

Submittal to:

Project:  
Princeton University

Engineer:

Opportunity / Quote No. (Ver): David Wysmuller\_100809\_131008972 / David Wysmuller\_101105\_073457378 (1)  
Rep Quote No.: MT10310

December 13, 2010

**Marley NC8400 Tower-3 cell**

TOWER MODEL	PERFORMANCE CONDITIONS	MOTOR DATA	TOWER DIMENSIONS	WEIGHTS
Quantity of (1) Marley NC Class Diamond Series model <b>NC8409TAS</b> factory assembled 3-Cell crossflow cooling tower	Per 3-cell tower: 5,400 gpm 97.7 °F Hot Water 85.0 °F Cold Water 78.0 °F Entering WB	NEMA 40 HP 1 speed / 1 wind 3 phase / 60 Hz / <b>230/460v</b> 1.15sf / TEFC 1800 RPM Premium Efficiency Inverter duty nameplated , 120 volt space heater	Each cell: (without options) Length 13' - 10 3/4" Width 22' - 5" Height 16' - 5 3/4"  Per 3-cell tower: (with options) Length 47' - 5 1/4" Width 22' - 5" Height 16' - 5 3/4"	Per cell: Shipping: 18,845 lb Operating: 37,737 lb  Per 3-cell tower: Shipping: 56,536 lb Operating: 113,212 lb

Quantities shown below are per tower.

**Base Tower Construction/Equipment:**

- Stainless Steel casing.
- Stainless Steel structure.
- Stainless Steel collection basin.
- Stainless Steel distribution basin.
- All stainless steel is series 300.
- Tower Structure Level 2 selected to meet customer specified design requirements for windload of 60.0 psf.
- Anchorage design selected to meet customer specified design requirements for wind load of 60.0 psf.
- Low Sound fan with aluminum blades.
- Marley designed Geareducer® with 5-year warranty.
- 20 mil PVC film fill with integral louvers and drift eliminators designed and manufactured by Marley.
- Drift rate guaranteed to be no greater than .005% of the design flow rate.
- CTI certification per STD-201.
- Factory Mutual Approval, including fill pack partition.
- Steel fan stack.

**Collection Basin Connections and Accessories:**

- All flanges are to Class 125 ANSI B16.1 standard.
- All threads are to American Standard Pipe Taper Thread.
- (3) 14 in (356 mm) diameter bottom outlet(s) with trash screen(s) and anti-vortex plate(s).
- 4 in (102 mm) diameter combination drain and overflow in each cell
- 4 in (102 mm) additional drain with plug in each cell

**Distribution Basin Inlet and Accessories:**

- (1) self-balancing 10 in (254 mm) diameter PVC bottom inlet connection per cell.
- All internal piping is PVC. External piping is PVC.
- Variable flow nozzles.

**Maintenance & Maintenance Access Features:**

- Tower is designed in accordance with OSHA safety standards.
- This quotation includes features that will allow safe access on the fan deck while the fan is still operating.
- External lube line with dipstick
- Low oil level switch
- S300 full face air inlet screens
- Convenient access to the collection basin and plenum area is provided via a large access door located on each endwall
- Stainless Steel plenum walkway in each cell
- Internal mechanical equipment access platform in each cell
- Fan deck extension
- Easy fitting perimeter guardrail, kneerail & toeboard
- (1) Cased face ladder
- Ladder(s) extended 48 in below base of tower

Easy fitting ladder safety cage(s)

**Control Systems:**

Marley M-5 121-110 DPDT Elec & Manual Reset vibration cutoff switch

DV/DT Output filter, 40HP, 480V/3ph/60Hz

(1) field installed control panel per cell

ABB VFD ACH550 NEMA 3R

Marley Terminal Box, U, Size TF1, NEMA 4X Fiberglass enclosure, field wired and installed, to give single location for connection of all tower wiring

VFD startup expenses included (no vibration test).

**NOT INCLUDED** is field skip frequency testing with vibration monitoring equipment to determine existence of objectionable frequencies over operational range when tower is connected to VFD drive

**Tower Specials:**

10 year Parts warranty

10 year Labor warranty

Price add for one Davit and Hand Winch for all 3 cells, and three Davit Pedestal & Tower Mods, one per cell.

**Field Installed Equipment:**

The field installed portion of the equipment will require approximately 94.7 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.

Please advise if the drawing type you need has not been supplied. These are the available drawing types:

- PDF 2D documents - These documents display the tower geometry with dimensions, notes and annotations.
- DWG 2D AutoCAD layouts – This 2D layout is a full scale electronic representation of the tower to insert into your own AutoCad layout. The .dwg contains no text so should be accompanied by the PDF files.

- JT 3D solid model files - These lightweight 3D solids may be used by solid model programs such as NX (Unigraphics), I-DEAS, Solid Edge, Catia, Pro/Engineer, and Autodesk Inventor 2009, among others. JT is relatively new technology and will be adopted by more programs in the coming months. A free JT viewer can be found at [www.jt2go.com](http://www.jt2go.com). JT is not compatible with Revit.
- Revit – Configuration specific Revit files are not yet available. However, a lightweight Revit part family showing the standard tower may be downloaded from our website. Go to <http://spxcooling.com/en/about/detail/revit-files/>

**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	SFA	1		Tower specific drawings
E	SFA	1		Generic detail drawings for informational purposed
E	SFA	1		VFD Submittal Information
E	SFA	1		Vibration Switch Information
E	SFA	1		Terminal Box information

**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.  
**RFA** = Corrected Document. Re-submitted for Approval and Release  
**OTH** = Other

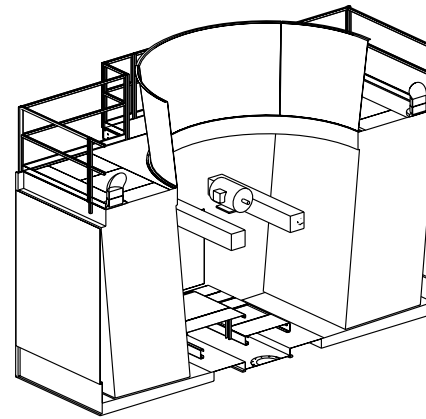
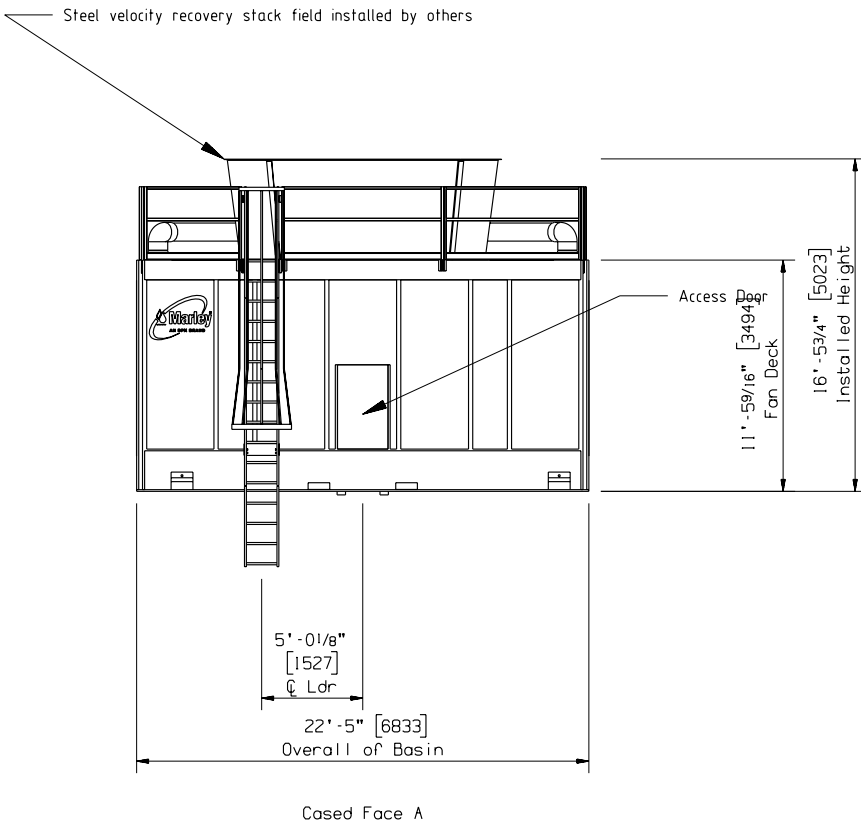
**Shipment Lead-Time After Drawing Approval:** 40 business days

**November 5, 2010**

For: SPX Cooling Technologies

By: Dyna-Tech Sales Corporation

**David Wysmuller**



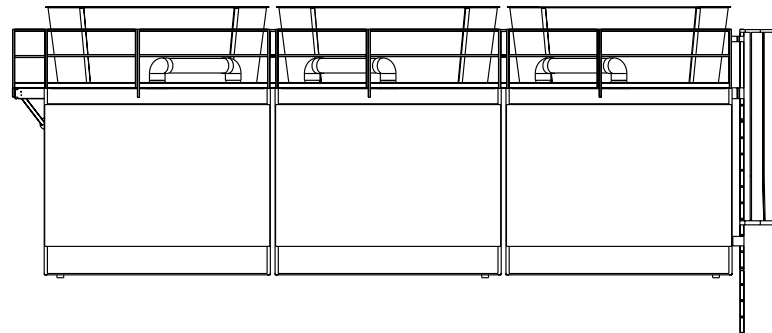
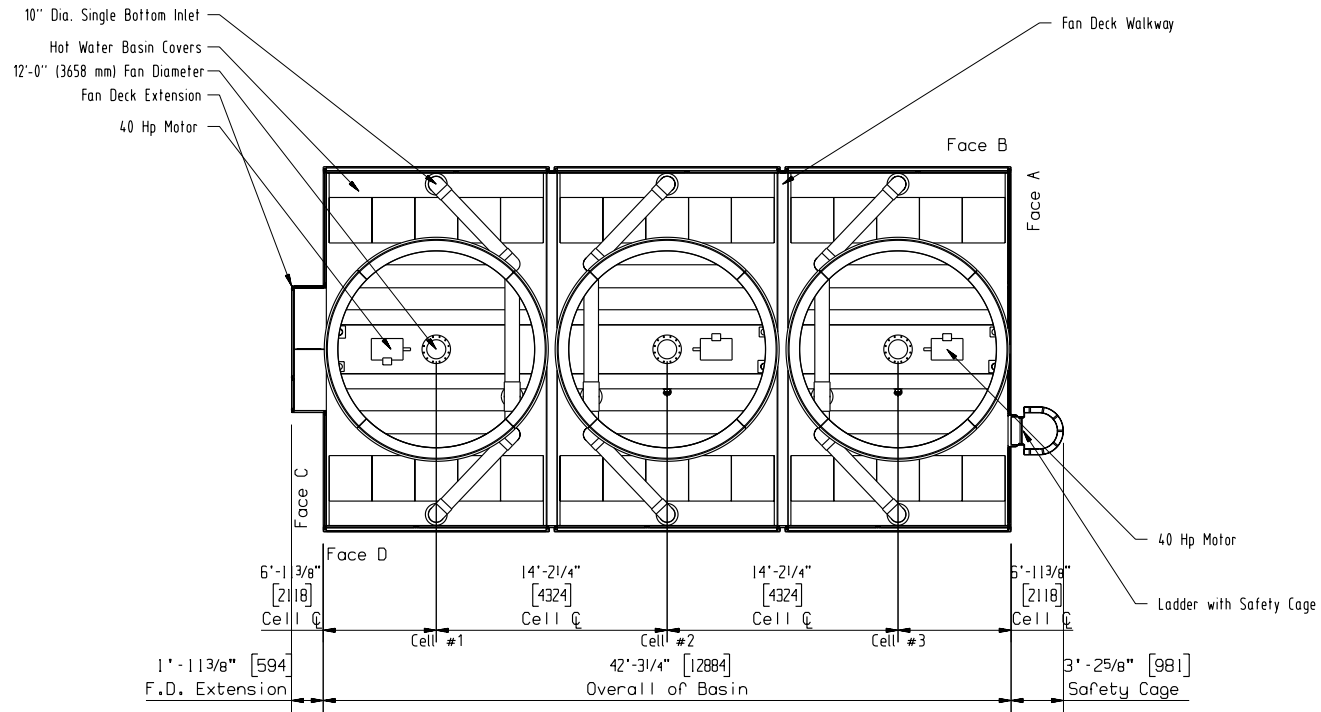
Interior View

NOTES

1. The fan motor must be locked out and inoperable before entering the tower. This warning has been placed on the access door.
2. Flanged connections conform to class 125 of the ANSI B16.1 specification. The bolt holes straddle the centerlines.
3. The internal inlet piping, including flat face flange gaskets, which starts at the face of the inlet connection is provided by SPX CT. The piping external to the tower and its supports are provided by others. The external piping may not be supported from the tower.
4. The external inlet piping at the top of the tower is provided by SPX CT and installed in the field by others. This piping can be an obstacle to personnel on top of the tower. The installation detail drawings are included in the Literature Package shipped with the tower.
5. Multi-cell towers should include provisions to balance flow between cells.
6. The internal vertical riser will apply an additional vertical operating load of 700 lb (318 kg) at the bottom inlet flange attachment to the external piping which is supported by others.
7. To insure maximum thermal performance the cooling tower must be installed level and plumb. Both of the air inlet faces must have adequate air supply. If obstructions exist, consult your SPX CT representative.
8. Contact your SPX CT sales engineer for the required pump head for this inlet arrangement.
9. Hoisting clips are provided for ease of unloading and positioning. For overhead lifts or where additional safety precautions are prudent, add slings beneath the tower. Adequate space has been provided for removal of the shackles and the 5 1/4" (133 mm) long pins from the hoist clips between the cells of a multi-cell tower. If the pin used is longer than 5 1/4" (133 mm), the cell may be slid into it's final position by using come-alongs at the base of the unit, after removal of shackle pins. See Hoisting Details drawing.
10. Construction of the ladder and guardrail: The guardrail is fabricated from galvanized structural tubing. Top rail, middle rail and posts are 1 1/2" (38 mm) square tube 1/8" (3 mm) thick. Toeboards are 12 gauge heavy mill galvanized steel. The ladder is aluminum 3" (76 mm) x 1 1/8" (29 mm) I-beam side rails and 1 1/4" (32 mm) serrated rungs.
11. The ladder and guardrail are field installed by others. The tower is shop modified to accept this option. The clips and hardware are provided by SPX CT for the field installation. The installation detail drawings are included in the literature package shipped with the tower.
12. O.S.H.A. standards recommend the use of a Safety Cage when the length of a single ladder exceeds 20'-0" (6096 mm).
13. The Fan Deck Extension is field assembled by others. The tower is shop modified and all attaching clips and fasteners are provided by SPX CT. Assembly details are included in the Literature Package shipped with the tower.
14. The Plenum Walkway consists of 11 gauge heavy mill galvanized steel supports and hot dip galvanized bar grating utilizing 1" (25 mm) x 5/16" (8 mm) bearing bars. The elevation of the Plenum Walkway is above the overflow water level of the collection basin. The distance from the top of the Plenum Walkway to the fan is 8'-1 5/16" (2472 mm).
15. The Interior Mechanical Equipment Platform consists of the Plenum Walkway plus an elevated platform for access to the mechanical equipment.
16. The distance from the elevated platform to the fan exceeds 6'-10 13/16" (2104 mm).
17. Platform supports are 11 gauge heavy mill galvanized steel. Walkways are hot dip galvanized bar grating utilizing 1" (25 mm) x 5/16" (8 mm) bearing bars.
18. O.S.H.A. standards recommend the use of an Access Door Platform if the door is 4'-0" (1219 mm) or higher above grade.
19. Single inlet options (side or bottom inlet) - This piping can be an obstacle to personnel on top of the tower.
20. The tower assembly tolerance applicable to all dimensions is + or - 1/8" (3 mm). Consult suppliers of supporting structure for construction tolerances.
21. The units of measure are in IP (SI) units unless otherwise noted.

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ECO NUMBER		NC8409TAS3SGF - Schematic Cased Elevation and Notes							
REV. BY	CHECKED	Princeton University-11-5 United States							
REV. DATE	DRAWN BY	DATE	CHECKED	APPROVED	ORDER NUMBER	PLOT	DRAWING NUMBER	REV.	
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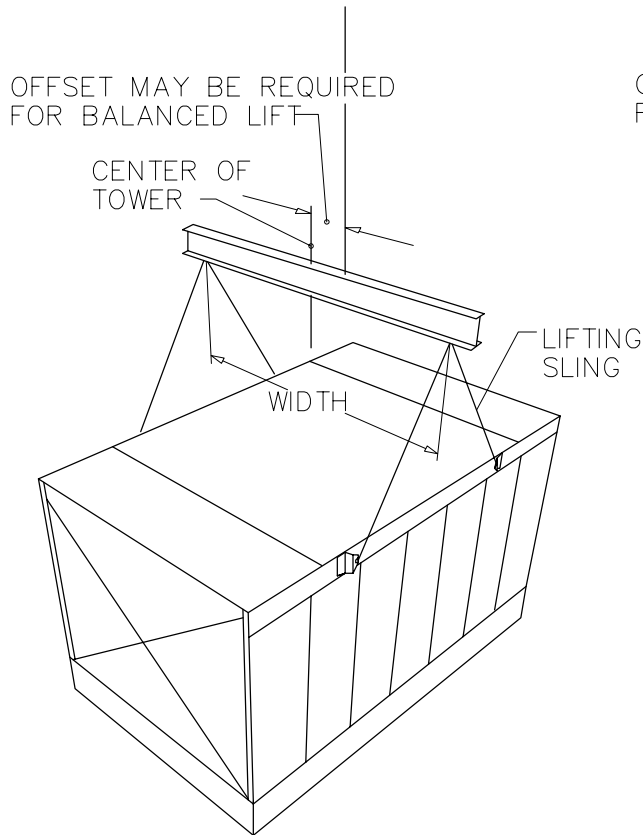


NOTES

1. The tower assembly tolerance applicable to all dimensions is + or - 1/8" (3 mm). Consult suppliers of supporting structure for construction tolerances.
2. The units of measure are in IP (SI) units unless otherwise noted.
3. See Schematic Cased Elevation and Notes drawing for additional notes.

