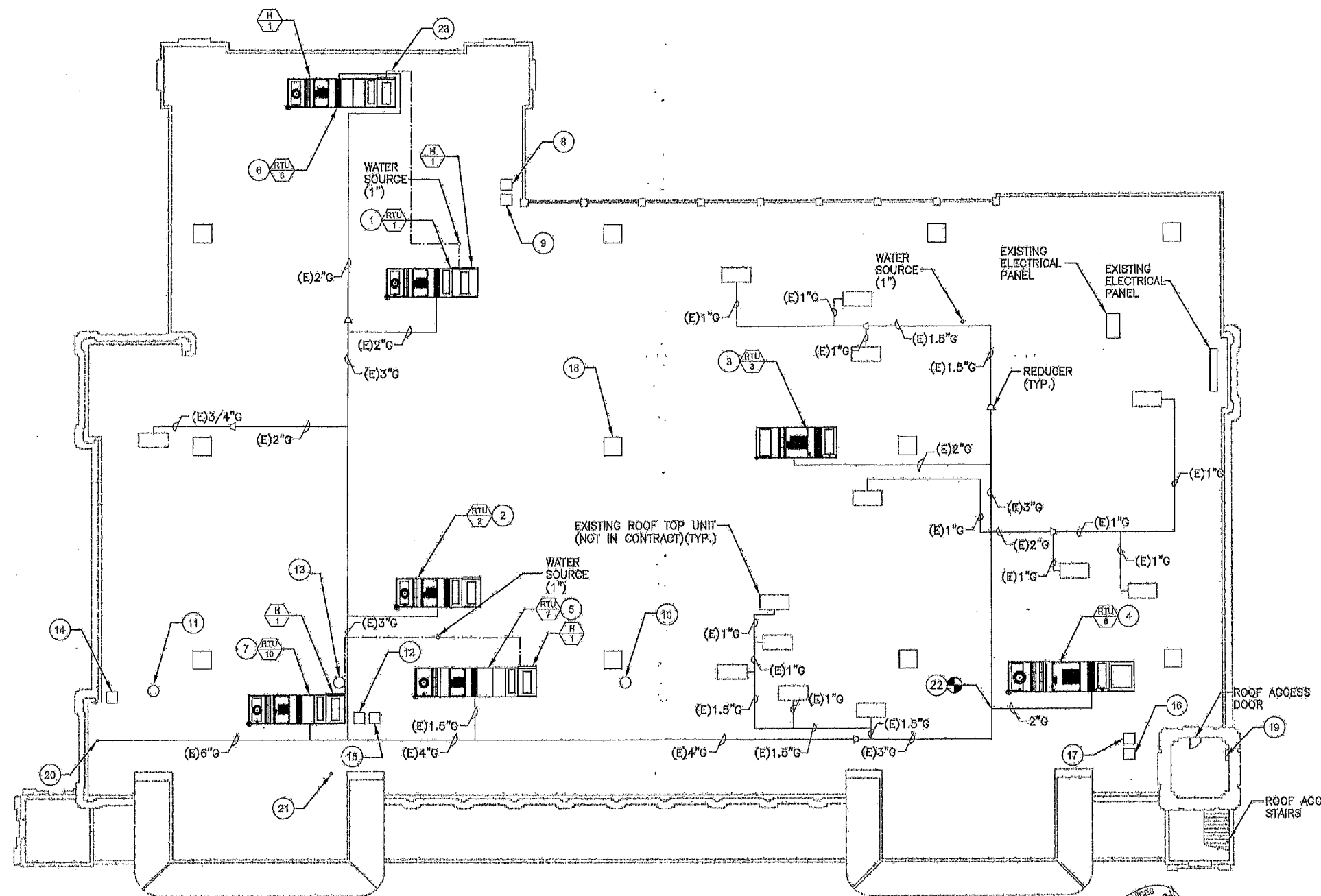


**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



WARNING
IF THIS BAR DOES NOT MEASURE THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



- PROPOSED NOTES**
- ① PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-1. PROVIDE A HUMIDIFIER.
 - ② PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-2.
 - ③ PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-3. Communication controller shall be provided by the roof top unit's manufacturer.
 - ④ PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-6.
 - ⑤ PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-7. PROVIDE A HUMIDIFIER.
 - ⑥ PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-8. PROVIDE A HUMIDIFIER.
 - ⑦ PROVIDE NEW ROOF TOP UNIT TO REPLACE EXISTING RT-10. PROVIDE A HUMIDIFIER.
 - ⑧ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-1. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑨ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-2. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑩ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-3. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑪ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-4. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑫ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-5. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑬ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-6. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑭ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-7. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑮ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-8. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑯ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-9. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑰ PROVIDE A NEW MOTOR AND BELT IN KIND FOR EXHAUST FAN-10. ALL MOVING PARTS SHALL BE LUBRICATED.*
 - ⑱ CAP ALL GRAVITY VENT THROAT WITH A 46"X46" METAL SHEET. (TYP. OF 11)
 - ⑲ BAGNET IP SWITCH
 - ⑳ PROVIDE NEW MAIN GAS SHUT-OFF VALVE.
 - ㉑ CAP ALL GRAVITY VENT THROAT WITH A 46"X46" METAL SHEET. (TYP. OF 11)
 - ㉒ PROVIDE 2" GAS PIPE FOR PROPOSED RTU-6.
 - ㉓ PROVIDE 1/2" COLD WATER FOR NEW HUMIDIFIERS.
*EF SHALL BE IN OPERATION

- GENERAL NOTES**
- 1- CURRENTLY, THE MAIN DUCTS OF RT-1 AND RT-2 ARE TIED, THE TWO ROOF TOP UNITS SHALL BE SEPARATED AS INTENDED IN THE ORIGINAL DESIGN. SEE M-3 AND M-4 SHEETS FOR FURTHER DETAILS.
 - 2- EXISTING GAS LINES SHALL BE CLEANED AND PAINTED. CONTRACTOR IS TO REPAIR ANY LEAKS.
 - 3- PROVIDE GAS METER AT EACH ROOF TOP UNIT.
 - 4- PROVIDE CONDENSATE DRAIN PER LATEST CODE. CONTRACTOR IS TO CLEAN CLOGGED CONDENSATE DRAIN PIPES.
 - 5- ENSURE THAT THERMAL OVERLOAD SWITCH IS BUILT-IN THE EXHAUST FAN UNITS AS STANDARD SAFETY FEATURE. PROVIDE TWO SPEED EXHAUST FAN MOTOR.
 - 6- CONTRACTOR SHALL CONNECT THE WATER SOURCE TO THE NEW HUMIDIFIERS PROPERLY.
 - 7- SEE M-8 SHEET FOR GAS ISOMETRIC DIAGRAM.
 - 8- The ten (10) exhaust fans shall be interlocked with roof top units through the HVAC DDC system.

MECHANICAL ROOF PROPOSED PLAN
1/16" = 1'-0" (1:192)



DEVELOPMENT SERVICES
228702
WWW.WATSONSHEET.COM
ELECTRICAL PLANNING DIVISION

PTS 228702 (rev)
BUILDING DEVELOPMENT REVIEW
DIVISION-STRUCTURAL
TED Poulos
02.25.2014

PLANS FOR THE CONSTRUCTION OF: CASA DE BALBOA - HVAC PROJECT	
MECHANICAL ROOF PROPOSED PLAN	
CITY OF SAN DIEGO, CALIFORNIA SHEET 4 OF 21 SHEETS	W.A.S. B-00939 PROJECT# 228708
FOR CITY ENGINEER	DATE
DESCRIPTION	BY
APPROVED	DATE
PLUMED	DATE
CONTROL IDENTIFICATION	
218-1719	
8200447-1846441	
820037 COORDINATE	
CONTRACTOR	DATE STARTED
INSPECTOR	DATE COMPLETED
	36649- 4 -D

CONSULTANT

Cega Design
233 A Street, Suite 101, San Diego, CA 92101
619.444.1111

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE

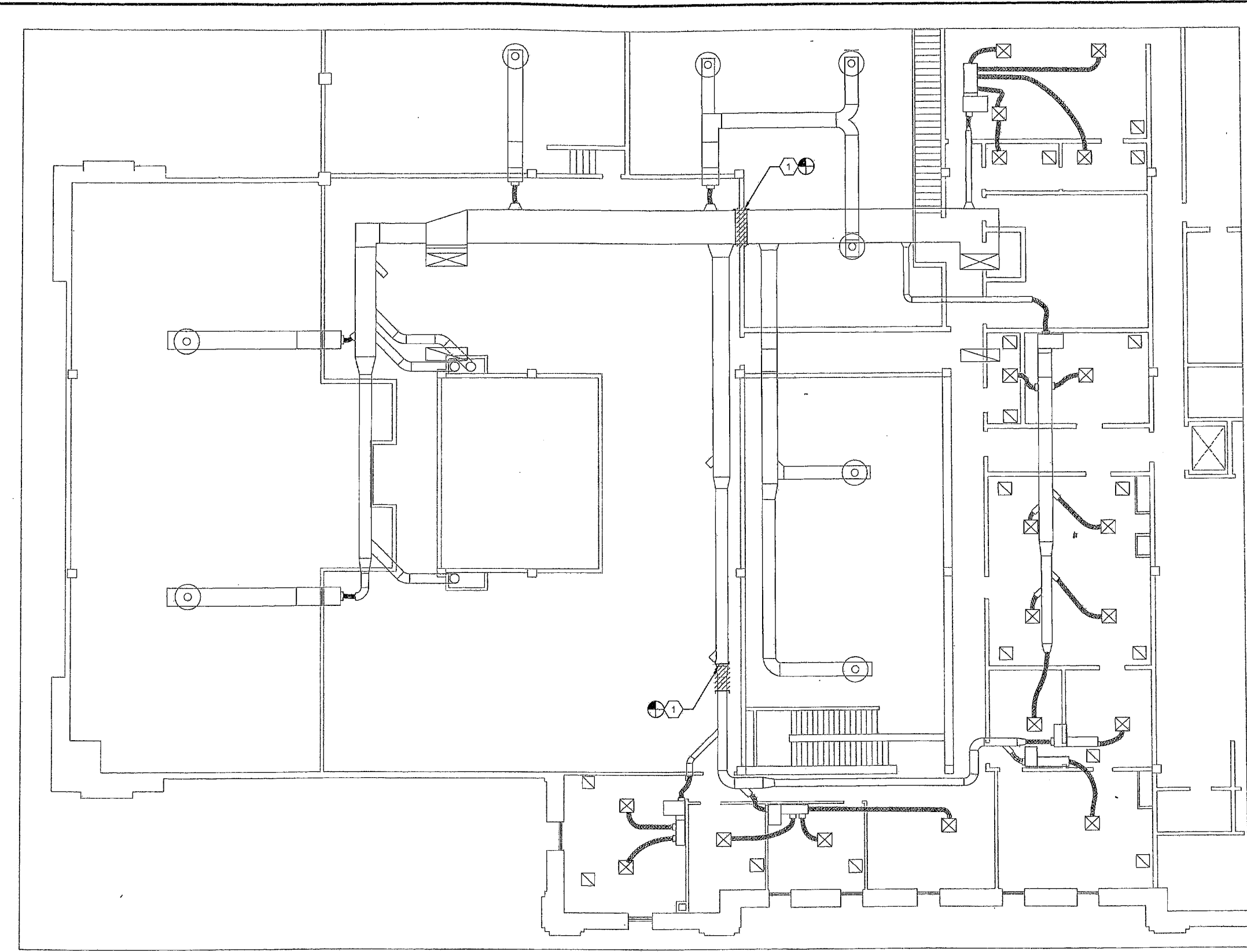


CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



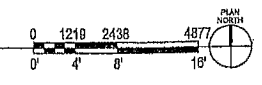
DEMOLITION NOTES

- 1 DEMOLISH THE DUCTWORK SHOWN CROSS-HATCHED AND CAP THE SEPARATED DUCTS IN PLACE. ENSURE DUCTS ARE LEAK PROOF.

GENERAL NOTES

- 1- CURRENTLY, THE MAIN DUCTS OF RT-1 AND RT-2 ARE TIED. THE TWO ROOF TOP UNITS SHALL BE SEPARATED AS INTENDED IN THE ORIGINAL DESIGN.

RT-1&2 DUCT SEPARATION PLAN
DEMOLITION
1/8" = 1'-0" [1-98]



SPEC. NO. 5199		M-3
PLANS FOR THE CONSTRUCTION OF: CASA DE BALBOA - HVAC PROJECT		
RT-1&2 DUCT SEPARATION PLAN - DEMOLITION		
CITY OF SAN DIEGO, CALIFORNIA SHEET 5 OF 21 SHEETS		W.B.S. 0-00539 PROJECT 228708
FOR CITY ENGINEER	DATE 1/27/12	PROJECT MANAGER
DESCRIPTION	BY	APPROVED
ORIGINAL	VEZA	
AS-BUILTS		
CONTRACTOR	DATE STARTED	CONTROL CERTIFICATION
INSPECTOR	DATE COMPLETED	200-1719 NA027 COORDINATE 6390407-104644 NA027 COORDINATE
		36649- 5 -D

CONSULTANT

SCALE HORIZONTAL NO SCALE VERTICAL NO SCALE

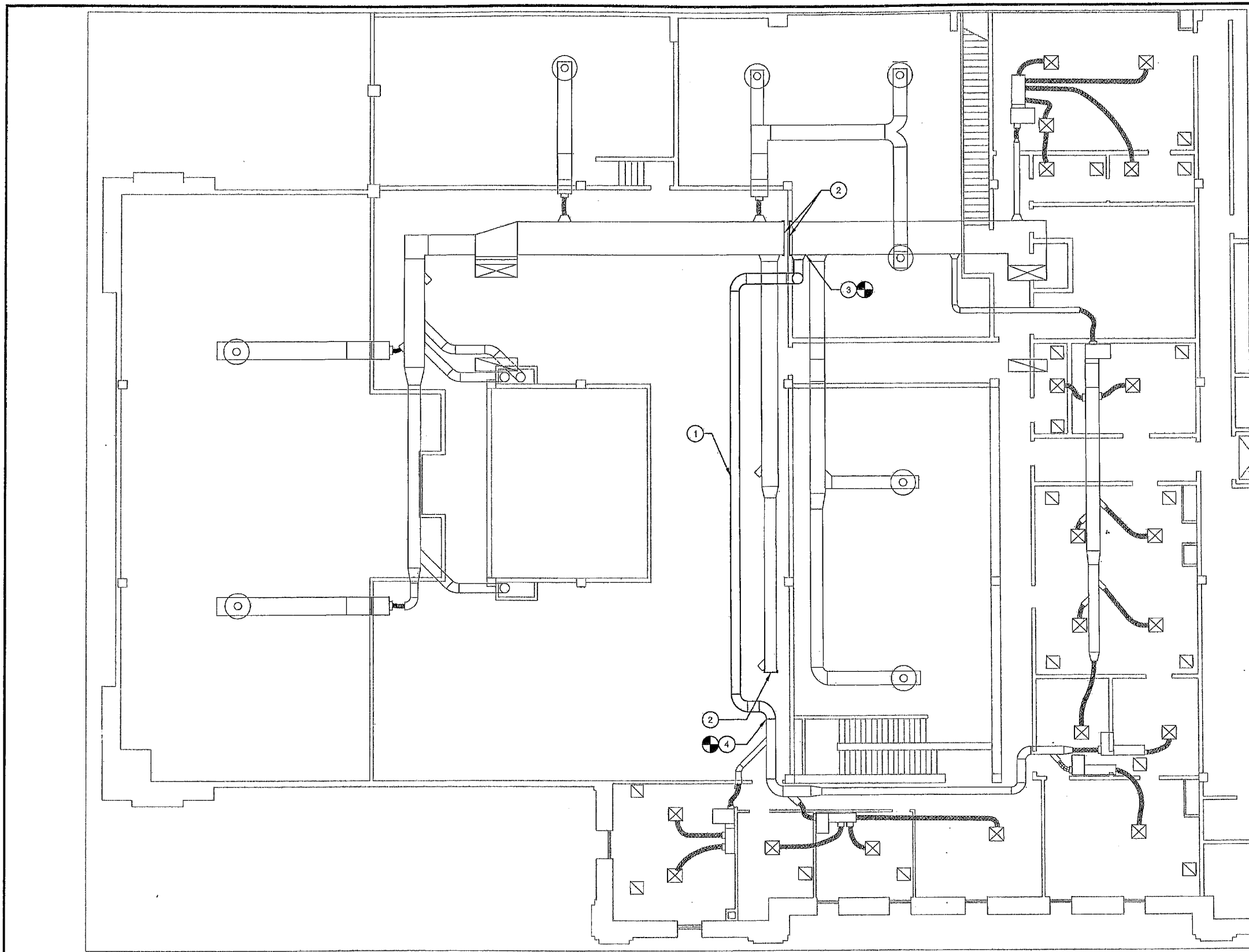


CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1' THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



PROPOSED NOTES

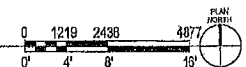
- ① PROVIDE 16" ROUND DUCTWORK AND CONNECT AS SHOWN. PROVIDE DUCT INSULATION PER CODE.
- ② DEMOLISHED SECTIONS OF THE DUCTWORK SHALL BE CAPPED.
- ③ POINT OF CONNECTION OF NEW 16" ROUND SUPPLY DUCT TO EXISTING MAIN SUPPLY AIR TRUNK.
- ④ POINT OF CONNECTION OF NEW 16" ROUND SUPPLY DUCT TO EXISTING 16" DUCTWORK.

