

19-187833FS

SCANNED

AUG 26 2020

GENERATOR DIESEL STORAGE TANK PERMIT APPLICATION

PBHB CANVAS

~~817 SW 17TH AVE~~
1750 SW Lam hill
PORTLAND, OR 97205

19-187833 ES

IES COMMERCIAL
16135 SW 74TH AVE
TIGARD, OR 97224
503-648-1900
JOB # 311 170 029

IES® We power
progress

1750 SW YAMHILL ST

19-187833-000-00-FS

Fire Systems Permit

Hazardous Materials/New

Recd: 07/02/19

1750 SW YAMHILL ST

HAZARDOUS/TANK - FUEL STORAGE TANK FOR GENERATOR- 339 GAL SUB-BASE
DIESEL FUEL, REMOTE FILL FUEL PIPING AND EXHAUST VENT PIPING

R667734620

1N1E33DC 03000

Addition PORTLAND

Lot/Blk1/Legal BLOCK 328

Lot/Blk2 LOT 1&2&7&8

Applicant

MATT SAAGER-IES COMMERCIAL INC
16135 SW 74TH AVE
TIGARD, OR 97224

Work 5036481900

Cellular 5033105111

Owner

URG OPB 17TH AVENUE LLC
1425 4TH AVE #500
SEATTLE, WA 98101

Fire Contractor

MATT SAAGER-IES COMMERCIAL INC
16135 SW 74TH AVE
TIGARD, OR 97224

Work 5036481900

Cellular 5033105111

Project Details:

Fire System Valuation	154073
Building, New Const or Existing	New Construction
Location	Above Ground/Inside
Product	Liquids/Tanks
Product Stored in Tank	DIESEL
Tank Capacity	339
Tank Material	CONCRETE/STEEL
Tank Wall Construction	Double Wall

8-21-19 OK to Issue J. Prynne

7-29-20 OK TO FINAL. SILVA

CANVAS	
DIPSTICK CHART FOR GENERATOR FUEL TANK	
INCHES OF FUEL ON DIPSTICK	MEASURED GALLONS
0.5	7.5
1.0	15.0
1.5	22.6
2.0	30.2
2.5	37.7
3.0	45.3
3.5	52.8
4.0	60.3
4.5	67.9
5.0	75.4
5.5	83.0
6.0	90.5
6.5	98.1
7.0	105.6
7.5	113.1
8.0	120.7
8.5	128.2
9.0	135.8
9.5	143.3
10.0	150.9
10.5	158.4
11.0	165.9

CANVAS	
DIPSTICK CHART FOR GENERATOR FUEL TANK	
INCHES OF FUEL ON DIPSTICK	MEASURED GALLONS
11.5	173.5
12.0	181.0
12.5	188.6
13.0	196.1
13.5	203.7
14.0	211.2
14.5	218.7
15.0	226.3
15.5	233.8
16.0	241.4
16.5	248.9
17.0	256.5
17.5	264.0
18.0	271.5
18.5	279.1
19.0	288.6
19.5	294.2
20.0	301.7
20.5	309.3
21.0	316.8
21.5	324.3
22.0	331.9
22.5	339.4