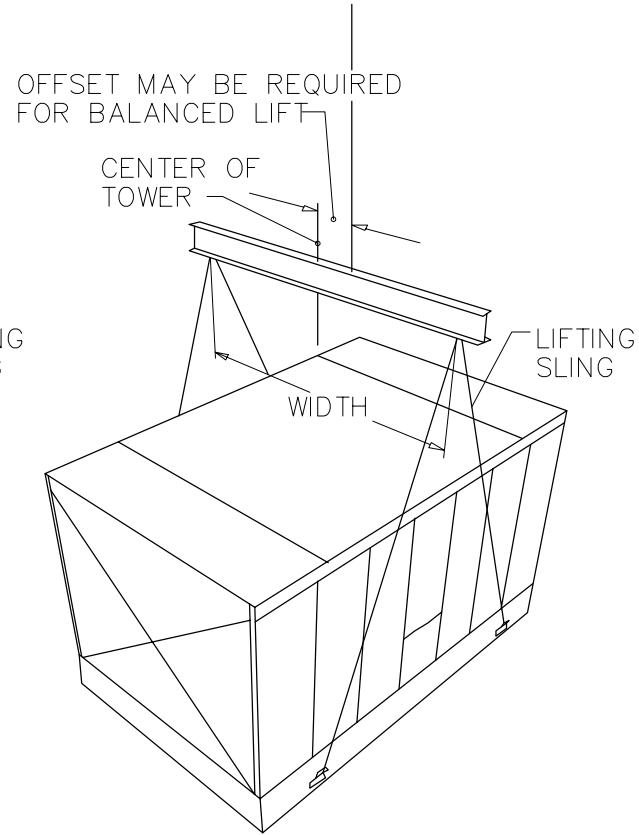
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	David Wismuller_101105_073457378 V1	12/13/10	QTC	SYS	0	1=1	5 DW399976S		



TOWER UNITS WITH  
HOISTING CLIPS AT THE TOP

8401 THRU 8407  
TOP MODULE OF 8411, 8412, 8413 & 8414



TOWER UNITS WITH  
HOISTING CLIPS AT THE BOTTOM

8409  
BOTTOM MODULE OF 8411, 8412, 8413 & 8414

TOWER MODEL	TOWER WIDTH	MINIMUM SLING LENGTH
8401	6'-7" [2007]	5'-6" [1676]
8402	8'-6" [2591]	6'-0" [1829]
8403	8'-6" [2591]	8'-0" [2438]
8405	10'-0" [3048]	8'-0" [2438]
8407	12'-0" [3658]	8'-6" [2591]
8409	14'-0" [4267]	17'-6" [5334]
8411 TOP	12'-0" [3658]	9'-0" [2743]
8411 BOTTOM	12'-0" [3658]	16'-6" [5029]
8412 TOP	14'-0" [4267]	9'-0" [2743]
8412 BOTTOM	14'-0" [4267]	16'-6" [5029]
8413 TOP	12'-0" [3658]	9'-0" [2743]
8413 BOTTOM	12'-0" [3658]	16'-6" [5029]
8414 TOP	14'-0" [4267]	9'-0" [2743]
8414 BOTTOM	14'-0" [4267]	16'-6" [5029]

NOTES:

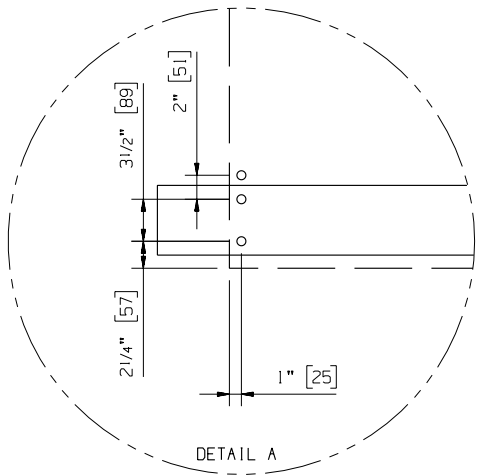
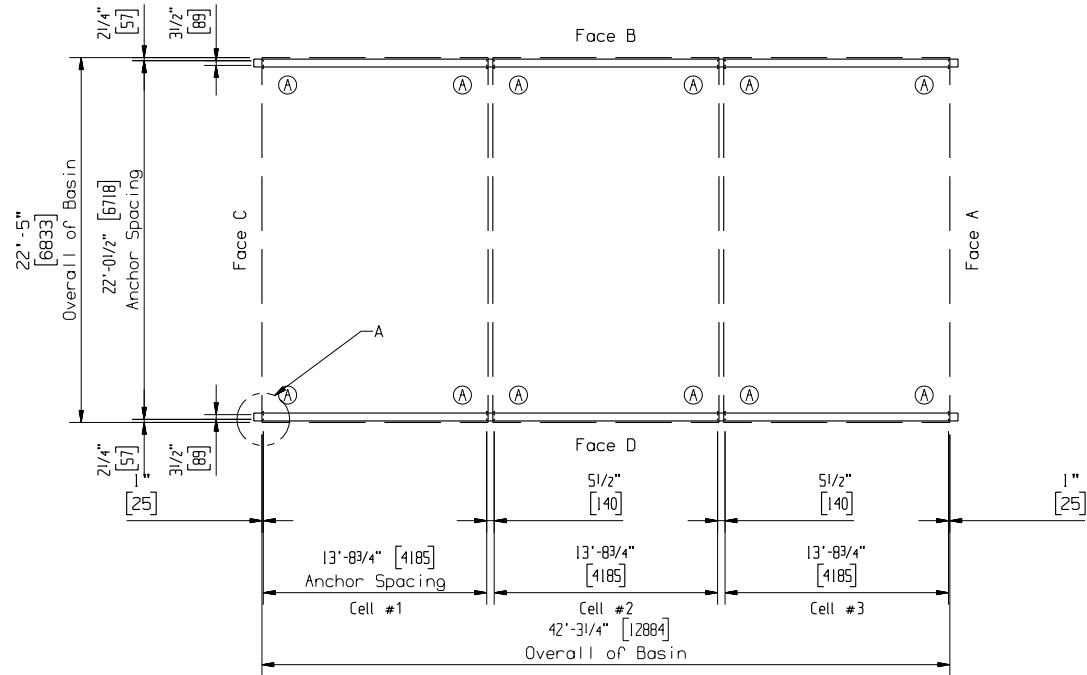
1. ALL HOISTING CLIP HOLES ARE 1 1/4" [32].
2. OVERALL LENGTH OF SHACKLE PIN SHOULD NOT EXCEED 5 1/4" [133].
3. FOR OVERHEAD LIFTS OR WHERE ADDITIONAL SAFETY IS REQUIRED, ADD SLINGS BENEATH THE TOWER UNIT.
4. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [SI] Units

ECO NUMBER		HOISTING DETAILS				SPX. COOLING TECHNOLOGIES			
REV. BY	CHECKED	8401 THRU 8414 TOWERS				ORDER NUMBER	PLOT	DRAWING NUMBER	REV.
REV. DATE	DRAWN BY	DATE	CHECKED	APPROVED					
	B. GOODING	01/23/2009		MN		1=1	09-136		

Shipping Weight		Design Operating Loads			Wind Load		Seismic Load	
per Tower	per Cell	per Tower	per Cell	at A	Vert. Reaction at A	Horiz. Reaction at A	Vert. Reaction at A	Horiz. Reaction at A
56527 lb (25640 kg)	18842 lb (8547 kg)	113203 lb (51348 kg)	37734 lb (17116 kg)	10376 lb (4706 kg)	68.85 x P lb (6.4 x P kgf)	71.71 x P lb (6.66 x P kgf)	5280 x G lb (2395 x G kgf)	6760 x G lb (3066 x G kgf)

(8) 3/4" ASTM A307 or M20 Grade 4.6 anchor bolts are required per cell. These anchor bolts are capable of resisting 126 psf (6033 Nm<sup>2</sup>) wind load or a factored 1.44 G seismic load applied to the tower. This tower structure is capable of resisting 70 psf (3352 Nm<sup>2</sup>) wind load or a factored 0.4 G seismic load. Determination of the site specific design wind and seismic loads are by others.



The first anchor bolt hole is the closest to the end of the cold water basin flange. The second anchor bolt should use the hole that matches the gauge of the beam.

**NOTES**

- SUPPORTING STEEL:** The supporting steel is to be designed, constructed and furnished by the customer. It shall include customer supplied anchor bolts to suit the general dimensions of this drawing and of the Outlet Piping Plan 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 in order to assure that the cooling tower is level and plumb.
- 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 the maximum allowable flow rates. The design loads are shown for your use as a quick reference. The actual operating load is variable, and 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 the values stated. Consult a SPX CT representative for greater detail on this or any other subject.
- WIND & SEISMIC LOADS:** Reactions shown are the result of the wind/seismic load being applied perpendicular to the face of the tower structure. Loads are additive to the operating loads. Wind reactions can be calculated by multiplying by P, which is the wind pressure in psf for Imperial units and kgf/m<sup>2</sup> for metric units. Seismic reactions can be calculated by design G.
- SHIPPING WEIGHTS AND MAXIMUM OPERATING LOADS:** Values shown in table include the optional equipment weights.
- PIER SUPPORTS:** The tower may be supported from piers at each anchor bolt location as an alternate. A pier should be at least 6" (152 mm) x 6" (152 mm).
- The tower assembly tolerance applicable to all dimensions is + or - 1/8" (3 mm). Consult suppliers of supporting structure for construction tolerances.
- The units of measure are in IP (SI) units unless otherwise noted.

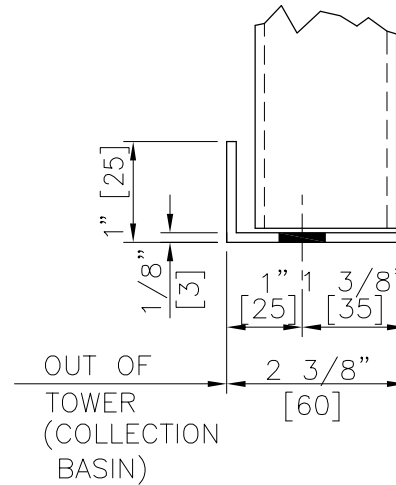
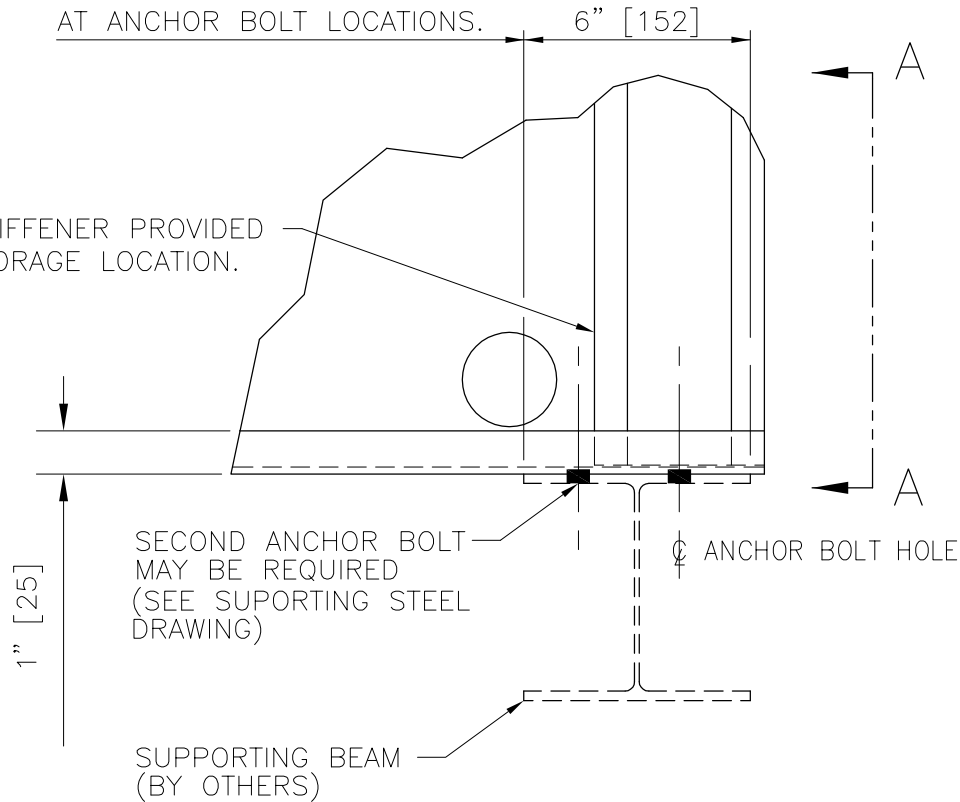
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REV. BY		Princeton University-11-5							
CHECKED		United States							
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	David Wismuller.101105.073457378 V1	12/13/10	QTC	SYS	0	1=1	DW399976G		

MINIMUM BEARING WIDTH  
MAY BE PROVIDED BY BEAM  
FLANGE OR BEARING PLATE  
AT ANCHOR BOLT LOCATIONS.

BASIN STIFFENER PROVIDED  
AT ANCHORAGE LOCATION.

SECOND ANCHOR BOLT  
MAY BE REQUIRED  
(SEE SUPPORTING STEEL  
DRAWING)

SUPPORTING BEAM  
(BY OTHERS)



SECTION A-A

(LOUVER FACE B OR D)

GENERAL NOTES

1. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS  $\pm 1/16"$  [2] & ASSEMBLY TOLERANCE IS  $\pm 1/8"$  [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN INCHES UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

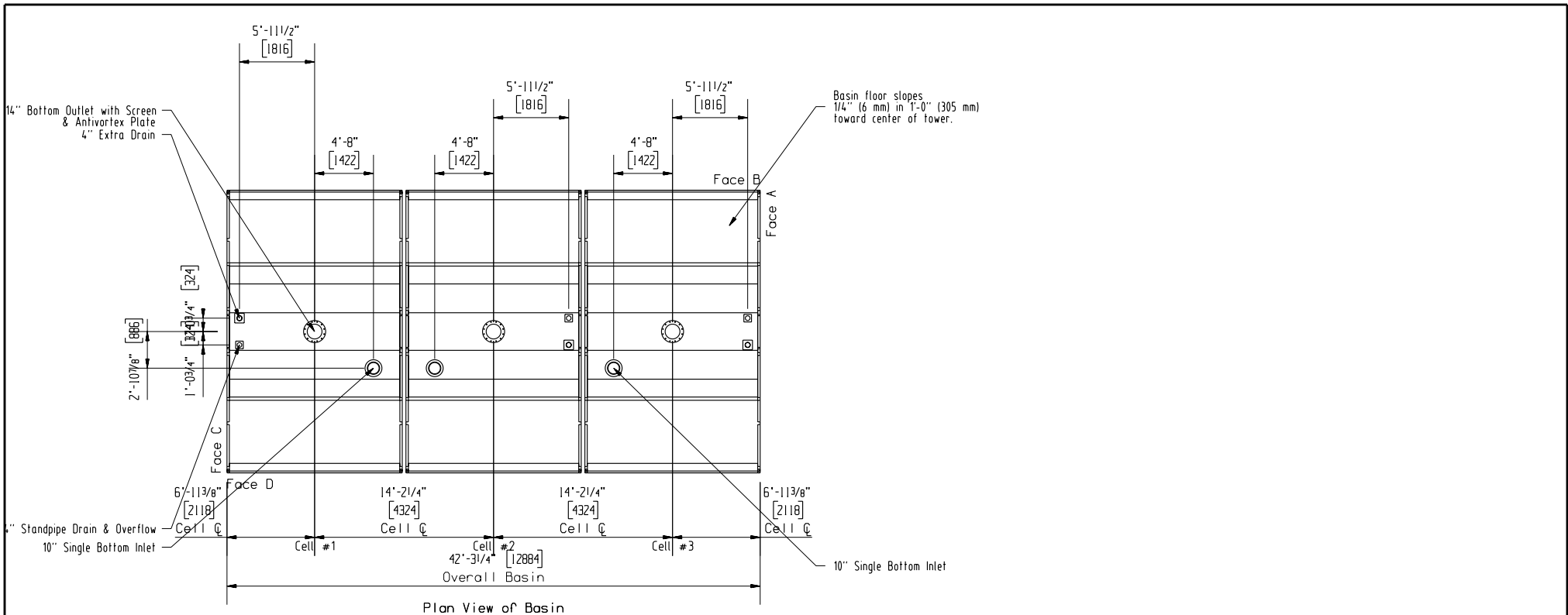
SUPPORT BEARING DETAILS

(PARTIAL CASED FACE A OR C ELEVATION)

I-P [SI] UNITS

ECO NUMBER QTC-CHK		SUPPORT BEARING DETAILS				<b>SPX.</b> <b>COOLING TECHNOLOGIES</b>			
REV. BY BCG		CHECKED MN		8401 THRU 8414 TOWERS					
REV. DATE 02/04/09	DRAWN BY B. GOODING	DATE 01/16/2009	CHECKED	APPROVED MN	ORDER NUMBER	PLOT 1=1	DRAWING NUMBER 09-14	REV. A	






