



CONSIGLI

Est. 1905

Letter of Transmittal

To: John Nolan
Titan Mechanical, Inc. (ME)
232 Riverside Industrial Prkwy
Portland, ME 04103
Ph: (207)878-5223 / Fax: (207)878-5235
jnolan@titanmech.com

Transmittal #: 200

Date: 6/12/2013

Job: 1150 Hyatt Place - Portland

Subject: Submittal 230000 - 004 - Cooling Tower (AAN)

WE ARE SENDING YOU

<input type="checkbox"/> Attached	<input type="checkbox"/> Under separate cover via the following items:
<input type="checkbox"/> Shop drawings	<input type="checkbox"/> Prints
<input type="checkbox"/> Copy of letter	<input type="checkbox"/> Change order
<input type="checkbox"/> Plans	<input type="checkbox"/> Samples
<input type="checkbox"/> Specifications	<input checked="" type="checkbox"/> Submittal

Document Type	Copies	Date	No.	Description
Submittal	1	6/12/13	230000-004 Rev 0	P/D: Cooling Tower (Para. 2.11) Status: Approved as noted

THESE ARE TRANSMITTED as checked below:

- | | | |
|---|---|---|
| <input type="checkbox"/> For approval | <input type="checkbox"/> Approved as submitted | <input type="checkbox"/> Resubmit ___ copies for approval |
| <input type="checkbox"/> For your use | <input checked="" type="checkbox"/> Approved as noted | <input type="checkbox"/> Submit ___ copies for distribution |
| <input type="checkbox"/> As requested | <input type="checkbox"/> Returned for corrections | <input type="checkbox"/> Return ___ corrected prints |
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| <input type="checkbox"/> FOR BIDS DUE | <input type="checkbox"/> PRINTS RETURNED AFTER LOAN TO US | |

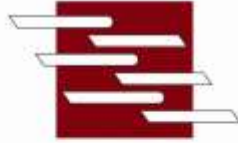
Remarks:

Copy To:

Signature: Darlene Guay - CONSIGLI CONST. CO., INC. - ME

If enclosures are not as noted, kindly notify us at once.

Page 1 of 1



BENNETT ENGINEERING

MECHANICAL • ELECTRICAL
(207) 865-9475

- NO EXCEPTIONS TAKEN
- MAKE CORRECTIONS NOTED
- AMEND & RE-SUBMIT

- SUBMIT SPECIFIED ITEM
- REJECTED-SEE REMARKS
- SEE COMMENTS BELOW

CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE, FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF THE WORK WITH THAT OF OTHER TRADES AND THE SATISFACTORY PERFORMANCE OF THE WORK.

Stephen P. Doel
SIGNATURE

6/12/13
REVIEW DATE

Project: Hyatt Place Portland Hotel

Submittal: 230000 - 004 - Cooling Tower

Comments: MAKE CORRECTIONS NOTED

1. The VFD is specified to have a NEMA 4X enclosure for outdoor mounting.



Titan Mechanical, Inc. *Design Build Engineering • Mechanical Contracting • Service*

232 Riverside Industrial Parkway • Portland, ME 04103 • Ph 207.878.5223 • Fax 207.878.5235

P.O. Box 103 • Newport, ME 04953 • Ph 207.368.2503 • Fax 207.368.2395

CERTIFICATE OF COMPLIANCE

SUBMITTAL

Project Name: Hyatt Hotel
Project Location: Portland, Maine
Project Number: Job # 13-241
General Contractor: Consigli Construction
Sub-Contractor: Titan Mechanical
Submittal Supplied By: R T Forbes Company Inc.
Item: Marley Tower
Specification Section: 23000 – 2.11
Reviewed By: John Nolan
Date: 5/22/13
Initials: JPN

This Submission contains variations from Contract Documents

This Submission does not contain any variations from the Contract Documents



CONSIGLI

Est. 1905

Submittal

Job: 1150
 Hyatt Place - Portland
 433 Fore Street
 Portland, ME 04101

Spec Section No: 230000
Submittal No: 004
Revision No: 0
Sent Date: 6/11/2013
Due Date: 6/24/2013

Spec Section Title: HVAC System
Submittal Title: P/D: Cooling Tower (Para. 2.11)

Contractor:
 Consigli Construction Co., Inc.

Architect:
 Canal5Studio
 Hart, Tim

Consigli Construction Co., Inc. 15 Franklin Street - Portland, ME 04101	
<input type="checkbox"/> Approved for A/E Review <input type="checkbox"/> Revise & Resubmit <input checked="" type="checkbox"/> Approved as Noted for A/E Review <input type="checkbox"/> Rejected	
Spec. Section	230000
Submittal No.	004
Date	6/11/2013
By	Matt Hossfeld
If so marked, approval is given for design only. It does not relieve the subcontractor from complying with the requirements of the contract, contract drawings and specifications. The subcontractor shall be responsible for all dimensions, quantities, schedules and field conditions.	

Architect's Stamp

Engineer / Government / Other Approval



COOLING TECHNOLOGIES

R T Forbes Company Inc

P O Box 209

DANVERS, MA 01923

978 777.1220 /

email: rscogland@comcast.net

Cooling Tower Submittal to:

Titan Mechanical, Inc.
232 Riverside Ind. Pkwy.
Portland, ME 04103

Project:

Hyatt Hotel
Portland, ME

Engineer:

Bennett Engineering
Freeport, ME

May 22, 2013

TOWER MODEL	PERFORMANCE	MOTOR DATA	TOWER DIMENSIONS	WEIGHTS
Quantity of (1) ONE Marley Aquatower Model AQ495K1CAF Factory Assembled 1-Cell Crossflow Cooling Tower	Per 1-cell tower: 270 gpm 100 °F Hot Water 88 °F Cold Water 74 °F Entering WB	NEMA 5 HP 1 speed / 1 wind 3 phase / 60 Hz / 200v 1.15sf / TEFC 1800	Each cell: (without options) Length 7' - 11 1/2" Width 6' - 5 3/4" Height 9' - 0" Per 1-cell tower: (with options) Length 7' - 11 1/2" Width 6' - 5 3/4" Height 9' - 0"	Per cell: Shipping: 1,762 lb Operating: 3,857 lb Per 1-cell tower: Shipping: 1,762 lb Operating: 3,857 lb

Quantities shown below are per cell.

Base Tower Construction/Equipment:

- Galvanized Steel casing.
- Galvanized Steel structure.
- Stainless Steel collection basin.
- Galvanized Steel distribution basin.
- All stainless steel is series 300.
- Structure and anchorage designed for wind load of 30.0 psf (7.2 kPa).
- Marley designed belt drive.
- Marley designed and manufactured 15 mil PVC film fill with integral louvers and drift eliminators.
- Drift rate guaranteed to be no greater than .005% of the design flow rate.
- CTI certification per STD-201.

Collection Basin Connections and Accessories:

- (1) 6 in (152 mm) diameter side suction outlet per cell with trash screen for pump flow applications.
- (1) 8 in (203 mm) diameter bottom outlet per cell with trash screen. (can be used as a gravity flow outlet when used in combination with the plug provided for side suction; can also be used as an equalizer)
- (1) 2 in (51 mm) diameter drain with separate 2 in (51 mm) diameter overflow in each cell.
- (1) 3/4 inch (19 mm) water make-up float valve in each cell.
- (1) Component electric immersion heater system for freeze protection of the collection basin during cold weather system shutdown.
- Heater system circuit breaker
- Heater system disconnect switch

Distribution Basin Inlet:

- (1) 6 in (152 mm) diameter top inlet connection in each cell.

Maintenance & Maintenance Access Features:

- Tower is designed in accordance with OSHA safety standards.
- Oil cup
- Air inlet screens

Control Systems:

- ACH 550, 5 HP, NEMA 12, VFD, 3/60/200, RTD, Includes startup
- Shop installed Single Speed UL NEMA 3R safety switch with interlock

Field Installed Equipment:

The field installed portion of the equipment will require approximately 13.5 man-hours of installation time after the tower arrives at the jobsite (based on USA experienced crew). The price to install these components is NOT included in the total price.

Cooling Tower Submittal

Drawings & Data

<i>Transmittal Code</i>	<i>Approval Code</i>	<i>No. of Copies</i>	<i>Drawing Number /Rev/Date</i>	<i>Description</i>
E, R	SFA	1	3/21/2013	Hyatt AQ495K Product Data
E, R	SFA	1	3/21/2013	Hyatt AV495K Sound Data at 50'
E, R	SFA	1	01-4650A	Schematic, Inlet & Outlet Piping
E, R	SFA	1	01-336A	Optional Bottom Outlet Screen
E, R	SFA	1	01-4655C	Suggested Supporting Steel
E, R	INF	1	01-4656B	Electric Basin Heater
E, R	INF	1	08-122	5 HP 208 V NEMA 12

Transmittal Codes:

E = Enclosed Herewith
S = Sent Separately
F = Sent via Fax
O = Other

Other Codes:

P = Print
R = Reproducible
D = Reduced Copy

Approval Codes:

SFA = Approval Document. Equipment is held for Approval and Release.
AFC = Certified Document. Equipment has been Approved for Construction.
Changes made after this point may result in price adds and/or delays.
INF = Information Document. Submitted for Information only.

Shipment Lead-Time After Drawing Approval: 35 business days

May 23, 2013

For: SPX Cooling Technologies

By: R T Forbes Company Inc

Richard Scogland

Job Information

Hyatt
 Bennett
 Portland, ME

Selected By

R. T Forbes Company, Inc.
 1 Lummus Avenue
 PO Box 209
 rscogland@comcast.net

Richard Scogland
 Tel 978-777-1220
 Fax 978-777-1750

Cooling Tower Definition

Manufacturer	Marley	Fan Motor Speed	1800 rpm
Product	Aquatower Steel	Fan Motor Capacity per cell	5.000 BHp
Model	495K	Fan Motor Output per cell	4.000 BHp
Cells	1	Fan Motor Output total	4.000 BHp
CTI Certified	Yes	Air Flow per cell	27320 cfm
Fan	4.500 ft, 6 Blades	Air Flow total	27320 cfm
Fan Speed	635 rpm, 8977.1 fpm	Static Lift	7.885 ft
Fans per cell	1	Distribution Head Loss	0.000 ft
		ASHRAE 90.1 Performance	59.9 gpm/Hp

Model Group Standard
 Sound Pressure Level 80 dBA (Single Cell), 5,000 ft from Air Inlet Face. See sound report for details.

Conditions

Tower Water Flow	270.0 gpm	Air Density In	0.07167 lb/ft³
Hot Water Temperature	100.00 °F	Air Density Out	0.07128 lb/ft³
Range	12.00 °F	Humidity Ratio In	0.01467
Cold Water Temperature	88.00 °F	Humidity Ratio Out	0.02867
Approach	14.00 °F	Wet-Bulb Temp. Out	87.45 °F
Wet-Bulb Temperature	74.00 °F	Estimated Evaporation	3.2 gpm
Relative Humidity	50.0 %	Total Heat Rejection	1613100 Btu/h
Capacity	128.6 %		

This selection satisfies your design conditions.

Weights & Dimensions

	Per Cell	Total
Shipping Weight	1758 lb	1758 lb
Max Operating Weight	3853 lb	3853 lb
Width	6.479 ft	6.479 ft
Length	7.958 ft	7.958 ft
Height	9.000 ft	

Minimum Enclosure Clearance

Clearance required on air inlet sides of tower without altering performance. Assumes no air from below tower.

