



**Middle Atlantic Products, Inc.**  
an ISO 9001:2000 Registered Company

REVISION:	-
REV BY	AK
EFFECTIVE DATE:	08-09-13
PAGE	1 of 4

8.65 [220] /  
11.15 [283] /  
13.15 [334] /  
16.15 [410]

3/4" PLYWOOD (FOR STUD WALLS) AND OPTIONAL 5/8" GYPBOARD

WALL

2250 TYP

CG

CG DIMENSIONS (See chart)

CG

11.5 [292] /  
16.5 [419] /  
20.5 [520] /  
26.5 [673]

17.3 [439] / 22.3 [566]  
26.3 [668] / 32.3 [820]

DWR BACKPAN ANCHOR POINTS

16.00 TYP.

5.36

2.690

12.50 SQ. KNOCKOUT

1.890

0.406

OVERALL HEIGHT

FRONT VIEW, BACK PAN

MATERIAL: CRS 16GA  
.055-.065 (1.4 -1.65)

SEE TABLE  
(QUANTITY MOUNTING HOLES)

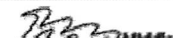

MOUNTING HOLES USED FOR:  
A. ANCHORING TO CONCRETE OR MASONRY WALLS, OR  
B. ANCHORING TO PLYWOOD BACKBOARD

TWO LINES OF SCREWS FOR ANCHORAGE OF PLYWOOD BACKBOARD TO STUD FRAMED WALLS (STUD LOCATIONS FOR FRAMED WALL - TYPICAL 16" ON CENTER). SEE TABLE 2 FOR QUANTITY OF SCREWS

2

REGISTERED PROFESSIONAL ENGINEER  
WILLIAM M. BROWN  
C 67887  
EXPIRES 6/2014  
CIVIL  
STATE OF CALIFORNIA



USER ID -- --	APPROVALS	DATE	 Middle Atlantic Products, Inc.	
NEXT ASSY: -- --	MODELED		TITLE DWR-SERIES OSHPD	
	DRAWN			
	CIRCLED DIMENSIONS ARE CRITICAL INSPECTION DIMENSIONS UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE: DECIMAL: ± .010 ±.003 DIM PLG ±.010			
MATERIAL: SEE COMPONENTS	FRACTIONS: ±1/32 ANGLES: 30° SCALE = 1/2"		PART NO.	PART REV.
FINISH: -- --			SIZE 3	EXF NO. NONE
-- --			DWG NO.	DWG REV.

THIS DRAWING CONTAINS TRADE INFORMATION  
DEEMED TO BE CONFIDENTIAL AND PROPRIETARY  
PROPERTY OF MIDDLE ATLANTIC PRODUCTS, INC.  
AND IS TO BE USED ONLY FOR THE PURPOSES FOR  
WHICH IT IS SUBMITTED AND FURTHER SHALL NOT  
BE COPIED IN WHOLE OR PART WITHOUT WRITTEN  
PERMISSION FIRST OBTAINED FROM MIDDLE  
ATLANTIC PRODUCTS, INC.



OPA-2709-10

REVISION:	-
REV BY	AK
EFFECTIVE DATE:	08-09-13
PAGE	2 of 4

DWR-SERIES OSHPD

DRAWING NOTES FOR DWR SERIES  
GENERAL

1. THE WORK SHOWN ON THESE DRAWINGS IS FOR THE SEISMIC ANCHORAGE OF THE SUBJECT RACK ENCLOSURES. MAXIMUM PERMISSIBLE CONTENT CAPACITIES APPLIES TO ALL HEIGHTS WITHIN THE BUILDING.

2. ANCHORAGE DESIGN HAS BEEN DONE IN ACCORDANCE WITH THE 2010 EDITION OF THE CALIFORNIA BUILDING CODE, PART 2, VOLUME 2 OF 2, AND ASCE 7-05, USING THE FOLLOWING PARAMETERS:

$I_p = 1.5$  (ESSENTIAL FACILITY INSTALLATIONS)

$S_{DS} = 1.93G$

$A_p = 1.0$  AND  $R_p = 1.5$  (ASCE TABLE 13.6-1)

$Z, H = \text{VARIES}$

LATERAL FORCE,  $F_{P,H} = [(0.4 A_p S_{DS} I_p W_p) / R_p] * (1 + 2 Z/H)$

VERTICAL FORCE,  $F_{P,V} = 0.2 S_{DS} W_p$

INSTALLATION NOTES

1. THE MAXIMUM PERMISSIBLE SEISMIC CONTENT CAPACITY OF THE RACK ENCLOSURE IS 140 POUNDS FOR ALL RACKS AND ALL HEIGHTS WITHIN THE BUILDING.