Plan View of Basin

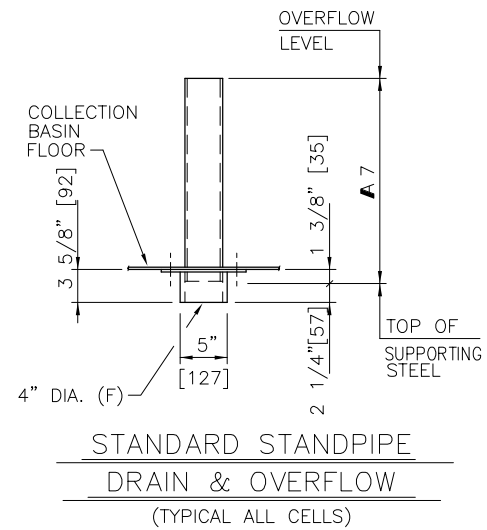
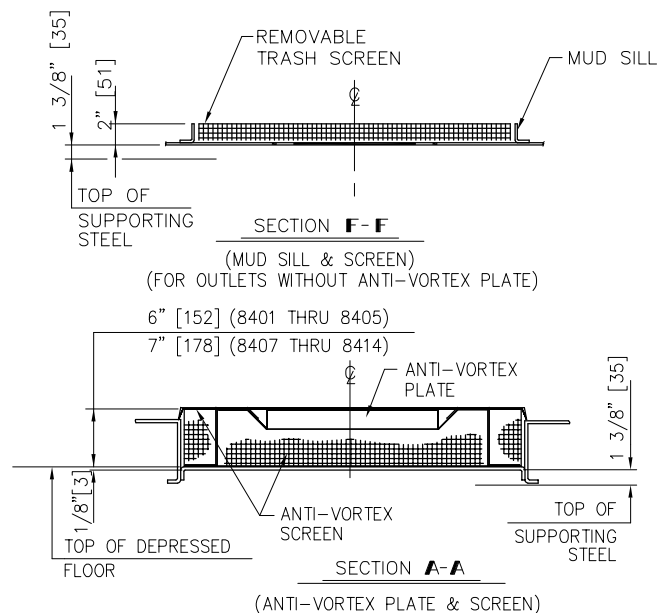
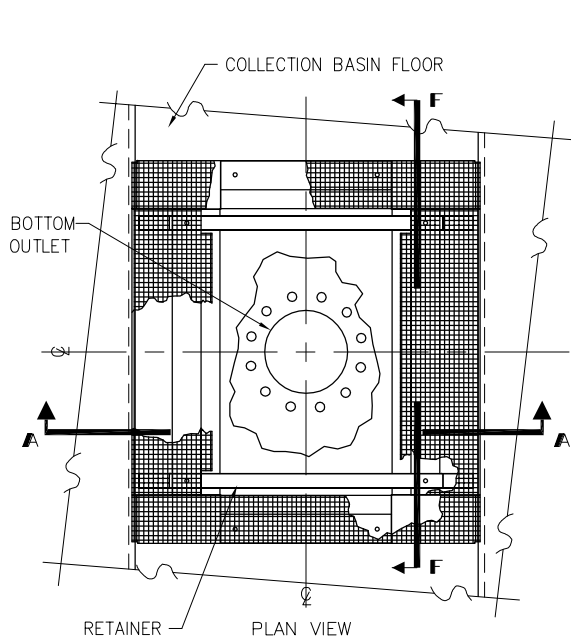
NOTES

1. All piping supports are by others. Do NOT support outlet piping from the tower.
2. The collection basin piping accessories shown on this drawing are furnished by SPX CT. This includes a full faced gasket. Flat faced flange, fasteners and seal washers attachment to the outlet are supplied by others. The use of a flange other than a flat faced flange will damage the collection basin floor.
3. The standpipe overflow is to be field installed by others.
4. The design operating loads shown in the table on the Grillage Details drawing are based upon the volume of water in the collection basin at shutdown. The shutdown water level has been sized to accommodate the maximum allowable flow rates. 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 can result in loads exceeding values stated. Consult a SPX CT representative for greater detail on this or any other subject.
5. Basin flumes are shipped inside the tower and are to be field installed by others. The connecting collars are shop installed.
6. The tower assembly tolerance applicable to all dimensions is + or - 1/8" (3 mm). Consult suppliers of supporting structure for construction tolerances.
7. The units of measure are in IP (SI) units unless otherwise noted.

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ECO NUMBER		NC8409TAS3SGF - Piping Plan							
REV. BY	CHECKED	Princeton University-11-5 United States							
REV. DATE	DRAWN BY	DATE	CHECKED	APPROVED	ORDER NUMBER	PLOT	DRAWING NUMBER	REV.	
	David Wismuller_101105_073457378 V1	12/13/10	QTC	SYS	0	1=1	DW399976P	9	

TOWER MODEL	DIMENSIONS	
	A7	
8401	1'-4 1/2"	[419]
8402	1'-4 1/2"	[419]
8403	1'-6 1/2"	[470]
8405	1'-6 1/2"	[470]
8407	1'-6 1/2"	[470]
8409	1'-6 1/2"	[470]
8411	1'-10 1/2"	[572]
8412	1'-10 1/2"	[572]
8413	2'-0 1/2"	[622]
8414	2'-0 1/2"	[622]



GENERAL NOTES

1. ALL ACCESSORIES SHOWN ARE PROVIDED WITH THE COOLING TOWER.
2. ALL PIPING SUPPORTS ARE BY OTHERS. DO NOT SUPPORT PIPING FROM TOWER.
3. FLANGE DRILLING SHOWN CONFORMS TO CLASS 125 ANSI B16.1. BOLT HOLES WILL STRADDLE CENTERLINE OF AN OUTLET. THE OUTLET PIPING ATTACHMENT REQUIRES USE OF A FLAT FACED FLANGE, FASTENERS AND SEAL WASHERS(SUPPLIED BY OTHERS) AND A FULL FACED GASKET (PROVIDED WITH THE COOLING TOWER).
4. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS  $\pm 1/16"$  [2] AND ASSEMBLY TOLERANCE IS  $\pm 1/8"$  [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
5. ALL DIMENSIONS SHOWN INSIDE OF BRACKET[ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

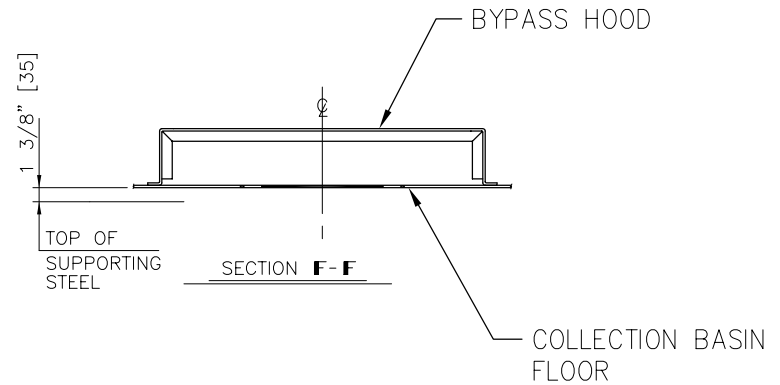
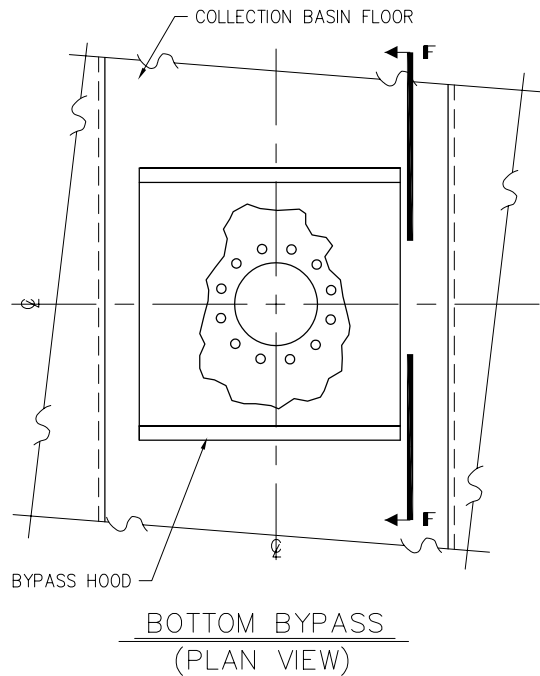
- BOTTOM OUTLET WITH ANTI-VORTEX PLATE AND SCREEN
- BOTTOM OUTLET WITH MUD SILL AND SCREEN
- BOTTOM OUTLET WITHOUT SCREEN
- BOTTOM OUTLET EQUALIZER

NOTE: ANTI-VORTEX PLATE AND SCREEN ARE NOT PROVIDED FOR BOTTOM OUTLET EQUALIZER.

SEE "OUTLET PIPING PLAN" DRAWING FOR OUTLET DIAMETER

I-P [SI] UNITS

ECO NUMBER QTC-CHK		STANDARD BOTTOM OUTLET PIPING DETAILS				<b>SPX</b> COOLING TECHNOLOGIES			
REV. BY BCG	CHECKED MN	8401 THRU 8414 TOWERS							
REV. DATE 02/02/09	DRAWN BY B. GOODING	DATE 01/16/09	CHECKED	APPROVED MN	ORDER NUMBER	PLOT 1=1	DRAWING NUMBER 09-113	REV. A	



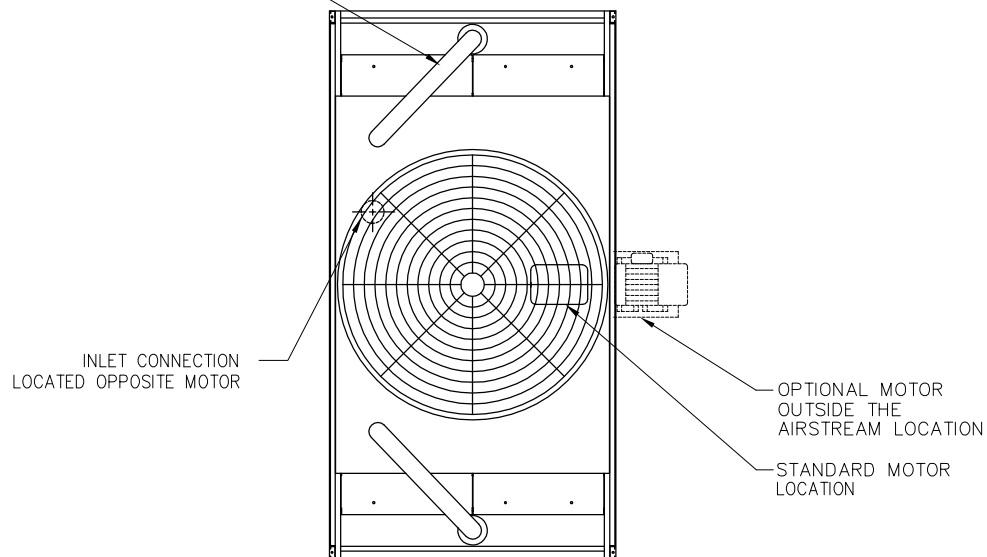
GENERAL NOTES

1. ALL ACCESSORIES SHOWN ARE PROVIDED WITH THE COOLING TOWER.
2. ALL PIPING SUPPORTS ARE BY OTHERS. DO NOT SUPPORT PIPING FROM TOWER.
3. FLANGE DRILLING SHOWN CONFORMS TO CLASS 125 ANSI B16.1. BOLT HOLES WILL STRADDLE CENTERLINE OF THE BOTTOM BYPASS. THE OUTLET PIPING ATTACHMENT REQUIRES USE OF A FLAT FACED FLANGE, FASTENERS AND SEAL WASHERS(SUPPLIED BY OTHERS) AND A FULL FACED GASKET (PROVIDED WITH THE COOLING TOWER).
4. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS  $\pm 1/16"$  [2] AND ASSEMBLY TOLERANCE IS  $\pm 1/8"$  [3]. CONSULET SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
5. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS[ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [SI] UNITS

ECO NUMBER		BOTTOM BYPASS DETAILS							
REV. BY	CHECKED								
REV. DATE	DRAWN BY	DATE	CHECKED	APPROVED	ORDER NUMBER	PLOT	DRAWING NUMBER	REV.	
	B. GOODING	01/16/09		MN		1=1	09-129		

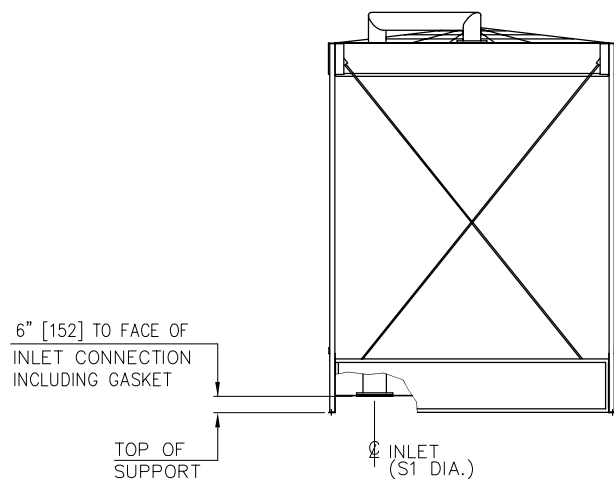
EXTERNAL INLET PIPING PROVIDED WITH THE COOLING TOWER AND FIELD INSTALLED BY OTHERS



PLAN

TOWER MODEL	DIMENSIONS
	S1
8401	N/A
8402	8"
8403	8"
8405	10"
8407	10"
8409	10"
8411	12"
8412	12"
8413	12"
8414	12"

SEE "OUTLET PIPING PLAN" DRAWING FOR DIMENSIONAL LOCATION OF INTERNAL INLET PIPING.



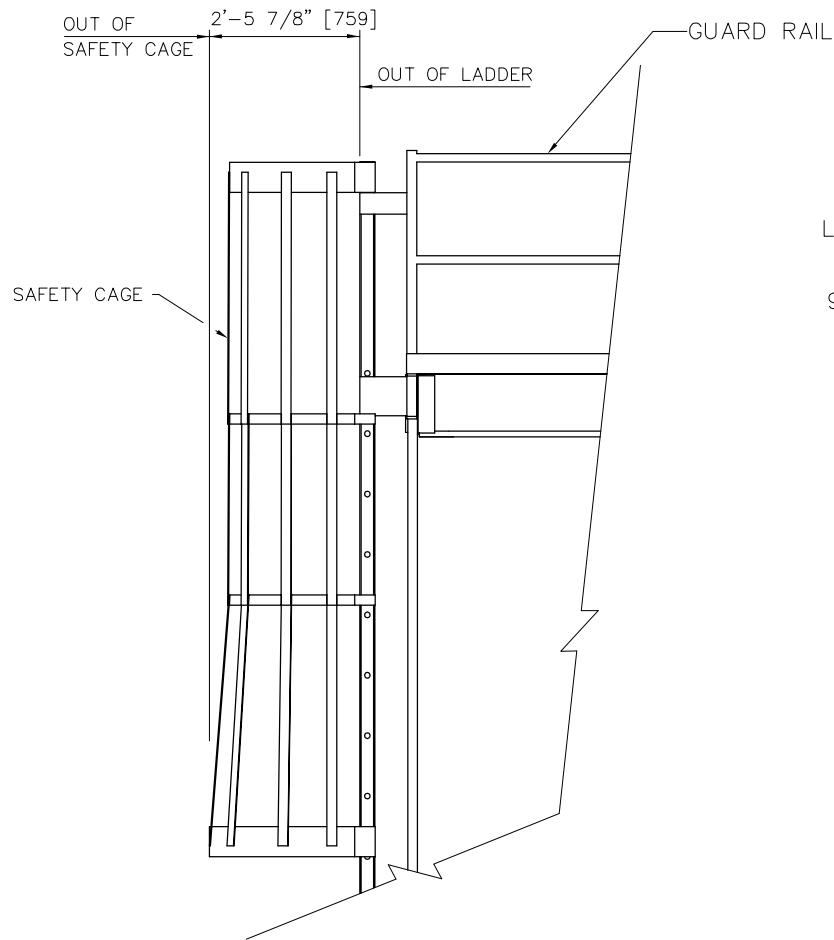
AIR INLET ELEVATION

NOTES

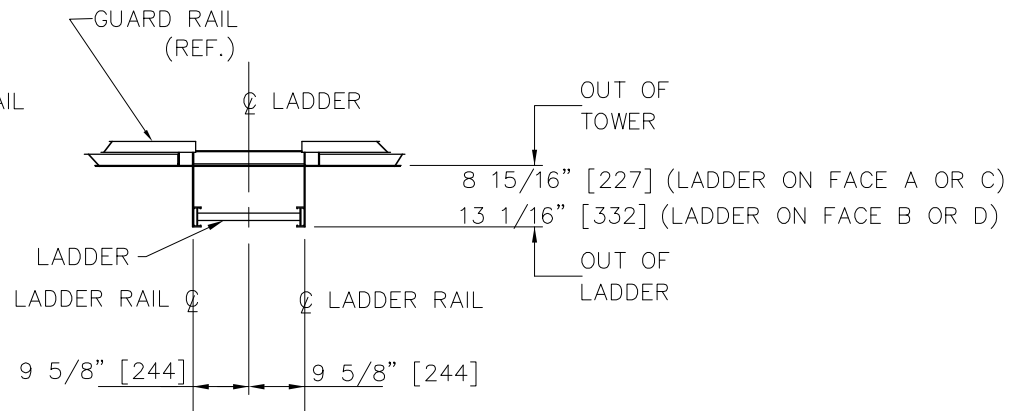
1. ALL INTERNAL INLET PIPING TO THE FACE OF THE INLET CONNECTION, INCLUDING RUBBER SLEEVE IS SUPPLIED WITH THE COOLING TOWER. EXTERNAL PIPING AND SUPPORTS BEYOND THE INLET CONNECTION IS BY OTHERS. EXTERNAL PIPING MAY NOT BE SUPPORTED FROM THE TOWER.
2. ASSEMBLY TOLERANCE IS  $\pm 1/8"$  [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN I-P (INCH-POUND) UNITS UNLESS OTHERWISE NOTED.
3. S1 DIAMETER INLET CONNECTION CONFORMS TO CLASS 125 ANSI B16.1 SPECIFICATIONS. BOLT HOLES STRADDLE CENTERLINES. FLAT FACE FLANGE GASKETS ARE SUPPLIED WITH THE COOLING TOWER. USE THIS DRAWING IN CONJUNCTION WITH THE SCHEMATIC DETAIL DRAWINGS.
4. MULTI-CELL TOWERS SHOULD INCLUDE PROVISIONS TO BALANCE FLOW BETWEEN CELLS.
5. CONTACT YOUR SALES ENGINEER FOR THE REQUIRED PUMP HEAD FOR THIS ARRANGEMENT.
6. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [SI] UNITS

ECO NUMBER QTC-CHK		BOTTOM INLET CONNECTION DETAILS 8401 THRU 8414 TOWERS								
REV. BY BCG	CHECKED MN	REV. DATE 02/02/09	DRAWN BY B. GOODING	DATE 01/16/09	CHECKED					APPROVED MN



LADDER WITH CAGE ELEVATION



LADDER DETAIL  
(PLAN VIEW)