Solid Wall	3.521 ft
50 % Open Wall	3.000 ft

Weights and dimensions do not include options; refer to sales drawings. For CAD layouts refer to file 495.dxf

Cold Weather Operation

Heater Sizing (to prevent freezing in the collection basin during periods of shutdown)

Heater kW/Cell	4.5	3.0	1.5
Ambient Temperature °F	-17.30	2.97	23.24

Marley VFD Product Specification:

- 6 Pulse PWM drive with IGBT switching and integrated bypass design.
- Main circuit breaker disconnect with thermal and short circuit protection.
- Service switch to manually isolate VFD from supply voltage during service.
- VFD requires a speed reference input signal from a remote source such as a Building Automation System or Marley RTD with 4-20ma transmitter. VFD will accept a 4-20mA, 0-20mA or 0-10VDC signal. Speed may also be controlled via the onboard keypad.
- Field selectable automatic or manual bypass mode.
- 5% line impedance standard.
- Status indicators give the operator indication of drive and bypass operation modes.
- Programmable output relay contacts for connection to Building Automation System. Examples: System run, Drive fault, Bypass fault, Bypass HOA position, System started.
- Both VFD and E-Clipse bypass have embedded fieldbus protocols allowing communications with: (Modbus RTU, Johnson Controls N2, Siemens Building Technologies FLN (P1) and BACnet (MS/TP)).
- Optional communication protocols are available, ie: LonWorks, Profibus, DeviceNet, Ethernet IP/Modbus TCP/IP.

- Built in Real Time Clock to recording drive events to actual time and day.
- Fault logger for tracking down drive issues so you know what happened, when and why.
- Interactive start-up assistance guides user through the start-up.
- UL Listed.
- Keypad for VFD control/monitoring and a *Keypad for bypass control/monitoring.

Warranty: When start-up service is purchased - 3 years from date of start-up or 38 months from date of VFD shipment which ever is less. Includes parts, labor and travel. Continental USA locations only. Contact your Marley sales representative for start-up in other areas. **If start-up is not purchased - Warranty is 2 years from VFD shipment. This is a parts only warranty and does not include labor or travel.**

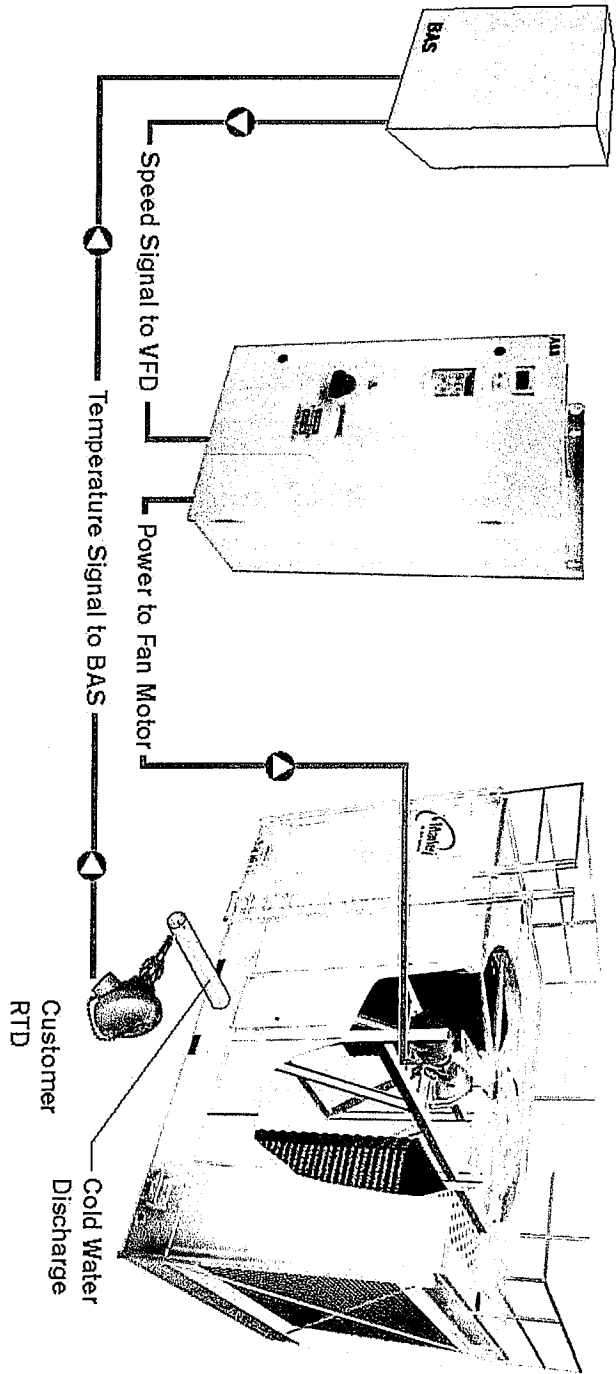
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A		6/6/2012	16020	ECO	MG	JB	208/3/60 5 HP 40 AMP MAIN BREAKER NEMA 12 ENCLOSURE	
DATE	DATE	ECO	BY	CHKD	SCALE	DATE	DRAWN	CHECKED
6/6/2012	2/24/2011				2/24/2011	GROOTHUIS		
COMMON FRACTIONS MAY VARY ± 1/16"				ORDER NUMBER		DRAWING NUMBER		APPROVED
ANGLES MAY VARY ± 1/2°				08-122		08-122		REV A

Marley VFD Item #E83714
ABB CAT # ACH550-BCR-017A-2+B055+F267

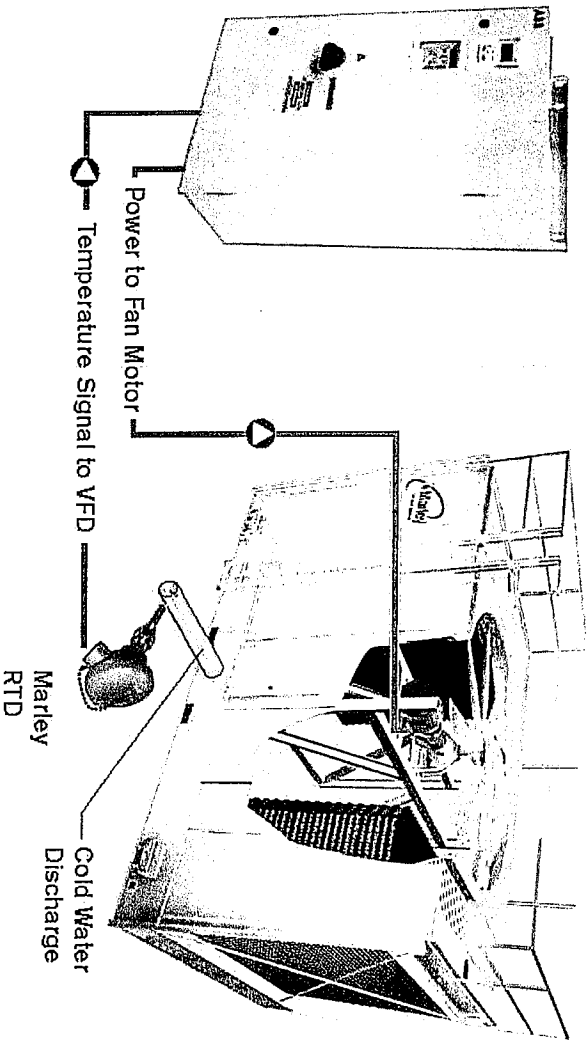


Option using customers BAS system for temperature control



Cooling Tower

Option using VFD with Integrated Temperature Controller and Marley RTD for temperature control



Cooling Tower

Job Information

Hyatt
 Bennett
 Portland, ME

Selected By

R. T Forbes Company, Inc.
 1 Lummus Avenue
 PO Box 209
 rscogland@comcast.net

Richard Scogland
 Tel 978-777-1220
 Fax 978-777-1750

Cooling Tower Definition

Manufacturer	Marley	Fan Speed (100.0 %)	635 rpm
Product	Aquatower Steel	Fan Tip Speed (100.0 %)	8977.1 fpm
Model	495K	Fan Motor Speed (100.0 %)	1800 rpm
Cells	1	Fan Motor Capacity per cell	5.000 BHp
Fan	4.50 ft, 6 Blades	Fan Motor Output per cell	4.000 BHp
Fans per cell	1	Fan Motor Output total	4.000 BHp
Model Group	Standard		

Sound

1-Cell sound data for an unobstructed environment.

Sound Pressure Level (SPL) expressed in dB (re: 20x10⁻⁶ Pa)
 Sound Power Level (PWL) expressed in dB (re: 1x10⁻¹² watts)

Distance	Location	Octave Band Center Frequency (Hz)								Overall dBA
		63	125	250	500	1000	2000	4000	8000	
50.00 ft	Air Inlet Face SPL	69	76	68	64	60	55	46	39	67
50.00 ft	Cased Face SPL	71	74	65	61	54	49	42	36	63
50.00 ft	Fan Discharge Face SPL	70	76	66	66	62	57	49	41	68
50.00 ft	Top Deck SPL	68	71	64	60	55	50	46	43	62
	Tower PWL	102	107	98	95	90	85	78	72	97

Notes

Sound Pressure Levels at Fan Discharge are measured on the cased face side opposite the motor, far enough outside the air stream to prevent air noise from affecting the reading.
 Sound data is in accordance with ATC-128.

Submittal Details

Item	Tag / Equipment ID	Product ID
2		ACH550-BCR-017A-2+B055+F267

Item Description
Input Voltage: 208 VAC Rated Output Current: 16.7 AMPS Construction: E-clipse-Bypass, Circuit Breaker Enclosure: NEMA 12 UL Type 12 Nominal Horsepower: 5 Frame Size: R1 Input Disconnecting Means: Circuit Breaker Bypass: E-Clipse Bypass Input Impedance: 5% Short Circuit Current Rating: 100 kA Communication Protocols: Johnson Controls N2, Siemens Buildings Technologies FLN (P1), Modbus RTU, BACnet Other Options: Service Switch

Drive Input Fuse Ratings ¹	
(Note: Drive is UL approved without the need for input fuses. Fuse rating information provided for customer reference)	
Amps (600 V)	Bussmann Type
30	KTK-R-30