C13/C15/C18 Dip Charts for Fuel Tanks

U.S. Sourced
Diesel Generator Set
350-600 kW 60 Hz

Integral Tanks

C13 Integral Fuel Tank FTDW013				C15 Integral Tanks FTDW001/2			
Inches of Fuel on Dipstick	Measured Gallons	Inches of Fuel on Dipstick	Measured Gallons	Inches of Fuel on Dipstick	Measured Gallons	Inches of Fuel on Dipstick	Measured Gallons
0.5	18.4	13.0	477.6	0.5	7.5	13.0	196.1
1.0	36.7	13.5	496.0	1.0	15.1	13.5	203.7
1.5	55.1	14.0	514.4	1.5	22.6	14.0	211.2
2.0	73.5	14.5	532.7	2.0	30.2	14.5	218.7
2.5	91.9	15.0	551.1	2.5	37.7	15.0	226.3
3.0	110.2	15.5	569.5	3.0	45.3	15.5	233.8
3.5	128.6	16.0	587.8	3.5	52.8	16.0	241.4
4.0	147.0	16.5	606.2	4.0	60.3	16.5	248.9
4.5	165.3	17.0	624.6	4.5	67.9	17.0	256.5
5.0	183.7	17.5	643.0	5.0	75.4	17.5	264.0
5.5	202.1	18.0	661.3	5.5	83.0	18.0	271.5
6.0	220.4	18.5	679.7	6.0	90.5	18.5	279.1
6.5	238.8	19.0	698.1	6.5	98.1	19.0	286.6
7.0	257.2			7.0	105.6	19.5	294.2
7.5	275.6			7.5	113.1	20.0	301.7
8.0	293.9			8.0	120.7	20.5	309.3
8.5	312.3			8.5	128.2	21.0	316.8
9.0	330.7			9.0	135.8	21.5	324.3
9.5	349.0			9.5	143.3	22.0	331.9
10.0	367.4			10.0	150.9	22.5	339.4
10.5	385.8			10.5	158.4		
11.0	404.1			11.0	165.9		
11.5	422.5			11.5	173.5		
12.0	440.9			12.0	181.0		
12.5	459.3			12.5	188.6		

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2.0	73.5	14.5	532.7	2.0	30.2	14.5	218.7
2.5	91.9	15.0	551.1	2.5	37.7	15.0	226.3
3.0	110.2	15.5	569.5	3.0	45.3	15.5	233.8
3.5	128.6	16.0	587.8	3.5	52.8	16.0	241.4
4.0	147.0	16.5	606.2	4.0	60.3	16.5	248.9
4.5	165.3	17.0	624.6	4.5	67.9	17.0	256.5
5.0	183.7	17.5	643.0	5.0	75.4	17.5	264.0
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6.5	238.8	19.0	698.1	6.5	98.1	19.0	286.6
7.0	257.2			7.0	105.6	19.5	294.2
7.5	275.6			7.5	113.1	20.0	301.7
8.0	293.9			8.0	120.7	20.5	309.3
8.5	312.3			8.5	128.2	21.0	316.8
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AMANDA 4.4.30.1053010 - User Coffey,Susan Signed on to AMANDA at trprod

File Data Search Edit Actions Reports Window Help

19-18783315

Close Update Pick Accept Retrieve Detail Query To-Do List Reports Permit/Case Property People Previous Next Add Log Off

Press Blocks Office Building Half Block Development [CO]

Folder Property People Info Fee/Charge Process Process Select Document File Inspection Req. Comment Attachm

Folder #	F ^
2016 281409 000 00 WT	TH04
2016 285370 000 00 WE	EP32
2017 101113 000 00 TR	
2017 157456 000 00 TR	
2017 174094 000 00 TR	
2017 182179 000 00 CO	PM
2017 182179 REV 01 CO	PM
2017 182179 DMO 01 CO	
2017 182179 SDC 01 TS	
2017 182179 DFS 01 CO	PM
2017 182179 REV 02 CO	PM
2017 182179 DFS 02 CO	PM
2017 182179 SDC 02 PK	
2017 182179 REV 03 CO	PM
2017 182179 DFS 03 CO	PM
2017 182179 REV 04 CO	PM
2017 182179 DFS 04 CO	PM
2017 182179 REV 05 CO	PM
2017 182179 DFS 05 CO	PM
2017 182179 REV 06 CO	PM
2017 182179 DFS 06 CO	PM
2017 182179 REV 07 CO	PM
2017 182179 DFS 07 CO	PM

Cen Yr Sequence Sec Rev Folder Type
Folder 20 17 182179 000 00 CO Commercial Building Permit

Property

House # Prefix Street Type Direction Unit Type Un
Address 1750 SW YAMHILL ST
City Zip State ID Property R:
97205 1N1E33DC 03000 2,188
Location 1750 SW YAMHILL ST (8 STORY OFFICE BLDG, LOBBY)
PORTLAND, BLOCK 328, LOT 1&2&7&8, LAND & IMPS SEE R646216 Property Ur