GENERAL NOTES

- 1- CURRENTLY, THE MAIN DUCTS OF RT-1 AND RT-2 ARE TIED. THE TWO ROOF TOP UNITS SHALL BE SEPARATED AS INTENDED IN THE ORIGINAL DESIGN.

**RT-1&2 DUCT SEPARATION PLAN
PROPOSED**

1/8" = 1'-0" (1:96)



SPEC. NO. 5198

M-4

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

RT-1&2 DUCT SEPARATION PLAN - PROPOSED

CITY OF SAN DIEGO, CALIFORNIA		SHEET 6 OF 21 SHEETS		PROJECT # 228708	
DATE 1/27/12		DATE 1/27/12		PROJECT MANAGER	
DESCRIPTION	BY	APPROVED	DATE	FILED	CONTROL CERTIFICATION
ORIGINAL	TEZA				208-1719 NAD27 COORDINATE 6280407-1846444 NAD83 COORDINATE
AS-BUILTS					
CONTRACTOR		DATE STARTED			36649-6-D
INSPECTOR		DATE COMPLETED			

CONSULTANT



SCALE HORIZONTAL NO SCALE VERTICAL NO SCALE



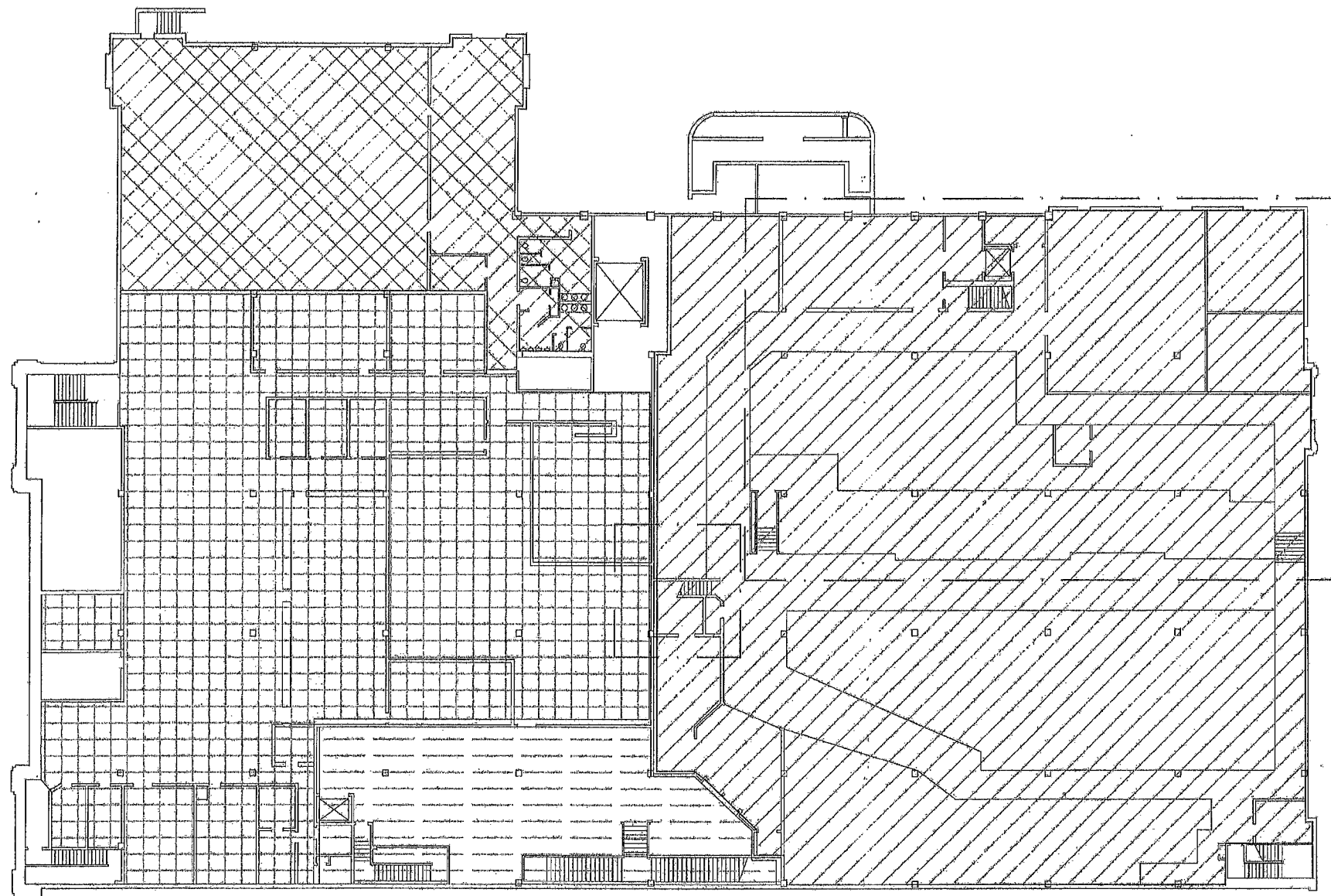
**CITY OF SAN DIEGO
PUBLIC WORKS PROJECT**



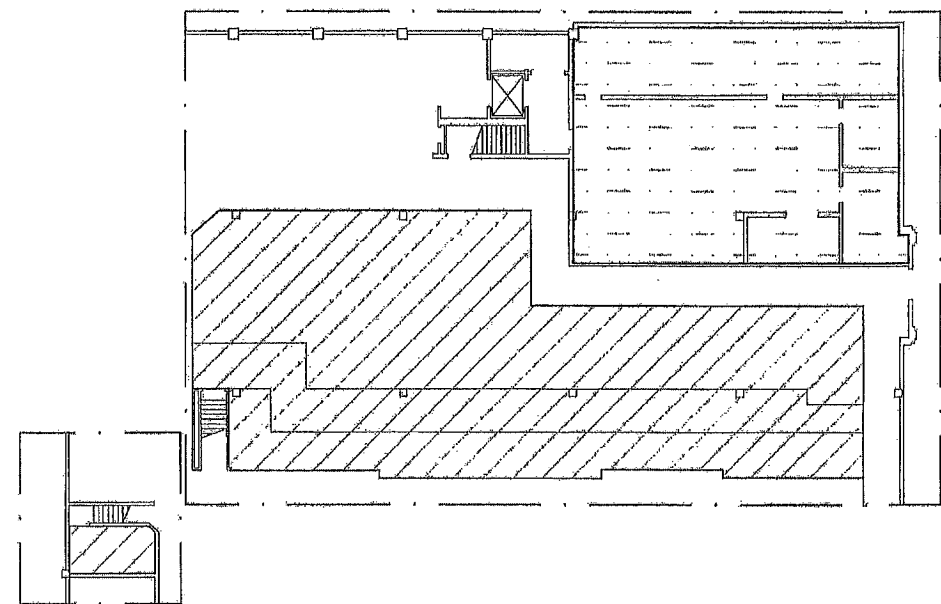
WARNING

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



MECHANICAL GROUND FLOOR ZONING PLAN
1/16" = 1'-0" (1:96)



MECHANICAL GROUND FLOOR UPPER LEVEL PLAN

1/16" = 1'-0" (1:96)



KEY NOTES

- RT-6 MUSEUM OF MODEL RAILROAD
- RT-8 AUDITORIUM - SAN DIEGO HISTORICAL SOCIETY
- RT-7 ARCHIVES - SAN DIEGO HISTORICAL SOCIETY
- RT-3 MAIN LOBBY
- FAN COIL LIBRARY - MUSEUM OF MODEL RAILROAD

GENERAL NOTES

1- ZONING PLAN IS PROVIDED INFORMATION ONLY

SPEC. NO. 5196

M-5

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

MECHANICAL GROUND FLOOR ZONING PLAN

CITY OF SAN DIEGO, CALIFORNIA
SHEET 1 OF 21 SHEETS

M.B.S. 8-00939
PROJECT# 228708

DESCRIPTION	BY	APPROVED	DATE	FILED	CONTROL CERTIFICATION
ORIGINAL	IEZA				208-1719 MADZY COORDINATE
AS-BUILT					0280407-124644 MADZY COORDINATE
CONTRACTOR			DATE STARTED		36649-7-D
INSPECTOR			DATE COMPLETED		

CONSULTANT



SCALE HORIZONTAL NO SCALE
VERTICAL NO SCALE

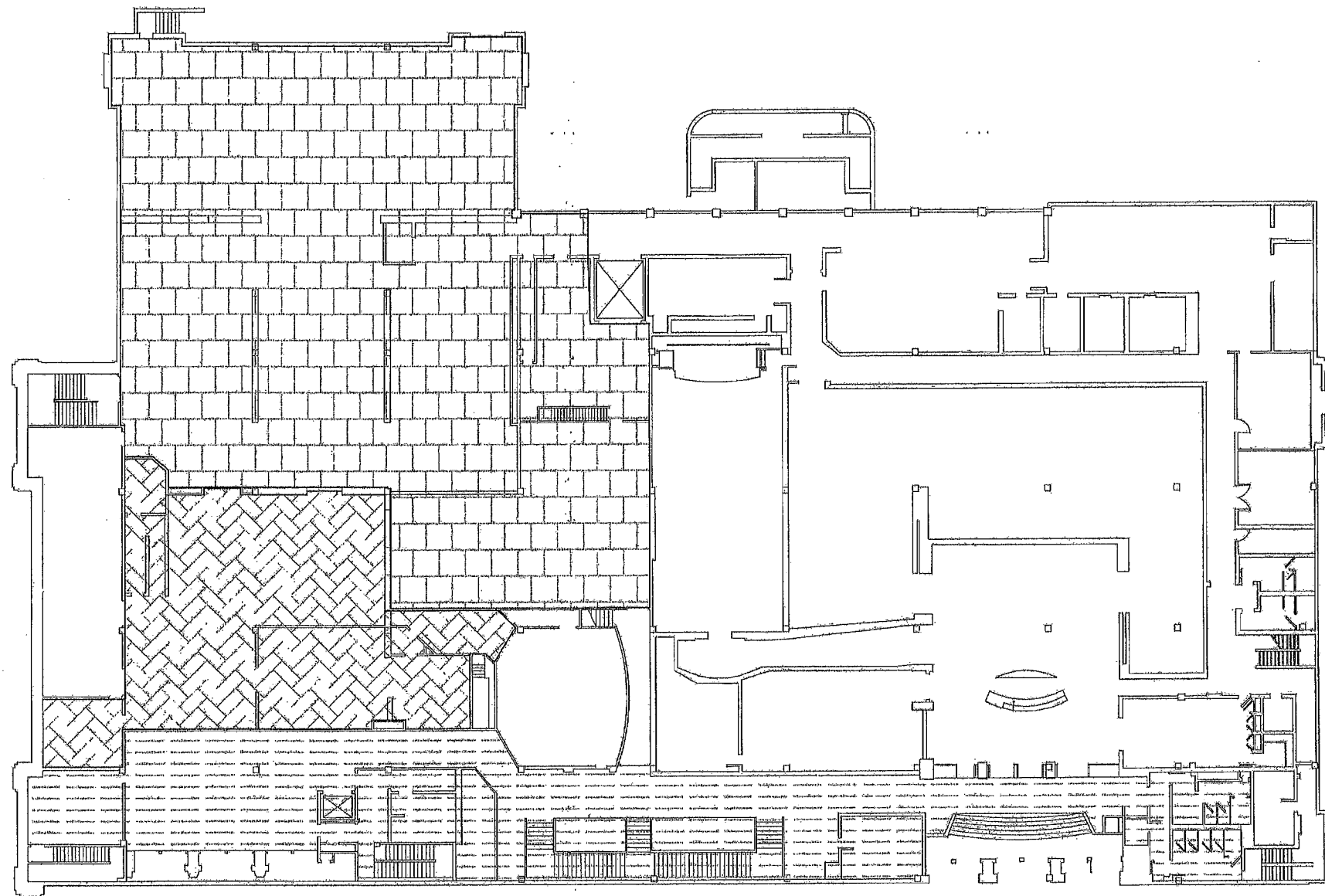


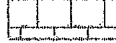
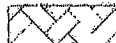
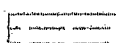
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



- KEY NOTES**
- RT-1  SAN DIEGO HISTORICAL SOCIETY
 - RT-2  SAN DIEGO HISTORICAL SOCIETY
 - RT-3  MAIN LOBBY

- GENERAL NOTES**
- 1- ZONING PLAN IS PROVIDED INFORMATION ONLY.
 - 2- SEE M-3 AND M-4 FOR RT-1&2 DUCTWORK SEPARATION PLAN.
 - 3- WORK IN MUSEUM OF PHOTOGRAPHIC ARTS (MOPA) IS NOT PART OF THIS CONTRACT.