NOTES

1. THE COOLING TOWER FAN DECK IS NOT CONSIDERED AN ELEVATED WORKING PLATFORM SINCE NORMAL RECOMMENDED MAINTENANCE PROCEDURES ARE LESS THAN THE FREQUENCY OF MAN-HOURS THAT OSHA DEFINES FOR SUCH A PLATFORM, PER OSHA'S 1984 INTERPRETATION OF THEIR REGULATIONS. THIS OPTION AND OTHERS ARE AVAILABLE FOR THOSE CUSTOMERS WHO PREFER THE EXTRA DEGREE OF PROTECTION IT PROVIDES.
2. NORMAL TOWER MAINTENANCE DOES NOT REQUIRE PERSONNEL TO BE ON TOP OF THE TOWER. IF ACCESS TO TOP OF THE TOWER IS NEEDED, THEN LADDER AND HANDRAIL OPTION IS RECOMMENDED.
3. LADDER IS ALL ALUMINUM CONSTRUCTION CONSISTING OF 3" [76] X 1 1/8" [29] I-BEAM SIDE RAILS AND 1 1/4" [32] DIAMETER SERRATED RUNGS.
4. TOWER IS MODIFIED FOR LADDER AND HANDRAIL WITH ALL ATTACHING CLIPS AND HARDWARE PROVIDED WITH THE COOLING TOWER. LADDER AND HANDRAIL ARE ASSEMBLED AND INSTALLED IN THE FIELD BY OTHERS. INSTALLATION DETAILS ARE SHIPPED WITH THE TOWER.
5. TOLERANCE APPLICABLE TO DIMENSIONS SHOWN ARE DEPENDENT UPON FABRICATION, ASSEMBLY AND CONSTRUCTION TOLERANCES. FABRICATION TOLERANCE IS  $\pm 1/16"$  [2] & ASSEMBLY TOLERANCE IS  $\pm 1/8"$  [3]. CONSULT SUPPLIERS OF SUPPORTING STRUCTURE FOR CONSTRUCTION TOLERANCE. ALL OF THE DIMENSIONS SHOWN ARE IN INCHES UNLESS OTHERWISE NOTED.
6. PER O.S.H.A. STANDARDS, SAFETY CAGE IS RECOMMENDED WHEN THE DIFFERENCE IN ELEVATION BETWEEN TOWER FAN DECK AND GRADE EXCEEDS 20' [6096].
7. OPTIONAL LADDER EXTENSIONS ARE PROVIDED IN NOMINAL LENGTHS OF 5' [1524] AND 11' [3353] ONLY. FIELD MODIFICATION, BY OTHERS, IS REQUIRED FOR EXTENSIONS OF DIFFERENT LENGTHS. PER O.S.H.A. STANDARDS, AN ACCESS DOOR PLATFORM IS RECOMMENDED IF TOWER IS ELEVATED.
8. IF LADDER EXTENSION WITH SAFETY CAGE IS PURCHASED, THE ACTUAL LADDER EXTENSION LENGTH MUST BE SPECIFIED TO ASSURE THE PROPER BOTTOM ELEVATION OF SAFETY CAGE.
9. ALL DIMENSIONS SHOWN INSIDE OF BRACKETS [ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [SI] UNITS

ECO NUMBER QTC-CHK		LADDER DETAILS WITH SAFETY CAGE								
REV. BY BCG	CHECKED MN									
REV. DATE 02/04/09	DRAWN BY B. GOODING	DATE 01/16/09	CHECKED	APPROVED MN	ORDER NUMBER	PLOT 1=1	DRAWING NUMBER 09-117	REV. A		



Dyna-Tech Sales Corp.

No.: MT10310

Date: 12/23/2010

Customer : Princeton University

TECHNICAL PROPOSAL

Three-phase induction motor - Squirrel cage rotor

Product line : Cooling Tower Motors : NEMA Premium

Catalog Number : 04018ET3ECT324T

Notes:  
Cooling Tower Motors : NEMA Premium

Performed by:

Checked:



Dyna-Tech Sales Corp.

No.: MT10310

Date: 12/23/2010

## DATA SHEET Three-phase induction motor - Squirrel cage rotor

Customer : Princeton University  
Product line : Cooling Tower Motors : NEMA Premium

Frame : 324T  
Output : 40 HP  
Frequency : 60 Hz  
Poles : 4  
Full load speed : 1775  
Slip : 1.39 %  
Voltage : 208-230/460 V  
Rated current : 107-96.5/48.3 A  
Locked rotor current : 647/323 A  
Locked rotor current (I<sub>L</sub>/I<sub>n</sub>) : 6.7  
No-load current : 40.0/20.0 A  
Full load torque : 117 lb.ft  
Locked rotor torque : 230 %  
Breakdown torque : 230 %  
Design : B  
Insulation class : F  
Temperature rise : 80 K  
Locked rotor time : 33 s (hot)  
Service factor : 1.25  
Duty cycle : S1  
Ambient temperature : -20°C - +40°C  
Altitude : 1000 m  
Degree of Protection : IP55  
Approximate weight : 595 lb  
Moment of inertia : 9.1624 sq.ft.lb  
Noise level : 71 dB(A)

	D.E.	N.D.E.
Bearings	6312 2RS	6212 2RS
Regreasing interval	---	---
Grease amount	---	---

Load	Power factor	Efficiency (%)
100%	0.83	94.1
75%	0.79	94.1
50%	0.68	93.0

Notes:

Performed by:

Checked:

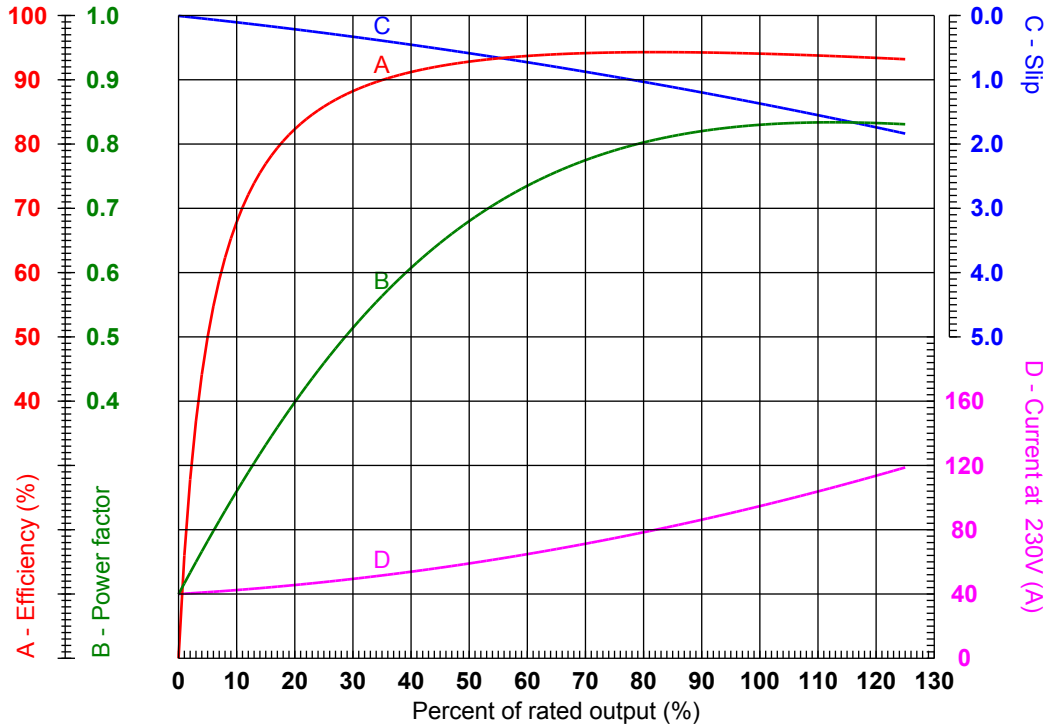


# Dyna-Tech Sales Corp.

No.: MT10310

Date: 12/23/2010

## PERFORMANCE CURVES RELATED TO RATED OUTPUT Three-phase induction motor - Squirrel cage rotor



Customer : Princeton University  
Product line : Cooling Tower Motors : NEMA Premium

Output	: 40 HP	Locked rotor current (I <sub>l</sub> /I <sub>n</sub> )	: 6.7
Frame	: 324T	Duty cycle	: S1
Full load speed	: 1775	Service factor	: 1.25
Frequency	: 60 Hz	Design	: B
Voltage	: 208-230/460 V	Locked rotor torque	: 230 %
Insulation class	: F	Breakdown torque	: 230 %
Rated current	: 107-96.5/48.3 A		

Notes:

Performed by:

Checked:



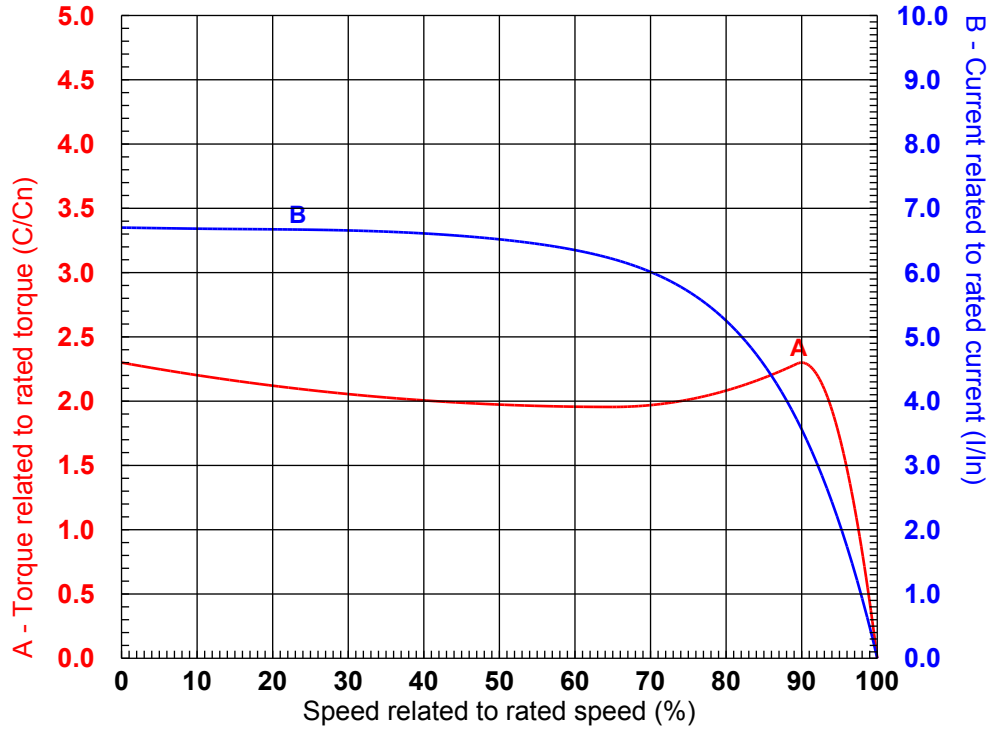


Dyna-Tech Sales Corp.

No.: MT10310

Date: 12/23/2010

CHARACTERISTIC CURVES RELATED TO SPEED  
Three-phase induction motor - Squirrel cage rotor



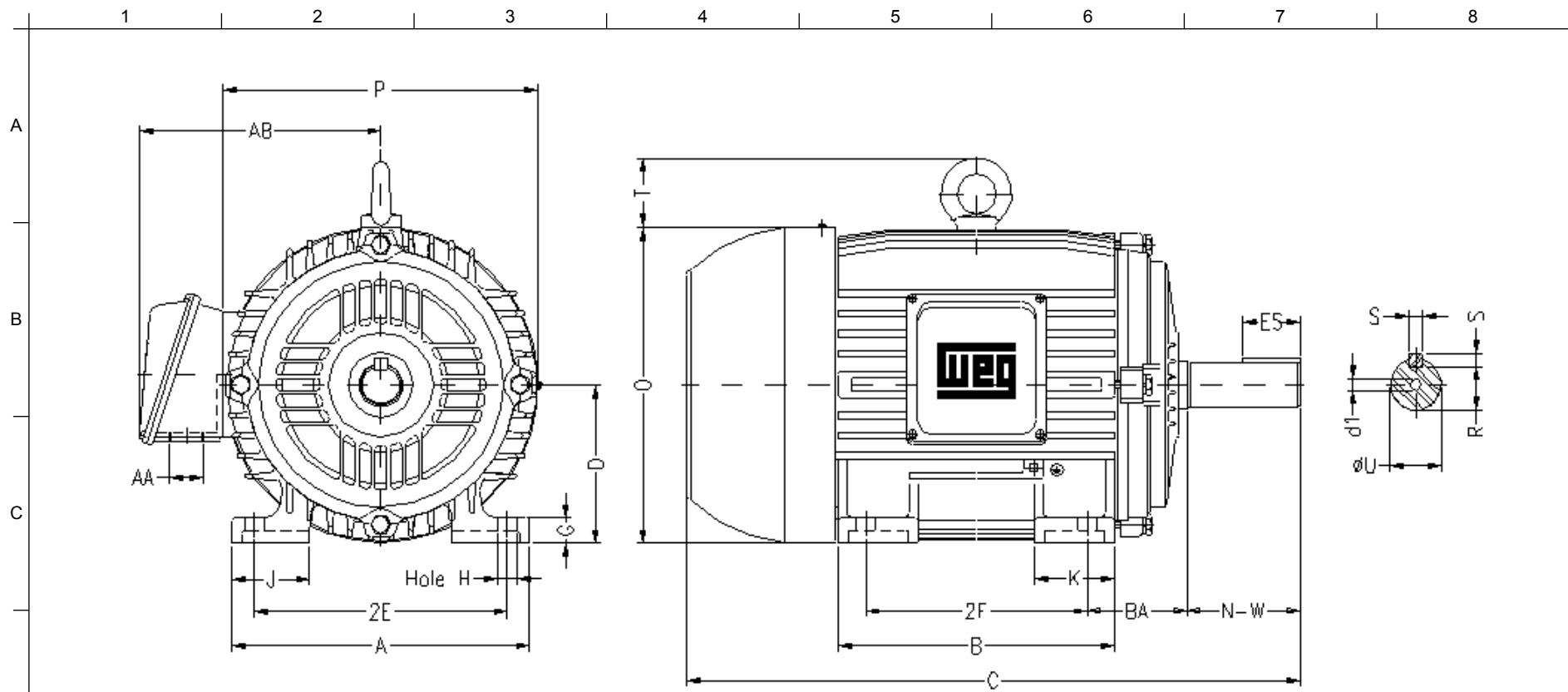
Customer : Princeton University  
Product line : Cooling Tower Motors : NEMA Premium

Output	: 40 HP	Locked rotor current (I <sub>l</sub> /I <sub>n</sub> )	: 6.7
Frame	: 324T	Duty cycle	: S1
Full load speed	: 1775	Service factor	: 1.25
Frequency	: 60 Hz	Design	: B
Voltage	: 208-230/460 V	Locked rotor torque	: 230 %
Insulation class	: F	Breakdown torque	: 230 %
Rated current	: 107-96.5/48.3 A		

Notes:

Performed by:

Checked:



Notes:

Performed by:

Checked:

Customer: Princeton University

Cooling Tower Motors : NEMA Premium

Three-phase induction motor  
Frame 324T - IP55

12/23/2010  
MT10310



2E 12.500	2F 10.500	H 0.657	BA 5.250	A 15.157
B 13.071	C 29.620	D 8.000	G 1.307	J 3.228
K 3.346	O 15.953	P 15.591	T 2.441	ES 3.937
S 0.500	N-W 5.250	U 2.125	R 1.844	AB 11.496
AA NPT 2"	d1 A 4			

# Marley Accessories

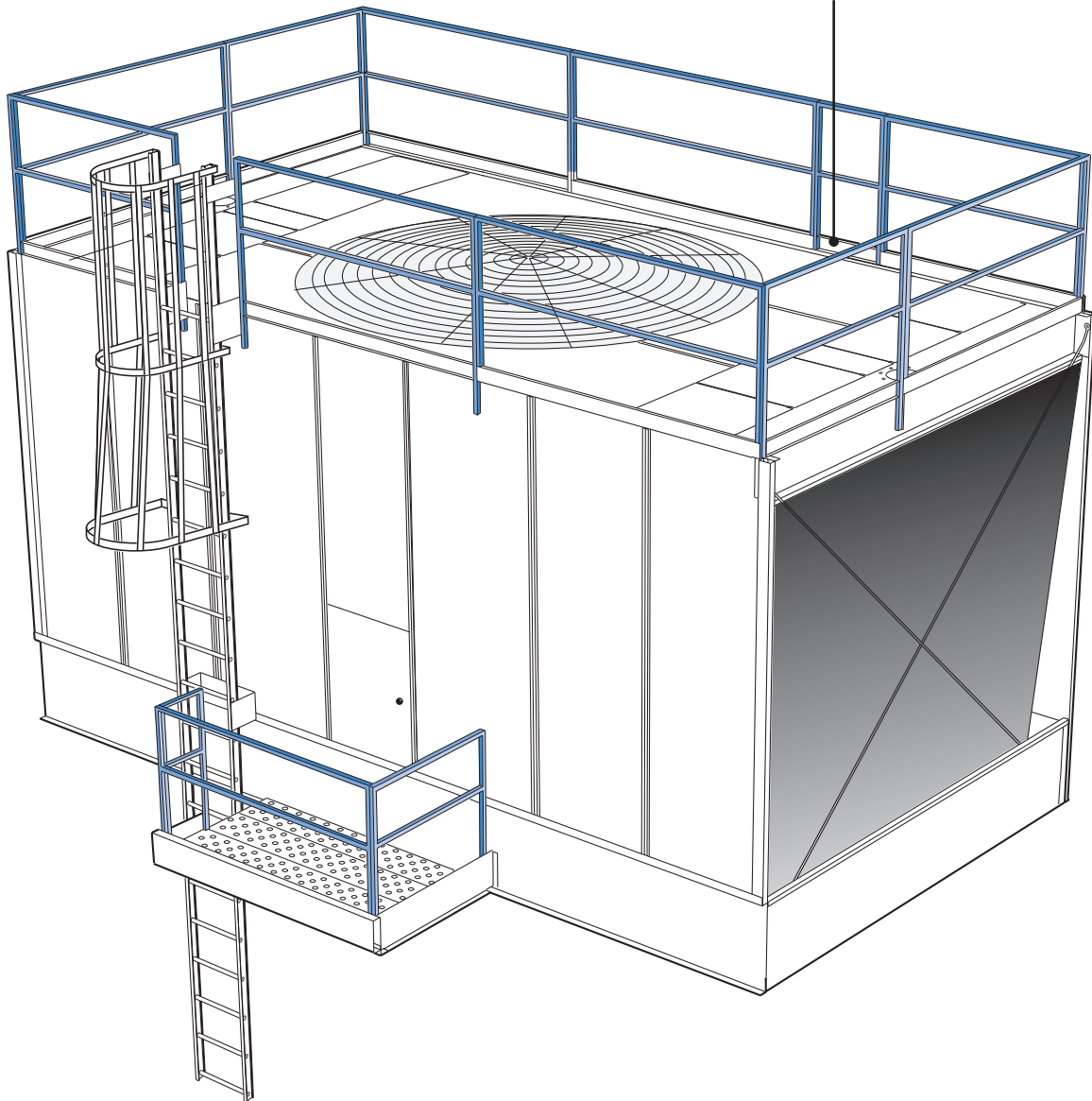
## Easy Fit Guardrail and Safety Cage System for Marley NC<sup>®</sup>

The new guardrail system for NC towers offers faster assembly and easier maintenance. A significant reduction in parts and clear instructions ensure that your guardrails are assembled accurately and securely.