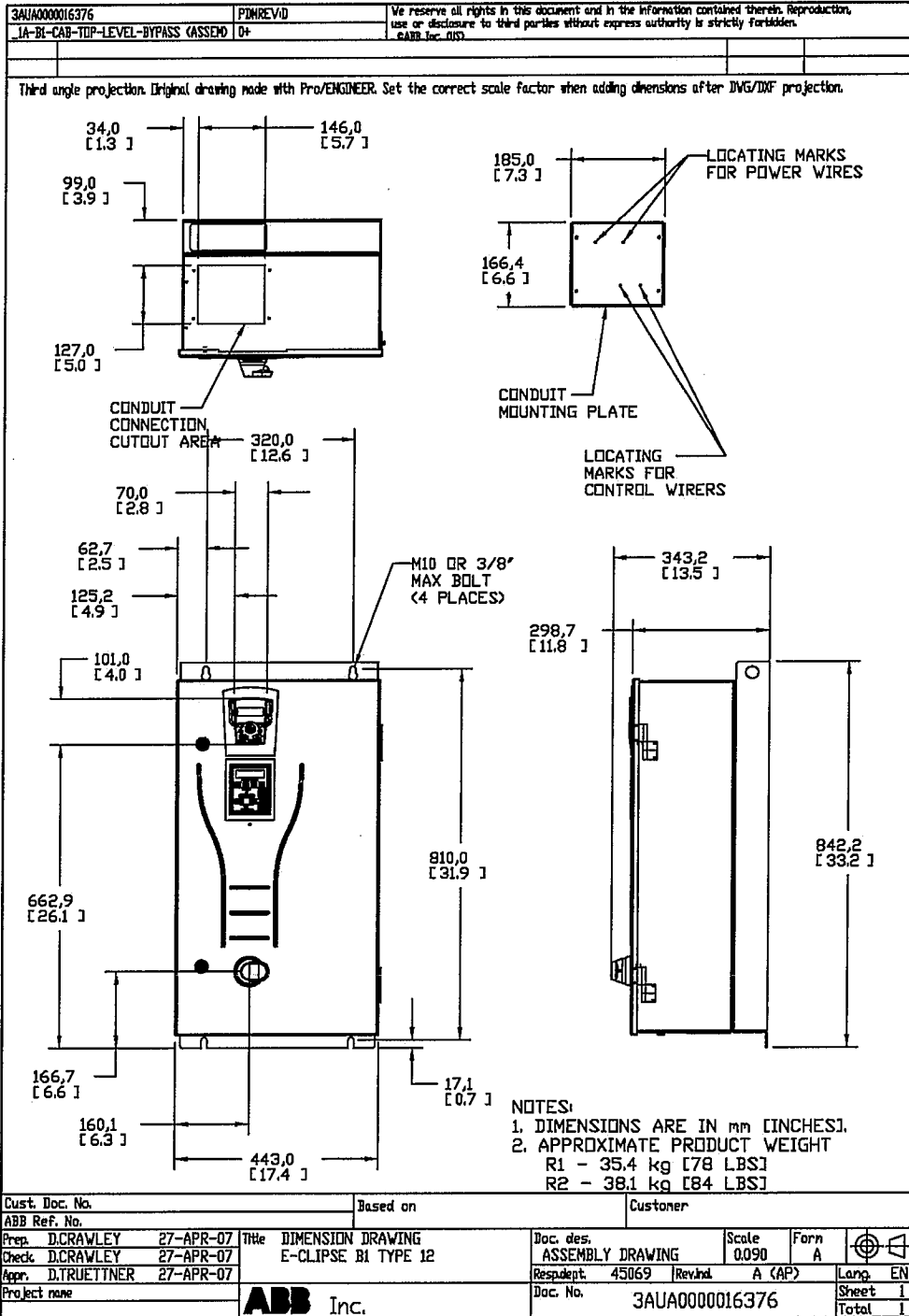
Wire Size Capacities of Power Terminals				
Circuit Breaker	Disconnect Switch	Terminal Block	Overload Relay	Ground Lug
#10 35 in-lbs	N/A N/A	#6 30 in-lbs	N/A N/A	#4 35 in-lbs

Dimensions and Weights				
Height in / mm	Width in / mm	Depth in / mm	Weight lbs / kg	Dimension Drawing
33.2 / 842	17.4 / 443	13.5 / 343	78 / 35.4	3AUA0000016376-1

Heat Dissipation & Airflow Requirements			
Power Losses		Airflow	
Watts	BTU/Hr	CFM	CM/Hr
161	551	26	44

Reference Drawings		
Power Wiring	Connection Diagram	Dimension Detail
BC00R012PW-C	BCBDR016CC-A	3AUA0000016376-1

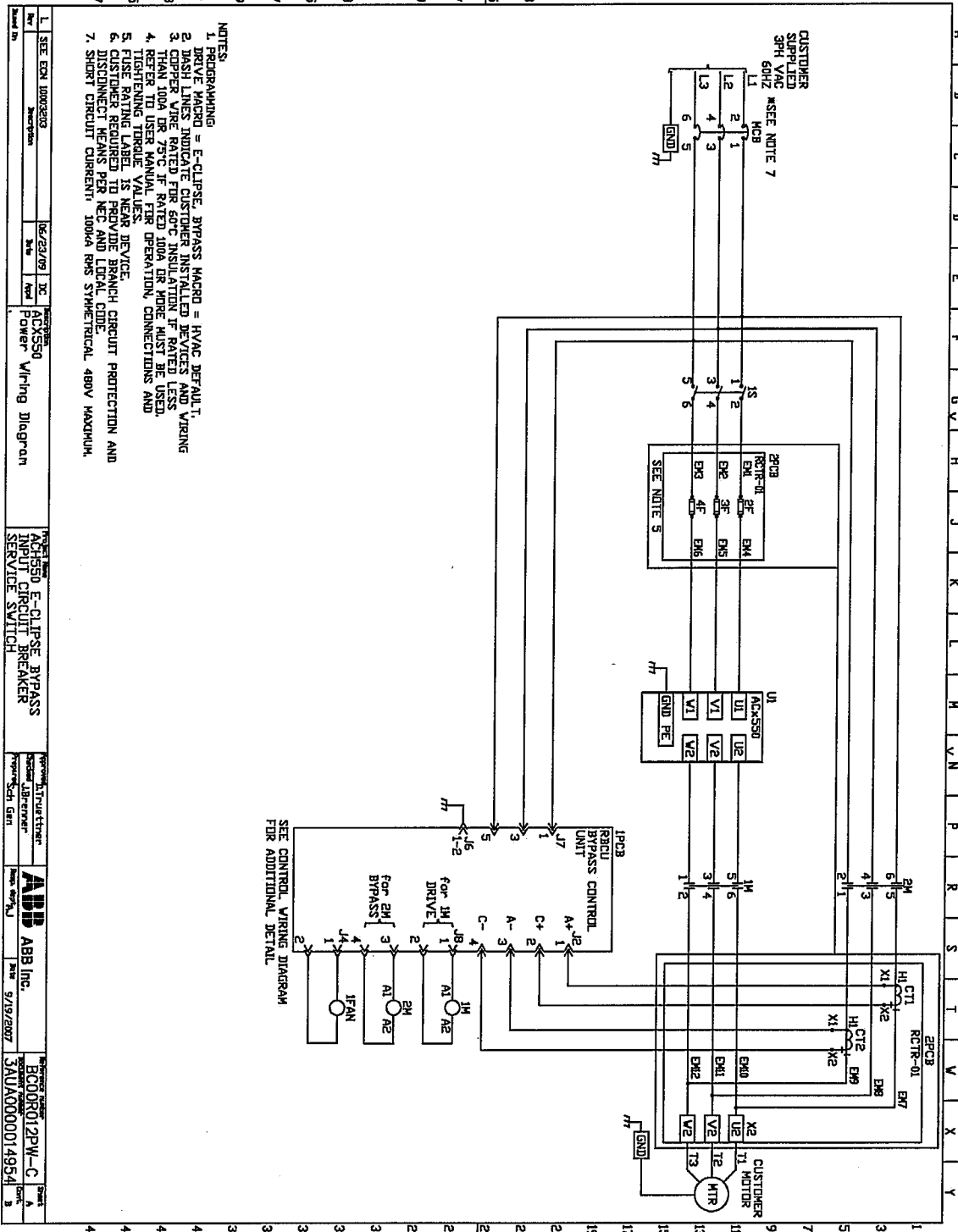
Dimension Drawing for 08-122 - ACH550-BCR-017A-2+B055+F267



F-301409999-4, rev. 2, 10-21-04

Power Drawing for 08-122 - ACH550-BCR-017A-2+B055+F267

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- NOTES:
1. PROGRAMMING
 2. DRIVE MACRO = E-CLIPSE, BYPASS MACRO = HVAC DEFAULT.
 3. DASH LINES INDICATE CUSTOMER INSTALLED DEVICES AND WIRING
 4. COPPER WIRE RATED FOR 60°C INSULATION IF RATED LESS THAN 100A OR 75°C IF RATED 100A OR MORE MUST BE USED.
 5. REFER TO USER MANUAL FOR OPERATION, CONNECTIONS AND FUSING AND TORQUE VALUES.
 6. CUSTOMER REQUIRED TO PROVIDE BREAK PROTECTION AND DISCONNECT MEANS PER NEC AND LOCAL CODE.
 7. SHORT CIRCUIT CURRENT: 100KA RMS SYMMETRICAL, 480V MAXIMUM.

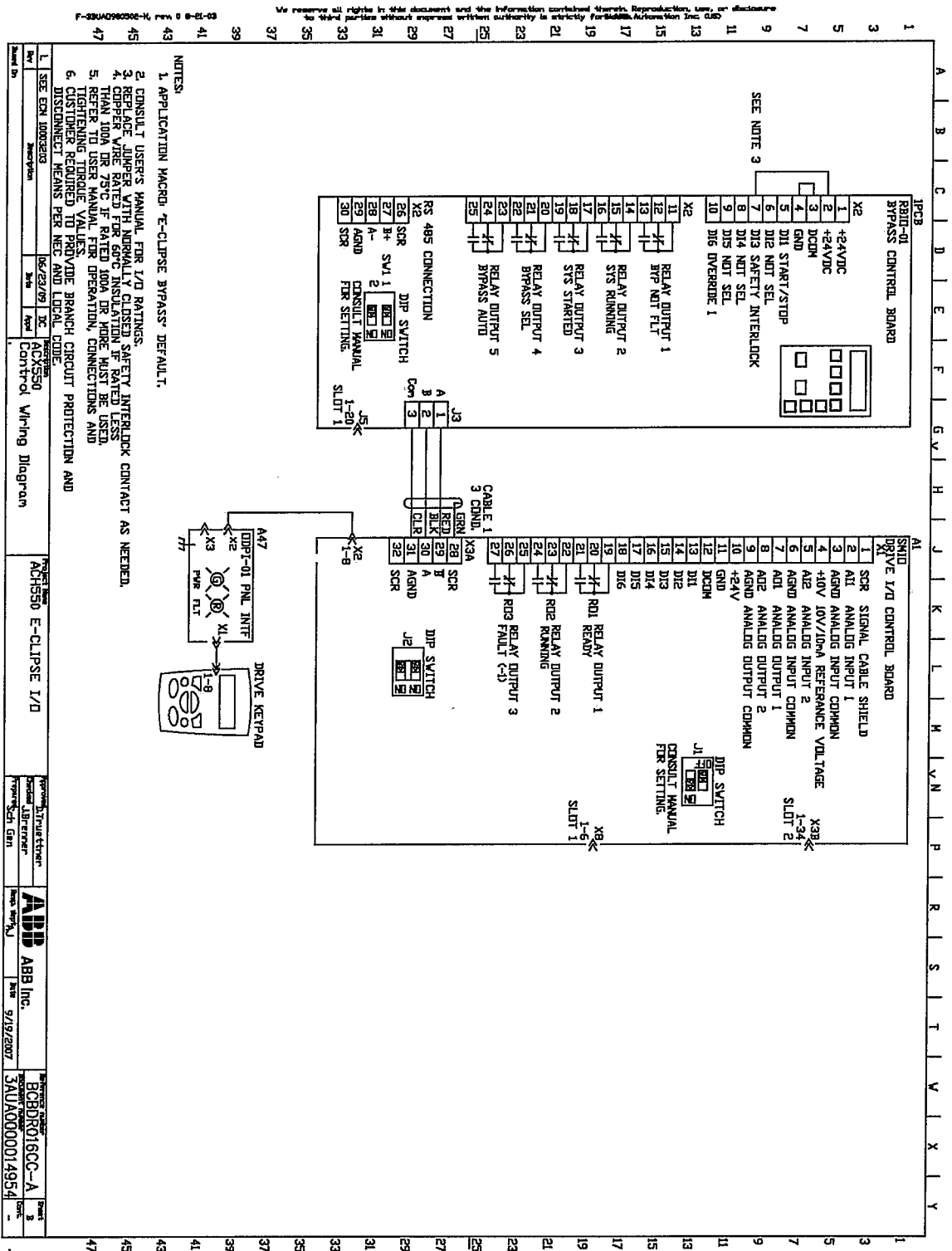
REV	DATE	BY	CHKD	DESCRIPTION
1	08/23/09	TC	TC	ACH550 Power Wiring Diagram