MECHANICAL MAIN FLOOR ZONING PLAN
1/16" = 1'-0" (1/8")



SPEC. NO. 5196 M-6

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA -- HVAC PROJECT

MECHANICAL MAIN FLOOR ZONING PLAN

CITY OF SAN DIEGO, CALIFORNIA
SHEET 8 OF 21 SHEETS

W.B.S. B-00939
PROJECT# 228708

DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	JEZA			

FOR CITY ENGINEER

CONTROL CERTIFICATION


206-1719
MAD27 COORDINATE
8280407-1845444
MAD03 COORDINATE

AS-BUILT

CONTRACTOR: _____ DATE STARTED: _____
INSPECTOR: _____ DATE COMPLETED: _____

36649- 8-D

CONSULTANT


Cesa Design
Quantity & Mechanical Engineering
1014 Street Hill Rd. San Diego, CA 92108
(619) 444-1111 • Fax: (619) 444-1112

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE

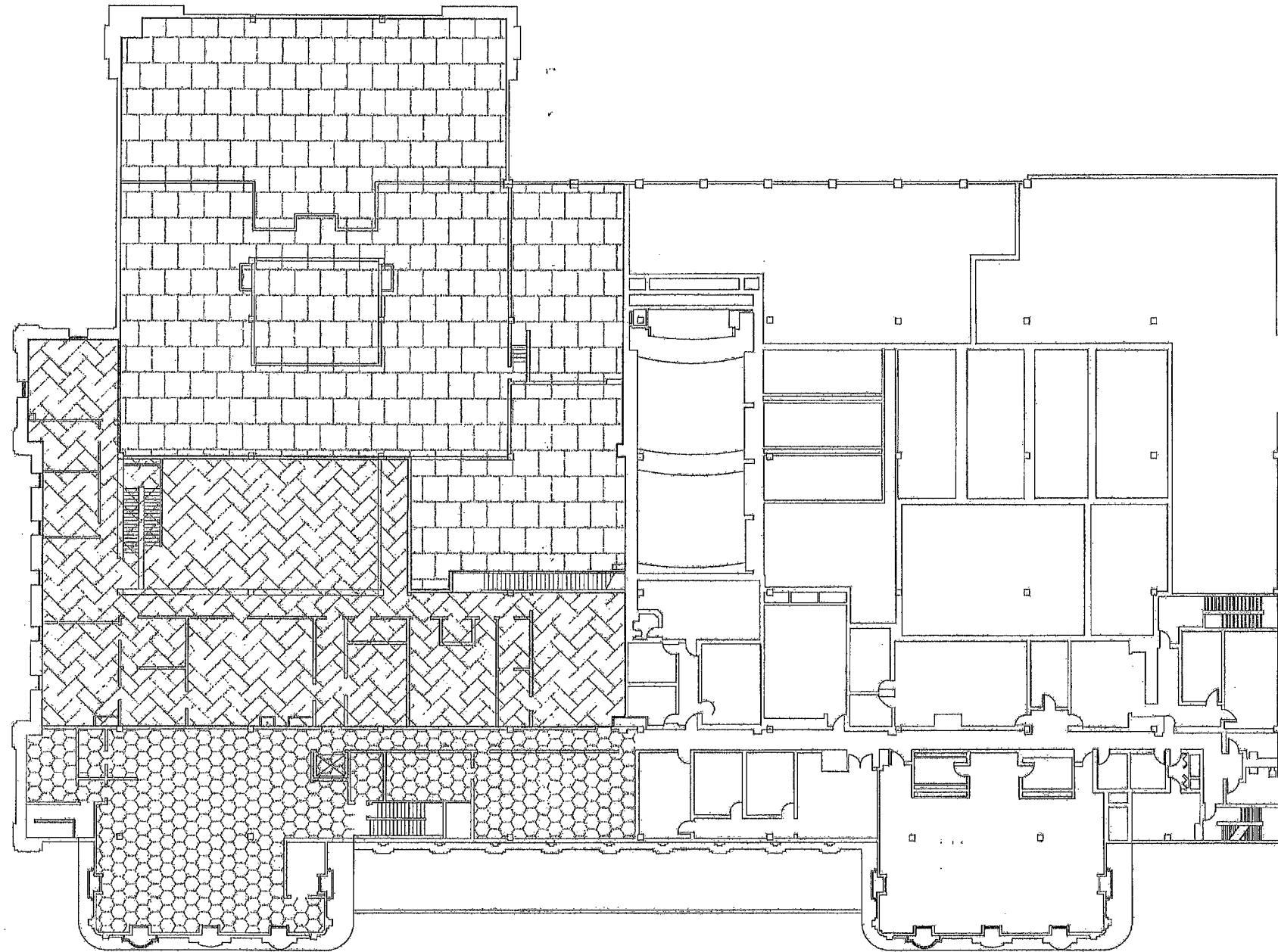


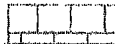
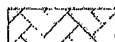
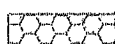
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE THEN DRAWING IS NOT TO SCALE

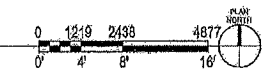
CASA DE BALBOA - HVAC PROJECT



- KEY NOTES**
- RT-1  SAN DIEGO HISTORICAL SOCIETY
 - RT-2  SAN DIEGO HISTORICAL SOCIETY
 - RT-10  BALBOA ART CONSERVATION CENTER (BAOC)

- GENERAL NOTES**
- 1- ZONING PLAN IS PROVIDED INFORMATION ONLY.
 - 2- SEE M-3 AND M-4 FOR RT-1&2 SEPARATION PLAN.
 - 3- WORK IN MUSEUM OF PHOTOGRAPHIC ARTS (MOPA) IS NOT PART OF THIS CONTRACT.

MECHANICAL MEZZANINE LEVEL ZONING PLAN
 1/16" = 1'-0" [1:96]



M-7

SPEC. NO. 519F

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT


MECHANICAL MEZZANINE LEVEL ZONING PLAN

CITY OF SAN DIEGO, CALIFORNIA
SHEET 9 OF 21 SHEETS

<i>[Signature]</i> FOR CITY ENGINEER	<i>[Signature]</i> PROJECT MANAGER
DATE	DATE
APPROVED	FILED
BY	CONTROL CERTIFICATION
DESCRIPTION	208-1718
ORIGINAL	NAUBS COORDINATE
MEZA	8280107-1846114
AS-BUILT	NAUBS COORDINATE
CONTRACTOR	DATE STARTED
INSPECTOR	DATE COMPLETED

36649- 9 -D

CONSULTANT



Teza Design
 Consulting Mechanical Engineering
277 A Street, Suite 400, San Diego, CA 92101
 Phone: (619) 594-1234 Fax: (619) 594-1235

SCALE: HORIZONTAL NO SCALE
 VERTICAL NO SCALE

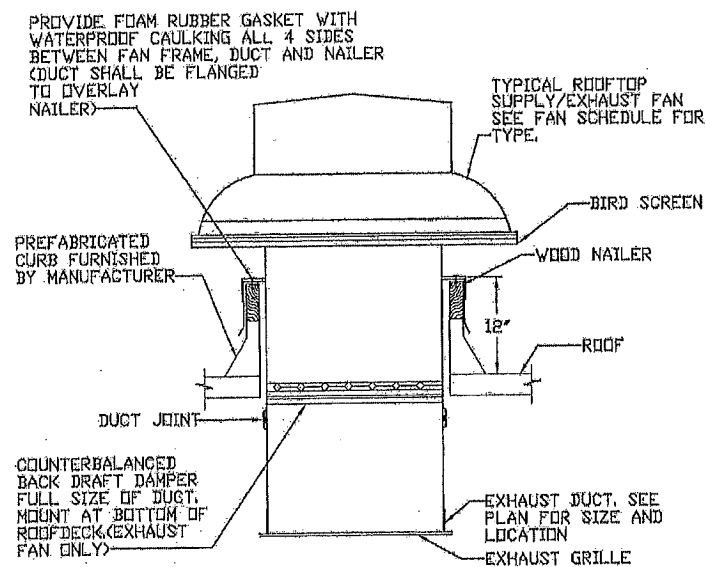


CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

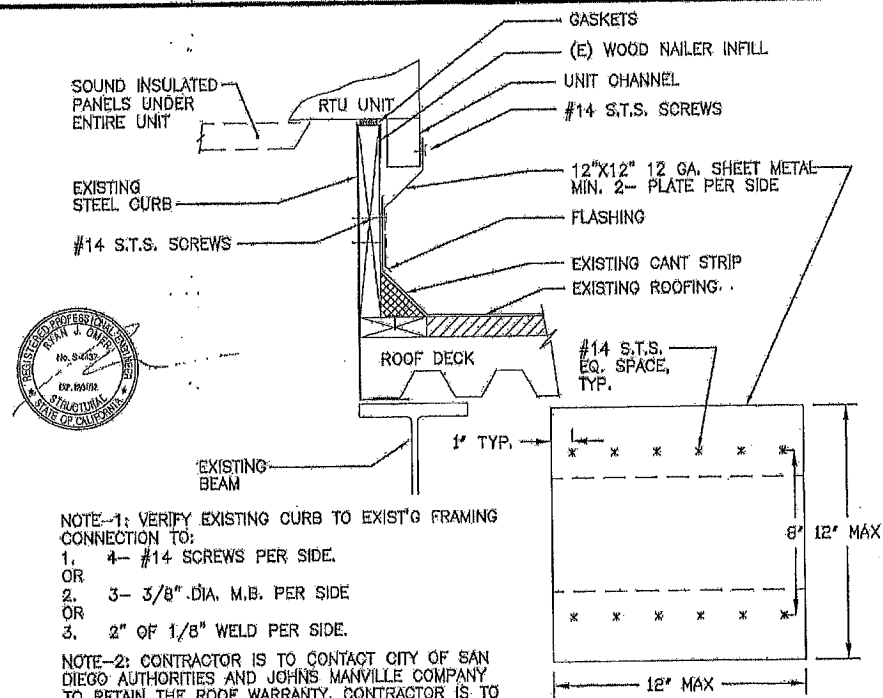


WARNING
 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



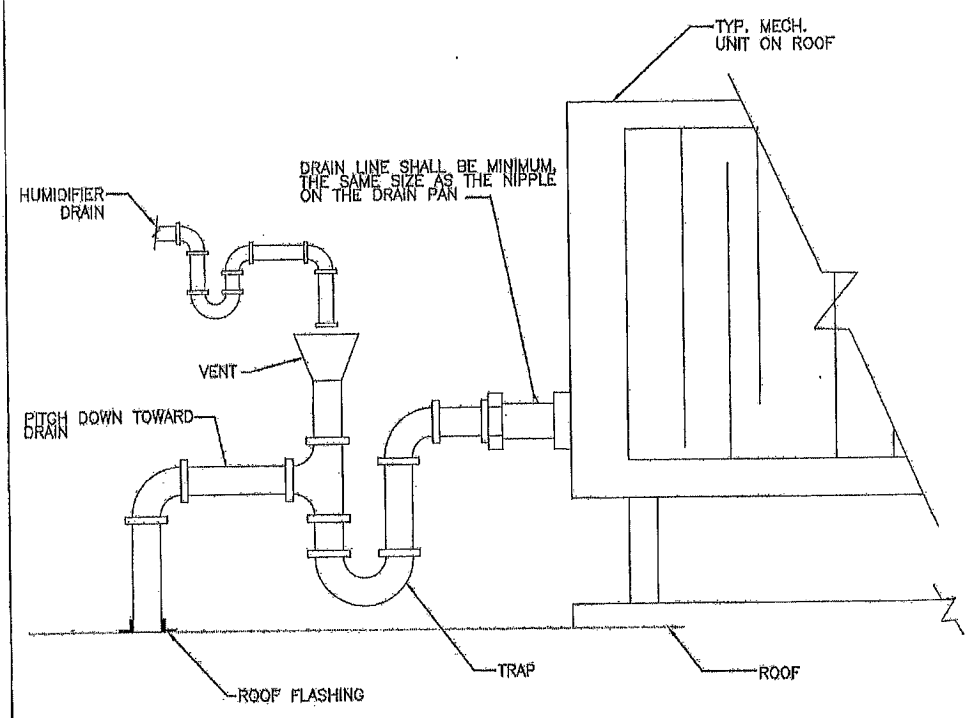
A ROOFTOP EXHAUST FAN DETAIL
NOT TO SCALE



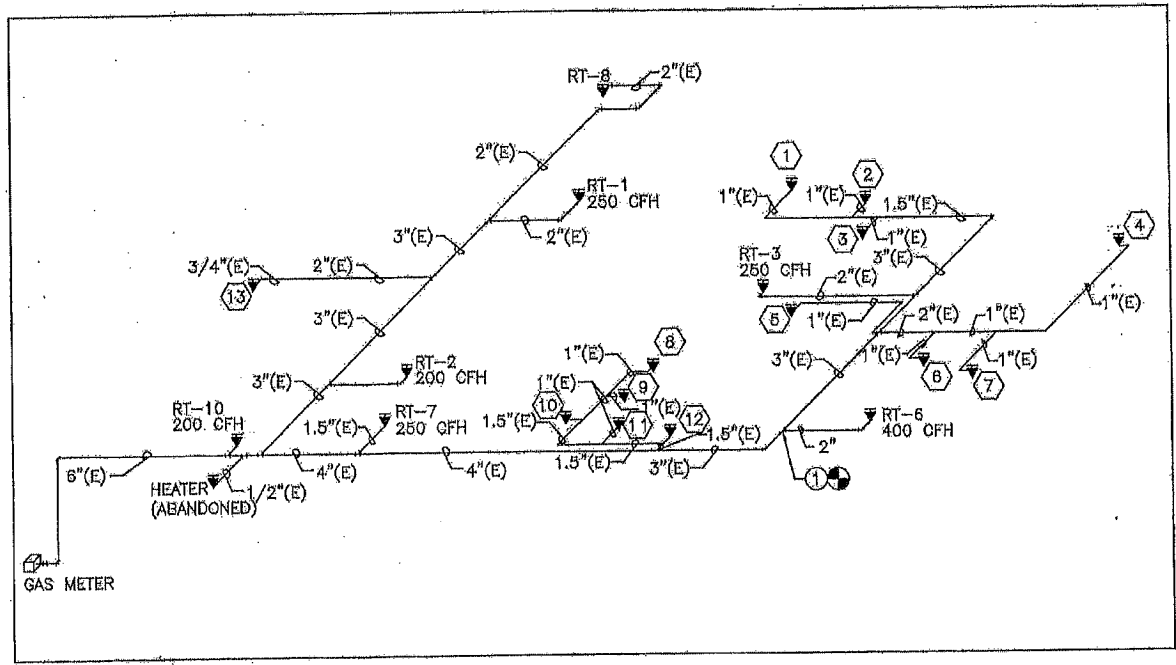
NOTE-1: VERIFY EXISTING CURB TO EXIST'G FRAMING CONNECTION TO:
 1. 4- #14 SCREWS PER SIDE.
 OR
 2. 3- 3/8" DIA. M.B. PER SIDE
 OR
 3. 2" OF 1/8" WELD PER SIDE.

NOTE-2: CONTRACTOR IS TO CONTACT CITY OF SAN DIEGO AUTHORITIES AND JOHNS MANVILLE COMPANY TO RETAIN THE ROOF WARRANTY. CONTRACTOR IS TO REPAIR ANY ROOF OR EQUIPMENT DAMAGE THAT OCCURS DURING THE INSTALLATION ON HIS OWN EXPENSE.

B ROOF MOUNTED AIR CONDITIONING UNIT
NOT TO SCALE



C CONDENSATE DRAIN PIPING DETAIL
NOT TO SCALE



GAS SYSTEM CALCULATIONS

DEMAND	PROPOSED	EXISTING	EXISTING	EXISTING
RTU-1	250 MBH 250 CFH	① EXISTING AC (NOT IN CONTRACT)	72 MBH 72 CFH	⑧ EXISTING AC (NOT IN CONTRACT) 72 MBH 72 CFH
RTU-2	200 MBH 200 CFH	② EXISTING AC (NOT IN CONTRACT)	125 MBH 125 CFH	⑨ EXISTING AC (NOT IN CONTRACT) 72 MBH 72 CFH
RTU-3	250 MBH 250 CFH	③ EXISTING AC (NOT IN CONTRACT)	125 MBH 125 CFH	⑩ EXISTING AC (NOT IN CONTRACT) 125 MBH 125 CFH
RTU-6	400 MBH 400 CFH	④ EXISTING AC (NOT IN CONTRACT)	72 MBH 72 CFH	⑪ EXISTING AC (NOT IN CONTRACT) 72 MBH 72 CFH
RTU-7	250 MBH 250 CFH	⑤ EXISTING AC (NOT IN CONTRACT)	125 MBH 125 CFH	⑫ EXISTING AC (NOT IN CONTRACT) 250 MBH 250 CFH
RTU-8	200 MBH 200 CFH	⑥ EXISTING AC (NOT IN CONTRACT)	72 MBH 72 CFH	⑬ EXISTING AC (NOT IN CONTRACT) 100 MBH 100 CFH
RTU-10	200 MBH 200 CFH	⑦ EXISTING AC (NOT IN CONTRACT)	72 MBH 72 CFH	
TOTAL	3105 MBH 3105 CFH			

DISTANCE FROM METER TO REMOTE UNIT 440 FT
 PIPE MATERIAL STEEL - SCHEDULE 40

KEY NOTES

- ① PROVIDE 2" GAS PIPE FOR ROOF TOP UNIT-6
- ② MOPA SHARES A NATURAL GAS PIPING SYSTEM WITH THE REST OF THE GAS FIRED SYSTEM. TO ACCOMPLISH KEY NOTE ① ABOVE THE MAIN GAS SHUT OFF WILL HAVE TO BE TURNED OFF THEN RESTARTED.