2. FOR STUD WALL APPLICATIONS, THE DWR SERIES RACK SHALL BE MOUNTED DIRECTLY TO A 3/4-INCH PLYWOOD BACKBOARD (STRUCTURAL I OR BETTER) WITH THE APPROPRIATE FASTENER LISTED IN TABLE 2.

3. WHEN MOUNTED TO A STRUCTURAL WALL OF WOOD OR METAL STUD-FRAMED CONSTRUCTION (2 X 4 DIMENSIONAL LUMBER, OR EQUIVALENT), THE PLYWOOD BACKBOARD SHALL BE ANCHORED WITH #12 X 2 1/2 INCH WOOD SCREWS CONFORMING TO ANSI/ASME STANDARD B18.6.1-1981 (8 TOTAL, OR 4 PER STUD).

4. WHEN MOUNTED TO A STRUCTURAL WALL OF COLD FORMED STEEL STUDS, THE PLYWOOD BACKBOARD SHALL BE ANCHORED WITH #12-14 HWH X 2 1/2 INCH HILTI SELF-DRILLING SCREWS CONFORMING TO ESR-2196 AND MANUFACTURER'S RECOMMENDED INSTALLATION (8 TOTAL, OR 4 PER STUD). STUDS SHALL BE GAGE 20 (0.036 INCH) OR THICKER WITH MINIMUM TENSILE STRENGTH (FU) OF 45 KIPS PER SQUARE INCH (KSI).

5. WHEN MOUNTED TO A STRUCTURAL WALL OF C-SHAPED STEEL STUDS, THE PLYWOOD BACKBOARD SHALL BE ANCHORED WITH SHEET METAL SCREWS, 0.25 INCH DIAMETER X 2 1/2 INCH, CONFORMING TO AC118 AND MANUFACTURER'S RECOMMENDED INSTALLATION (12 TOTAL, 6 PER STUD). STUDS SHALL BE GAGE 18 (0.043 INCH) OR THICKER WITH CHANNEL DEPTH OF 3.625 INCH OR MORE, AND FLANGE WIDTH OF 1.625 INCH OR MORE. MINIMUM YIELD STRENGTH (FY) OF 33 KSI AND TENSILE STRENGTH OF 52 KSI.

6. WHEN MOUNTED TO A STRUCTURAL WALL OF REINFORCED CONCRETE, THE DWR SERIES RACK SHALL BE ANCHORED TO THE WALL WITH ONE OF THE FOLLOWING TWO TYPES MANUFACTURED BY HILTI, INC. OF CARBON STEEL WITH DIAMETER, EMBEDMENT, AND SPACING AS SHOWN ON THE DRAWINGS:

- HILTI HDA-P (PRESET CONFIGURATION) UNDERCUT ANCHORS (ICC ESR 1546)

- HILTI KWIK BOLT TZ (KB-TZ) EXPANSION ANCHORS (ICC ESR 1917)

THE CONCRETE WALL SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES AND A MINIMUM CONCRETE COMPRESSION STRENGTH (F'C) OF 2,500 POUNDS PER SQUARE INCH (PSI) UNLESS OTHERWISE NOTED.

7. WHEN MOUNTED TO A STRUCTURAL WALL OF FULLY-GROUTED UNCRACKED MASONRY CONFORMING TO ASTM C90, THE DWR SERIES RACK SHALL BE ANCHORED TO THE WALL WITH ONE OF THE FOLLOWING TWO TYPES MANUFACTURED BY HILTI, INC. OR POWERS FASTENERS, INC., RESPECTIVELY, WITH DIAMETER, EMBEDMENT, AND SPACING AS SHOWN ON THE DRAWINGS:

- HILTI KWIK BOLT 3 MASONRY EXPANSION ANCHORS (ICC ESR 1385)

- POWERS WEDGE-BOLT+ MASONRY SCREW ANCHORS (ICC ESR 1678)

THE MASONRY UNITS SHALL HAVE A MINIMUM THICKNESS OF 6 INCHES AND A MINIMUM COMPRESSION STRENGTH (F'M) OF 1,500 POUNDS PER SQUARE INCH (PSI) UNLESS OTHERWISE NOTED.