*Pre-assembled parts  
make installation easy*

*Complies with  
OSHA standards*

*Integrated toe  
board*



### **Pre-Assembled**

Guardrails are shipped as large welded sections that are self fixturing for easy and simple installation.

### **Fewer Parts**

With 130 fewer parts to contend with, you save both time and effort.

### **One Bolt Diameter**

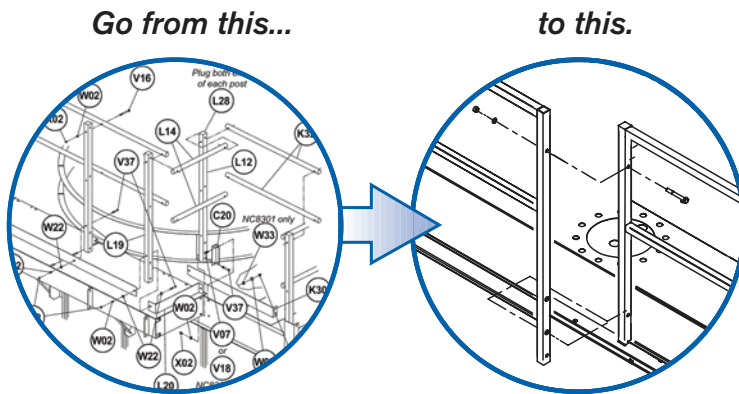
No more switching tools. Install your rails quickly without searching for the right tool for a variety of bolt sizes.

# Marley Accessories

## Easy Fit Guardrail and Safety Cage System for Marley NC<sup>®</sup>

### Clear Instructions

User-friendly installation instructions take the guesswork out of assembling your guardrails.



### Simpler is Safer

A significant reduction in parts and new clear instructions ensure that your easy fit guardrails are assembled accurately and securely.

### Guardrail single cell example

Element	Old Design	New Design	Reduction
Steel parts total	41	11	73%
Plastic plugs total	56	0	100%
Hardware pieces total	262	132	50%
Number of unique pieces	8	4	50%
Number of bolt diameters	2	1	50%

### Safety cage example

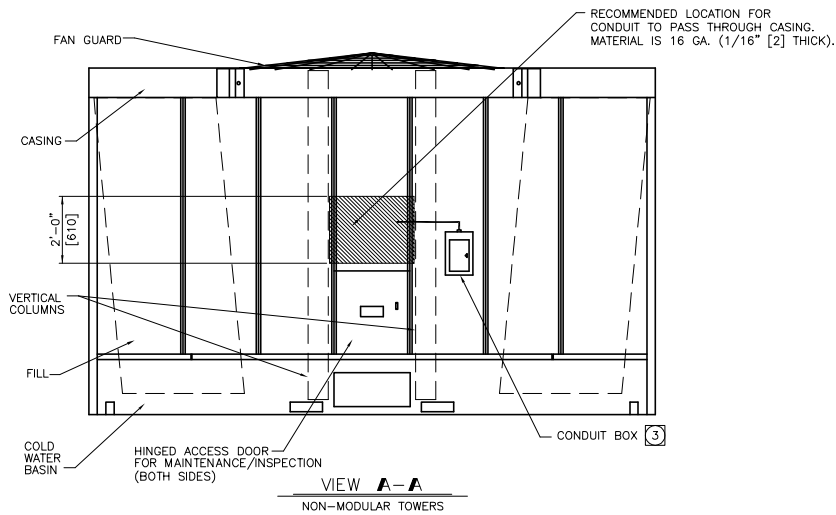
Element	Old Design	New Design	Reduction
Cage pieces total	27	4	85%
Hardware pieces total	274	128	53%
Number of unique pieces	7	3	57%
No. of bolt/screw diameters	2	1	50%

**SPX**<sup>®</sup>

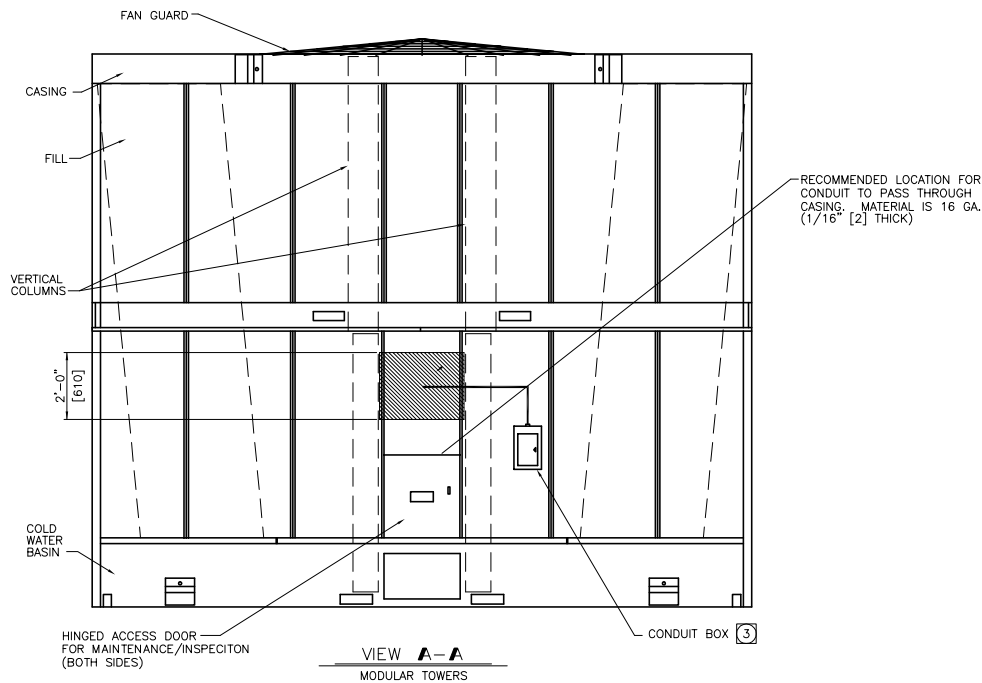
COOLING TECHNOLOGIES

7401 WEST 129 STREET  
OVERLAND PARK, KANSAS 66213  
UNITED STATES  
913 664 7400  
spxcooling@spx.com  
[spxcooling.com](http://spxcooling.com)

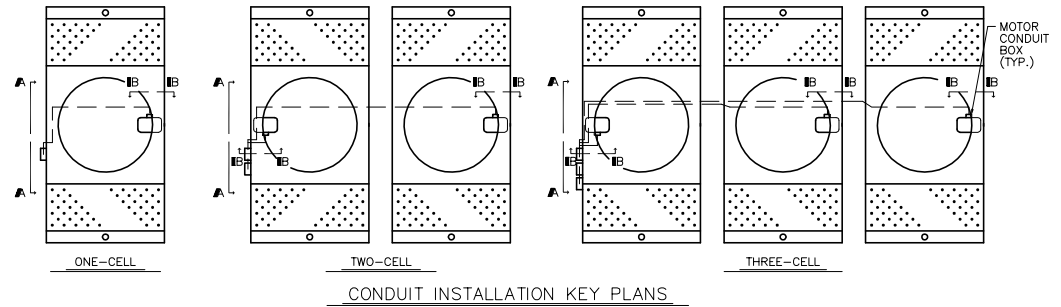
In the interest of technological progress, all products are subject to design and/or material change without notice.  
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Printed in USA | ACC-NC-2B



VIEW A-A  
NON-MODULAR TOWERS



VIEW A-A  
MODULAR TOWERS

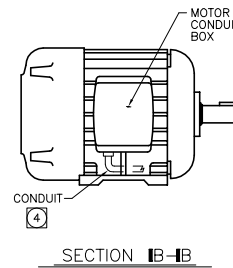


CONDUIT INSTALLATION KEY PLANS

GENERAL NOTES

- ALL CONDUIT, CONNECTIONS, SUPPORTING CLIPS, HANGERS, AND SAFETY SWITCHES ARE SUPPLIED BY OTHERS.
- ALL WIRING MUST CONFORM TO LOCAL AND NATIONAL CODES.
- NON-FUSED SAFETY DISCONNECT SWITCHES ARE RECOMMENDED; THREE-POLE FOR SINGLE SPEED MOTORS; SIX-POLE FOR TWO SPEED MOTORS; WITH VOLTAGE AND HORSEPOWER RATED FOR FAN MOTOR, LOCATED IN A NEMA 3 OR 4 WEATHERPROOF ENCLOSURE. ATTACH ENCLOSURE TO EXTERIOR OF TOWER USING VERTICAL FLANGES OF CASING. CONDUIT BOX MUST BE LOCATED AT A LOWER ELEVATION THAN MOTOR.
- CONDUIT SHOULD BE SUPPORTED APPROXIMATELY EVERY TEN FEET [3048], EXCEPT WHERE NOTED BELOW. IMPORTANT! CONDUIT MUST BE PITCHED DOWN TO ALLOW CONDENSATION TO DRAIN AWAY FROM MOTOR AND OUT OF CONDUIT. CONDUIT MUST BE WATERTIGHT. CONDUIT SHOULD BE RIGID EXCEPT AS NOTED BELOW.
  - APPROXIMATELY 2 FEET [610] OF FLEXIBLE STEEL CONDUIT (SEALTIGHT OR EQUIVALENT) SHOULD BE USED AT THE MOTOR CONDUIT BOX.
  - A CONDUIT SUPPORT SHOULD BE LOCATED WITHIN 3 FEET [914] OF ALL CONDUIT BOXES.
  - IF MOISTURE CANNOT DRAIN OUT OF MOTOR CONDUIT BOX, A SMALL (3/16\" [5] - 1/4\" [6]) DRAIN HOLE MUST BE DRILLED IN BOTTOM OF CONDUIT BOX.
- CONDUIT MAY BE SUPPORTED ON THE SIDE OF THE INTERIOR BOX BEAMS OR SUSPENDED FROM BOTTOM OF THE BEAM. SEE KEY PLANS AND VIEW A-A FOR LOCATION AT WHICH TO RUN CONDUIT THROUGH TOWER CASING.
- HOLE(S) CUT IN CASING FOR CONDUIT SHOULD NOT BE FLAME CUT, AND SHOULD NOT BE LARGER THAN NECESSARY TO ACCOMMODATE CONDUIT FITTINGS. SEAL HOLES WITH WATERPROOF CAULKING.
- TOWERS WITH NO LADDER AND HANDRAIL:
  - ONE CELL TOWERS MAY HAVE DISCONNECT SWITCH LOCATED ON MOTOR FACE OF TOWER.
  - MULTI-CELL TOWERS SHOULD HAVE DISCONNECT SWITCHES LOCATED TOGETHER. SEPARATE CONDUIT IS REQUIRED FOR EACH MOTOR. ROUTE CONDUIT THROUGH CASING AND ACROSS ADJACENT CELLS AS SHOWN ON INSTALLATION KEY PLAN.
- TOWERS WITH LADDER AND HANDRAIL: DISCONNECT SWITCHES SHOULD BE LOCATED ON LADDER SIDE OF TOWER FOR EASE OF ACCESSIBILITY. SEPARATE CONDUIT IS REQUIRED FOR EACH MOTOR. ROUTE CONDUIT THROUGH CASING AND ACROSS ADJACENT CELLS AS SHOWN IN INSTALLATION KEY PLAN.
- ALL OF THE DIMENSIONS SHOWN INSIDE BRACKETS [ ] ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

I-P [S] UNITS



SECTION B-B

ECO NUMBER		RECOMMENDED CONDUIT INSTALLATION								
REV. BY	CHECKED									
REV. DATE	DRAWN BY B. GOODING	DATE 02/05/2009	CHECKED	APPROVED MN	ORDER NUMBER	PLOT 1=1	DRAWING NUMBER 09-167	REV.		

## Customer's Start-up Checklist

for use with:  
ABB ACH550 VFD

YES	NO	N/A
-----	----	-----

### EQUIPMENT LOCATION

Are the drive(s) mounted in their permanent location(s)?			
Is the work area around the drive(s) accessible?			
Does the work facility have safety provisions ? (e.g., first aid, fire extinguishers, etc.)			

### POWER CONNECTIONS (POWER SUPPLY SIDE)

Has the supply voltage been verified and agree with the VFD being installed?			
Is the proper sized incoming power connections installed and completely terminated?			
Are the incoming power leads in the standard (A-B-C) rotation pattern?			
Have proper grounding practices been followed? (National Electrical Code)			

### MOTOR CONNECTIONS (LOAD SIDE of DRIVE)

Have the proper motor(s) been installed, wired correctly and ready to run?			
Are the motor leads completely terminated between the VFD and motor?			
Can the motor be run at FULL speed in Bypass mode?			

### COOLING TOWER

Is the cooling tower installed and ready?			
Will hot water over the tower be available during start-up? (not required)			
Do the fan tips rotate freely without hitting the fan cylinder?			
Has the motor, driveshaft, geareducer, and fan been properly coupled and aligned?			

### CONTROL CIRCUIT WIRING

Has a Marley supplied 4-20mA RTD been specified? (Provides temperature reference input signal.)			
If an RTD is to be used, has it been installed properly with a shielded analog signal cable?			
If a vibration switch is used is it wired to the "RUN ENABLE" OR "SAFETY INTERLOCK" of the drive?			
Is control wiring separated from the power wiring?			
If used, does the shielded analog signal cable have the shielding connected at the VFD only?			
Multiple VFDs: Are the output power cables independently routed with respect to other VFD cables?			

### OTHER USER INTERFACES

The supplied VFD is designed to be controlled externally from a building automation system or a supplied RTD with a 4-20 mA transmitter. When interfacing with a building automation system, automatic VFD operation is the responsibility of others, such as a controls / programming specialist contractor. In this case, controls contractor needs to be present and their control wiring / BAS installed and operational.

### AUTHORIZED PERSONNEL

Will the person(s) responsible for the entire process be available to verify final operation?			
Will all necessary UNION trade personnel be ready and available if they need to be present?			

### TRAINING

VFD operation will be reviewed at time of start-up. Will the maintenance person be available?			
---	--	--	--

### SPECIAL REQUIREMENTS (Please list any SPECIFIC concerns/comments):

#### CUSTOMER'S "READINESS" ACKNOWLEDGMENT

I / We have verified and answered all checklist questions. All questions with a YES response indicate a "readiness" state for the start-up to be efficient and successful. Explanation(s) for any question with a NO response is listed in the SPECIAL REQUIREMENTS section above. **Please note: When authorized service personnel arrive on-site and the above necessary items are not completed, additional charges will apply. Additional charges will be assessed for extended idle time or return visit.**

Name: \_\_\_\_\_

Company Name: \_\_\_\_\_

Phone Number: (\_\_\_\_\_) - \_\_\_\_\_ - \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**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.