CONSULTANT



SCALE HORIZONTAL NO SCALE VERTICAL NO SCALE



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

PLAN FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

MECHANICAL DETAILS

CITY OF SAN DIEGO, CALIFORNIA
SHEET 16 OF 21 SHEETS

PROJECT 228708

DATE 10/11/11

FOR CITY ENGINEER

BY DEZA

APPROVED DATE FILLED

CONTROL CERTIFICATION

206-1719

NA027 COORDINATE

6280107-1846144

NA063 COORDINATE

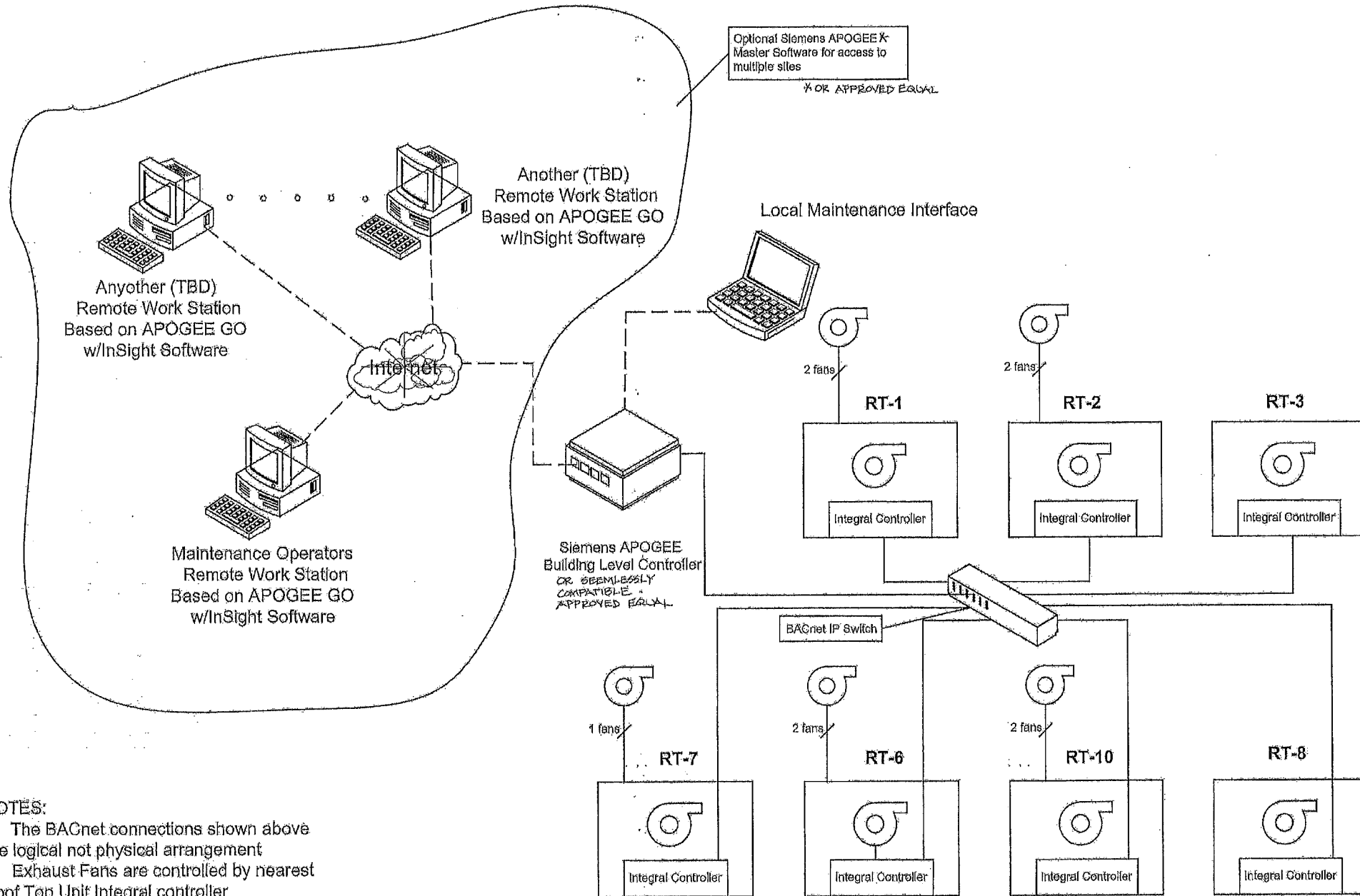
AS-BUILT

CONTRACTOR DATE STARTED

INSPECTOR DATE COMPLETED

36649-10-D

CASA DE BALBOA - HVAC PROJECT



- NOTES:
1. The BACnet connections shown above are logical not physical arrangement
 2. Exhaust Fans are controlled by nearest Roof Top Unit Integral controller
 3. Exhaust Fans are 2 speed (High/Low)
 3. BACNet IP Switch located in Roof Access Room

IP SYSTEM ARCHITECTURE
NO SCALE

M-9

SPEC. NO. 6198

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

IP SYSTEM ARCHITECTURE

CITY OF SAN DIEGO, CALIFORNIA
SHEET 11 OF 21 SHEETS

W.B.S. B-00238
PROJECT# 228708

FOR CITY ENGINEER: *[Signature]* DATE: *[Date]* PROJECT MANAGER: *[Signature]*

DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL				

CONTROL CERTIFICATION

206-1719
NADP7 COORDINATE

6780407-184844
NADP8 COORDINATE

AS-BUILTS

CONTRACTOR: _____ DATE STARTED: _____
INSPECTOR: _____ DATE COMPLETED: _____

36649-11-D

CONSULTANT

EZA Teza Design
CONSULTING & ARCHITECTURAL ENGINEERING
1711 MISSION VALLEY BLVD. SUITE 100 SAN DIEGO, CA 92108
PHONE: 619-594-2222 FAX: 619-594-2223

SCALE: HORIZONTAL NO SCALE
VERTICAL NO SCALE



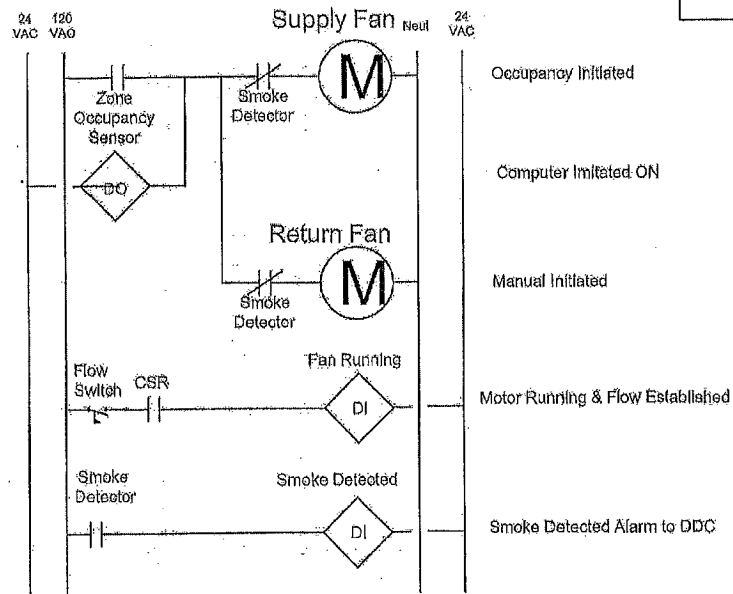
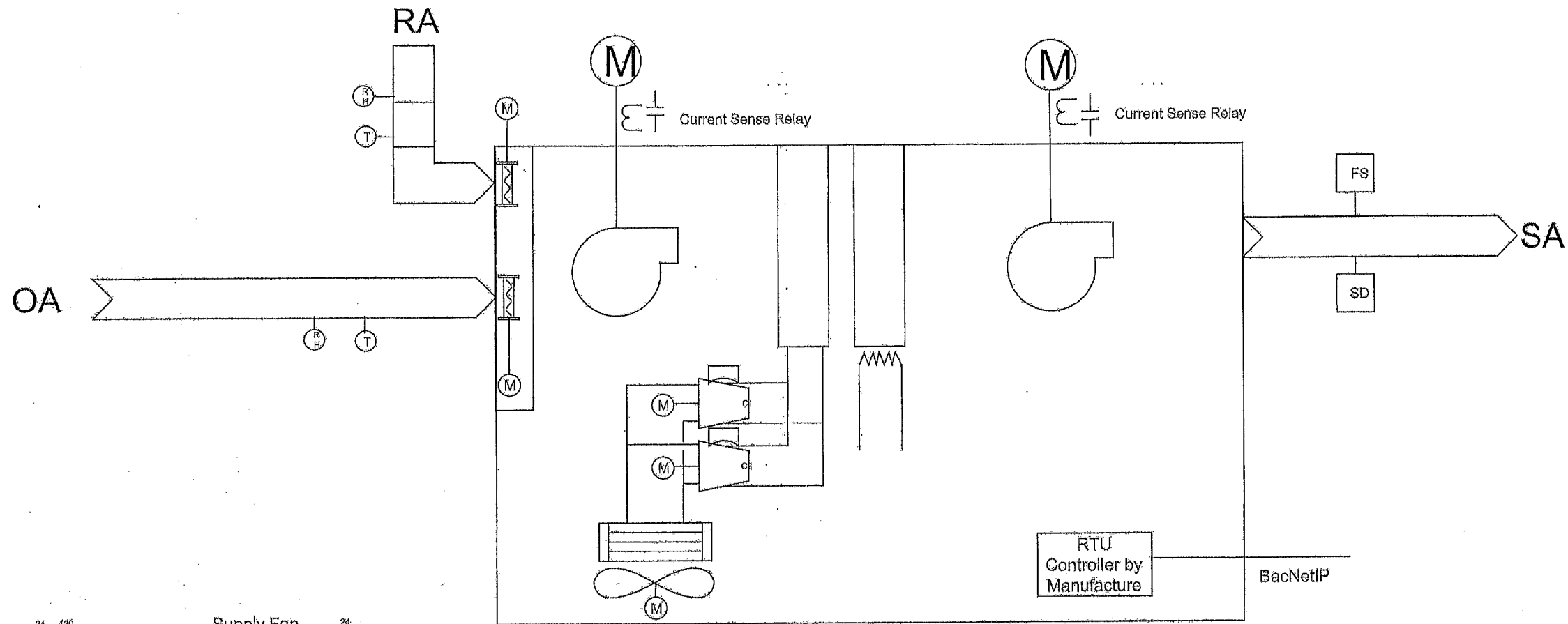
CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING

IF THIS BAR DOES NOT MEASURE THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



- INSTRUMENT LEGEND**
- Thermostat
 - Humidity
 - Temperature
 - Motorized Damper Operator
 - Current Sense Relay
 - Flow Switch
 - Smoke Detector

ROOF TOP UNIT CONTROL ARCHITECTURE
NO SCALE

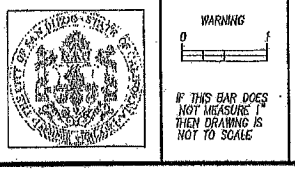
SPEC. NO. 5106		M-10
PLANS FOR THE CONSTRUCTION OF: CASA DE BALBOA - HVAC PROJECT		
ROOF TOP UNIT CONTROL ARCHITECTURE		
CITY OF SAN DIEGO, CALIFORNIA SHEET 12 OF 21 SHEETS		U.S. PROJECT 228708
FOR CITY ENGINEER	DATE 10/18/11	PROJECT MANAGER
DESCRIPTION	BY	APPROVED
ORIGINAL	REZA	
		DATE
		FILMED
CONTROL CERTIFICATION		
206-1719		
HARDY COORDINATE		
AS-BUILTS		
CONTRACTOR		DATE STARTED
INSPECTOR		DATE COMPLETED
		36649-12-D

CONSULTANT

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



CASA DE BALBOA - HVAC PROJECT

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 1 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 6/28/2011
 Project Address: 233 A Street, San Diego, CA 92101
 Climate Zone: 7
 Total Cond. Floor Area: 86,299
 Additions Floor Area: n/a

GENERAL INFORMATION
 Building Type: Nonresidential High-Rise Residential Hotel/Motel Guest Room
 Schools (Public School) Relocatable Public School Bldg Conditioned Spaces Unconditioned Spaces (Attic)

PHASE OF CONSTRUCTION: New Construction Addition Alteration

APPROACH OF COMPLIANCE: Component Overall Envelope TUV Entry Unconditioned (file attached)

FIELD INSPECTION ENERGY CHECKLIST
 HVAC SYSTEM DETAILS
 Equipment¹: RT-1
 Room or System Type (i.e. AC-1, RTU-1, HP-1): Packaged DX
 Equipment Type²: 1
 Number of Systems: 1
 Max Allowed Heating Capacity³: 220,947 Btu/hr
 Minimum Heating Efficiency³: 82% FE
 Max Allowed Cooling Capacity³: 220,947 Btu/hr
 Minimum Cooling Capacity³: 220,947 Btu/hr
 Cooling Efficiency³: 10.3 EER
 Duct Leakage R-Value: Conditioned / B.O.
 When duct leakage is required, submit MECH-4A & MECH-4-HERS: No
 Economizer: D/E, Enthalpy (Integrated)
 Thermostat: Software Required
 Fan Control: Constant Volume

1. If the actual installed equipment performance efficiency and capacity is less than the Proposed from the energy compliance submission or from the building plans, the responsible party shall resubmit energy compliance to include the new changes.
 2. For additional details on compliance see Page 2 of the Inspection Checklist Form. Compliance fails if a Fail box is checked.
 3. Indicate Equipment Type: Gas (HP or SP), Oil, VAV, HP (HP or split), Hydronic, PTAC, or other.