PROJECT NAME	PROJECT NO.	DATE
ACH550 E-CLIPSE BYPASS INPUT CIRCUIT BREAKER SERVICE SWITCH		

DESIGNED BY	DATE
JAVAD	9/19/2007

REVISION	DESCRIPTION
1	ACH550 E-CLIPSE BYPASS INPUT CIRCUIT BREAKER SERVICE SWITCH

Connection Drawing for 08-122 - ACH550-BCR-017A-2+B055+F267



ACH550 Standard Features

- UL, cUL Labeled and CE marked
- EMI/RFI Filter (1st Environment, Restricted Distribution)
- Start-Up Assistants
- Maintenance Assistants
- Diagnostic Assistants
- Real Time Clock
 - Includes Day, Date and Time
- Operator Panel Parameter Backup (read/write)
- Full Graphic and Multilingual Display for Operator Control, Parameter Set-Up and Operating Data Display:
 - Output Frequency (Hz)
 - Speed (RPM)
 - Motor Current
 - Calculated % Motor Torque
 - Calculated Motor Power (kW)
 - DC Bus Voltage
 - Output Voltage
 - Heatsink Temperature
 - Elapsed Time Meter (reset-able)
 - KWh (reset-able)
 - Input / Output Terminal Monitor
 - PID Actual Value (Feedback) & Error
 - Fault Text
 - Warning Text
 - Three (3) Scalable Process Variable Displays
 - User Definable Engineering Units
- Two (2) Programmable Analog Inputs
- Six (6) Programmable Digital Inputs
- Two (2) Programmable Analog Outputs
- Up to six (6) Programmable Relay Outputs (Three (3) Standard)
- Adjustable Filters on Analog Inputs and Outputs
- Mathematical Functions on Analog Reference Signals
- All Control Inputs Isolated from Ground and Power
- Four (4) Resident Serial Communication Protocols
 - Johnson Controls N2
 - Siemens Building Technologies FLN (P1)
 - Modbus RTU
 - BACnet (MS/TP)
- Input Speed Signals
 - Current 0 (4) to 20 mA
 - Voltage 0 (2) to 10 VDC
 - Increase/Decrease Reference Contacts (Floating Point)
 - Serial Communications
- Start/Stop
 - 2 Wire (Dry Contact Closure)
 - 3 Wire (Momentary Contact)
 - Application of Input Power
 - Application of Reference Signal (PID Sleep/Wake-Up)
- Up)
 - Serial Communications
- Start Functions
 - Ramp
 - Flying Start
 - Premagnetization on Start
 - Automatic Torque Boost
 - Automatic Torque Boost with Flying Start
 - Auto Restart (Reset) – Customer Selectable and Adjustable
- Stop Functions
 - Ramp or Coast to Stop
 - Emergency Stop
 - DC Braking / Hold at Stop
 - Flux Braking
- Accel/Decel
 - Two (2) sets of Independently Ramps
 - Linear or Adjustable 'S' Curve Accel/Decel Ramps

- HVAC Specific Application Macros
- Separate Safeties (2) and Run Permissive Inputs
- Damper Control
- Override Input (Fire Mode)
- Timer Functions
 - Four (4) Daily Start/Stop Time Periods
 - Four (4) Weekly Start/Stop Time Periods
 - Four Timers for Collecting Time Periods and Overrides
- Seven (7) Preset Speeds
- Supervision Functions
- Adjustable Current Limit
- Electronic Reverse
- Automatic Extended Power Loss Ride Through (Selectable)
- Programmable Maximum Frequency to 500 Hz
- PID Control
 - Two (2) Integral Independent Programmable PID Setpoint Controllers (Process and External)
 - External Selection between Two (2) Sets of Process PID Controller Parameters
 - PID Sleep/Wake-Up
- Motor Control Features
 - Scalar (V/Hz) and Vector Modes of Motor Control
 - V/Hz Shapes
 - Linear
 - Squared
 - Energy Optimization
 - IR Compensation
 - Slip Compensation
 - Three (3) Critical Frequency Lockout Bands
- Preprogrammed Protection Circuits
 - Overcurrent
 - Short Circuit
 - Ground Fault
 - Overvoltage
 - Undervoltage
 - Input Phase Loss
 - Output Device (IGBT) Overtemperature
 - Adjustable Current Limit Regulator
 - UL508C approved Electronic Motor Overload (I²T)
- Programmable Fault Functions for Protection Include
 - Loss of Analog Input
 - Panel Loss
 - External Fault
 - Motor Thermal Protection
 - Stall
 - Underload
 - Motor Phase Loss
 - Ground Fault
- 5% Input Impedance
 - Equivalent 5% Impedance with Internal Reactor(s)
 - Patented Swinging Choke Design for Superior Harmonic Mitigation (R1 to R4)

OPTIONAL FEATURES

- 3 Relay Extension Module (OREL-01)
- 115/230 V Digital input Interface Card (OHDI-01)
- Fieldbus Adapter Modules
 - LonWorks
 - Profibus
 - Ethernet
- DriveWindow Light Start-up, Operation, Programming and Diagnostic Tool
- Fan Replacement Kit

ACH550 Specifications

Input Connection

Input Voltage (U ₁)	208/220/230/240 VAC 3-phase +/-10%
	208/220/230/240 VAC 1-phase +/-10%
	380/400/415/440/460/480 VAC 3-phase +/-10%
	500/600 VAC 3-phase +/-10%
Frequency:	48 - 63 Hz
Line Limitations:	Max +/-3% of nominal phase to phase input voltage
Fundamental Power Factor (cos φ):	0.98 at nominal load
Connection:	U ₁ , V ₁ , W ₁ (U ₁ , V ₁ , 1-phase)
Output (Motor) Connection	
Output Voltage:	0 to U ₁ , 3-phase symmetrical, U ₂ at the field weakening point
Output Frequency:	-500 to 500 Hz
Frequency Resolution:	0.01 Hz
Continuous Output Current:	
Variable Torque:	1.0 * I _{2N} (Nominal rated output current, Variable Torque)
Short Term Overload Capacity:	
Variable Torque:	1.1 * I _{2N} , (1 min/10 min)
Peak Overload Capacity:	
Variable Torque:	1.35 * I _{2N} , (2 sec/1 min)
Base Motor Frequency Range:	10 to 500 Hz
Switching Frequency:	1, 4, 8 or 12 kHz
Acceleration Time:	0.1 to 1800 s
Deceleration Time:	0.1 to 1800 s
Efficiency:	0.98 at nominal power level
Short Circuit Withstand Rating:	100,000 AIC (UL) w/o fuses
Connection:	U ₂ , V ₂ , W ₂
Enclosure	
Style:	UL (NEMA) Type 1, Type 12, or Type 3R UL Plenum Rated Type 1, Type 12

Agency Approval

Listing and Compliance: UL, cUL, CE

Ambient Conditions, Operation

0° to 40°C (32° to 104°F), above 40°C the maximum output current is de-rated 1% for every additional 1°C (up to 50°C (122°F)) maximum limit.

5 to 95%, no condensation allowed, maximum relative humidity is 60% in the presence of corrosive gasses

Contamination Levels:

IEC: 60721-3-1, 60721-3-2 and 60721-3-3

Chemical Gasses: 3C1 and 3C2

Solid Particles: 3S2

0 to 1000 m (3300 ft) above sea level. At sites over 1000 m (3300 ft) above sea level, the maximum power is de-rated 1% for every additional 100 m (330 ft). If the installation site is higher than 2000 m (6600 ft) above sea level, please contact your local ABB distributor or representative for further information

Max 3.0 mm (0.12 in) 2 to 9 Hz, Max 10 m/s² (33 ft/s²) 9 to 200 Hz sinusoidal

Ambient Conditions, Storage (in Protective Shipping Package)

Air Temperature: -40° to 70°C (-40° to 158°F)

Relative Humidity: Less than 95%, no condensation allowed

Vibration Tested to (IEC 60068-2-6): In accordance with ISTA 1A and 1B specifications

Bump Tested to (IEC 60068-2-29): Max 100 m/s² (330 ft/s²) 11 ms (Tested 500 times each axis, each pole; 3000 times total)

Ambient Conditions, Transportation (in Protective Shipping Package)

Air Temperature: -40° to 70°C (-40° to 158°F)

Relative Humidity: Less than 95%, no condensation allowed

Atmospheric Pressure: 60 to 106 kPa (8.7 to 15.4 PSI)

Vibration Tested to (IEC 60068-2-6): Max 3.0 mm (0.14 in) 2 to 9 Hz, Max 15 m/s² (49 ft/s²) 9 to 200 Hz sinusoidal

Bump Tested to (IEC 60068-2-29): Max 100 m/s² (330 ft/s²) 11 ms (Tested 500 times each axis, each pole; 3000 times total)

Shock Tested to (IEC 60068-2-27)

R1: 76 cm (30 in) R2: 61 cm (24 in) R3: 46 cm (18 in) R4: 31 cm (12 in) R5 & 6: 25 cm (10 in)

ACH550 Specifications (continued)

Cooling Information

Integral fan(s)
Power Loss: Approximately 3% of rated power

Analog Inputs

Quantity Two (2) programmable
Voltage Reference: 0 (2) to 10 V, 250kOhm, single ended
Current Reference: 0 (4) to 20 mA, 100Ohm, single ended
Potentiometer: 10 VDC, 10 mA (1K to 10KOhms)
Input Updating Time 8 ms
Terminal Block Size 2.3mm² / 14AWG

Reference Power Supply

Reference Voltage +10 VDC, 1% at 25°C (77°F)
Maximum Load 10 mA
Applicable Potentiometer 1 kOhm to 10 kOhm
Terminal Block Size 2.3mm² / 14AWG

Analog Outputs

Quantity Two (2) programmable current outputs
Signal Level 0 (4) to 20 mA
Accuracy +/- 1% full scale range at 25°C (77°F)
Maximum Load Impedance 500 Ohms
Output Updating Time 2 ms
Terminal Block Size 2.3mm² / 14AWG

Digital Inputs

Quantity Six (6) programmable digital inputs
Isolation Isolated as one group
Signal Level 24 VDC, (10V Logic 0)
Input Current 15 mA at 24 VDC
Input Updating Time: 4 ms
Terminal Block Size 2.3mm² / 14AWG

Internal Power Supply

Primary Use Internal supply for digital inputs
Voltage: +24 VDC, max 250 mA
Maximum Current: 250 mA
Protection: Short circuit protected

Relay Outputs

Quantity Three (3) programmable relay (Form C) outputs
Switching Capacity: 8 A at 24 VDC or 250 VAC, 0.4 A at 120 VDC
Max Continuous Current: 2A RMS
Contact Material: Silver Cadmium Oxide (AgCdO)
Isolation Test Voltage 4 kVAC, 1 minute
Output Updating Time 12 ms
Terminal Block Size 2.3mm² / 14AWG