8. DOCUMENTATION VERIFYING CONCRETE OR MASONRY COMPOSITION, STRENGTH, AND THICKNESS SHALL BE SUBMITTED TO THE ENFORCEMENT AGENCY.

9. INSTALLATION OF THE RACK ENCLOSURES IS LIMITED TO INTERIOR OR ENVIRONMENTALLY PROTECTED LOCATIONS.



USED ON	APPROVALS	DATE	Middle Atlantic Products, Inc.	
MODELED				
DRAWN			TITLE DWR-SERIES OSHPD	
NEXT ASSY				
MATERIAL: SEE COMPONENTS			PART NO.	PART REV
FINISH			SIZE 3	SWF NO. NONE
			SVG NO.	SVG REV



THIS DRAWING CONTAINS TRADE INFORMATION  
DEEMED TO BE CONFIDENTIAL AND PROPRIETARY  
PROPERTY OF MIDDLE ATLANTIC PRODUCTS, INC.  
AND IS TO BE USED ONLY FOR THE PURPOSES FOR  
WHICH IT IS SUBMITTED AND FURTHER SHALL NOT  
BE COPIED IN WHOLE OR PART WITHOUT WRITTEN  
PERMISSION FIRST OBTAINED FROM MIDDLE  
ATLANTIC PRODUCTS, INC.



OPA-2709-10

REVISION:	-
REV BY	AK
EFFECTIVE DATE:	08-09-13
PAGE	3 of 4

DWR-SERIES OSHPD

10. LOCATE ALL EXISTING REINFORCING BARS WITHIN 12 INCHES OF PROPOSED ANCHOR LOCATIONS PRIOR TO DRILLING FOR CONCRETE ANCHORS. DO NOT CUT, CORE, OR DRILL THROUGH EXISTING REINFORCING BARS WITHOUT PRIOR APPROVAL FROM THE SEOR.
11. ALL CONCRETE ANCHORS SHALL BE INSTALLED WITH PROPER TOOLS AND PROCEDURES IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ICC EVALUATION SERVICE REPORTS REFERENCED ABOVE.
12. CONCRETE AND MASONRY ANCHORS REQUIRE SPECIAL INSPECTION FOR INSTALLATION IN ACCORDANCE WITH CBC CHAPTER 17A.

#### ANCHOR TESTING NOTES

1. TENSION TESTING OF EXPANSION ANCHORS PER 2010 CBC, 1916A.7, SHALL OCCUR 24 HOURS OR MORE AFTER INSTALLATION OF THE CONCRETE ANCHORS.
2. APPLY TENSION TEST LOADS TO THE CONCRETE ANCHORS WITHOUT REMOVING THE NUT. IF NUT REMOVAL IS REQUIRED, REMOVE THE NUT AND INSTALL A THREADED COUPLER TO THE SAME TORQUE AS THE ORIGINAL NUT USING A TORQUE WRENCH AND THEN APPLY THE TEST LOAD.
3. REACTION LOADS FROM TEST FIXTURES MAY BE APPLIED IN CLOSE PROXIMITY TO THE ANCHOR BEING TESTED PROVIDED THE ANCHOR IS NOT RESTRAINED FROM WITHDRAWING BY THE FIXTURES.
4. TEST EQUIPMENT SHALL BE CALIBRATED BY AN APPROVED TESTING LABORATORY IN ACCORDANCE WITH STANDARD RECOGNIZED PROCEDURES.
5. ONE HALF (50%) OF EACH APPLICATION OF CONCRETE ANCHORS SHALL BE TESTED IN TENSION FOR 3 MINUTES ACCORDING TO THE TEST LOADS SHOWN IN TABLE 3. ONE APPLICATION OF ANCHORS SHALL BE DEFINED AS THOSE ANCHORS INSTALLED BY A SINGLE CREW IN A SINGLE DAY. IF ANY ANCHOR FAILS, IT SHALL BE REPLACED, RE-TESTED, AND ALL ANCHORS IN THE SAME APPLICATION SHALL BE TESTED. IF ANY ANCHOR FAILS, ALL PREVIOUSLY UNTESTED ANCHORS INSTALLED BY THAT CREW SHALL BE TESTED UNTIL TWENTY (20) CONSECUTIVE ANCHORS PASS, THEN RESUME 50% TESTING.
6. TENSION TESTING OF THE CONCRETE ANCHORS SHALL BE DONE IN THE PRESENCE OF THE INSPECTOR-OF-RECORD AND A REPORT OF THE TEST RESULTS SHALL BE SUBMITTED TO THE ENFORCEMENT AGENCY.