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 1 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 7/18/2011
 Project Address: 233 A Street, San Diego, CA 92101
 Climate Zone: 7
 Total Cond. Floor Area: 86,299
 Additions Floor Area: n/a

GENERAL INFORMATION
 Building Type: Nonresidential High-Rise Residential Hotel/Motel Guest Room
 Schools (Public School) Relocatable Public School Bldg Conditioned Spaces Unconditioned Spaces (Attic)

PHASE OF CONSTRUCTION: New Construction Addition Alteration

APPROACH OF COMPLIANCE: Component Overall Envelope TUV Entry Unconditioned (file attached)

FIELD INSPECTION ENERGY CHECKLIST
 HVAC SYSTEM DETAILS
 Equipment¹: RT-3
 Room or System Type (i.e. AC-1, RTU-1, HP-1): Packaged DX
 Equipment Type²: 1
 Number of Systems: 1
 Max Allowed Heating Capacity³: 306,117 Btu/hr
 Minimum Heating Efficiency³: 82% FE
 Max Allowed Cooling Capacity³: 292,807 Btu/hr
 Cooling Efficiency³: n/a
 Duct Leakage R-Value: AHIC, Ceiling Ins. vented / B.O.
 When duct leakage is required, submit MECH-4A & MECH-4-HERS: No
 Economizer: D/E, Enthalpy (Integrated)
 Thermostat: Software Required
 Fan Control: Constant Volume

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 1 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 7/14/2011
 Project Address: 233 A Street, San Diego, CA 92101
 Climate Zone: 7
 Total Cond. Floor Area: 86,299
 Additions Floor Area: n/a

GENERAL INFORMATION
 Building Type: Nonresidential High-Rise Residential Hotel/Motel Guest Room
 Schools (Public School) Relocatable Public School Bldg Conditioned Spaces Unconditioned Spaces (Attic)

PHASE OF CONSTRUCTION: New Construction Addition Alteration

APPROACH OF COMPLIANCE: Component Overall Envelope TUV Entry Unconditioned (file attached)

FIELD INSPECTION ENERGY CHECKLIST
 HVAC SYSTEM DETAILS
 Equipment¹: RT-7
 Room or System Type (i.e. AC-1, RTU-1, HP-1): Packaged DX
 Equipment Type²: 1
 Number of Systems: 1
 Max Allowed Heating Capacity³: 229,263 Btu/hr
 Minimum Heating Efficiency³: 82% FE
 Max Allowed Cooling Capacity³: 405,821 Btu/hr
 Cooling Efficiency³: 10.0 EER
 Duct Leakage R-Value: AHIC, Ceiling Ins. vented / B.O.
 When duct leakage is required, submit MECH-4A & MECH-4-HERS: No
 Economizer: D/E, Enthalpy (Integrated)
 Thermostat: Software Required
 Fan Control: Constant Volume

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 3 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 7/14/2011

Required Acceptance Tests
 Designer: This form is to be used by the designer and attached to the plans. Listed below are all the acceptance tests for mechanical systems. The designer is required to check the applicable boxes by all acceptance tests that apply and kind of equipment that requires an acceptance test. If all equipment of a certain type requires a test, list the equipment description and the number of systems. The RA number designates the Section of the Appendix of the Residential Performance Requirements that apply to the test. Since the form will be part of the plans, completion of this section will allow the responsible party to budget for the scope of work appropriately.

Building Departments:
 Systems Acceptance: Before occupancy permit is granted for a newly constructed building or space, or a new space-conditioning system serving a building or space is operated for normal use, all control devices serving the building or space shall be certified as meeting the Acceptance Requirements for Code Compliance.
 Systems Acceptance: Before occupancy permit is granted. All newly installed HVAC equipment must be tested using the Acceptance Requirements.

The MECH-1C form is not considered a completed form and is not to be accepted by the building department unless the correct boxes are checked. The equipment requiring testing, checked-off boxes are required for ALL newly installed equipment. In addition a Certificate of Acceptance form is required. The following information shall be submitted to the building department that certifies plans, specifications, installation, commissioning, and operating and maintenance information meet the requirements of 916-10300 and Title-24 Part 6. The building inspector must receive the completed and signed forms before the building can receive final occupancy.

TEST DESCRIPTION	MECH-2A	MECH-2A.1	MECH-2A.2	MECH-2A.3	MECH-2A.4	MECH-2A.5	MECH-2A.6	MECH-2A.7	MECH-2A.8	MECH-2A.9	MECH-2A.10	MECH-2A.11	MECH-2A.12
Equipment Testing or Verification	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk
RT-1													
RT-2													
RT-3													
RT-4													
RT-5													
RT-6													
RT-7													
RT-8													
RT-9													
RT-10													

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 4 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 6/28/2011

TEST DESCRIPTION

TEST DESCRIPTION	MECH-1C.1	MECH-1C.2	MECH-1C.3	MECH-1C.4	MECH-1C.5	MECH-1C.6	MECH-1C.7	MECH-1C.8	MECH-1C.9	MECH-1C.10	MECH-1C.11	MECH-1C.12	MECH-1C.13	MECH-1C.14	MECH-1C.15	MECH-1C.16	MECH-1C.17	MECH-1C.18	MECH-1C.19	MECH-1C.20
Equipment Testing or Verification	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk
RT-1																				
RT-2																				
RT-3																				
RT-4																				
RT-5																				
RT-6																				
RT-7																				
RT-8																				
RT-9																				
RT-10																				

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 1 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 6/28/2011
 Project Address: 233 A Street, San Diego, CA 92101
 Climate Zone: 7
 Total Cond. Floor Area: 86,299
 Additions Floor Area: n/a

GENERAL INFORMATION
 Building Type: Nonresidential High-Rise Residential Hotel/Motel Guest Room
 Schools (Public School) Relocatable Public School Bldg Conditioned Spaces Unconditioned Spaces (Attic)

PHASE OF CONSTRUCTION: New Construction Addition Alteration

APPROACH OF COMPLIANCE: Component Overall Envelope TUV Entry Unconditioned (file attached)

FIELD INSPECTION ENERGY CHECKLIST
 HVAC SYSTEM DETAILS
 Equipment¹: RT-10
 Room or System Type (i.e. AC-1, RTU-1, HP-1): Packaged DX
 Equipment Type²: 1
 Number of Systems: 1
 Max Allowed Heating Capacity³: 144,119 Btu/hr
 Minimum Heating Efficiency³: 82% AFUE
 Max Allowed Cooling Capacity³: 276,524 Btu/hr
 Cooling Efficiency³: 11.3 EER
 Duct Leakage R-Value: AHIC, Ceiling Ins. vented / B.O.
 When duct leakage is required, submit MECH-4A & MECH-4-HERS: No
 Economizer: D/E, Enthalpy (Integrated)
 Thermostat: Software Required
 Fan Control: Constant Volume

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 2 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 6/28/2011

TEST DESCRIPTION

TEST DESCRIPTION	MECH-1C.1	MECH-1C.2	MECH-1C.3	MECH-1C.4	MECH-1C.5	MECH-1C.6	MECH-1C.7	MECH-1C.8	MECH-1C.9	MECH-1C.10	MECH-1C.11	MECH-1C.12	MECH-1C.13	MECH-1C.14	MECH-1C.15	MECH-1C.16	MECH-1C.17	MECH-1C.18	MECH-1C.19	MECH-1C.20
Equipment Testing or Verification	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk	Chk
RT-1																				
RT-2																				
RT-3																				
RT-4																				
RT-5																				
RT-6																				
RT-7																				
RT-8																				
RT-9																				
RT-10																				

CERTIFICATE OF COMPLIANCE and FIELD INSPECTION ENERGY CHECKLIST (Part 5 of 5) MECH-1C
 Project Name: Casa de Balboa - HVAC Project
 Date: 6/28/2011

Documentation Author's Declaration Statement
 I certify that this Certificate of Compliance documentation is accurate and complete.

The Principal Mechanical Designer's Declaration Statement
 I am eligible under Division 3 of the California Business and Professions Code to accept responsibility for the mechanical design.
 This Certificate of Compliance identifies the mechanical features and performance specifications required for compliance with Title-24, Parts 1 and 5 of the California Code of Regulations.
 The design features represented on this Certificate of Compliance are consistent with the information provided to document this design on the other applicable compliance forms, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.

Mandatory Measures
 Indicates whether or not the following measures are included:
 MECH-1C: Certificate of Compliance, Required on plans for all subdivisions.
 MECH-2C: Mechanical Equipment Summary is required for all subdivisions.
 MECH-3C: Mechanical Ventilation and Filtration is required for all subdivisions with mechanical ventilation.
 MECH-4C: Fan Power Consumption is required for all prescriptive subdivisions.

GENERAL NOTES

- 1- CERTIFICATE OF ACCEPTANCE (MECH-2A) AND ALL RELATED ACCEPTANCE DOCUMENTS SHALL BE SUBMITTED TO THE FIELD INSPECTOR DURING CONSTRUCTION. CERTIFICATE OF OCCUPANCY WILL NOT BE ISSUED UNTIL THESE FORMS ARE REVIEWED AND APPROVED.
- 2- SEE TITLE-24 COMPLIANCE SET FOR MECH-2C, MECH-3C, MECH-4C AND MECH-MM.

M-11

SPEC. NO. 5196

PLANS FOR THE CONSTRUCTION OF: CASA DE BALBOA - HVAC PROJECT

TITLE-24 COMPLIANCE

CITY OF SAN DIEGO, CALIFORNIA
 SHEET 13 OF 21 SHEETS

W.B.S. 8-00939
 PROJECT# 228708

FOR CITY ENGINEER: [Signature]
 DATE: 7/18/11

CONTRACTOR: [Signature]
 PROJECT MANAGER: [Signature]

DESCRIPTION	BY	APPROVED	DATE	FILED	CONTROL CERTIFICATION
ORIGINAL	JEZA				206-1719 NAD27 COORDINATE
AS-BUILT'S					6290407-1846444 NAD27 COORDINATE

DATE STARTED: _____ DATE COMPLETED: _____

CONTRACTOR: _____ INSPECTOR: _____

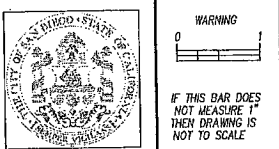
36649-13-D

CONSULTANT

Teza Design
 Consulting Mechanical Engineering
 127 A Street Suite 203 San Diego, CA 92101
 Phone: 619-594-9999

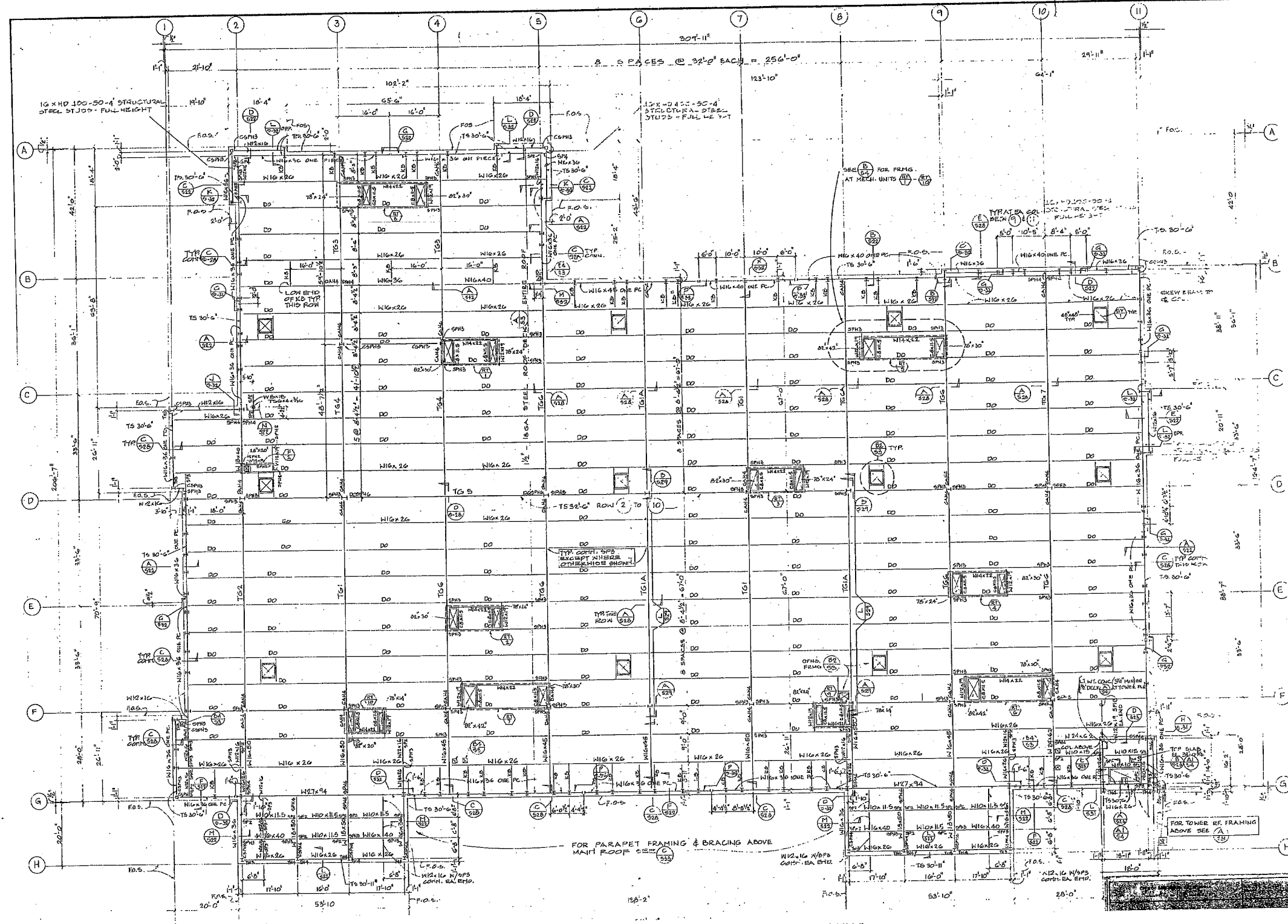
SCALE: HORIZONTAL NO SCALE
 VERTICAL NO SCALE

CITY OF SAN DIEGO
 PUBLIC WORKS PROJECT



WARNING
 IF THIS BAR DOES NOT MEASURE THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT



EXISTING (AS-BUILT) STRUCTURAL ROOF FRAMING PLAN (FOR REFERENCE ONLY)

CONSULTANT

Teza Design
Consulting in Mechanical Engineering
112 A Street, Suite 400 San Diego, CA 92101
Phone: (619) 594-4477 Fax: (619) 594-7700

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

SPEC. NO. 5196 M-12

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

EXISTING STRUCTURAL ROOF FRAMING PLAN

CITY OF SAN DIEGO, CALIFORNIA
SHEET 14 OF 21 SHEETS

W.B.S. B-00939
PROJECT# 229708

FOR CITY ENGINEER: [Signature] DATE: 10/10/11 PROJECT MANAGER: [Signature]

DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	HEZA			

CONTROL CERTIFICATION
206-1719
NAU27 COORDINATE
E280407-184644
NAU23 COORDINATE

AS-BUILTS
CONTRACTOR: DATE STARTED: 36649-14-D
INSPECTOR: DATE COMPLETED:

CASA DE BALBOA - HVAC PROJECT

LEGEND

- MOTOR
- SAFETY SWITCH, FUSED
- SAFETY SWITCH, NON-FUSED
- STARTER OR MOTOR CONTROLLER
- COMBINATION STARTER OR MOTOR CONTROLLER, WITH SAFETY SWITCH
"F" INDICATES FUSED SAFETY SWITCH
- TRANSFORMER (T-1 SHOWN)
- METER
- JUNCTION BOX
- ELECTRICAL EQUIPMENT AS SPECIFIED ON PLANS
- CONDUIT WITH WIRE, ELECTRICAL EQUIPMENT AS SPECIFIED ON PLANS (NEW)
- CONDUIT WITH WIRE, ELECTRICAL EQUIPMENT AS SPECIFIED ON PLANS (EXISTING TO REMAIN)
- CONDUIT WITH WIRE, ELECTRICAL EQUIPMENT AS SPECIFIED ON PLANS (EXISTING TO BE DEMOLISHED)
- HOME RUN
- FLEX CONDUIT
- KEY NOTE (HEX)
- DETAIL CALLOUT
- ELECTRICAL EQUIPMENT CALLOUT
- MECHANICAL EQUIPMENT CALLOUT
- TRANSFORMER
- CIRCUIT BREAKER