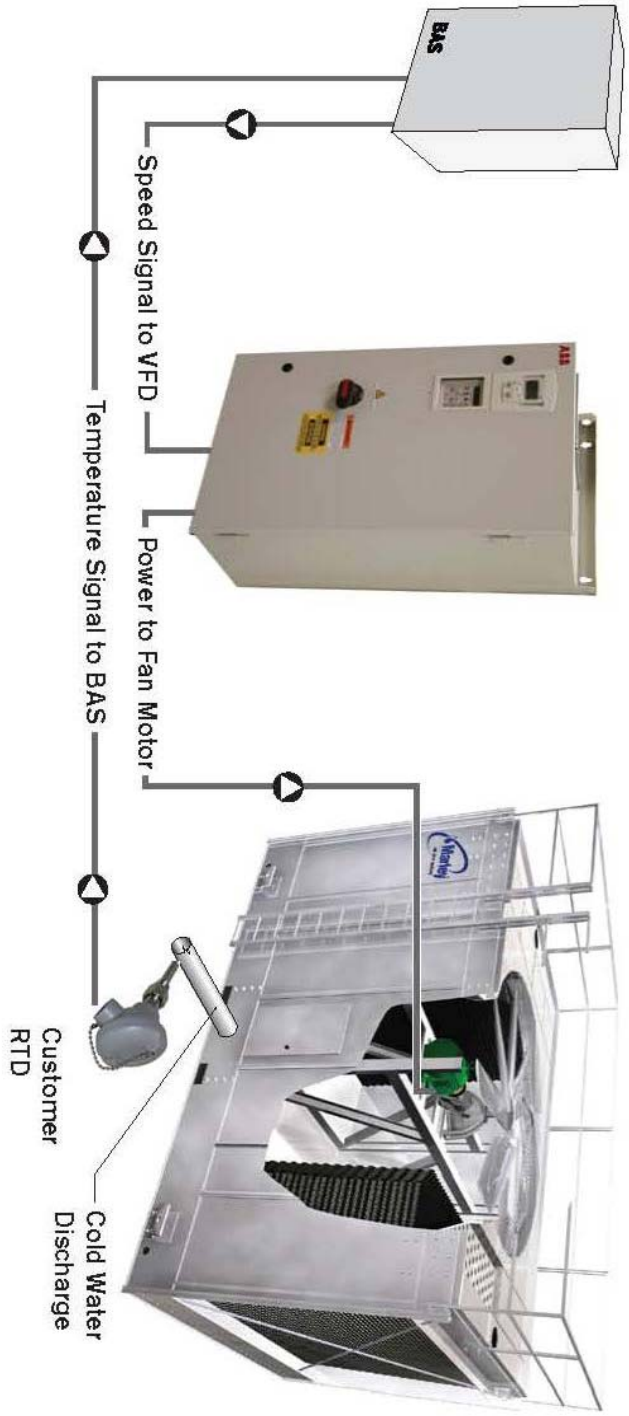
**Warranty:** When start-up service is purchased - 3 years from date of start-up or 38 months from date of VFD shipment which ever is less. Includes parts, labor and travel. Continental USA locations only. Contact your Marley sales representative for start-up in other areas. **If start-up is not purchased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

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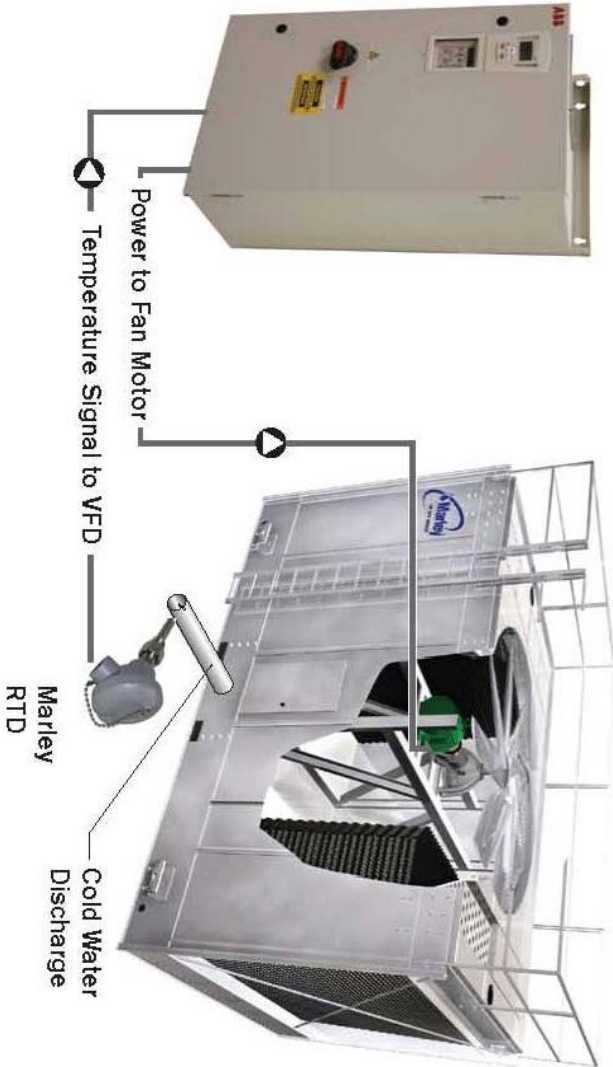
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LTR.	DATE	ECO	BY	CHKD							
					SCALE	DATE	DRAWN	CHECKED	APPROVED		
					11-15-09	GROOTHUIS					
					ORDER NUMBER	DRAWING NUMBER					
					08-184	08-184					
<p style="text-align: center;">Marley VFD Item #E83810                  ABB CAT # ACH550-BCR-059A-4+B055+F267                  480/3/60   40 HP   100 AMP MAIN BREAKER   NEMA 12 ENCLOSURE</p>											
											

Option using customers BAS system for temperature control



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





# Submittal Details

Item	Tag / Equipment ID	Product ID
34		ACH550-BCR-059A-4+B055+F267

Item Description
<b>Input Voltage:</b> 480 VAC <b>Rated Output Current:</b> 100 AMPS <b>Construction:</b> E-clipse-Bypass, Circuit Breaker <b>Enclosure:</b> NEMA 12 UL Type 12 <b>Nominal Horsepower:</b> 40 <b>Frame Size:</b> R4 <b>Input Disconnecting Means:</b> Circuit Breaker <b>Bypass:</b> E-Clipse Bypass <b>Input Impedance:</b> 5% <b>Short Circuit Current Rating:</b> 100 kA <b>Communication Protocols:</b> Johnson Controls N2, Siemens Buildings Technologies FLN (P1), Modbus RTU, BACnet <b>Other Options:</b> Service Switch

Drive Input Fuse Ratings <sup>1</sup>	
(Note: Drive is UL approved without the need for input fuses. Fuse rating information provided for customer reference)	
Amps (600 V)	Bussmann Type
100	JJS-100

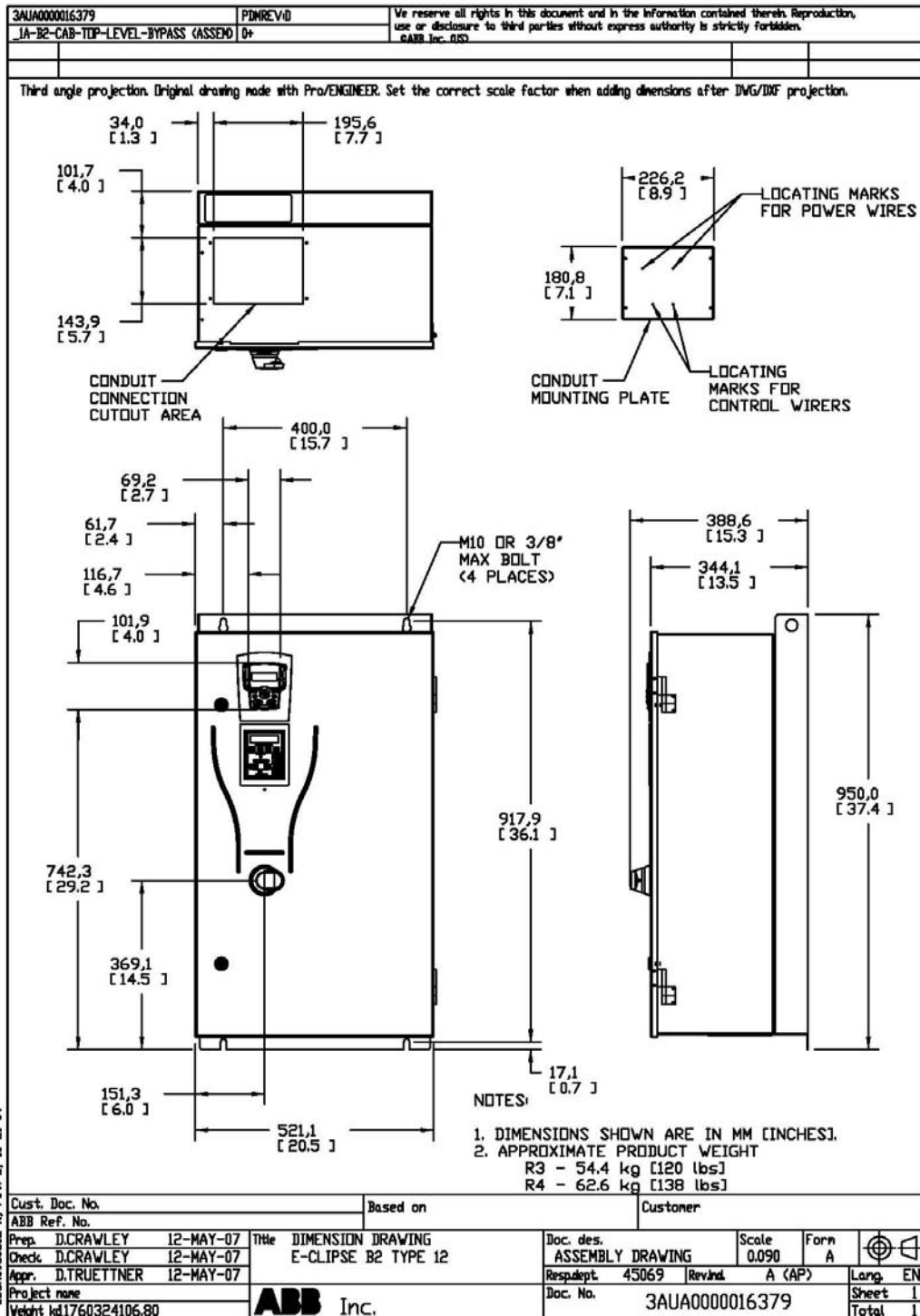
Wire Size Capacities of Power Terminals				
Circuit Breaker	Disconnect Switch	Terminal Block	Overload Relay	Ground Lug
#1 50 in-lbs	N/A N/A	#2/0 120 in-lbs	N/A N/A	#2 50 in-lbs

Dimensions and Weights				
Height in / mm	Width in / mm	Depth in / mm	Weight lbs / kg	Dimension Drawing
37.4 / 950	20.5 / 521	15.3 / 389	138 / 62.6	3AUA0000016379-1

Heat Dissipation & Airflow Requirements			
Power Losses		Airflow	
Watts	BTU/Hr	CFM	CM/Hr
907	3096	165	280

Reference Drawings		
Power Wiring	Connection Diagram	Dimension Detail
BC00R024PW-C	BCBDR016CC-A	3AUA0000016379-1

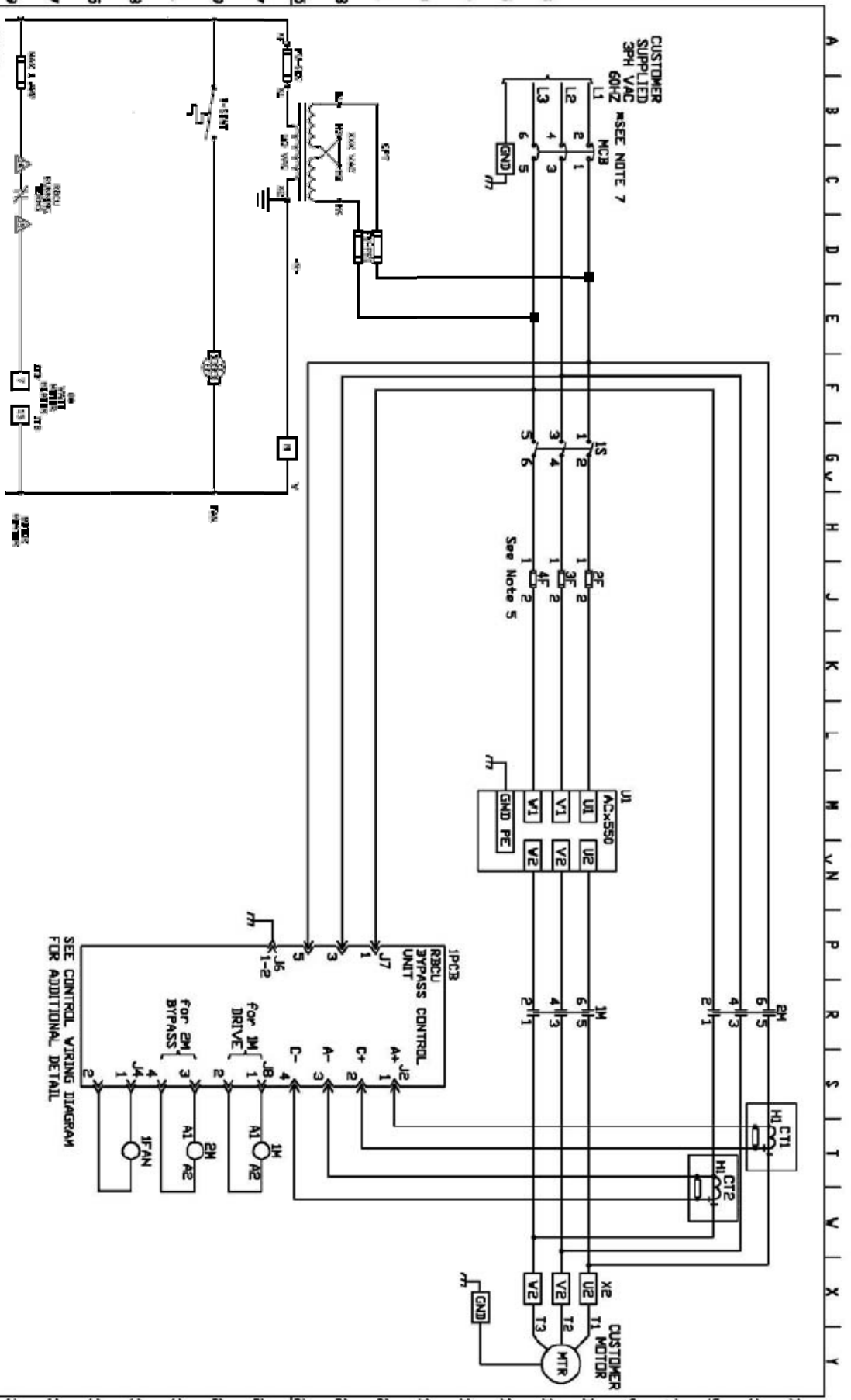
# Dimension Drawing for 08-184 - ACH550-BCR-059A-4+B055+F267



# Power Drawing for 08-184 - ACH550-BCR-059A-4+B055+F267

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



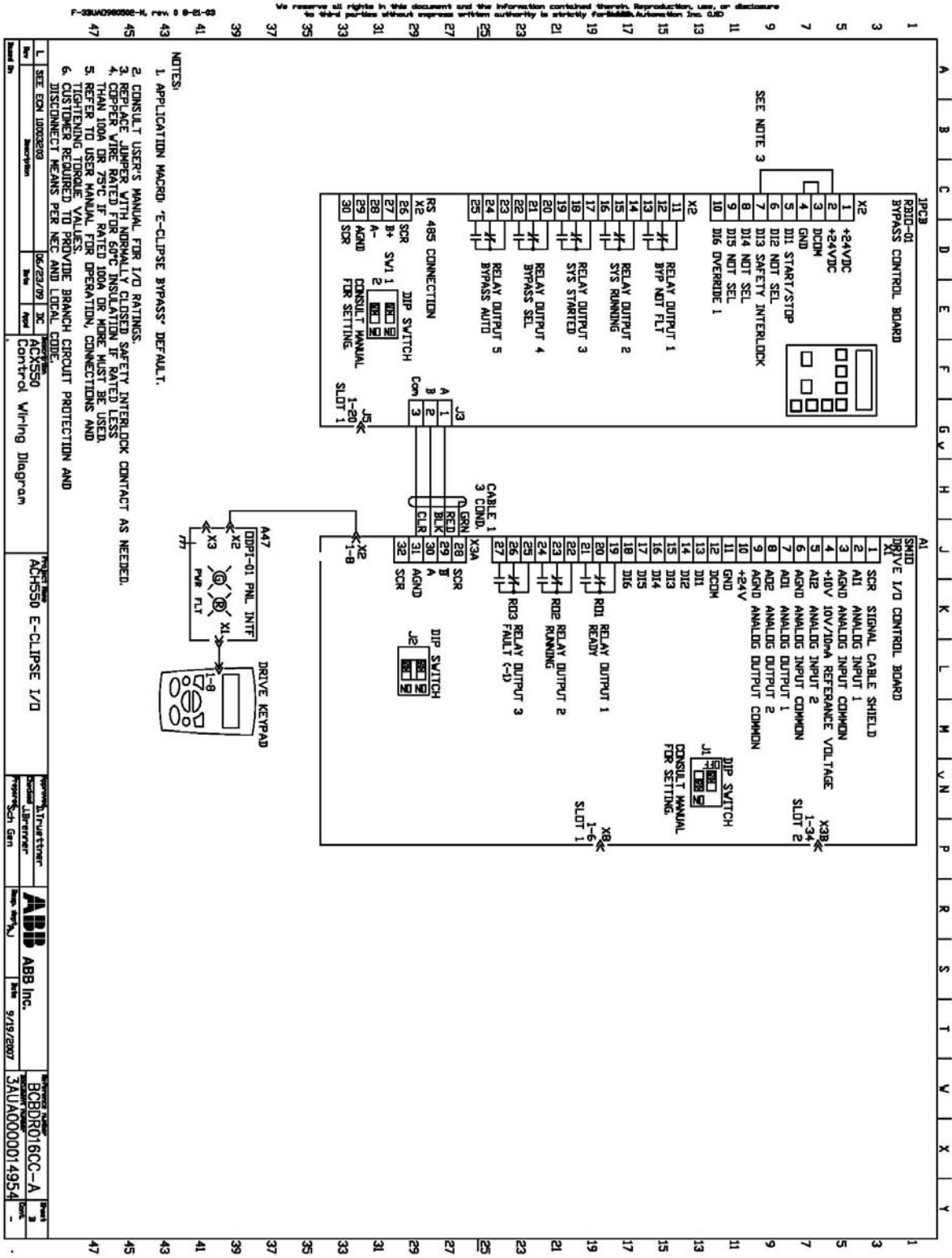
SEE CONTROL WIRING DIAGRAM FOR ADDITIONAL DETAIL

Rev	DATE	BY	CHK	DESCRIPTION
1	06/23/79		3C	ACH550 E-CLIPSE BYPASS INPUT CIRCUIT BREAKER SERVICE SWITCH
2				
3				
4				
5				
6				
7				

Project	08-184
Location	3AUA00000014954
Scale	
Sheet	3

ABB Inc.  
9/15/2007

# Connection Drawing for 08-184 - ACH550-BCR-059A-4+B055+F267



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## ACH550 Standard Features

- UL, cUL labeled and CE marked
- EMI/RFI Filter (1<sup>st</sup> 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 (I<sup>2</sup>T)
- 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 <sub>1</sub> )	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 <sub>1</sub> , V <sub>1</sub> , W <sub>1</sub> (U <sub>1</sub> , V <sub>1</sub> , 1-phase)
Output (Motor) Connection	
Output Voltage:	0 to U <sub>1</sub> , 3-phase symmetrical, U <sub>2</sub> at the field weakening point
Output Frequency:	500 to 500 Hz
Frequency Resolution:	0.01 Hz
Continuous Output Current:	
Variable Torque:	1.0 * I <sub>2N</sub> (Nominal rated output current, Variable Torque)
Short Term Overload Capacity:	
Variable Torque:	1.1 * I <sub>2N</sub> , (1 min/10 min)
Peak Overload Capacity:	
Variable Torque:	1.35 * I <sub>2N</sub> , (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 <sub>2</sub> , V <sub>2</sub> , W <sub>2</sub>
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/s<sup>2</sup> (33 ft/s<sup>2</sup>) 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/s<sup>2</sup> (330 ft/s<sup>2</sup>) 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/s<sup>2</sup> (49 ft/s<sup>2</sup>) 9 to 200 Hz sinusoidal