Protections

Single Phase Protected (input & output)
Overcurrent Trip Limit: 3.5 x I_{2N} instantaneous
Adjustable Current Regulation Limit: 1.1 x I_{2N} (RMS) max.
Overvoltage Trip Limit: 1.30 x U_N
Undervoltage Trip Limit: 0.65 x U_N
Overtemperature (Heatsink): +115°C (+239°F)
Auxiliary Voltage: Short Circuit Protected
Ground Fault: Protected
Short Circuit: Protected
Microprocessor fault: Protected
Motor Stall Protection: Protected
Motor Overtemperature Protection (I_{2t}): Protected
Input Power Loss of Phase: Protected
Loss of Reference: Protected
Short Circuit Current Rating: 100,000 RMS symmetrical Amperes
Input Line Impedance: Swinging choke 5% equivalent R1-R6, 3% equivalent R8

U₁ = Input Voltage

U₂ = Output Voltage

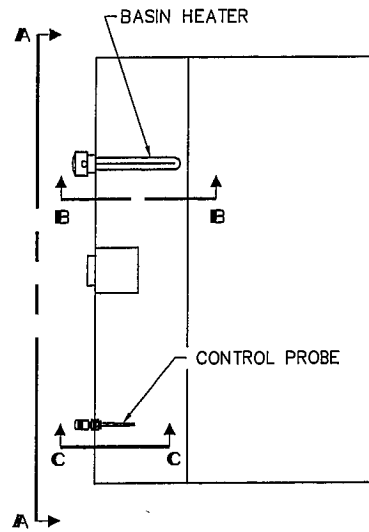
P_N = Power – Normal Duty (HP)

U_N = Nominal Motor Voltage

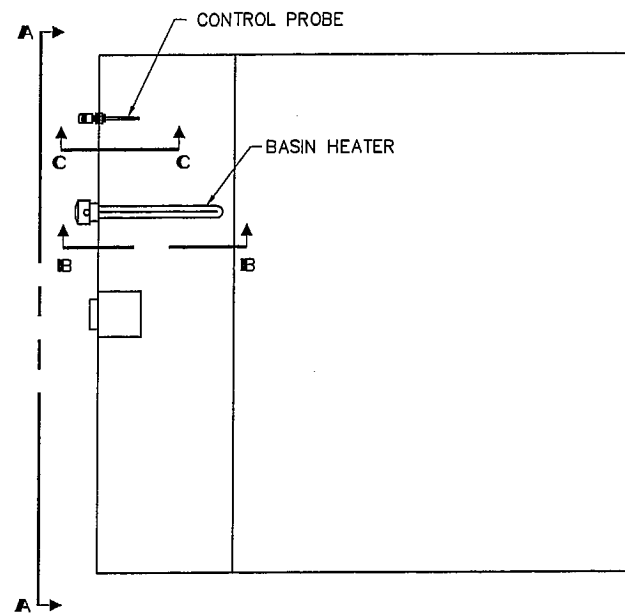
f_N = Nominal Motor Frequency

I_{2N} = Nominal Motor Current – Normal Duty

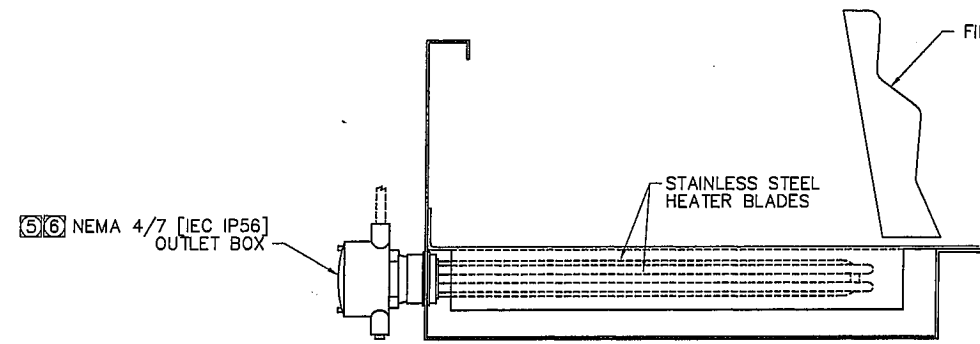
Specifications are subject to change without notice. Please consult the factory when specifications are critical.



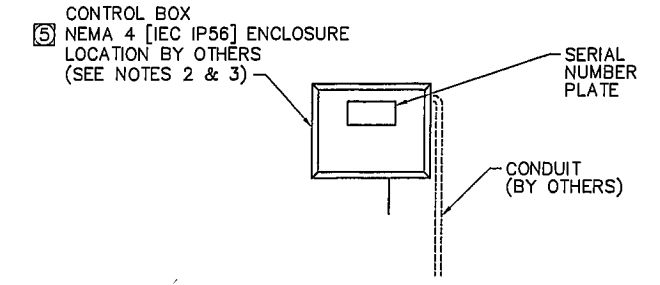
BASIN PLAN VIEW
(490 THRU 492)



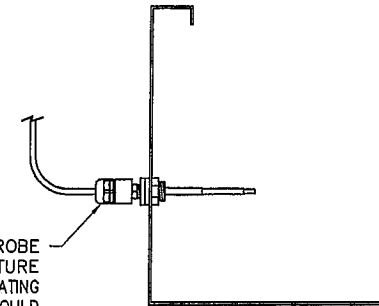
BASIN PLAN VIEW
(493 THRU 496)



SECTION B-B



CONTROL BOX

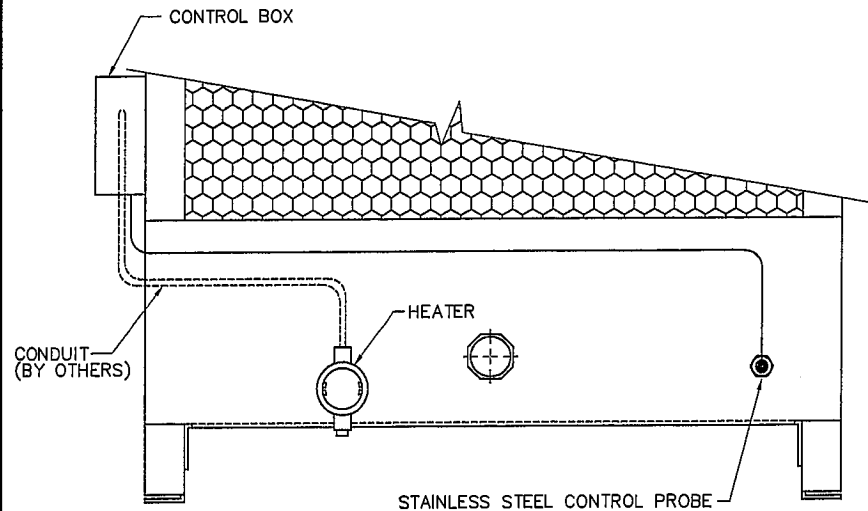


SECTION C-C

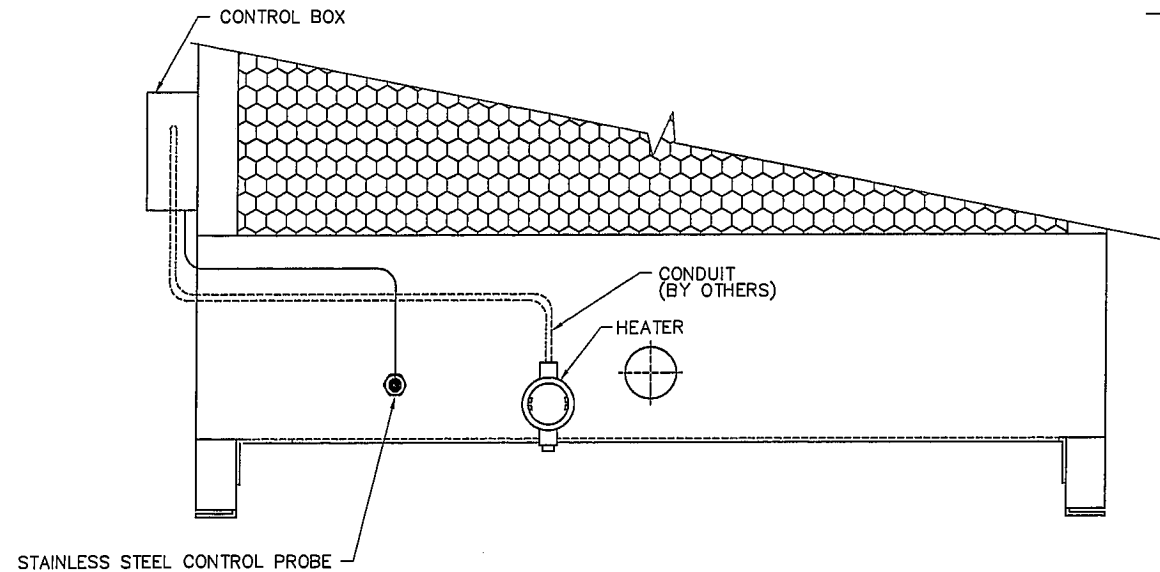
STAINLESS STEEL CONTROL PROBE TO MONITOR WATER TEMPERATURE AND PREVENT HEATERS FROM OPERATING OUT OF WATER. THE HEATERS WOULD OPERATE IN EXCESS OF 1500° F [815° C] IN THE AIR AND WOULD BE A POTENTIAL FIRE HAZARD.

GENERAL NOTES

- ALL BASIN HEATER COMPONENTS MUST BE FIELD INSTALLED AND WIRED BY OTHERS. CUSTOMER'S INSTALLATION MUST MEET REQUIREMENTS OF LATEST NATIONAL ELECTRICAL CODE AND LOCAL CODES.
- CONTROL BOX COMPONENTS:
 - TRANSFORMER - STEP DOWN LINE VOLTAGE TO 24 VOLTS FOR CONTROL CIRCUIT.
 - MAGNETIC CONTACTOR - CONTROLS POWER TO HEATER. CONTACTS ARE RATED FOR LINE VOLTAGE. COIL IS RATED FOR A 24 VOLT CIRCUIT.
 - CIRCUIT BOARD / CONTROL PROBE - SENSES WATER TEMPERATURE AND CONTROLS THE CONTACTOR TO MAINTAIN THE SET WATER TEMPERATURE. PREVENTS THE CONTACTOR FROM CLOSING WHEN THE CONTROL PROBE SENSES THE WATER LEVEL DROPPING TOO LOW FOR SAFE OPERATION OF THE HEATERS.
 - OPTIONAL FEATURES AS SELECTED.
- ALL STANDARD HEATER PACKAGES WITH NEMA 4 [IEC IP56] CONTROL BOXES ARE U.L. LISTED. (U.L. LISTING NOT AVAILABLE ON EXPLOSION PROOF CONTROL BOXES).
- CONTROL PROBE CORD LENGTH MAY LIMIT CONTROL BOX LOCATION
- NEMA ENCLOSURES MEET OR EXCEED THE TEST REQUIREMENTS FOR THE ASSOCIATED IEC CLASSIFICATIONS.
- ACCORDING TO TEST SPECIFIED IN IEC PUBLICATION 529 THERE IS NO DIRECT IEC EQUIVALENT OF THE NEMA 7 ENCLOSURE.
- ALL DIMENSIONS SHOWN ARE IN IMPERIAL UNITS (I-P) AND THOSE SHOWN INSIDE BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.