ABBREVIATIONS

- A AMPERE
- AF AMP FRAME, AMP FUSED
- AHU AIR HANDLING UNIT
- AIC AMPS INTERRUPTING CURRENT
- AMB AMBIENT
- ANSI AMERICAN NATIONAL STANDARDS INSTITUTE
- ARCH ARCHITECTURAL
- AT AMP TRIP
- APPROX APPROXIMATE
- AWG AMERICAN WIRE GAUGE
- C CONDUIT
- CEO CALIFORNIA ELECTRICAL CODE
- CIR, CKT CIRCUIT
- CLR CLEAR
- COND CONDENSER
- CONT CONTINUOUS, CONTINUED
- CS COMBINATION STARTER/DISCONNECT
- CTRL CONTROL
- CU COPPER
- EX EXISTING
- (EX) EACH
- EX EXHAUST FAN
- EMT ELECTRIC METALLIC TUBING
- ENC ENCLOSURE
- EST ESTIMATED
- FLA FULL LOAD AMPS
- FLEX FLEXIBLE CONDUIT
- G GROUND
- HP HORSE POWER
- HZ HERTZ
- J-BOX JUNCTION BOX
- KAIC THOUSAND AMPS INTERRUPT CURRENT
- KV THOUSAND VOLTS
- KVA THOUSAND VOLT-AMPS
- KW KILOWATTS
- MB MAIN BREAKER
- MCA MINIMUM CIRCUIT AMPS
- MCM, KMIL THOUSAND CIRCULAR MILS
- MLO MAIN LUG ONLY
- MOOP MAXIMUM OVERCURRENT PROTECTION
- MTG MOUNTING
- NEC NATIONAL ELECTRIC CODE
- NEMA NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
- NEU NEUTRAL
- NFPA NATIONAL FIRE PROTECTION ASSOCIATION
- NIC NOT IN CONTRACT
- NO. # NUMBER
- NTS NOT TO SCALE
- P PLUG, POLE, PUMP, AS APPROPRIATE
- PB PULL BOX
- PH, Ø PHASE
- PNL PANEL
- POC POINT OF CONNECTION
- V VOLTS
- VA VOLT-AMPS
- VFD VARIABLE FREQUENCY DRIVE
- W WATTS, WIRE AS APPROPRIATE
- W/ WITH
- XFMR TRANSFORMER
- Y WYE
- & AND
- ' FEET
- " INCHES

GENERAL NOTES

- A. GENERAL
- A.A. THE MATERIAL REQUIRED FOR THE WORK SHALL BE CONTRACTOR FURNISHED AND CONTRACTOR INSTALLED, UNLESS SPECIFICALLY NOTED OTHERWISE. CONTRACTOR SHALL ASSUME NOTES LISTING MATERIAL AND/OR EQUIPMENT BEGIN WITH THE WORDS "PROVIDE AND INSTALL" (P.O.I.).
- A.B. CONTRACTOR SHALL VERIFY EXISTING CONDITIONS BEFORE SUBMITTING BID AND BECOME THOROUGHLY FAMILIAR WITH ACTUAL EXISTING CONDITIONS AT THE BUILDING. BY THE ACT OF SUBMITTING A BID PROPOSAL FOR THE WORK, THE CONTRACTOR SHALL BE DEEMED TO HAVE MADE SUCH STUDY AND EXAMINATION AND TO ACCEPT ALL CONDITIONS PRESENT AT THE SITE. NO REQUEST FOR ADDITIONAL PAYMENT WILL BE CONSIDERED AS VALID, DUE TO FAILURE TO ALLOW FOR CONDITIONS, WHICH MAY EXIST.
- A.C. CONTRACTOR'S BID SHALL BE BASED ON ALL WORK SHOWN ON THE PLANS AND SPECIFICATIONS. SUBSTITUTION REQUESTS FOR EQUIPMENT SPECIFIED SHALL BE SUBMITTED FOR CONSIDERATION TO THE OWNER AND ENGINEER PRIOR TO BID IN WRITING. ALL SUBSTITUTIONS MUST BE REVIEWED BY THE ENGINEER IN WRITING. SUCH REVIEW SHALL NOT RELIEVE THE CONTRACTOR COMPLYING WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS, AND THE CONTRACTOR SHALL BE RESPONSIBLE AT HIS OWN EXPENSE FOR ANY CHARGES RESULTING FROM HIS PROPOSED SUBSTITUTIONS WHICH AFFECT OTHER PARTS OF HIS OWN WORK, THE OWNER, ENGINEER OR RECORD OR THE WORK OF OTHER CONTRACTORS.
- A.D. COORDINATE ALL WORK WITH OTHER TRADES. OBTAIN ALL DRAWINGS THAT WILL REQUIRE COORDINATION AND PROVIDE ALL ELECTRICAL CONNECTIONS REQUIRED WHETHER SHOWN ON ELECTRICAL DRAWINGS OR NOT. ELECTRICAL EQUIPMENT LOCATIONS INDICATED ARE SHOWN DIAGRAMMATICALLY, EXACT LOCATION SHALL BE VERIFIED.
- A.E. UNINTERRUPTED EXISTING ELECTRICAL POWER SHALL BE MAINTAINED TO OTHER TRADES FOR TEMPORARY POWER AREAS OF THE SITE DURING CONSTRUCTION. PROVIDE ANY TEMPORARY SERVICES AS MAY BE REQUIRED. IDENTIFY AT BID TIME.
- A.F. INSTALLATION SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) - 2008 EDITION.
- A.G. INSTALLATION SHALL BE IN ACCORDANCE WITH THE NATIONAL FIRE PROTECTION ASSOCIATION FIRE CODES (NFPA).
- B. CABLES AND CONDUCTORS
- B.A. WIRE FOR BRANCH CIRCUITS AND ABOVE SHALL BE 800 VOLT RATED, COPPER, THHN/THWN, #12 MINIMUM, 75°C TEMPERATURE RATING OF CONDUCTORS
- C. RACEWAYS AND BOXES
- C.A. FLEXIBLE CONDUIT SHALL BE USED FOR CONNECTION TO ALL EQUIPMENT WITH THE POTENTIAL FOR VIBRATION. CONNECTIONS SHALL NOT BE MORE THAN 6' LONG.
- C.B. CONCRETE ENCASED OR UNDERGROUND CONDUIT SHALL BE POLYVINYL CHLORIDE (PVC) SCHEDULE 40, 2" MINIMUM. IT SHALL CONFORM TO UL 651.
- C.C. FITTINGS SHALL BE COMPRESSION TYPE, DIECAST.
- D. CONDUITS
- D.A. CONDUIT RUNS OF MORE THAN 100' SHALL HAVE EXPANSION FITTINGS.
- D.B. CONDUIT MOUNTED ON STRUCTURE SHALL BE NEATLY MOUNTED IN NORTH-SOUTH OR EAST-WEST DIRECTIONS. UNDER GROUND CONDUIT SHALL BE ORIENTED IN NORTH-SOUTH OR EAST-WEST DIRECTIONS.
- D.C. BOXES IN INTERIOR LOCATIONS SHALL BE GALVANIZED STEEL OF THE TYPE, SHAPE, SIZE AND DEPTH TO SUIT EACH RESPECTIVE LOCATION, MINIMUM 1-1/2" HIGH DEEP AND OF SIZE TO ACCOMMODATE DEVICES NOTED. SURFACE MOUNTED CONDUIT NOT ALLOWED EXCEPT WHERE INDICATED IN DRAWINGS. CONDUIT IN EXISTING WALLS, CUT AND PATCH WALLS TO MATCH EXISTING FINISH.
- D.D. DAMP, WET, EXTERIOR BOXES SHALL BE CAST IRON RAIN-TIGHT, DUST-TIGHT, WATER-TIGHT, CORROSION RESISTANT, WITH THREADED HUBS AND GASKETED COVERS. ALL ELECTRICAL RACEWAYS, COMPONENTS AND FITTINGS INSTALLED IN SUCH LOCATIONS SHALL COMPLY WITH WET LOCATION REQUIREMENTS. COVERS SHALL BE OF THE SAME RATING AS THE BOX AND SHALL BE FULLY GASKETED. COVERS SHALL BE SCREW ON TYPE.
- E. GROUNDING
- E.A. NON-CURRENT CARRYING METAL PARTS OF THE SYSTEM SHALL BE PROPERLY GROUNDED TO COMPLY WITH NEC REQUIREMENTS. PROVIDE A GREEN WIRE GROUND CONDUCTOR IN ALL RACEWAYS. THE CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH NEC 890 PART V.
- F. BASIC MATERIALS AND METHODS
- F.A. EQUIPMENT SHALL BE LISTED, LABELED OR CERTIFIED FOR ITS USE BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) AS RECOGNIZED BY THE U.S. DEPARTMENT OF LABOR, OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION.
- F.B. BUSSING FOR PANELBOARDS AND SWITCHBOARDS, SHALL BE COPPER.
- F.C. PANELBOARDS SHALL HAVE HINGED DOORS. BOTH INTERIOR AND EXTERIOR DOORS.

- G. EXISTING EQUIPMENT AND CONDITIONS
- G.A. DISCONNECT AND REMOVE ABANDONED/NOT IN USE EQUIPMENT.
- G.B. EXISTING EQUIPMENT AND ASSOCIATED APPURTENANCES SHALL BE EXISTING TO REMAIN AND PROTECTED IN PLACE UNLESS OTHERWISE NOTED ON THE PLANS.
- G.C. PATCH AND REPAIR ALL OPENINGS LEFT BY DEMOLITION AND INSTALLATION TO MATCH EXISTING SURFACE FINISH.

171-017 9/15/2011

CONSULTANT

LOPEZ ENGINEERING, INC.
PROFESSIONAL CONSULTING ENGINEERS

1015 La Jolla Village Drive, Suite 100, San Diego, CA 92161
619-594-1111
www.lopezeng.com

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE

CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING


IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

SPEC. NO. 0199 E-0.1

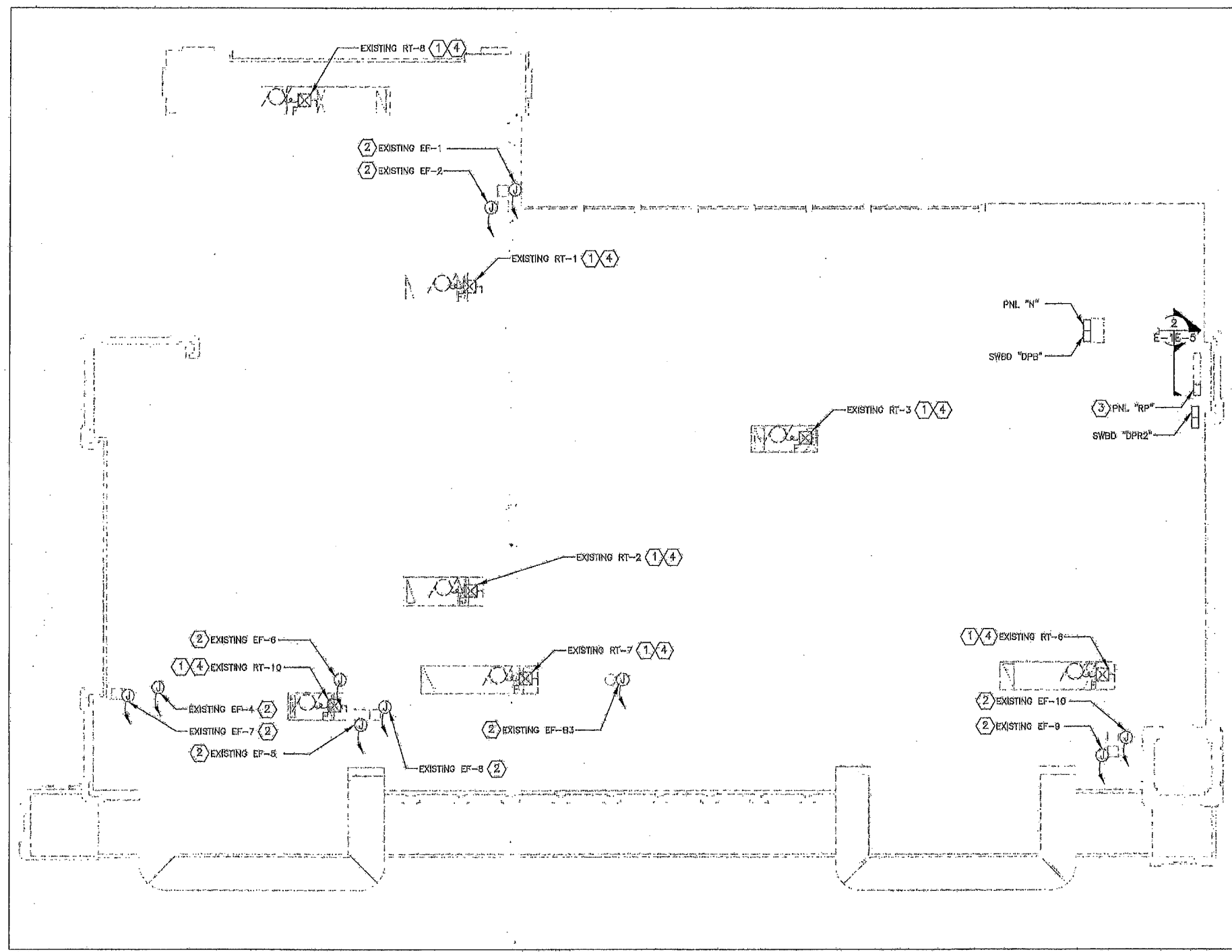
**PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT**

LEGEND, ABBREVIATIONS, AND GENERAL NOTES

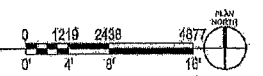
CITY OF SAN DIEGO, CALIFORNIA SHEET 15 OF 21 SHEETS		P.R.S. B-00939 PROJECT# 220708
FOR CITY ENGINEER	BY	DATE
APPROVED	LOPEZ	DATE
FILMED		
DESCRIPTION		CONTROL CERTIFICATION
ORIGINAL		208-1710
		NA027 COORDINATE
		6286407-1048444
		NA083 COORDINATE
AS-BUILTS	DATE STARTED	36649-15-D
CONTRACTOR	DATE COMPLETED	
INSPECTOR		

KEY NOTES 

1. DISCONNECT AND REMOVE EXISTING STARTER, DISCONNECT, WIRES, AND APPURTENANCES BACK TO PANEL "RP".
2. DISCONNECT AND REMOVE JUNCTION BOX, CONDUIT, WIRE, AND APPURTENANCES BACK TO PANELBOARD.
3. DISCONNECT AND REMOVE PANELBOARD, CONDUIT, WIRE, AND APPURTENANCES.
4. CUT AND CAP ALL EXISTING UNUSED CONDUITS UNDER AND NEAR THE MECHANICAL UNITS.