7. THE TENSION TEST OF AN ANCHOR SHALL BE ACCEPTED IF THERE IS NO OBSERVABLE MOVEMENT DURING THE APPLICATION OF THE TEST LOAD. A PRACTICAL WAY TO DETECT OBSERVABLE MOVEMENT IS WHETHER THE WASHER UNDER THE NUT BECOMES LOOSE.

TABLE 2: SUMMARY OF ACCEPTABLE FASTENERS

Component	Mounting Material	Fastener
DWR Series Wall Mount Rack Enclosures	¾ inch plywood backboard	3/8" dia x 1 inch lag screws conforming to ANSI/ASME Standard B18.2.1 (1 screw per Mounting Hole)
Plywood Backboard	Wood stud-framed wall with 16-inch or 24-inch stud spacing	#12 x 2½ inch wood screws conforming to ANSI/ASME Standard B18.6.1-1981 (8 Total, 4 per stud)
Plywood Backboard	Cold Formed Steel (CFS) stud-framed wall – with thickness ≥ 0.036" (20 gage) and Fu ≥ 45ksi	Hilti Self-Drilling Screws, #12-14 HWH x 2 ½ inch conforming to ESR-2196 and following Manufacturer's recommended installation. (8 Total, 4 per stud)
Plywood Backboard	C-shaped Steel stud-framed wall – with thickness ≥ 0.043" (18 gage), depth ≥ 3.625", flange width ≥ 1.625", Fy ≥ 33ksi, Fu ≥ 52ksi	Sheet Metal Screws (attached to Steel Framing), 0.25" dia x 2 ½ inch conforming to AC118 and following manufacture's recommended installation. (12 Total, 6 per stud)
DWR Series Wall Mount Rack Enclosures	6-inch (min) reinforced concrete wall	Anchors per Table 3 (1 anchor per Mounting Hole)
DWR Series Wall Mount Rack Enclosures	Uncracked, fully-grouted masonry wall	Anchors per Table 4 (1 anchor per Mounting Hole)



USED ON	APPROVALS	DATE
MODELED		
DRAWN		
INSPECTION DIMENSIONS		
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN INCHES		
TOLERANCES ARE:		
DECIMAL: ± 0.015		
FRACTIONS: ± 1/32		
ANGLES: ± 1°		
SCALE: 1/8" = 1'-0"		
FINISH		
MIDDLE ATLANTIC PRODUCTS, INC.		
TITLE	DWR-SERIES OSHPD	
PART NO.		PART REV
SIZE		
DWG NO.	NONE	
DWG REV		

THIS DRAWING CONTAINS TRADE INFORMATION  
DEEMED TO BE CONFIDENTIAL AND PROPRIETARY  
PROPERTY OF MIDDLE ATLANTIC PRODUCTS, INC.  
AND IS TO BE USED ONLY FOR THE PURPOSES FOR  
WHICH IT IS SUBMITTED AND FURTHER SHALL NOT  
BE COPIED IN WHOLE OR PART WITHOUT WRITTEN  
PERMISSION FIRST OBTAINED FROM MIDDLE  
ATLANTIC PRODUCTS, INC.



OPA-2709-10

REVISION:	-
REV BY	AK
EFFECTIVE DATE:	08-09-13
PAGE	4 of 4

DWR-SERIES OSHPD

TABLE 3: CONCRETE ANCHORS AND TEST LOADS FOR NORMAL-WEIGHT CONCRETE (F'C = 2,500 PSI)

ANCHOR TYPE	OUTSIDE DIAMETER (INCHES)	MINIMUM EMBEDMENT (INCHES)	MIN EDGE DISTANCE (INCHES)	TENSION TEST LOAD (LBS)
HDA-P	3/4 (M10)	4	6	6255
KB-TZ	3/8	2	5	1580

NOTES:

- WHEN USED IN LIGHT-WEIGHT CONCRETE, ANCHOR TEST LOADS ARE MULTIPLIED BY 0.60.
- TEST LOADS ARE BASED ON OSHPD 'CODE APPLICATION NOTICE' 2-1916A.8 METHOD 2; 2 TIMES THE MAXIMUM ALLOWABLE TENSION LOAD BUT NOT TO EXCEED 80% OF NOMINAL ANCHOR YIELD STRENGTH.
- MINIMUM EDGE DISTANCE IS BASED ON THE LARGER OF 1.5 TIMES THE ANCHOR EMBEDMENT DEPTH OR THE ICC ESR REPORTED MINIMUM EDGE DISTANCE

TABLE 4: ANCHORS FOR UNCRACKED FULLY GROUTED MASONRY

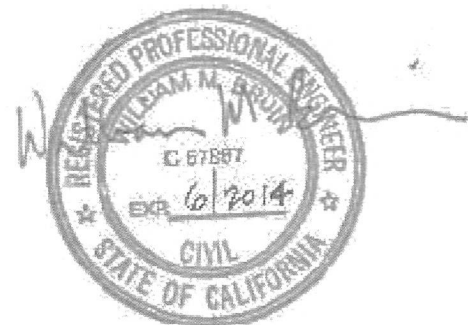
ANCHOR TYPE	OUTSIDE DIAMETER (INCHES)	MINIMUM EMBEDMENT (INCHES)	MIN EDGE DISTANCE (INCHES)
KWIK BOLT 3	3/8	2.5	4
WEDGE-BOLT+	1/2	2	12

NOTES:

- MINIMUM EDGE DISTANCE IS BASED ON THE ICC ESR REPORTED MINIMUM EDGE DISTANCE

RESPONSIBILITIES OF THE STRUCTURAL ENGINEER-OF-RECORD (SEOR)

- THE SEOR SHALL DETERMINE THE MODEL NUMBER OF THE UNIT TO BE USED.
- SEOR SHALL VERIFY THAT A PLACARD IS PLACED ON THE RACK STATING THE FOLLOWING:
  - UNIT MODEL NUMBER.
  - NAME OF THE BUILDING IN WHICH IT WILL BE INSTALLED.
  - MAXIMUM WEIGHT OF THE CONTENTS THAT CAN BE STORED ON THE RACK IS 140 POUNDS.
- SEOR SHALL VERIFY THAT THE STRUCTURAL WALL MEETS THE REQUIREMENTS OF THIS PRE-APPROVAL.
- SEOR SHALL VERIFY THAT THE EXISTING STRUCTURE IS ADEQUATE TO SUPPORT THE LOADS AND FORCES IMPOSED ON IT BY THIS UNIT IN ADDITION TO ALL OTHER LOADS AND FORCES.
- FOR ANCHORAGE TO FULLY GROUTED MASONRY, SEOR SHALL VERIFY THAT THE MASONRY WALL REMAINS UNCRACKED PER ICC-ES AC 01 AND THE APPLICABLE ESR REPORT FOR THE ANCHORS.
- THE SEOR SHALL VERIFY THAT THE WEIGHT OF RACK ENCLOSURE CONTENTS DOES NOT EXCEED THE APPROVED CAPACITY FOR THE LOCATION OF INSTALLATION
- VERIFY THAT THE CONCRETE OR MASONRY WALL TO WHICH THE EQUIPMENT IS ANCHORED MEETS ALL REQUIREMENTS OF THE APPLICABLE ICC ESR.
- VERIFY THAT THE EXPANSION ANCHORS ARE AN ADEQUATE DISTANCE FROM ANY EDGES OR OPENINGS.
- VERIFY THAT ALL NEW OR EXISTING ANCHORS ARE AN ADEQUATE DISTANCE FROM THE ANCHORS SHOWN IN THIS PRE-APPROVAL. VERIFY THAT THERE IS NO ADVERSE INTERACTION WHERE OTHER ANCHORS ARE WITHIN 18 INCHES OR  $6 \cdot (H_{EF})$  FROM THIS UNIT'S ANCHORS.
- VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2010 CBC AND THE DETAILS SHOWN IN THIS PRE-APPROVAL.
- VERIFY THAT THE MATERIAL AND GAGE OF THE UNITS WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PRE-APPROVAL DOCUMENTS.



USED ON	APPROVALS	DATE
MODELED		
DRAWN		
INSPECTED		
TESTED		
SEE COMPONENTS		
FINISH		
SCALE = 3/4"		
Middle Atlantic Products, Inc.		
TITLE DWR-SERIES OSHPD		
PART NO.	PART REV	
SIZE 3	DWG NO. NONE	
DWG NO.	DWG REV	