Bump Tested to (IEC 60068-2-29): Max 100 m/s<sup>2</sup> (330 ft/s<sup>2</sup>) 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 ..... 2.3mm<sup>2</sup> / 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 ..... 2.3mm<sup>2</sup> / 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 ..... 2.3mm<sup>2</sup> / 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 ..... 2.3mm<sup>2</sup> / 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 ..... 2.3mm<sup>2</sup> / 14AWG

### Protections

Single Phase ..... Protected (input & output)  
Overcurrent Trip Limit: ..... 3.5 x I<sub>2N</sub> instantaneous  
Adjustable Current Regulation Limit: ..... 1.1 x I<sub>2N</sub> (RMS) max.  
Overvoltage Trip Limit: ..... 1.30 x U<sub>N</sub>  
Undervoltage Trip Limit: ..... 0.65 x U<sub>N</sub>  
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<sub>2t</sub>): ..... 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

U<sub>1</sub> = Input Voltage

U<sub>2</sub> = Output Voltage

P<sub>N</sub> = Power – Normal Duty (HP)

U<sub>N</sub> = Nominal Motor Voltage

f<sub>N</sub> = Nominal Motor Frequency

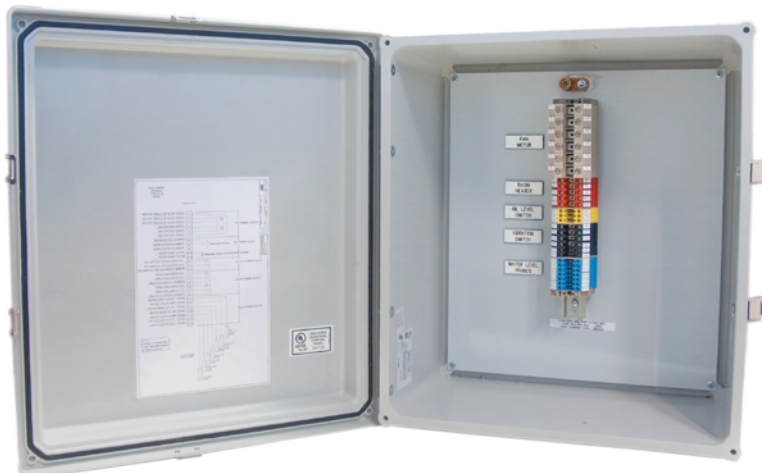
I<sub>2N</sub> = Nominal Motor Current – Normal Duty

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

The Marley Terminal Box provides a convenient and safe means for wiring a cooling tower without having to enter the tower. Internal components including the fan motor, vibration switch and water level probes are factory wired with the wiring brought outside and connected to terminal points within the Terminal Box mounted on the outside of the tower.

### Terminal Box Features:

- Factory installed
- Eliminates field wiring errors
- Reduces field wiring labor and materials
- Provides a single access point
- Terminal points are well identified
- NEMA 4X fiberglass enclosure
- Built to UL and CUL 508 standards
- Wiring diagram located on inside of box
- Less installation and start-up time
  - At a minimum saves up to four hours of field wiring
  - Provides outside access point to internal components for trouble shooting
- Standard terminal points include:
  - Fan motor
  - Vibration switch
  - Water level probes
  - Oil level switch
  - Basin heater



*The Marley Terminal Box may not apply to all tower applications due to cell configurations and larger shipping sizes. Contact your local Marley sales representative to get more information on how the Marley Terminal Box can be applied to your next project. See [spxcooling.com](http://spxcooling.com) to locate your Marley sales representative.*

**SPX**

COOLING TECHNOLOGIES

7401 WEST 129 STREET | OVERLAND PARK, KANSAS 66213 UNITED STATES | 913 664 7400 | [spxcooling@spx.com](mailto:spxcooling@spx.com) | [spxcooling.com](http://spxcooling.com)

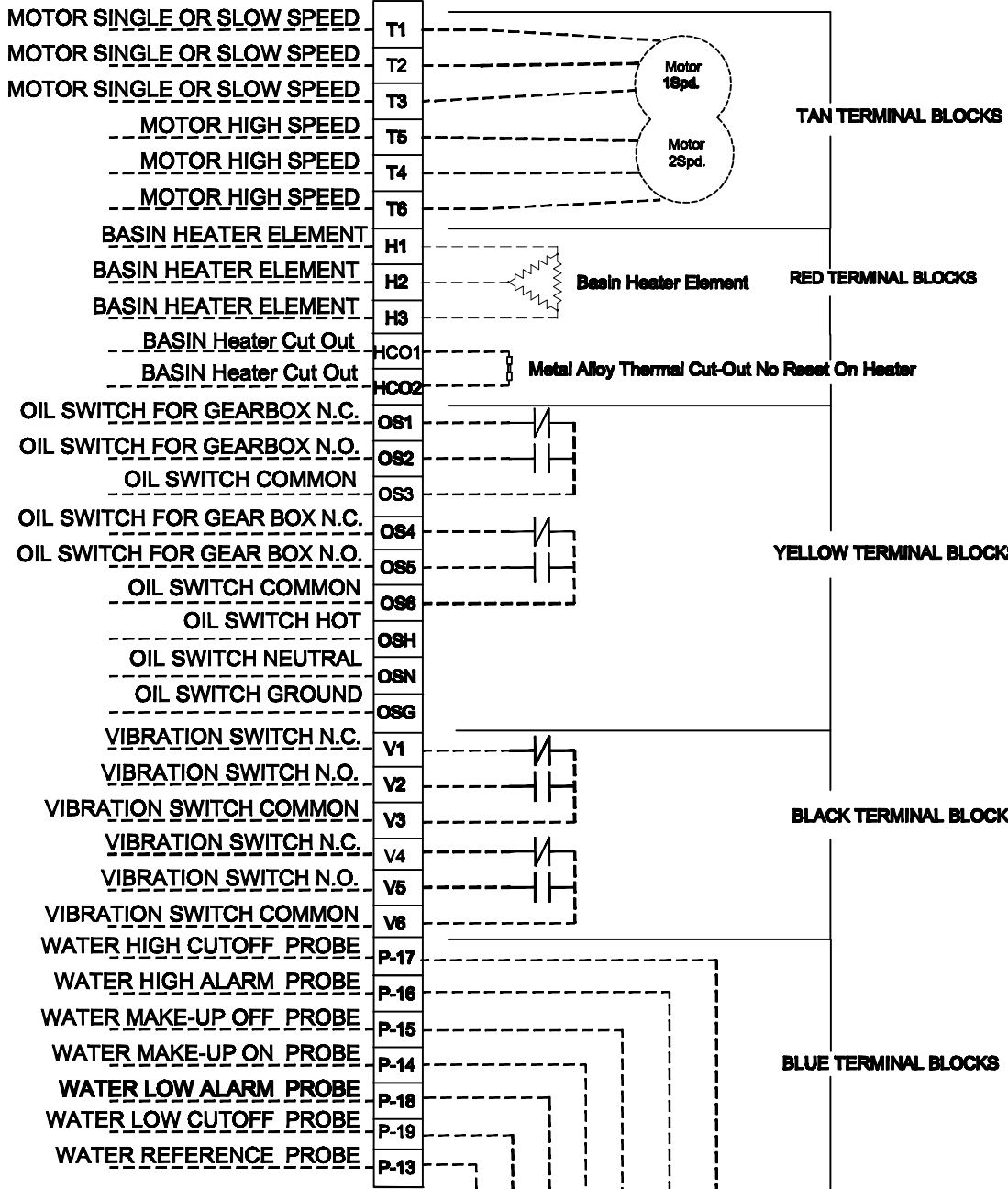
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SPEC-TermBox-09A



FIELD WIRING  
 TERMINAL  
 TORQUE 18  
 IN/LBS.

TERMINAL STRIP



**MARLEY TERMINAL BOX**

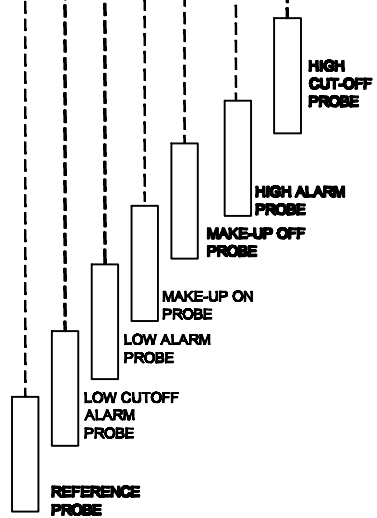
2/10/10

MSD

PO

**NOTE:**  
 Generic Terminal Strip  
 Tower May Not Include  
 all Options Shown

EXAMPLE PROBE  
 SETUP & WIRING





---

## **Installation**

This bulletin should be used by experienced personnel as a guide to the installation of the Marley M-5 vibration switch. Selection or installation of equipment should always be accompanied by competent technical assistance.

---

### **⚠ Caution**

***Before proceeding to install and wire the unit, read and thoroughly understand these instructions. The switch model number should be checked to confirm that you have the correct hazardous area rating for your application.***

### **Installation**

- 1—The sensitive axis of the vibration switch is perpendicular to the mounting base. The preferred mounting is with the sensitive axis in the horizontal plane, since most machines vibrate more in that plane. Mount the switch solidly to the frame of the machine. In most cases the switch or mounting bracket will come preinstalled.
- 2—Remove the cover and wire the switch(es) into the alarm or shutdown circuit. Do not exceed switch contact ratings listed in the specifications. Keep field wiring away from the moving part of the mechanism.
- 3—Observe all local electrical codes.
- 4—All the power must be switched off before opening of the enclosure in an explosive atmosphere.
- 5—The Vibration Switch must be electrically connected by means of a flame-proof cable gland or stopping box certified to EN 50018.
- 6—For ambient temperatures below +14°F and above +140°F use field wiring suitable for both minimum and maximum ambient temperature.
- 7—Reinstall the cover by first insuring the sealing gasket is in place and properly seated in the groove in the housing. Place the cover on the unit and install the four cover bolts. Torque the four bolts to 16 ft·lb. Caution should be used to not over-torque the bolts as this could damage the housing and compromise the seal.
- 8—The temporary conduit entry plugs are placed in the housing to provide physical protection for the threads during shipping. Once the unit is installed in the field these plugs must be replaced. These temporary plugs do not provide adequate environmental protection for the switch when installed in the field.

---

# Installation

## Vibration Switch Testing

---

### **⚠ Warning**

*The vibration switch is a safety circuit acting as a run permissive for the VFD or starter controlling the fan motor. Follow lockout / tagout procedures on the fan starting equipment.*

---

### **⚠ Caution**

*A special tool is required to adjust the setpoint—do not attempt to adjust. Adjusting the setpoint will VOID the warranty. The setpoint is factory set at 1g which is more than sufficient to allow the mechanical equipment to get up to speed without tripping the motor. The default trip setting should allow for a full voltage start and operation at all speeds.*

---

### **Note**

*During installation and testing, if a problem with either the sensitizing or desensitizing setting is suspected or you think the unit is defective, do not attempt to adjust the setpoint. Call 800-462-7539 or 281-940-1802 Field Service or 713-702-8805 Technical Assistance after hours for troubleshooting.*

To test the operation of the electrical contacts in the vibration switch please follow one of the provided procedures below. The first test procedure is the recommended procedure to use without having to remove the switch cover.

**Test 1 – Do not adjust the setpoint.** Loosen the four mounting bolts on the vibration switch support—do not remove. Either lightly tap or shake the vibration switch thus triggering the unit indicating the unit is active. Retighten the mounting bolts and reset the unit.

**Test 2 – Do not adjust setpoint.** Remove the cover to expose the inside of the switch. Using a screwdriver, toggle the trip plate to force the electrical contacts open and closed. The trip plate is bright metal and measures 1¾" x 1" and is located towards the bottom of the switch. With the adjusting pin located to the left, the normally closed contact will be closed when the right hand side of the trip plate is depressed. Check continuity at the terminal points COMMON and NORM CLOSED or at the fan controller to confirm contacts are operational. A typical control circuit uses a closed contact to allow the fan to run. An open contact means excessive vibration has occurred shutting off the starter or VFD.

---

## **Installation**

---

### **Note**

*As stated previously, adjusting the setpoint will void the warranty on this switch. If by either accident or intentionally, the setpoint is tampered with, the following instructions are provided indicating how to properly readjust the setpoint. If the proper setpoint cannot be achieved through these steps, then call for technical assistance. In order to adjust the setpoint, a special tool is required and may be furnished upon request from SPX Cooling Technologies.*

### **Turning Setpoint Adjustment Too Far Counter-Clockwise**

- If the setpoint adjustment is turned too far counter-clockwise (approximately 3-4 turns) the switch will trip and will not stay in a reset position after depressing the manual reset push-button.
- At approximately 11 turns the switch will trip and cannot be reset because the spring and adjusting rod have dislodged out of position. There is no mechanical stop position when turning counter clockwise. Repair of the internal mechanism can be accomplished in the field by removing the internal switch mechanism from the switch body. The switch mechanism is held in with three screws. Once removed the adjusting rod and spring may be put back into operating position.

### **Turning Setpoint Adjustment Too Far Clockwise**

- The adjusting rod has a nylon stop bushing preventing the rod from being over turned. Once the adjustment bottoms out, the switch is at or beyond the maximum setting and may not trip on vibration.

### **Getting The Adjustment Position Back To Normal**

- Once an adjustment is out of range and the rod and spring have not been dislodged the switch may be adjusted back to normal settings. With the switch cover removed rotate the adjusting rod clockwise until it bottoms out. Push the right hand side of the trip plate down to reset the switch. At this point the NORM CLOSED CONTACT is closed. Rotate the adjusting rod approximately two turns counter-clockwise slowly or until the trip bar moves up with a click. Then rotate the adjusting rod clockwise one full turn. If the cooling product fan start or run position trips the switch then rotate the adjusting rod clockwise in  $\frac{1}{8}$  increments until the trip holds in.

---

## ***Installation***

### **Electrical Reset and Startup Lockout**

The optional electrical reset circuit consists of an electrical solenoid in series with a thermistor. If the rated voltage is continuously applied to the reset circuit at startup, the reset solenoid energizes for a fixed time interval (approximately 30 seconds), after which time the solenoid is automatically de-energized by the thermistor. This action provides a trip lockout during machine startup roughness. The voltage must be removed from the reset circuit when the fan motor is stopped to allow the thermistor to cool off. The switch mechanism can then be reset electrically by a momentary application of the reset voltage or it can be reset manually.

---

### **Note**

*If the fan motor is restarted immediately after a shutdown, the lockout period will be shortened because the thermistor will be hot. An increase in the ambient temperature will also shorten the lockout period.*

### **Specifications**

**Function**—Armature mechanism trips on high vibration and operates snap action switch(es).

**Frequency Range**—0 to 3600 RPM.

**Reset**—Local reset, plus optional remote reset electrical coil. See How to Order ("D").

**Start Delay**—Applying reset coil voltage at start up holds mechanism from tripping for 20-30 seconds, after which the switch is active. Requires electric reset option.

**Temperature Range**— -40°F to 160°F

**Enclosure**—High strength copper-free ( $\frac{4}{10}$  of 1% max) aluminum alloy.

**Environmental Rating**—NEMA 4, IP 65 & CE Mark (NEMA 4X Optional).

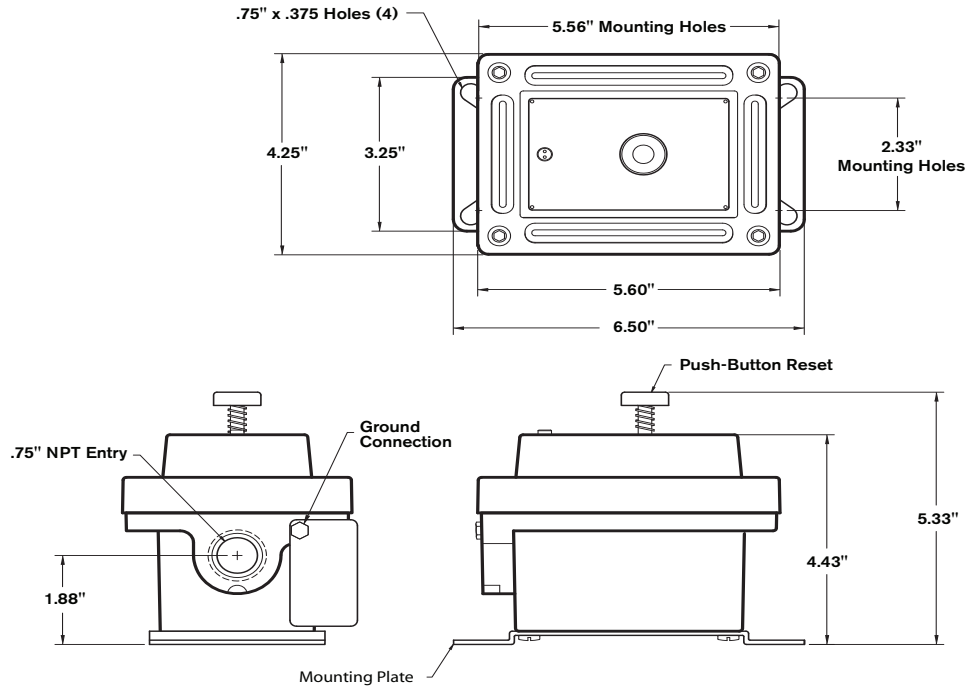
**Switch Contact(s) Rating**—15 amps, 125, or 480 VAC;  $\frac{1}{8}$  hp, 125 VAC;  $\frac{1}{4}$  hp, 250 VAC;  $\frac{1}{2}$  amp, 125 VDC;  $\frac{1}{4}$  amp, 250 VDC.