ELECTRICAL ROOF PLAN - DEMOLITION PLAN
1/16" = 1'-0" (1:96)



E-1

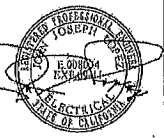
PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

ELECTRICAL ROOF PLAN - DEMOLITION PLAN			
CITY OF SAN DIEGO, CALIFORNIA SHEET 16 OF 21 SHEETS		W.P.S. PROJECT B-00939 228708	
DATE: 10/10/10		PROJECT MANAGER: [Signature]	
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	LOPEZ	[Signature]	
AS-BUILTS		DATE STARTED	CONTROL CERTIFICATION
CONTRACTOR	INSPECTOR	DATE COMPLETED	208-1719 NAZET COORDINATE 6280407-1848444 NAZET COORDINATE
			36649-16-D

17:017 9/15/2011

CONSULTANT
LOPEZ ENGINEERING, INC.
PROFESSIONAL ENGINEERS AND ARCHITECTS

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT

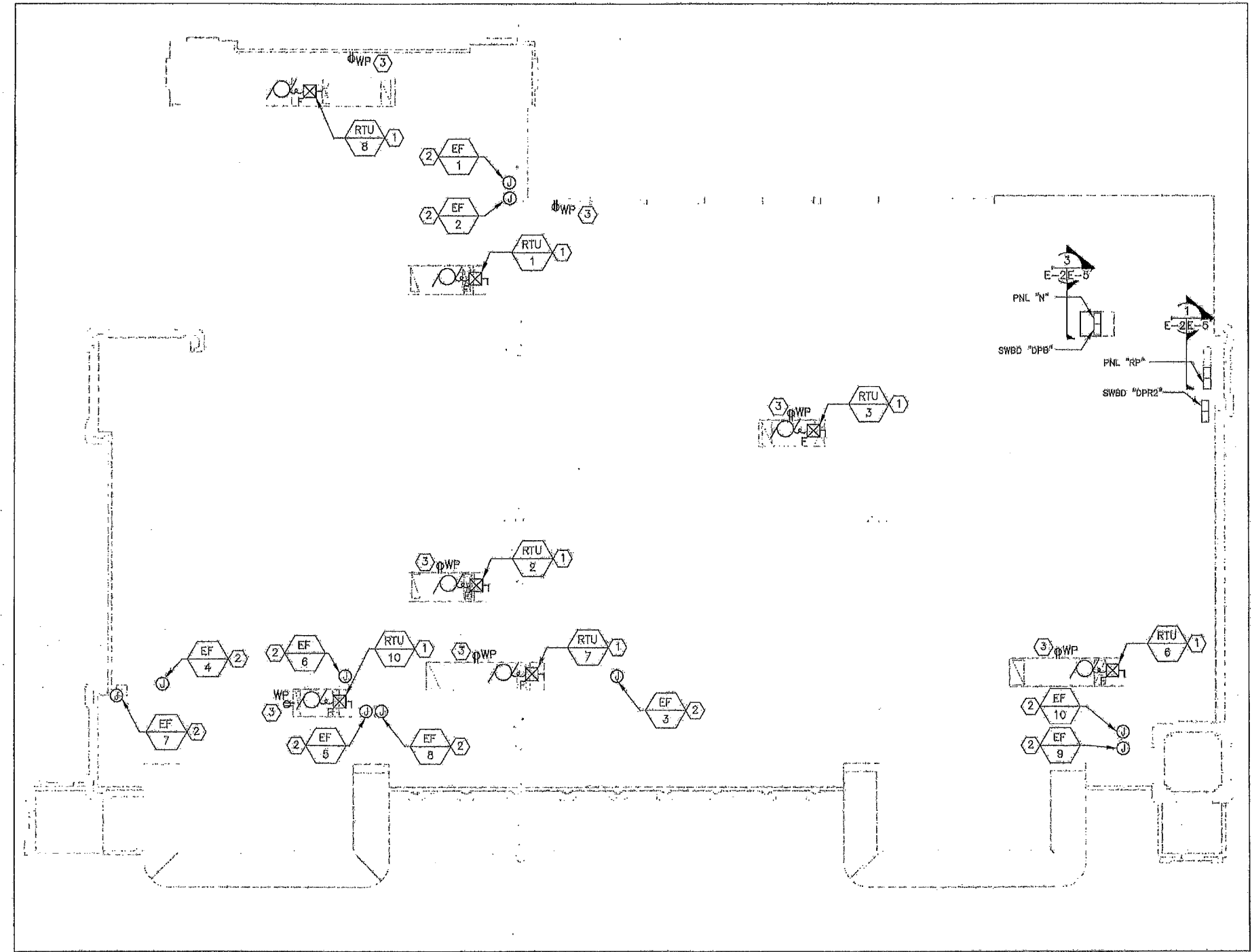


WARNING
IF THIS BAR DOES NOT MEASURE THEN DRAWING IS NOT TO SCALE

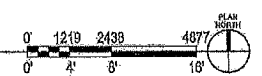
CASA DE BALBOA - HVAC PROJECT

KEY NOTES 

1. PROVIDE STARTER, DISCONNECT, AND WIRES CONNECT BACK TO PANEL "RP".
2. PROVIDE JUNCTION BOX, CONDUIT, AND WIRE, CONNECT BACK TO PANEL "N".
3. PROVIDE WP RECEPTACLES WITH GFCI PROTECTION MOUNT WITHIN 25' OF MECHANICAL EQUIPMENT. CONNECT BACK TO PANEL "N".



ELECTRICAL ROOF PLAN - PROPOSED PLAN
1/16" = 1'-0" (1:96)



SPEC. NO. 5766 E-2

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

ELECTRICAL ROOF PLAN - PROPOSED PLAN

CITY OF SAN DIEGO, CALIFORNIA
SHEET 17 OF 21 SHEETS

W.B.S. B-20839
PROJECT# 220708

FOR CITY ENGINEER: *[Signature]* DATE: 10/17/11 PROJECT MANAGER: *[Signature]*

DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LOPEZ			


CONTROL CERTIFICATION
208-1718
NADZ COORDINATE
6280407-1846444
NADZ COORDINATE

AS-BUILT: _____ DATE STARTED: _____
CONTRACTOR: _____ DATE COMPLETED: _____
INSPECTOR: _____

36649-17-D

171-017 9/15/2011

CONSULTANT


 **LOPEZ ENGINEERING, INC.**
PROFESSIONAL CONSULTING ENGINEERS

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING

IF THIS BAR DOES NOT MEASURE, THEN DRAWING IS NOT TO SCALE

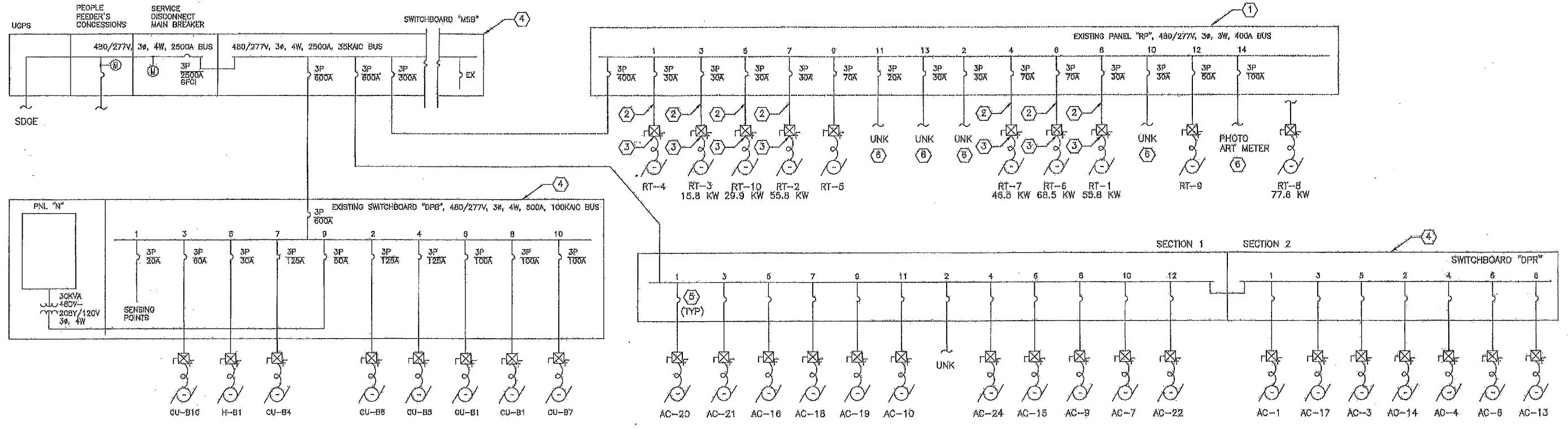
CASA DE BALBOA - HVAC PROJECT

GENERAL NOTES

- A. RESURFACE ALL RUSTED PANELBOARD COVERS. REPLACE MISSING SCREWS AND MISSING PANELBOARD LABELS.
- B. TRACE AND IDENTIFY UNLABELED BRANCH CIRCUIT BREAKERS.

KEY NOTES (6)

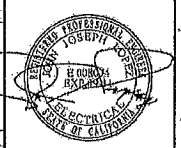
- 1. DISCONNECT AND REMOVE PANEL, BRANCH CIRCUIT BREAKERS, WIRE, CONDUIT, AND APPURTENANCES AS REQUIRED.
- 2. DISCONNECT AND REMOVE FEEDER, CONDUIT AND APPURTENANCES BACK TO SOURCE PANEL.
- 3. DISCONNECT AND REMOVE SAFETY SWITCH, STARTER AND APPURTENANCES.
- 4. EQUIPMENT EXISTING TO REMAIN; PROTECT IN PLACE.
- 5. VERIFY CIRCUIT BREAKER RATING.
- 6. TRACE AND IDENTIFY CIRCUITS. DISCONNECT FOR PANELBOARD REMOVAL.



PARTIAL SINGLE LINE DIAGRAM - DEMOLITION
N.T.S.

171.017 9/15/2011

CONSULTANT
LOPEZ ENGINEERING, INC.
 PROFESSIONAL CONSULTING ENGINEERS
 3011 Mission Blvd., Suite 200, San Diego, CA 92108
 619-594-1100
 www.lopezeng.com



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
 IF THIS BAR DOES NOT MEASURE THEN DRAWING IS NOT TO SCALE

SPEC. NO. 5108 E-3

**PLANS FOR THE CONSTRUCTION OF:
 CASA DE BALBOA - HVAC PROJECT**

SINGLE LINE DIAGRAM - DEMOLITION

CITY OF SAN DIEGO, CALIFORNIA
 SHEET 18 OF 21 SHEETS

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>DESCRIPTION</th> <th>BY</th> <th>APPROVED</th> <th>DATE</th> <th>FILED</th> </tr> <tr> <td>ORIGINAL</td> <td>LOPEZ</td> <td></td> <td></td> <td></td> </tr> </table>	DESCRIPTION	BY	APPROVED	DATE	FILED	ORIGINAL	LOPEZ				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="font-size: small;">U.S. PROJECT #</td> <td>06-09839</td> </tr> <tr> <td style="font-size: small;">PROJECT #</td> <td>228700</td> </tr> <tr> <td style="font-size: small;">FOR CITY ENGINEER</td> <td>DATE</td> </tr> <tr> <td style="font-size: small;">PROJECT MANAGER</td> <td></td> </tr> </table>	U.S. PROJECT #	06-09839	PROJECT #	228700	FOR CITY ENGINEER	DATE	PROJECT MANAGER	
DESCRIPTION	BY	APPROVED	DATE	FILED															
ORIGINAL	LOPEZ																		
U.S. PROJECT #	06-09839																		
PROJECT #	228700																		
FOR CITY ENGINEER	DATE																		
PROJECT MANAGER																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="font-size: x-small;">CONTRACTOR</td> <td style="font-size: x-small;">DATE STARTED</td> </tr> <tr> <td style="font-size: x-small;">INSPECTOR</td> <td style="font-size: x-small;">DATE COMPLETED</td> </tr> </table>		CONTRACTOR	DATE STARTED	INSPECTOR	DATE COMPLETED														
CONTRACTOR	DATE STARTED																		
INSPECTOR	DATE COMPLETED																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="font-size: x-small;">CONTROL CERTIFICATION</td> <td></td> </tr> <tr> <td style="font-size: x-small;">206-1718</td> <td></td> </tr> <tr> <td style="font-size: x-small;">NAD83 COORDINATE</td> <td></td> </tr> <tr> <td style="font-size: x-small;">AS-BUILTS</td> <td></td> </tr> <tr> <td style="font-size: x-small;">CONTRACTOR</td> <td></td> </tr> <tr> <td style="font-size: x-small;">INSPECTOR</td> <td></td> </tr> </table>		CONTROL CERTIFICATION		206-1718		NAD83 COORDINATE		AS-BUILTS		CONTRACTOR		INSPECTOR							
CONTROL CERTIFICATION																			
206-1718																			
NAD83 COORDINATE																			
AS-BUILTS																			
CONTRACTOR																			
INSPECTOR																			
<p>36649-18-D</p>																			

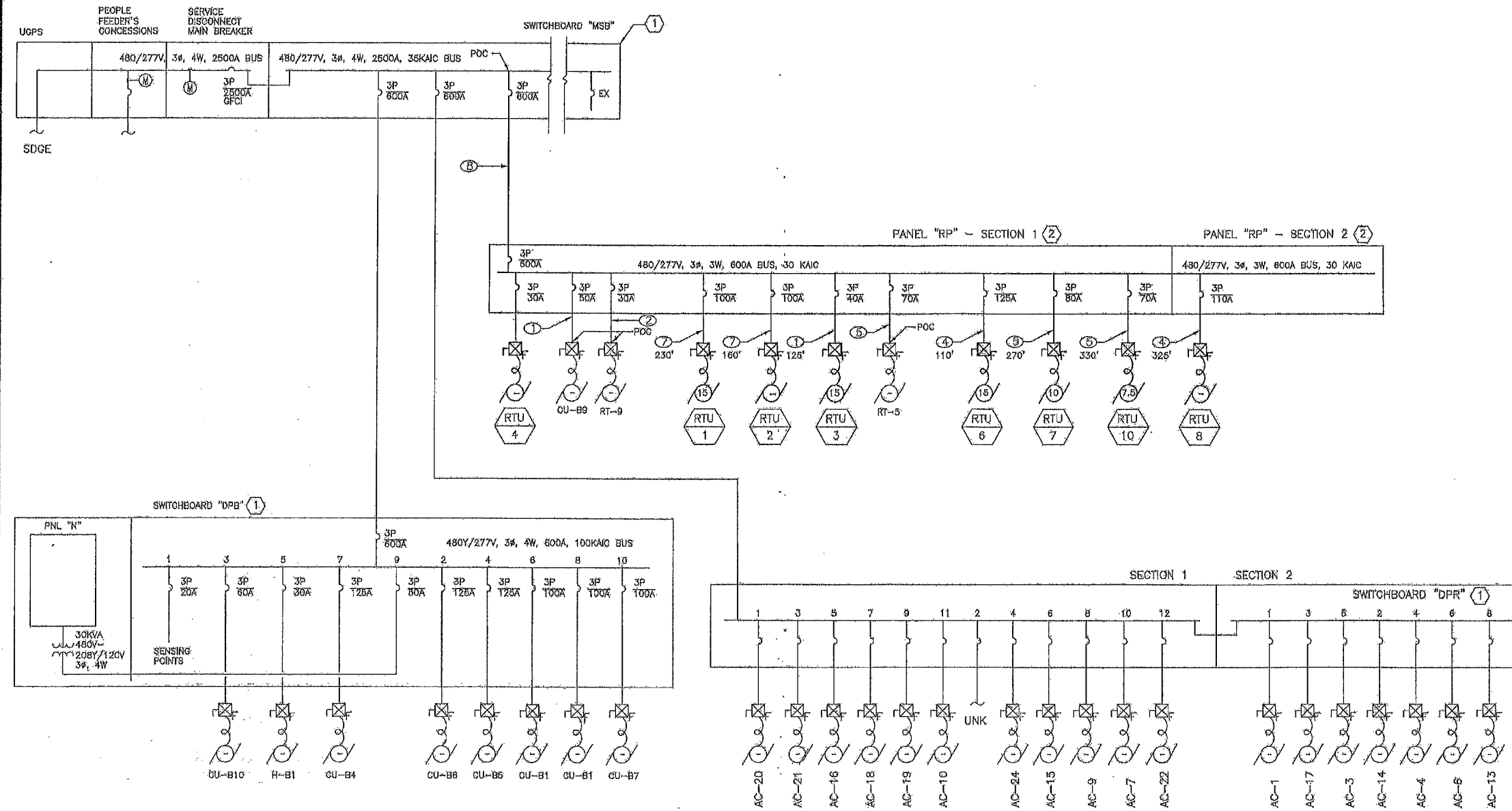
CASA DE BALBOA - HVAC PROJECT

GENERAL NOTES

- A. RESURFACE ALL RUSTED PANELBOARD COVERS, REPLACE MISSING SCREWS AND MISSING PANELBOARD LABELS.
- B. TRACE AND IDENTIFY UNLABELED BRANCH CIRCUIT BREAKERS.

KEY NOTES (1)

- 1. EQUIPMENT EXISTING TO REMAIN; PROTECT IN PLACE.
- 2. PROVIDE AND INSTALL PANEL BRANCH CIRCUIT BREAKERS, PERMANENT BRANCH CIRCUIT LABELS, AND APPURTENANCES.