In Date Jun 6, 2017 Issue Date Oct 15, 2018 E
Reference File # PM By Gondoputro,Aan Final
Sub Type Business Work Proposed New Construction
Folder Name Press Blocks Office Building Half Block Development P
Description New 8 story office building with 1.5 levels of below grade parking
Conditions Appeal ID 15833, 15983, 16198 (see attached documents) WQBF - RPDA rec
sprinkler water service and a RPBA on new domestic (See Vol. 1 Sheet P1.0
be installed meeting all applicable Water Bureau installation requirements.
Group Construction ParentRSN 3791612

AMANDA 4.4.30.1053010 - User Coffey,Susan Signed on to AMANDA at trprod

File Data Search Edit Actions Reports Window Help



Press Blocks Office Building Half Block Development [CO]

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2017 101113 000 00 TR		DS-Fireproofing - Deferred																																	
2017 157456 000 00 TR		DS-Post Tension																																	
2017 174094 000 00 TR		DS-Attachment of Equipment																																	
2017 182179 000 00 CO	PM	FIRE																																	
2017 182179 REV 01 CO	PM	Maintain Current Fire Protection?																																	
2017 182179 DMO 01 CO		Separate Sprinkler Permit Required?																																	
2017 182179 SDC 01 TS		Type of Sprinkler System Req'd																																	
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2017 182179 SDC 02 PK		<table border="1"> <thead> <tr> <th>Description</th> <th>Mand.</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>FIRE</td> <td></td> <td></td> </tr> <tr> <td>Separate Fixed Systems Permit Required?</td> <td></td> <td></td> </tr> <tr> <td>Separate Hydrant Permit Required?</td> <td></td> <td></td> </tr> <tr> <td>Sep. Tank/Process Piping Permit Req'd?</td> <td><input checked="" type="checkbox"/></td> <td>Yes</td> </tr> <tr> <td>Separate Stand Pipes Permit Required?</td> <td><input checked="" type="checkbox"/></td> <td>Yes</td> </tr> <tr> <td>Sep.Underground Fire Mains Permit Req'd?</td> <td><input checked="" type="checkbox"/></td> <td>Yes</td> </tr> <tr> <td>Required Fire Flow</td> <td></td> <td></td> </tr> <tr> <td>INTAKE</td> <td></td> <td></td> </tr> <tr> <td>Document Services - Bin Number</td> <td></td> <td>FC CO 6 (no scan set at issuance) (re</td> </tr> <tr> <td>Partial Permit?</td> <td></td> <td></td> </tr> </tbody> </table>	Description	Mand.	Value	FIRE			Separate Fixed Systems Permit Required?			Separate Hydrant Permit Required?			Sep. Tank/Process Piping Permit Req'd?	<input checked="" type="checkbox"/>	Yes	Separate Stand Pipes Permit Required?	<input checked="" type="checkbox"/>	Yes	Sep.Underground Fire Mains Permit Req'd?	<input checked="" type="checkbox"/>	Yes	Required Fire Flow			INTAKE			Document Services - Bin Number		FC CO 6 (no scan set at issuance) (re	Partial Permit?		
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WE RESPOND
Always Ready
Always There

CITY OF
PORTLAND, OREGON
 BUREAU OF FIRE & RESCUE
BUREAU OF DEVELOPMENT SERVICES
 1900 SW 4TH Avenue Suite 2100
 Portland, Oregon 97201

FIRE SAFETY PLAN REVIEW CHECKSHEET

Application #: **17-182179-000-00-CO**

Commercial Building Permit

Review Date: July 14, 2017

To:	PWP CONTRACT OR	GBD ARCHITECTS, INC *MICHELLE SCHULZ* GBD ARCHITECTS, INC 1120 NW COUCH, SUITE 300 PORTLAND, OR 97209	Work:	(503) 224-9656
			Home:	(503) -
			e-Mail:	michelles@gbdarchitects.com
From:	Fire	Joe Thornton	Phone:	503-823-4280
			e-Mail	Joe.Thornton@portlandoregon.gov
cc:	OWNER	URG OPB 17TH AVENUE LLC 1425 4TH AVE #500 SEATTLE, WA 98101		

PROJECT INFORMATION

Street Address: **817 SW 17TH AVE**

Description of Work: New 8 story office building with 1.5 levels of below grade parking

The following items are in apparent violation of the specific codes or laws noted.