VIEW A-A
(490 THRU 492)



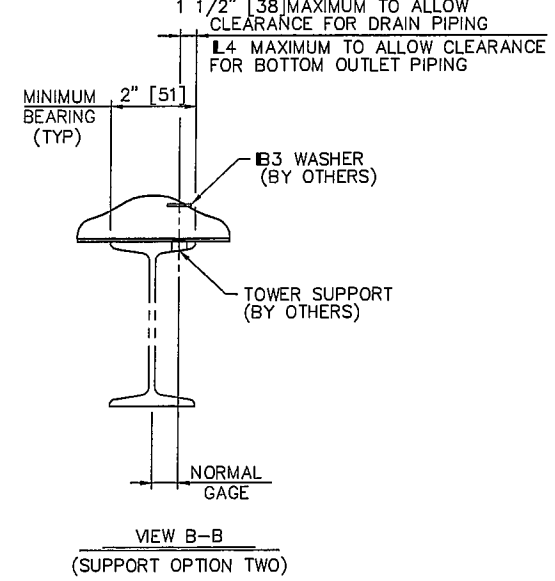
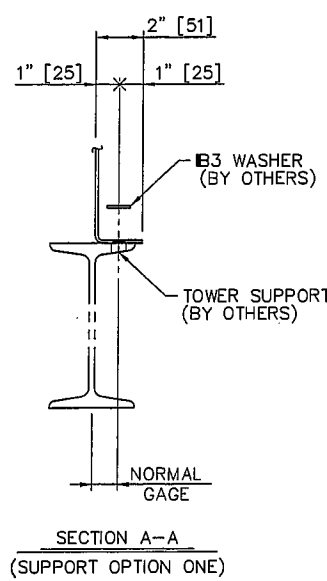
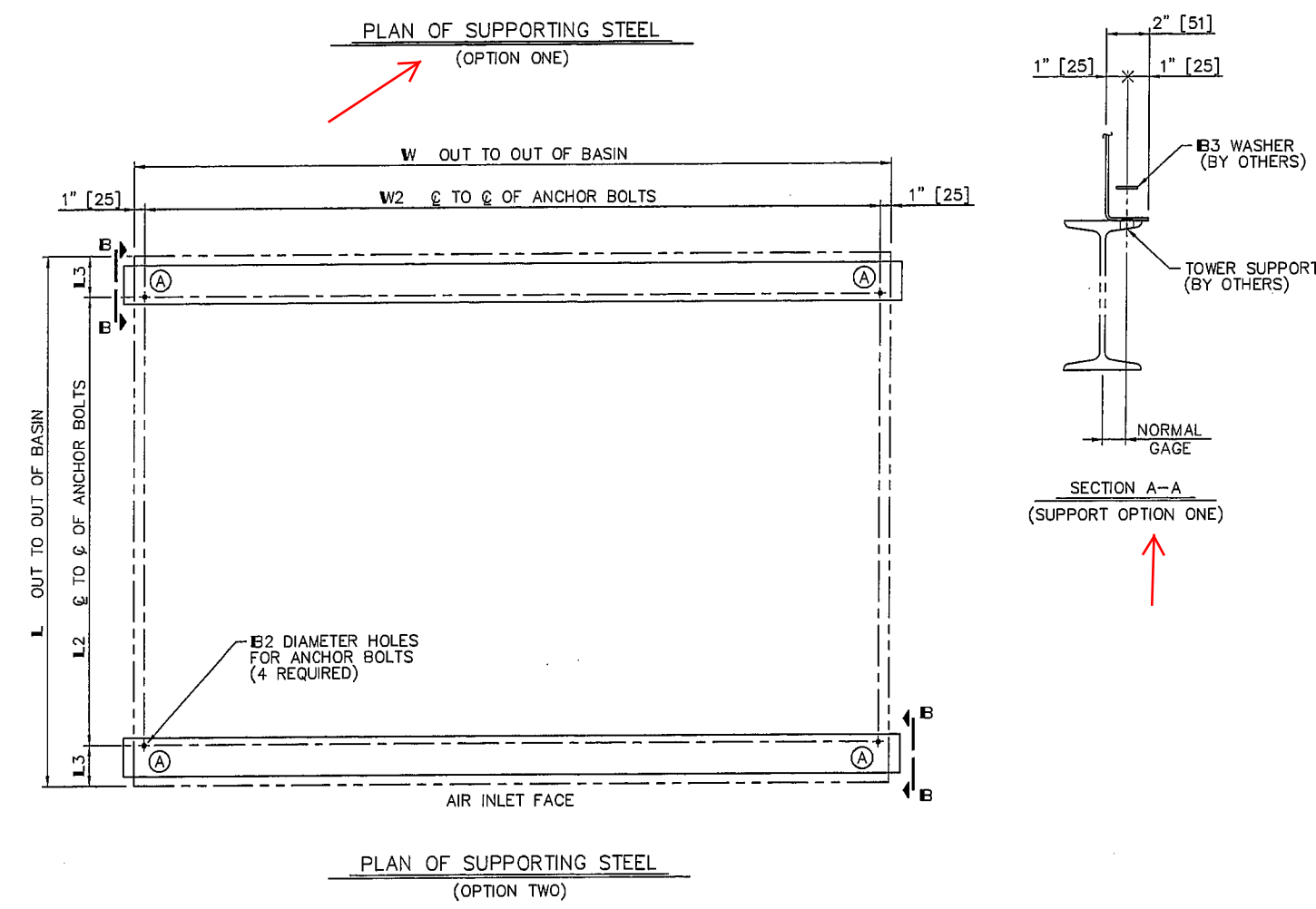
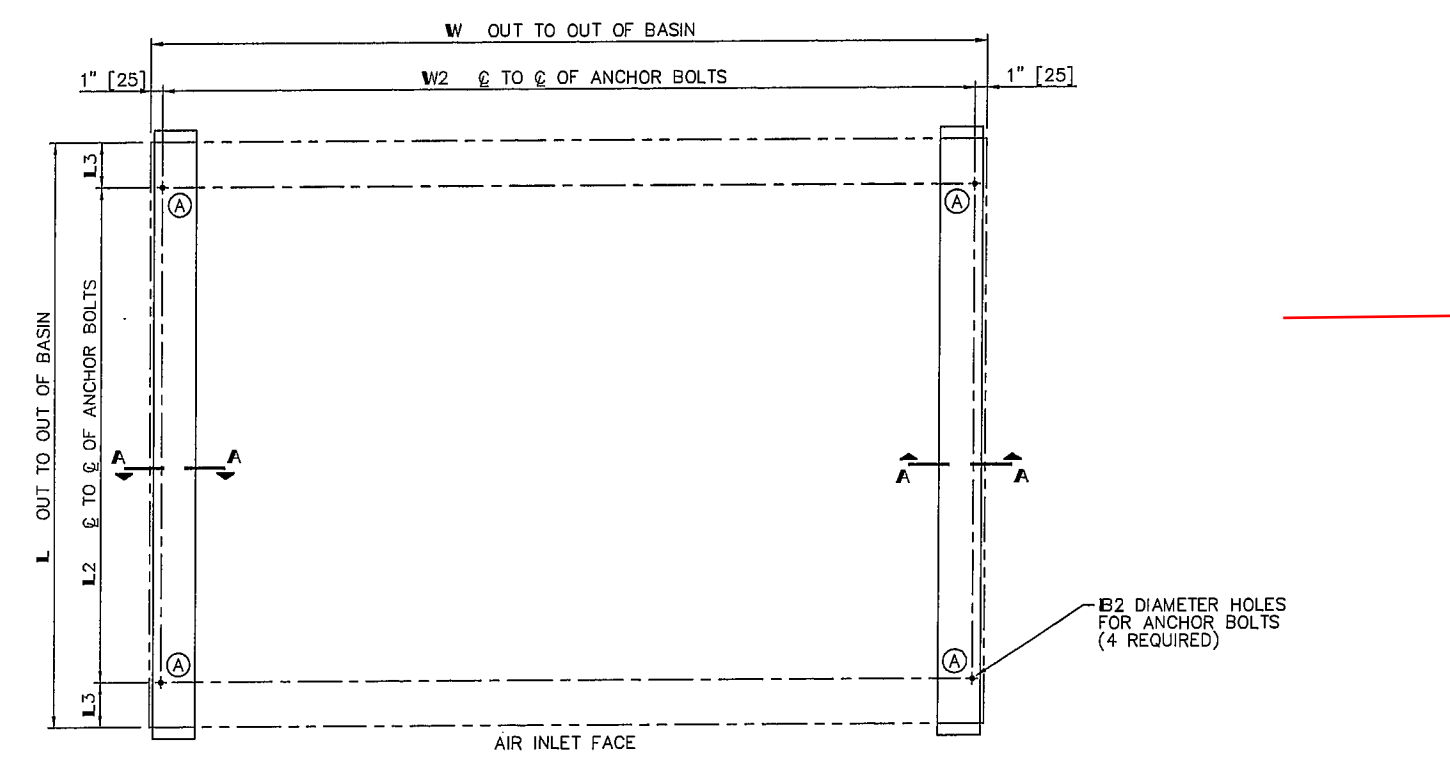
VIEW A-A
(493 THRU 496)

ECO NUMBER 12247		ELECTRIC BASIN HEATER DETAILS STEEL AQUATOWER								
REV. BY BCG	CHECKED	DRAWN BY DA/SR		DATE 09/13/2001	CHECKED MPC	APPROVED	ORDER NUMBER	PLOT 1=1	DRAWING NUMBER 01-4656	REV. B

TOWER MODEL	L	W	B2	B3	L2	L3	L4	W2	SHIPPING WEIGHT (lbs [kg])	DESIGN OPERATING LOADS (lbs [kg])		WIND LOADS (lbs [kg])	
										TOTAL	AT (A)	MAXIMUM VERTICAL REACTION AT (A)	MAXIMUM HORIZONTAL REACTION AT (A)
490	3'-4 1/8" [1019]	2'-11 1/2" [902]	5/8" [16]	1/2" [13]	3'-0" [914]	2 1/16" [52]	---	2'-9 1/2" [851]	437 [198]	756 [343]	189 [86]	180 [82]	115 [52]
492	4'-1 5/8" [1260]	3'-11 1/2" [1207]	5/8" [16]	1/2" [13]	3'-6" [1067]	3 13/16" [97]	7/8" [22]	3'-9 1/2" [1156]	742 [337]	1396 [633]	349 [158]	355 [161]	210 [95]
493	4'-1 5/8" [1260]	5'-11 1/2" [1816]	5/8" [16]	1/2" [13]	3'-6" [1067]	3 13/16" [97]	7/8" [22]	5'-9 1/2" [1765]	982 [445]	1995 [905]	499 [226]	525 [238]	285 [129]
494	5'-6 1/8" [1680]	5'-11 1/2" [1816]	5/8" [16]	1/2" [13]	5'-0" [1524]	3 1/16" [78]	1 7/8" [48]	5'-9 1/2" [1765]	1398 [634]	2948 [1337]	737 [334]	555 [252]	355 [161]
495	5'-6 1/8" [1680]	7'-11 1/2" [2426]	5/8" [16]	1/2" [13]	5'-0" [1524]	3 1/16" [78]	1 7/8" [48]	7'-9 1/2" [2375]	1758 [797]	3853 [1748]	963 [437]	745 [338]	470 [213]
496	5'-6 1/8" [1680]	9'-11 1/2" [3035]	5/8" [16]	1/2" [13]	5'-0" [1524]	3 1/16" [78]	1 7/8" [48]	9'-9 1/2" [2985]	2096 [951]	4751 [2155]	1188 [539]	1095 [497]	640 [290]