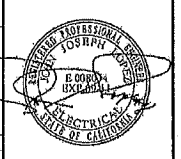
PARTIAL SINGLE LINE DIAGRAM - REVISED
N.T.S.

E-4

SPEC. NO. 5186		E-4	
PLANS FOR THE CONSTRUCTION OF: CASA DE BALBOA - HVAC PROJECT			
SINGLE LINE DIAGRAM - REVISED			
CITY OF SAN DIEGO, CALIFORNIA SHEET 19 OF 11 SHEETS		W.B.S. PROJECT # 0-00939 228799	
FOR CITY ENGINEER	DATE	DATE	PROJECT MANAGER
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	LOPEZ		
AS-BUILTS		DATE STARTED	DATE COMPLETED
CONTRACTOR			36649-19-D
INSPECTOR			

171.017 9/15/2011

CONSULTANT
LOPEZ ENGINEERING, INC.
PROFESSIONAL CONSULTING ENGINEERS
101 Avenida del Encino, Suite 400, San Diego, CA 92161
Tel: 619.594.1100 Fax: 619.594.1101
www.le-engineering.com



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

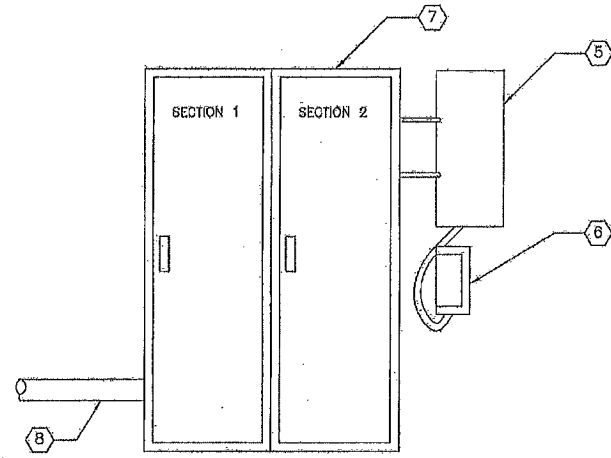
CASA DE BALBOA - HVAC PROJECT

GENERAL NOTES

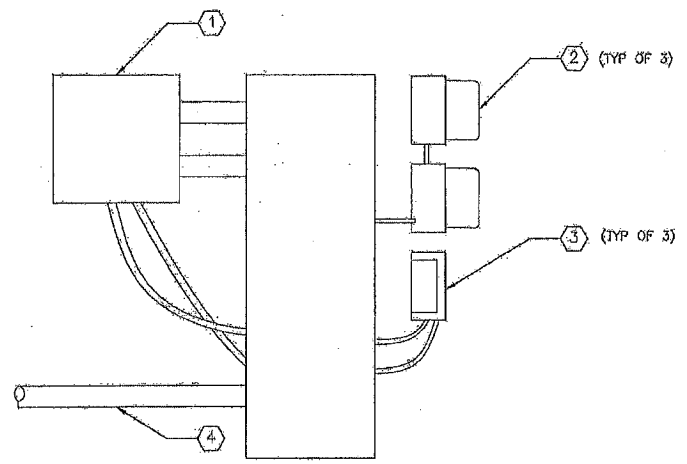
A. NOTE NOT USED THIS SHEET.

KEY NOTES (C)

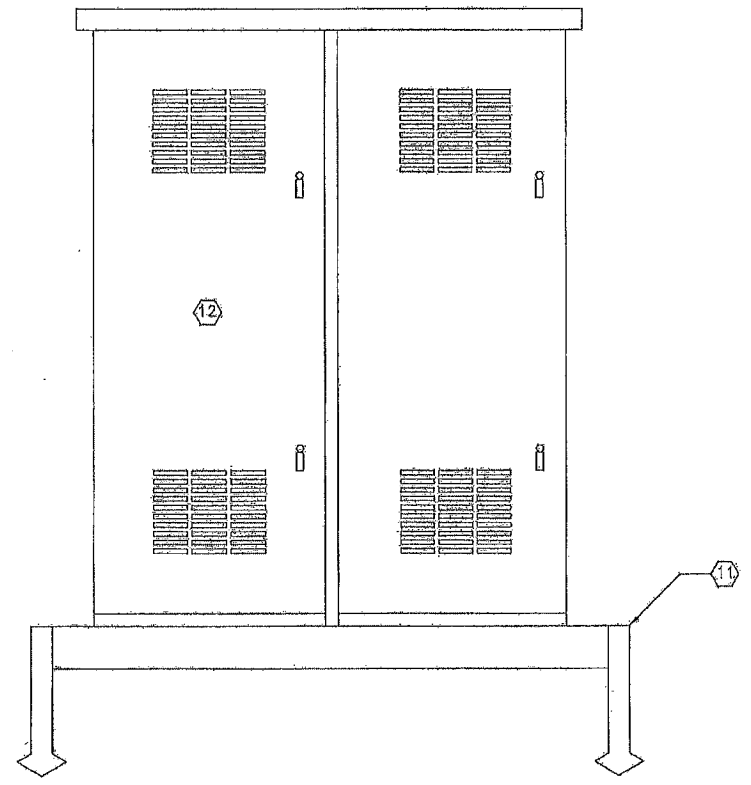
1. DISCONNECT AND REMOVE PULL BOX, FOR RELATION.
2. DISCONNECT AND REMOVE ABANDONED REVENUE METERS, CONDUIT, WIRE, AND APPURTENANCES.
3. DISCONNECT AND REMOVE E-MON METERS TO BE REINSTALLED AND RECONNECTED. METERS SHALL MONITOR THE DESIGNATED EQUIPMENT PER OWNER'S DIRECTION.
4. DISCONNECT AND REMOVE FEEDER; CLEAN CONDUIT AND INSTALL PULL ROPE. PROVIDE CONDUIT SUPPORTS EVERY TEN (10) FEET.
5. RELOCATED PULL BOX; RESURFACE AND APPLY CORROSION-PREVENTIVE COATING.
6. RELOCATED E-MON METERS.
7. PANELBOARD "RP", PROVIDE PERMANENT LABEL ON FRONT COVER.
8. EXTEND CONDUIT AND TERMINATE AT PANELBOARD. INSTALL FEEDER.
9. REPLACE DAMAGED SUPPORTS AND RESURFACE AND APPLY CORROSION-PREVENTIVE COATING FOR LIGHTLY CORRODED SUPPORTS.
10. REPLACE FLASHING FOR ALL ROOF PENETRATIONS.
11. EXTEND PLATFORM BY A MINIMUM OF 36" IN FRONT OF SWITCHBOARD. PROVIDE FLASHING FOR ALL ROOF PENETRATIONS.
12. RESURFACE PANELS AND APPLY CORROSION-PREVENTIVE COATING. PROVIDE PERMANENT LABEL ON FRONT COVER.
13. THE EXISTING CONDUIT RUN FROM THE EXISTING MAIN SWITCH BOARD TO THE EXISTING PANEL "RP", IS TO BE EMPTIED, CLEANED, AND CAPPED FOR FUTURE USE.



1 DETAIL - PANELBOARD "RP" IMPROVEMENTS (9x10)
N.T.S.



2 DETAIL - EXISTING PANELBOARD "RP"
N.T.S.



3 DETAIL - SWITCHBOARD "DPB"
N.T.S.

E-5

SCHEDULES AND DETAILS		E-5	
PLANS FOR THE CONSTRUCTION OF: CASA DE BALBOA - HVAC PROJECT			
CITY OF SAN DIEGO, CALIFORNIA SHEET 20 OF 21 SHEETS		SPECS NO. 5108	
FOR CITY ENGINEER	DATE	PROJECT MANAGER	
DESCRIPTION	BY	APPROVED	DATE
ORIGINAL	LOPEZ		
AS-BUILTS			
CONTRACTOR	DATE STARTED	INSPECTOR	DATE COMPLETED
			36649-20-D

171.017 9/15/2011

CONSULTANT

LOPEZ ENGINEERING, INC.
PROFESSIONAL CONSULTING ENGINEERS

SCALE: HORIZONTAL NO SCALE, VERTICAL NO SCALE



CITY OF SAN DIEGO
PUBLIC WORKS PROJECT



WARNING
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

CASA DE BALBOA - HVAC PROJECT

MECHANICAL EQUIPMENT SCHEDULE													
Mechanical Equipment	Equipment Nameplate Description	HP	FLA	KVA	KW	VOLTAGE	PHASE	CB	AS	MOCP	STARTER	NEMA	DISCONNECT
RTU-1	ROOF TOP UNIT	16	65.5	64.5	43.8	480	3	100	100	100	3	3R	Y
RTU-2	ROOF TOP UNIT	15	65.6	64.4	43.8	480	3	100	100	100	3	3R	Y
RTU-3	ROOF TOP UNIT	16	18.5	16.4	12.3	480	3	40	40	40	1	3R	Y
RTU-6	ROOF TOP UNIT	16	85.4	71.0	85.9	480	3	128	128	125	3	3R	Y
RTU-7	ROOF TOP UNIT	10	82.1	43.3	34.7	480	3	70	70	70	2	3R	Y
RTU-8	ROOF TOP UNIT	15	65.1	64.1	43.3	480	3	110	110	110	3	3R	Y
RTU-10	ROOF TOP UNIT	7.8	45.8	34.6	25.7	480	3	70	70	70	2	3R	Y
EF-1	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-2	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-3	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-4	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-5	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-6	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-7	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-8	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N
EF-10	EXHAUST FAN	1/3	7.2	0.9	0.7	120	1	16				N	N

EQUIPMENT SCHEDULE

N.T.S.

FEEDER SCHEDULE NUMBER	MATERIAL	NEC RATING (AMPS)	PHASE	NEUTRAL	GROUND	CONDUIT	PARALLEL RUNS	COMMENTS
①	CU	50	(3) #8		#10	3/4"	1	
②	CU	30	(3) #10		#10	3/4"	1	
③	CU	20	(3) #12		#12	1/2"	1	
④	CU	130	(3) #1		#6	2"	1	
⑤	CU	85	(3) #4		#8	1-1/4"	1	
⑥	CU	115	(3) #2		#6	2"	1	
⑦	CU	100	(3) #3		#8	1-1/4"	1	
⑧	CU	335	(3) 400MCM	400MCM	#4	3"	2	
⑨	CU	200	(2) #3/0	#3/0	#6	2"	1	
⑩	CU	20	(1) #12	#12	#12	3/4"	1	

FEEDER SCHEDULE

N.T.S.

PANEL: N (Existing)																			
MAIN: 100A																			
BUS: 100 Amp																			
M.T.C. Surface																			
VOLT: 208 Y-120 V, 3 Ø, 4 W																			
# CIRCUITS: 42																			
CR	PH	AMP	MISC	C/O	LTS	BUS A	BUS B	BUS C	LOCATION & REMARKS	LOCATION & REMARKS	BUS A	BUS B	BUS C	LTS	C/O	MISC	AMP	PH	CR
1	1	20							EP-B1 (Existing)	KWH METER (Existing)							20	1	2
3	1	20							SPARE	SPARE							20	1	4
6	1	20							0	0							16	1	8
7	1	20						900	ROOF RECEPTACLES	EF-2							15	1	8
9	1	20						900	ROOF RECEPTACLES	EF-3							15	1	10
14	1								0	SPACE									
13	1								0	SPACE									
15	1								0	SPACE									
17	1								0	SPACE									
19	1								0	SPACE									
21	1								0	SPACE									
23	1								0	SPACE									
26	1								0	SPACE									
27	1								0	SPACE									
29	1								0	SPACE									
31	1								0	SPACE									
33	3	40							0	USED									
35	-								0	SPACE									
37	-								0	SPACE									
39	2	40							0	USED									
41	-								0	SPACE									

PANEL SCHEDULE "N"

N.T.S.

Index	Circuit	Description	Amps	KVA	Parallel	Parallels	Phase Wires	Neutral Wire	Ground Wire	Conduit	L	%
EP-B1	RTU-1	RTU-1	65.5	64.5	No	1	3 # 2		1 # 8	1/2" x 1/2"	230'	1.00%
EP-B1	RTU-2	RTU-2	65.6	64.5	No	1	3 # 2		1 # 8	1/2" x 1/2"	190'	1.00%
EP-B1	RTU-3	RTU-3	18.5	16.4	No	1	3 # 10		1 # 10	3/4" x 3/4"	125'	0.83%
EP-B1	RTU-6	RTU-6	85.4	71.0	No	1	3 # 1		1 # 8	1/2" x 3/4"	110'	0.80%
EP-B1	RTU-7	RTU-7	82.1	43.3	No	1	3 # 4		1 # 8	1/2" x 3/4"	270'	1.40%
EP-B1	RTU-8	RTU-8	65.1	64.1	No	1	3 # 2		1 # 8	1/2" x 3/4"	325'	1.40%
EP-B1	RTU-10	RTU-10	45.8	34.6	No	1	3 # 4		1 # 8	1/2" x 3/4"	330'	1.40%

VOLTAGE DROP CALCULATION

N.T.S.

Load summary				
Equipment Nameplate Description	FLA	VOLTAGE	PHASE	
REVISED LOAD				
RT-1 ROOFTOP UNIT	65.5	480	3	
RT-2 ROOFTOP UNIT	65.6	480	3	
RT-3 ROOFTOP UNIT	18.5	480	3	
RT-6 ROOFTOP UNIT	85.4	480	3	
RT-7 ROOFTOP UNIT	82.1	480	3	
RT-10 ROOFTOP UNIT	45.8	480	3	
TOTAL REVISED LOAD ON PANEL "RP"	332.8	480	3	
EXISTING LOAD				
RT-4 ROOFTOP UNIT	21.0	480	3	
CU-B9 CONDENSING UNIT	32.0	480	3	
RT-9 ROOFTOP UNIT	78.0	480	3	
RT-5 ROOFTOP UNIT	48.0	480	3	
TOTAL EXISTING LOAD ON PANEL "RP"	179.0	480	3	
TOTAL LOAD ON PANEL "RP"	452.4	480	3	
RT-8 ROOFTOP UNIT	65.1	480	3	

LOAD SUMMARY

N.T.S.

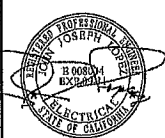
KEY NOTES

1. PROVIDE NEW 15A, 1POLE BREAKER.
2. PROVIDE NEW 20A, 1POLE BREAKER.
3. PER FEEDER SCHEDULE, TWO (2) NEW 3" CONDUITS NEED TO BE RUN FROM THE EXISTING MAIN SWITCH BOARD "MSB" TO THE NEW PANEL "RP" ON THE ROOF.

17L017 9/15/2011

CONSULTANT

LOPEZ ENGINEERING, INC.
 PROFESSIONAL CONSULTING ENGINEERS
 1800 Camino del Rio North, Suite 100
 San Diego, CA 92108
 Tel: 619-594-1100 Fax: 619-594-1101
 www.lopezeng.com



CITY OF SAN DIEGO
 PUBLIC WORKS PROJECT



WARNING
 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

PLANS FOR THE CONSTRUCTION OF:
CASA DE BALBOA - HVAC PROJECT

SCHEDULES

CITY OF SAN DIEGO, CALIFORNIA
 SHEET 21 OF 21 SHEETS

PROJECT # 0-00939
 DATE 2/28/08
 PROJECT MANAGER

DESCRIPTION	BY	APPROVED	DATE	FILED
ORIGINAL	LOPEZ			

CONTRACTOR CERTIFICATION
 208-1713
 NAD27 COORDINATE
 8220407-1048444
 NAD83 COORDINATE

CONTRACTOR INSPECTOR: DATE STARTED: DATE COMPLETED: 36649-21-D

CASA DE BALBOA - HVAC PROJECT