Item #	Location on plans	Code Section	Clarification / Correction Required
			You are required to submit a written plan of correction for each review comment below. Please include a copy of the checksheet with your responses. If major revisions are required, revised plans for that portion may be necessary to resubmit.
1.	G090	City of Portland, Title 31	Application for separate permits shall be obtained from the Fire Marshal's Office, 1300 SE Gideon Street, prior to the installation of the following: fire sprinklers, fire alarm systems, fire pumps, underground fire lines, fixed extinguishing systems, in-building radio enhancement systems, stationary generators and hazardous material tanks and related equipment. Thank you for creating the Separate Permits to be Obtained from the Fire Marshal's Office section. Please remove the stationary generator and replace with hazardous materials diesel tank (for the emergency generator).
2.	G090	PFC 105	Please update Applicable Codes to read 2016 Portland Fire Code. See link to this at https://www.portlandoregon.gov/fire/48127 for additional requirements related to a high-rise (items #15 & 17 below).
3.	G090	PFC 404	An approved Fire Safety Plan, Fire Evacuation Plan, and Building Information Card shall be prepared and approved prior to Fire Final. Thank you for showing these as deferred submittals. Please submit draft versions of these 3 documents with your checksheet response.
4.	G090	PFC 105	Appeals. Please provide any granted appeal information in the drawings. Please

FIRE SAFETY PLAN REVIEW CHECKSHEET		Application #	17-182179-000-00-CO
		Review Date:	July 14, 2017

			include the appeal ID#, a brief narrative of the appeal, and any conditions proposed or required.
5.	Elevations	PFC 505.1, 506.1	Please show the location of the assigned posted address and KnoxBox in the drawings on the elevations.
6.		PFC Ch. 3	Level 7 amenities deck and penthouse lounge deck. Will there be any BBQ's or firepits/fireplaces associated with these spaces? An open flame on a rooftop would require an administrative appeal. See attachment. This may result in further checksheet items.
7.		PFC 609	Penthouse level lounge. Will there be a stove in this space that would require a type 1 or 2 hood? This may result in further checksheet items.
8.		PFC 507.1	Please provide verification of the required fire flow at 20 psi residual. Information of available fire flow can be obtained by the Portland Water Bureau by emailing wbfireflow@portlandoregon.gov . This is for the fire hydrant closest to the FDC. Please submit the email from PWB with your checksheet response.
9.		PFC 509.1, 605.3.1	Rooms containing fire protection equipment (air-conditioning systems, fire sprinkler risers and valves or other fire detection, suppression or control elements) and electrical, mechanical, and elevator machine rooms shall be identified in an approved manner. Required signs shall be constructed of durable materials, permanently installed and readily visible. Thank you for the note on G090 but where are they shown on the door schedule on sheets A020 & 021 as indicated? Please update the drawings.
10.		PFC 504.3	Please provide a note on the plans that stairways that access the roof are to be marked at street level and floor levels with a sign indicating that the stairway continues to the roof. Please state this in the drawings, and show the locations of the posted signs.
11.		PFC 508.1.3	The fire command center does not appear to be the code required minimum 200 sq. ft. with the least dimension of 10'? Please update the drawings.
12.		OFC 903.3.5.2	The minimum capacity of the on-site secondary water supply tank shall supply the maximum sprinkler demand including 100 gpm inside hose. The minimum water supply shall be available for the duration specified in NFPA 13 based on the highest hazard protected by the system. Sufficient tank depth to meet the pump manufactures minimum submergence for pump impellers shall also be considered in sizing the tank. Please verify the calculations used for the sizing of the tank.
13.	G&A101, A204	PFC Ch. 57, NFPA30	The proposed locations of the remote fill station, tank vents and engine exhaust termination do not meet applicable code requirements. Briefly, the remote fill is required to be outside, the tank vents 5' from openings (including exhaust gas and combustion/cooling air openings), and exhaust gas termination 10' from openings and 3' from tank vents. See attachments. Please update the drawings.
14.	G090	NFPA20	Assuming the fire pump is electric, please indicate on the plans that the emergency generator will provide a minimum on-site fuel supply to accommodate at least 8-hours at full-demand of all required emergency equipment.
15.	G090	PFC 909.16	This is a Portland amendment to the Oregon and International Fire Code. Smoke control panel shall include a visual depiction of the building showing typical floor plan(s) with locations of exit enclosures and elevator shafts. The panel shall also include section views of the building to show the extent of travel for each exit enclosure and elevator. Exit enclosures and elevator shafts shall be labeled on the plan section views to match the labeling used in the building itself. Please state this in the drawings.
16.	G090	PFC 914.3.1.2, Portland Design Manual	Please state that required fire pumps shall be supplied by connections to a minimum of two water mains located in different streets. With the requirement of an on-site water supply, this section actually requires that the on-site supply be supplied by two separate water mains due to the fire pump(s) taking suction from the fire sprinkler tank. Public water supply connections shall be designed to refill