DATA FOR TOWERS WITH A VERTICAL DISCHARGE HOOD IS AS FOLLOWS:

494	5'-6 1/8" [1680]	5'-11 1/2" [1816]	5/8" [16]	1/2" [13]	5'-0" [1524]	3 1/16" [78]	1 7/8" [48]	5'-9 1/2" [1765]	1798 [816]	3348 [1519]	837 [380]	700 [318]	515 [234]
495	5'-6 1/8" [1680]	7'-11 1/2" [2426]	5/8" [16]	1/2" [13]	5'-0" [1524]	3 1/16" [78]	1 7/8" [48]	7'-9 1/2" [2375]	2133 [968]	4233 [1920]	1058 [480]	745 [338]	515 [234]
496	5'-6 1/8" [1680]	9'-11 1/2" [3035]	5/8" [16]	1/2" [13]	5'-0" [1524]	3 1/16" [78]	1 7/8" [48]	9'-9 1/2" [2985]	2596 [1178]	5251 [2382]	1313 [596]	1095 [497]	640 [290]



GENERAL NOTES

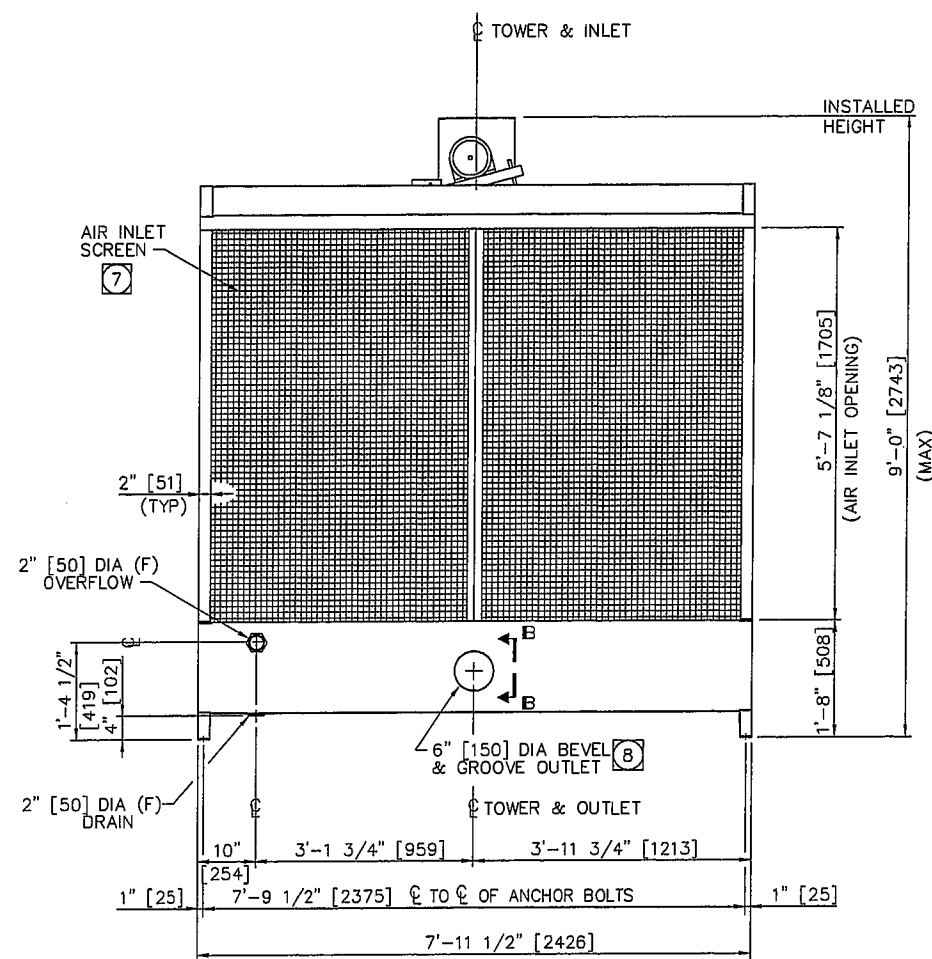
- TOWER SUPPORTS**
THE SUPPORTING STEEL IS TO BE DESIGNED, CONSTRUCTED, AND FURNISHED BY THE CUSTOMER. IT SHALL INCLUDE "B2" DIAMETER HOLES FOR CUSTOMER SUPPLIED "B3" DIAMETER ANCHOR BOLTS AND WASHERS TO SUIT THE GENERAL DIMENSIONS OF THIS DRAWING. THE TOP SURFACE OF THE SUPPORTING STEEL MUST BE FRAMED FLUSH AND LEVEL. THE MAXIMUM BEAM DEFLECTION SHALL BE LIMITED TO 1/360 OF SPAN, NOT TO EXCEED 1/2" [13 mm] AT THE ANCHOR BOLTS.
- DESIGN OPERATING LOADS**
THE DESIGN OPERATING LOADS SHOWN IN THE ABOVE TABLE ARE BASED UPON THE VOLUME OF WATER IN THE COLLECTION BASIN AT SHUTDOWN. THE SHUTDOWN WATER LEVEL HAS BEEN SIZED TO ACCOMMODATE MAXIMUM ALLOWABLE FLOW RATES. THE DESIGN LOADS ARE SHOWN FOR YOUR USE AS A QUICK REFERENCE. THE ACTUAL OPERATING LOAD IS VARIABLE, AND IS DEPENDENT UPON THE DESIGN FLOW RATE PER CELL. DESIGN LOADS ARE ALL BASED UPON THE RECOMMENDED OPERATING WATER LEVEL. OPERATING LEVELS IN EXCESS OF THAT RECOMMENDED WILL RESULT IN LOADS EXCEEDING VALUES STATED. CONSULT A MARLEY COOLING TOWER SALES ENGINEER FOR GREATER DETAIL ON THIS OR ANY OTHER SUBJECT.
- TOWER WIND LOADS**
WIND LOADS ARE CALCULATED ON A BASIS OF 30 psf [1437 N/m²] AND ARE ADDITIVE TO THE OPERATING LOADS.
- TOWER OBSTRUCTIONS**
AIR INLET FACE MUST HAVE AN ADEQUATE AIR SUPPLY. IF OBSTRUCTIONS EXIST NEARBY, CONSULT A MARLEY COOLING TOWER COMPANY SALES ENGINEER. REFER TO SCHEMATIC DRAWING FOR MINIMUM CLEARANCE.
- VIBRATION ISOLATION**
CONSULT A MARLEY COOLING TOWER COMPANY SALES ENGINEER IF TOWER IS TO BE DIRECTLY SUPPORTED ON VIBRATION ISOLATORS. NON-UNIFORM DEFLECTION OF ISOLATORS MAY CAUSE DAMAGE TO TOWER STRUCTURE. MODIFICATIONS MAY BE REQUIRED.
- PIER SUPPORTS**
TOWER MAY BE SUPPORTED FROM PIERS AT THE FOUR ANCHOR BOLT LOCATIONS AS AN ALTERNATE.
- UNITS**
TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. MARLEY'S FABRICATION TOLERANCE IS $\pm 1/16"$ [1.5 mm] & ASSEMBLY TOLERANCE IS $\pm 1/8"$ [3 mm]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN INCHES AND ALL WEIGHTS IN POUNDS AND THOSE SHOWN IN BRACKETS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P UNITS

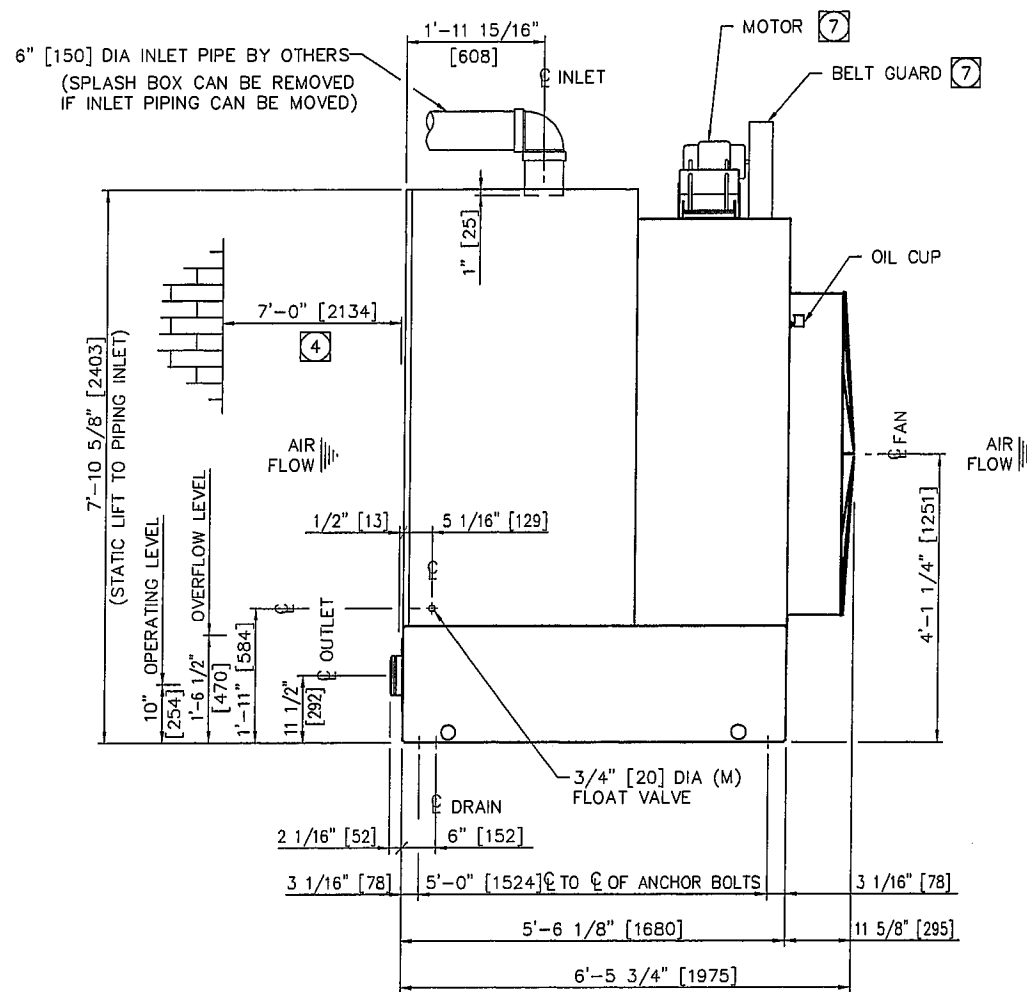
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ECO NUMBER 12247	SUGGESTED SUPPORTING STEEL		Marley	
REV. BY BCG	STEEL AQUATOWER			
REV. DATE 07/17/2009	DRAWN BY DA/SR	DATE 09/13/2001	CHECKED APPROVED MPC	ORDER NUMBER PLOT 1=8 01-4655 C

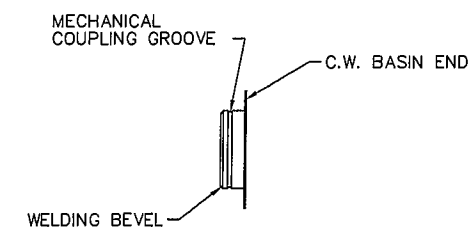
TOWER MODEL	FAN MOTOR HP [kW]	FAN DIAMETER
495K	5 [3.7]	54" [1372]
495M	7 1/2 [5.6]	