**Hazard Rating**—See How to Order ("A").

**Weight**—4.0 lb

# Information

## Schematic



## Wiring

Dependent on switch configuration

<p>DPDT Contacts</p> <p>L (+) 7 Reset Coil N (-) 8 Reset Coil GRN ——— Case</p>	<p>SPDT Contacts</p> <p>L (+) 4 Reset Coil N (-) 5 Reset Coil GRN ——— Case</p>
<p>DPDT Contacts</p>	<p>SPDT Contacts</p>

---

## Information

### How To Order

For new or replacement vibration switches call 1-800-4Marley

**M-5**    **A**  **B**  **C**  - **D**  **E**  **F**

Example: **M-5 111-010**

**A**  **Hazard Rating**

0 = None

1 = UL, cUL Explosion Proof, Class I, Div 1, Groups C and D  
Class II, Div 1, Groups E, F and G

2 = UL, cUL Explosion Proof, Class I, Div 1, Groups B, C and D  
Class II, Div 1, Groups E, F and G

**B**  **Contacts**

1 = SPDT 2 = DPDT

**C**  **Full Scale Range**

1 = 5g 2 = 2g 3 = 10g

**D**  **Reset Coil and Startup Delay**

0 = None 1 = 115VAC 2 = 230VAC 3 = 24VDC 4 = 115VDC

**E**  **Wiring Entry/Mounting Plate** (retro fit)

1 = 3/4" NPT 6 = M20 x 1.5

**F**  **Environmental Rating**

0 (or blank) = NEMA 4, IP65 1 = NEMA 4X, IP65

Tested for compliance with the applicable EC Electromagnetic Compatibility requirements



**note** When Option **C** = 2, Option **D** cannot = 3 for operation in the horizontal axis.

When Option **A** = 1 or **A** = 2, Option **E** cannot = 6



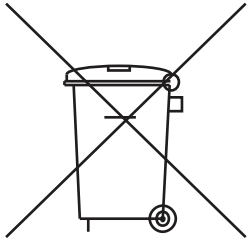
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## **Information**

### **Environmental**

---

#### **Note**



This electronic equipment was manufactured according to high quality standards to ensure safe and reliable operation when used as intended. Due to its nature, this equipment may contain small quantities of substances known to be hazardous to the environment or to human health if released into the environment. For this reason, Waste Electrical and Electronic Equipment (commonly known as WEEE) should never be disposed of in the public waste stream. The “Crossed-Out Waste Bin” label affixed to this product is a reminder to dispose of this product in accordance with local WEEE regulations. If you have questions about the disposal process, please contact SPX Cooling Technologies customer service.

**SPX**<sup>®</sup>

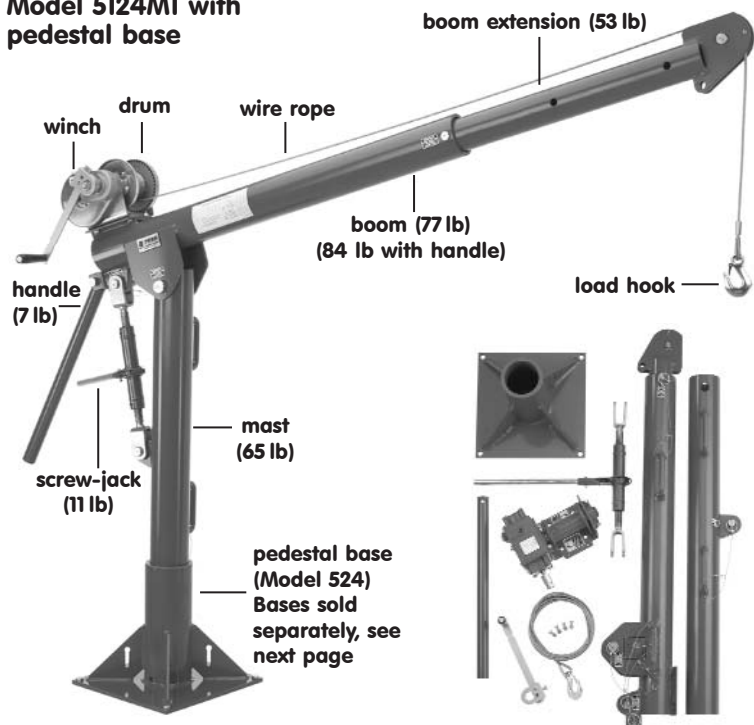
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M2010-1241

Model 5124M1 with pedestal base



Crane breaks down for transport

## Series 5124 Portable Davit Cranes

 Hand or Power Winch Operation  
 Up to 2000 lb capacity

 Ordering your crane is as easy as 1...2...3...  
 Select the option that best suits your needs for each item. Fill in the boxes below to create your crane part number.

<b>1</b> Crane	<b>2</b> Winch	<b>3</b> Optional Finish*
5124		

i.e. 5124M2GAL

\*Leave blank for standard powder coat finish

**4** Order your **Base, Wire Rope Assembly** and **Optional Accessories** separately. See next page.

■ **Two-year Limited Warranty**

### Crane Model

- **Crane Rotates 360°** on a pin and sleeve bearing in the base. Handle on the boom makes rotation easy.
- **Adjustable Boom** telescopes to 4 different lengths, and adjusts in height while under load with ratchet style screw-jack.
- **Crane Breaks Down** for storage or transport.

### 1 Crane Model 5124 – Section 4

base model	description	approx. ship wt.
5124 <sup>1</sup>	up to 2000 lb – portable davit	253 lb

<sup>1</sup> **Base Model includes corrosion resistant electrostatic powder coated finish. Other finishes available see Option 3.**  
 Please contact factory or nearest Thern Distributor for firm fixed price and delivery.

### Winch Models

- **Hand Winch Operated Models** include spur gear or worm gear hand winch with brake for load control. Model M2 winch can be drill driven, 400 rpm max.
- **Power Winch Operated Models** include electric winch with pendant control and brake. Other power options available, please contact factory.
- **Quick Disconnect Anchor** for quickly attaching or removing wire rope equipped with a swaged ball fitting.

### 2 Winch Options – Section 4

winch	description	approx. ship wt.
M1	M4312PB-K – zinc plated spur gear hand winch	28 lb
M2 <sup>2</sup>	4WM2-K – worm gear hand winch	42 lb
M3	M4312PBSS-K – stainless steel spur gear hand winch	28 lb
E2 <sup>3</sup>	4WP2-K electric winch – 115/1/60 VAC with 6 ft pendant control	85 lb
E4 <sup>3</sup>	4777-K electric winch – 115/1/60 VAC with 6 ft pendant control	110 lb
E4DC <sup>3</sup>	4777DC-K electric winch – 12 volt DC with 10 ft pendant control	105 lb

<sup>2</sup> Winch finish is powder coated, for epoxy finish contact factory.

<sup>3</sup> Winch finish is enamel, for epoxy finish contact factory.

### Optional Finishes

- **Galvanized Finish** provides extra protection against corrosion.
- **Stainless Steel Models** are constructed from all stainless steel with an electro-polished finish for superior corrosion resistance.

### 3 Optional Finish (crane only) – Section 4

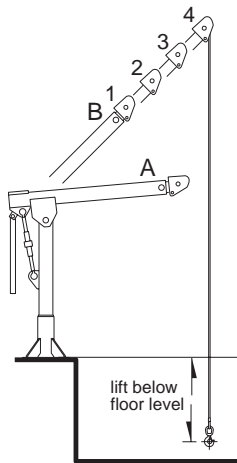
finish	description
GAL	galvanized finish – crane only
SS	stainless steel construction – crane only

**4 Series 5124 Bases, Wire Rope Assemblies and Accessories**
**INDEPENDENT BASES – sold separately**

- **Pedestal, Socket, or Wall** mount style.
- **Wheel Base** for floor crane operation. Base legs adjust in length and width. See Model 524R.
- **Important:** Base installation is purchaser's responsibility. Thern recommends consulting a civil engineer or other qualified professional. Contact factory for installation guidelines.

**Independent Bases – Section 4**

base	description	approx. ship wt.
524	pedestal base – powder coat finish (upright mount)	69 lb
524GAL	pedestal base – galvanized finish (upright mount)	69 lb
524SS	pedestal base – stainless steel (upright mount)	69 lb
524F	socket base – powder coat finish (flush mount)	58 lb
524FGAL	socket base – galvanized finish (flush mount)	58 lb
524SSF	socket base – stainless steel (flush mount)	58 lb
524W	wall mount base – powder coat finish	85 lb
524WGAL	wall mount base – galvanized finish	85 lb
524SSW	wall mount base – stainless steel	85 lb
524R	wheel base – enamel finish	445 lb


**Important:**

It is the owner's or operator's responsibility to determine the suitability of the equipment to its intended use. Study all applicable codes, manuals, and regulations. Be sure to read the Owner's Manual supplied with the equipment before operating it.

**WIRE ROPE ASSEMBLIES – sold separately**

- **Galvanized or Stainless Steel** wire rope assemblies with swaged ball fitting to work with the quick disconnect anchor on the winch.

**Wire Rope Assemblies – Section 9**

model number	wire rope diameter and length	approx. ship weight
galvanized aircraft cable with swivel hook and swaged ball fitting		
WA25-20NS	1/4 in x 20 ft	4 lb
WA25-28NS	1/4 in x 28 ft	5 lb
WA25-36NS	1/4 in x 36 ft	6 lb
WA25-45NS	1/4 in x 45 ft	7 lb
WA25-60NS	1/4 in x 60 ft	9 lb
WA25-75NS	1/4 in x 75 ft	10 lb
304 stainless steel wire rope with SS eye hook and swaged ball fitting - swivel hook also available please contact factory		
WS25-20NE	1/4 in x 20 ft	4 lb
WS25-28NE	1/4 in x 28 ft	5 lb
WS25-36NE	1/4 in x 36 ft	6 lb
WS25-45NE	1/4 in x 45 ft	7 lb
WS25-60NE	1/4 in x 60 ft	8 lb
WS25-75NE	1/4 in x 75 ft	10 lb

**ACCESSORIES – Section 4**

**Base Cover** – plastic cover fits in the mast hole in the base to help keep water from collecting inside the base when the crane is removed.



**TK4P**

**Drill-Motor Drive** – 7 amp, 400 rpm drill-motor to power drive the hand winch. Only available for cranes configured with the M2 winch option. 120 VAC drill-motor includes 1-1/8" hex socket drive.



**ED120BD 12 lb**

**Cable Spool** – stainless steel reel winds up wire rope when detached from crane.



**RW50 12 lb**

**Wire Rope Keeper** – metal bracket attaches to base or other structure to hold free end of the wire rope when detached from crane.



**B1766**

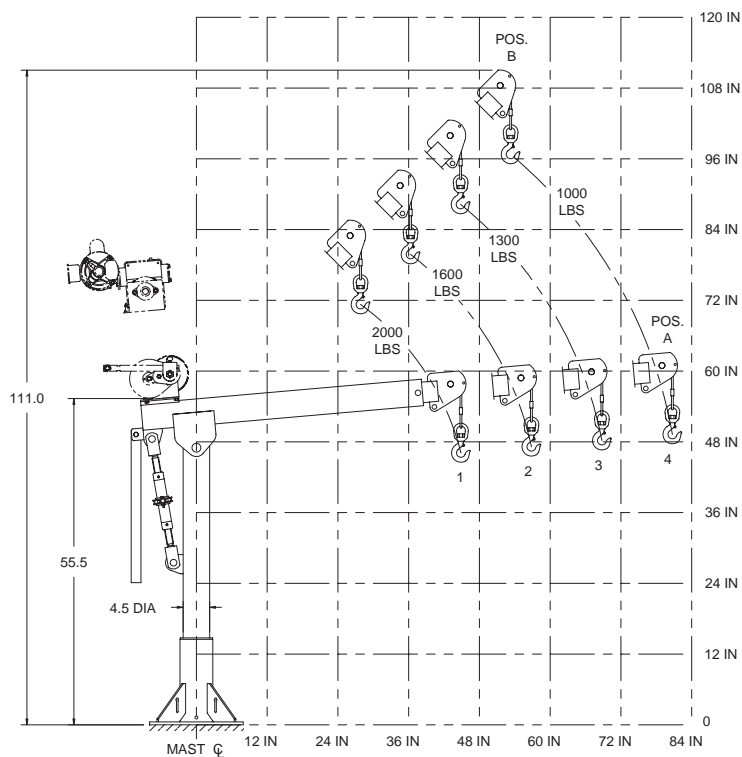
**Series 5124 Performance Characteristics**

wire rope dia.	wire rope length	load rating for 5124M1 and M3				load rating for 5124M2, E2, E4 and E4DC				lift below floor level (min – max) <sup>1</sup>
		position 1	position 2	position 3	position 4	position 1	position 2	position 3	position 4	
1/4 in	20 ft	2000 lb	1600 lb	1300 lb	1000 lb	2000 lb	1600 lb	1300 lb	1000 lb	0 – 4 ft
1/4 in	28 ft	1800 lb	1600 lb	1300 lb	1000 lb	1700 lb	1600 lb	1300 lb	1000 lb	8 – 12 ft
1/4 in	36 ft	1600 lb	1600 lb	1300 lb	1000 lb	1600 lb	1600 lb	1300 lb	1000 lb	16 – 20 ft
1/4 in	45 ft	1600 lb	1600 lb	1300 lb	1000 lb	1500 lb	1500 lb	1300 lb	1000 lb	25 – 29 ft
1/4 in	60 ft	1300 lb	1300 lb	1300 lb	1000 lb	1300 lb	1300 lb	1300 lb	1000 lb	40 – 44 ft
1/4 in	75 ft	–	–	–	–	1200 lb	1200 lb	1200 lb	1000 lb	55 – 59 ft
5/16 in	20 ft	2000 lb	1600 lb	1300 lb	1000 lb	2000 lb	1600 lb	1300 lb	1000 lb	0 – 4 ft
5/16 in	28 ft	1700 lb	1600 lb	1300 lb	1000 lb	1600 lb	1600 lb	1300 lb	1000 lb	8 – 12 ft
5/16 in	36 ft	1500 lb	1500 lb	1300 lb	1000 lb	1400 lb	1400 lb	1300 lb	1000 lb	16 – 20 ft
5/16 in	45 ft	1400 lb	1400 lb	1300 lb	1000 lb	1400 lb	1400 lb	1300 lb	1000 lb	25 – 29 ft

<sup>1</sup> Lift below floor level varies depending on boom position and base configuration. For longer lifts please contact factory.

See Dimensions on Next Page

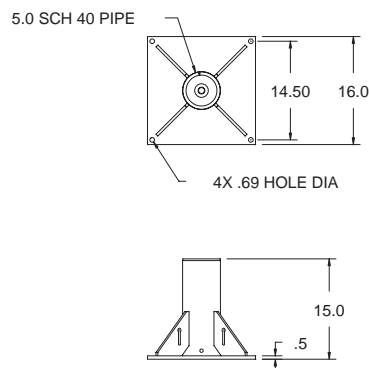
### 5124 with pedestal base mounted upright



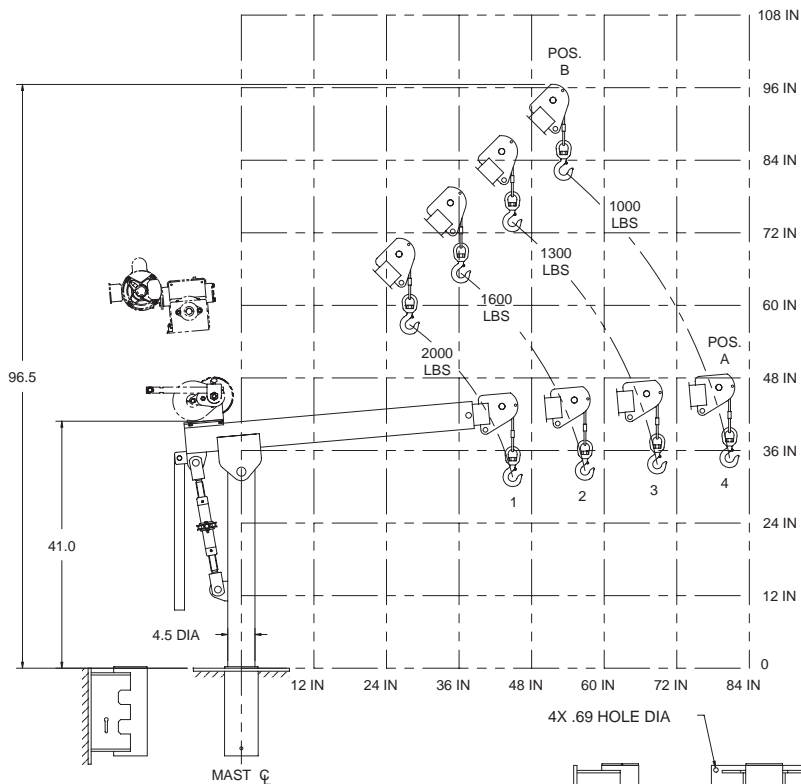
### 5124 Upright – Height and Reach

boom position	hook reach	hook height
A-1	45 in	46 in
A-2	57 in	47 in
A-3	69 in	48 in
A-4	81 in	49 in
B-1	28 in	71 in
B-2	36 in	80 in
B-3	45 in	88 in
B-4	53 in	97 in

Dimensions are for reference only and subject to change without notice.



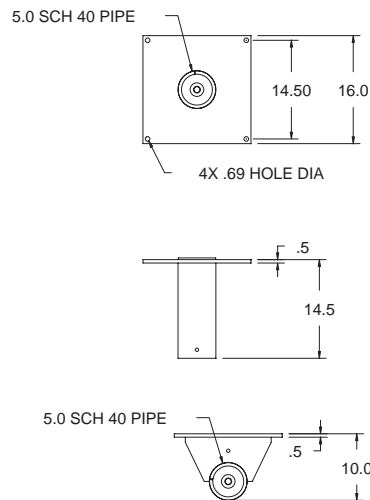
### 5124 with wall mount base or socket base mounted flush



### 5124 Flush – Height and Reach

boom position	hook reach	hook height
A-1	45 in	32 in
A-2	57 in	33 in
A-3	69 in	34 in
A-4	81 in	35 in
B-1	28 in	57 in
B-2	36 in	66 in
B-3	45 in	74 in
B-4	53 in	83 in

Dimensions are for reference only and subject to change without notice.



See Additional Dimensions on Next Page