FIRE SAFETY PLAN REVIEW CHECKSHEET	Application #	17-182179-000-00-CO
	Review Date:	July 14, 2017

			the tank at a rate of at least what is equal to or greater than the maximum system demand. Applicant has the option to contest this issue and submit and administrative building appeal. Applicants have been successful through the appeal process for this requirement with the on-site water supply tank designed to the Portland Fire & Rescue Design Manual standards. If successfully appealed, please provide appeal ID#, brief narrative of appeal, and any conditions proposed or required in the drawings (listed with any other approved appeals). Please see the searchable appeal database on the CofP website for precedence. Please call if any clarification is required.
17.		PFC 508	Please list all of the 19 required features for the fire command center in the drawings (as a note on A1.1). Please notice that item #19 in the PFC is a Portland amendment to the Oregon and International Fire Code (#19 On-site fire protection water tank fill valve control switch, tank level indicators, tank low level alarm, and tank fill signals). Please also note, in the required features list, the requirements for the smoke control panel (see item #15 above).
18.		OSSC 403.4.7	If it is proposed that fire fighters will have the ability to clear glazing, then safety glazing will be required. For fixed glazing that is meant to be cleared by the fire personnel, Portland Fire and Rescue requires tempered glass with PF&R window stickers to make these tempered panels easily identifiable to the fire personnel. These stickers may be ordered at the Bureau of Development Services (building department), Printing and Distribution, 1 st floor 1900 SW 4th. Please indicate how smoke removal will be achieved for post-fire salvage and overhaul operations in the drawings, to be reviewed by the Life Safety reviewer.
19.	A202	PFC 912.2	Fire department connections shall be located on the street side of buildings, fully visible and recognizable from the street and within 150 feet of a public fire hydrant. Signage to be mounted on all fire department connections serving automatic sprinklers, standpipes or fire pump connections and be visible from the public right-of-way. Where the building is protected by a fire pump, signage shall also indicate the design pressure of the fire pump. Please show the required signage indicating the fire pump design pressure (amount of pressure supplied by a fire engine) in the drawings.
20.	G090	PFC 904	Standpipe Systems. If pressure reducing valves (PRV) are required due to pressures in the sprinkler system exceeding 175 psi, the minimum drain size shall be 3". Accommodations shall be designed to allow for annual flow testing of each PRV. Please state this in the drawings.

To respond to this checksheet, come to Permitting Services located at 1900 SW Fourth Ave., 2nd Floor, and update all four sets of the originally submitted drawings. To update the drawings, you may either replace the original sheets with new sheets, or edit the originally submitted sheets. (Specific instructions for updating plans are posted in Document Services.)

Please complete the attached Checksheet Response Form and include it with your re-submittal.

If you have specific questions concerning this Checksheet, please call me at the phone number listed above. To check the status of your project, go to <http://www.portlandonline.com/bds/index.cfm?c=34194>. Or, you may request the status to be faxed to you by calling 503-823-7000 and selecting option 4.