AIR INLET ELEVATION



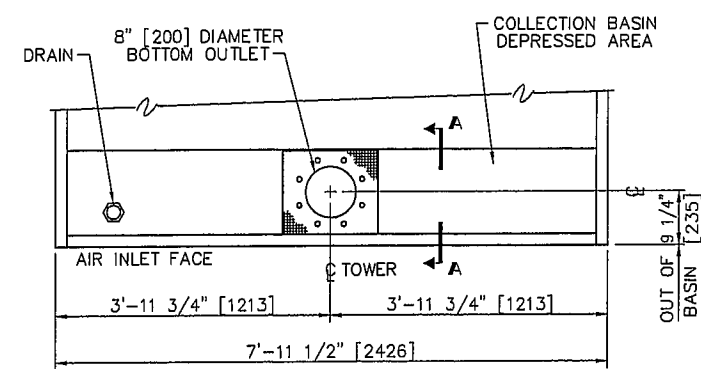
SIDE ELEVATION



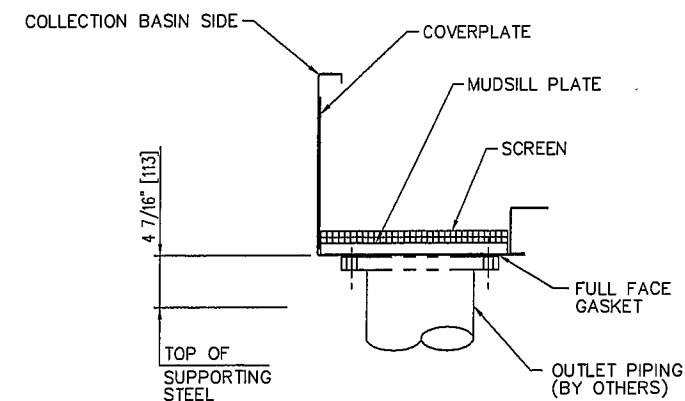
SECTION B-B

GENERAL NOTES

- THE COOLING TOWER MUST BE INSTALLED LEVEL TO INSURE MAXIMUM THERMAL PERFORMANCE AND TO AVOID RACKING.
- FLANGE DRILLING FOR BOTTOM OUTLET CONFORMS TO 125 LB. ANSI B16.1. BOLT HOLES WILL STRADDLE CENTERLINE OF OUTLET. THE OUTLET PIPING ATTACHMENT REQUIRES USE OF A FLAT FACED FLANGE (SUPPLIED BY OTHERS) AND A 1/4" [6 mm] THICK FULL FACED GASKET SUPPLIED BY MARLEY.
- STANDARD MOTORS ARE THREE PHASE.
- MINIMUM CLEARANCE FROM NEAREST OBSTRUCTION FOR ADEQUATE AIR SUPPLY. IF NO OBSTRUCTIONS EXIST AROUND THE TOWER, FOR BEST PERFORMANCE, TOWER SHOULD BE ORIENTED WITH ITS INLET FACING INTO PREVAILING SUMMER WINDS. IF THESE CONDITIONS CANNOT BE ACHIEVED, CONSULT A MARLEY COOLING TOWER COMPANY SALES ENGINEER.
- CONNECTIONS DESIGNATED AS (F) ARE NPT FEMALE THREADS, (M) ARE NPT MALE THREADS.
- SUPPORTS FOR INLET AND OUTLET PIPING BY OTHERS. DO NOT SUPPORT PIPING FROM TOWER STRUCTURE.
- THESE ITEMS ARE FIELD INSTALLED BY OTHERS.
- STANDARD TOWER SHIPS WITH CONNECTIONS FOR BOTH, SIDE AND BOTTOM OUTLET. SIDE OUTLET IS SUITABLE FOR PUMP SUCTION ONLY. SIMPLY FIELD INSTALL THE DESIRED CONNECTION AND SEAL THE UNUSED OPENING WITH THE COVERPLATE PROVIDED. THE MAXIMUM FLOW FOR THE SIDE SUCTION IS 900 GPM [205 m³/hr].
- MAXIMUM FLOW FOR BOTTOM OUTLET IS 550 GPM [125 m³/hr] FOR BOTH PUMP AND GRAVITY FLOW SYSTEMS. ON GRAVITY FLOW SYSTEMS, THE OUTLET PIPING MUST DROP VERTICALLY TO CREATE ENOUGH HEAD TO OVERCOME ALL OTHER HEAD LOSSES IN THE PIPING SYSTEM.
- TOWER MAINTENANCE OR INSPECTION DOES NOT REQUIRE ANYONE TO BE ON TOP OF THE TOWER. A PORTABLE LADDER MAY BE REQUIRED TO INSPECT THE HOT WATER BASIN AND THE MOTOR. ADEQUATE SAFETY PRECAUTIONS MUST BE TAKEN WHEN USING A PORTABLE LADDER.
- THIS PRODUCT HAS BEEN DESIGNED WITH PROVISIONS FOR MAINTENANCE IN MIND. PLEASE CONSULT DRAWINGS AND OWNERS MANUALS SHIPPED WITH PRODUCT FOR DETAILS OF MAINTENANCE, OPERATION AND ASSEMBLY REQUIRED BY USER. USER IS TO PROVIDE FOR SAFE ACCESS TO TOWER AND ITS COMPONENTS.
- ALL DIMENSIONS SHOWN ARE IN IMPERIAL UNITS (I-P) AND THOSE SHOWN INSIDE BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.



OPTIONAL BOTTOM OUTLET PLAN VIEW OF BASIN

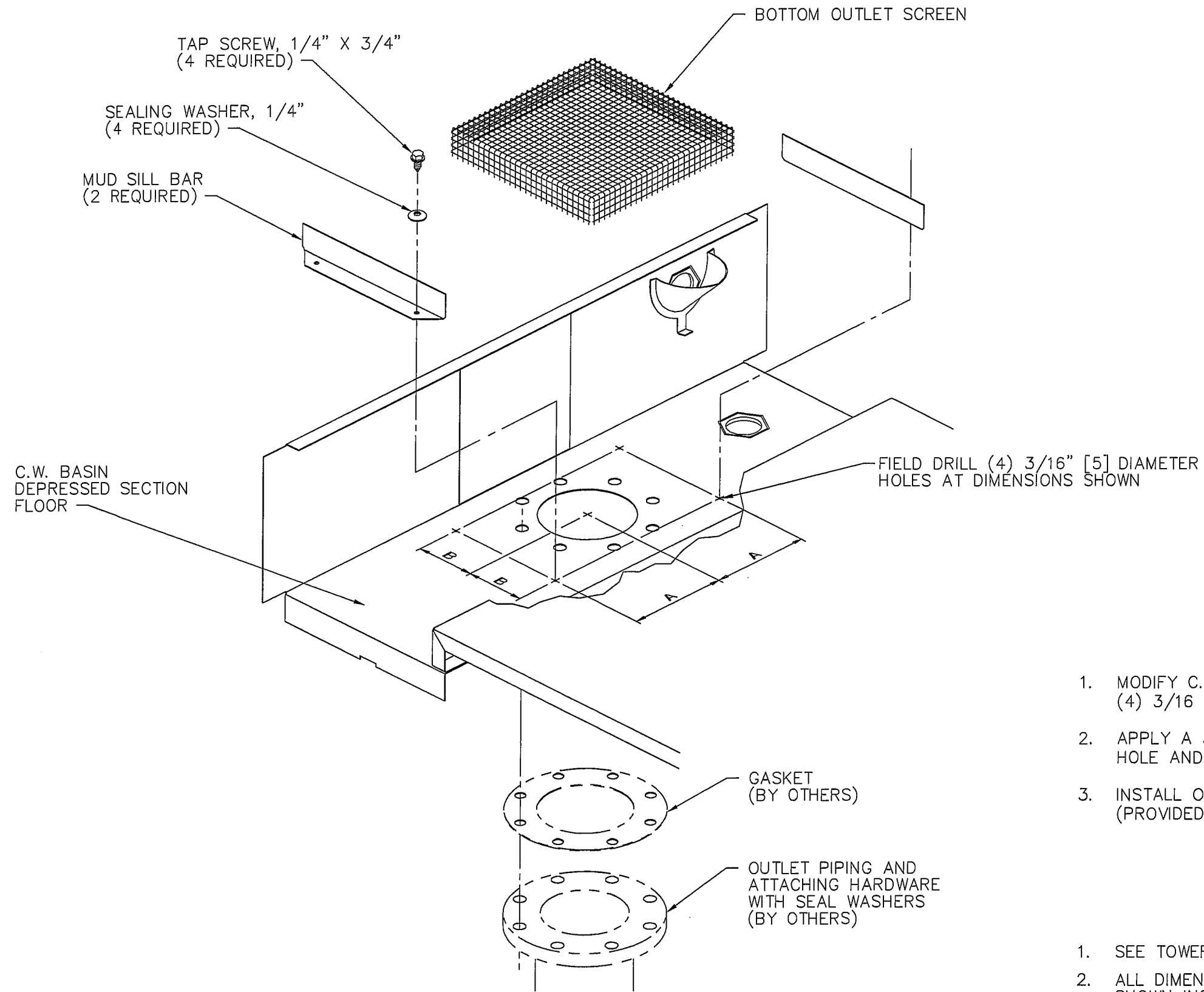


SECTION A-A

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ECO NUMBER 12247	SCHEMATIC, INLET & OUTLET PIPING		STEEL 495 AQUATOWER		
REV. BY BCG	CHECKED	DATE	APPROVED	ORDER NUMBER	
REV. DATE 07/17/2009	DRAWN BY DA/SR	DATE 09/13/2001	CHECKED MPC	APPROVED	PLOT 1=16 DRAWING NUMBER 01-4650 REV. A

TOWER MODEL	DIMENSIONS	
	A	B
492 THRU 493	7 3/4" [197]	4 3/4" [121]
494 THRU 496	9 1/4" [235]	6" [152]



BOTTOM OUTLET SCREEN INSTALLATION

INSTALLATION INSTRUCTIONS

1. MODIFY C.W. BASIN DEPRESSED SECTION FLOOR BY FIELD DRILLING (4) 3/16 [5 mm] DIAMETER HOLES AT DIMENSIONS SHOWN IN TABLE.
2. APPLY A 3/8" [10 mm] DIAMETER BEAD OF SEALER AROUND EACH HOLE AND INSTALL MUD SILL BARS USING HARDWARE AS INDICATED.
3. INSTALL OUTLET PIPING, GASKET, AND ATTACHING HARDWARE (PROVIDED BY CUSTOMER).

GENERAL NOTES

1. SEE TOWER SCHEMATIC DRAWING FOR BOTTOM OUTLET DETAILS.
2. ALL DIMENSIONS SHOWN ARE IN IMPERIAL UNITS (I-P) AND THOSE SHOWN INSIDE BRACKETS [] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

ECC NUMBER 12247		OPTIONAL BOTTOM OUTLET SCREEN STEEL AQUATOWER							
REV. BY BCG	CHECKED	DRAWN BY DA/SR	DATE 09/13/2001	CHECKED MPC	APPROVED	ORDER NUMBER	PLOT 1=6	DRAWING NUMBER 01-336	REV. A