You may receive separate Checksheets from other City agencies that will require separate responses.

NEW DEVELOPMENT SERVICES CENTER HOURS: The DSC (1st floor) and Permitting Services (2nd floor) are open Monday through Friday from 8:00 a.m. to 3:00 p.m. (closed at noon on Thursday). In the DSC, Land Use, Site Development or Building Permit application review, submittal or intake of complete permits/applications will be limited to between 8:00 AM and 12:00 PM. Land Use applications and Building Permit review or intake will not be processed after 12:00 PM. Please visit the BDS website for more information regarding the Development Services Center hours.

FIRE SAFETY PLAN REVIEW CHECKSHEET	Application #	17-182179-000-00-CO
	Review Date:	July 14, 2017

Appeals: Pursuant to City Code Chapters 31.10 and 28.03, you may appeal any code provision cited in this Checksheet to the Administrative Board of Appeals within 180 calendar days of the review date. For information on the appeals process, costs, including forms, appeal fee and payment methods, the following information is available: For Fire Code appeals go to www.portlandoregon.gov/fire/31187, call (503) 823-3712 or come in to the Fire Marshal's Office, 1300 SE Gideon St. For Building Code appeals go to www.portlandoregon.gov/bds/appeals, call (503) 823-7300 or come in to the Development Services Center, 1900 SW 4th Ave. If you have questions or are not sure if your appeal should be a Fire Code or Building Code appeal, please call the Fire Plan Reviewer listed above. Permit application expiration will not be extended pending resolution of any administrative appeal.

CITY OF
PORTLAND, OREGON
BUREAU OF FIRE AND RESCUE
Fire Marshal's Office
 1300 SE Gideon Street
 Portland, Oregon 97202

Fire Protection Systems CHECKSHEET

Application # : **19-187833-000-00-FS**

Fire Systems Permit

Review Date : July 10, 2019

To:	PWP CONTRACT OR	IES COMMERCIAL INC *MATT SAAGER* IES COMMERCIAL INC 16135 SW 74TH AVE TIGARD, OR 97224	Work: (503) 648-1900 Cellular: (503) 310-5111 e-Mail: MATT.SAAGER@IESCI.NET
From:	Fire Inspector/Sp ecialist	Jerome Perryman	Phone: 503-823-XXXX Fax: Jerome.Perryman@portlandoregon.gov e-Mail:
cc:	OWNER	URG OPB 17TH AVENUE LLC 1425 4TH AVE #500 SEATTLE, WA 98101	

PROJECT INFORMATION

Street Address:	1750 SW YAMHILL ST
Description of Work:	HAZARDOUS/TANK - FUEL STORAGE TANK FOR GENERATOR- 339 GAL SUB-BASE DIESEL FUEL, REMOTE FILL FUEL PIPING AND EXHAUST VENT PIPING

The following items are in apparent violation of the specific codes or laws noted.

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1.		PFC 105	Please create an Applicable Codes section in the drawings, and state that installation Please shall be in accordance with CofP Code Guide IBC/27/#1 & NEC/7/#1, 2016 PFC, Ch.'s 50, 57 and NFPA30, 37 & 110.
2.		NFPA30, 22.11.4.5 PFC 5704.2.7.5.8	Please provide a note in the drawings that "the initial first fill for the generator diesel tank is required to be witnessed by the Fire Marshal's Office Hazardous Materials Inspector, where the 90% alarm and 95% shut-off will be verified.
3.		PFC 5704.2.12.1 and NFPA30, 21.5	Please state on plan set that inner and outer tank testing documentation shall be provided in accordance with NFPA30, 21.5 once tank is in place on site." Pressure test documentation will be required at time of tank final.
4.		PFC 906, NFPA10	Please show the 4A40BC rated portable fire extinguisher for the generator space in the drawings.
5.		PFC 5704.2.3.2	Please show the required NFPA704 placards on the tank in the drawings.
6.		PFC 5704.2.3.1 and	Please show the "No Smoking" sign in the drawings where hazardous materials are stored.

Fire Protection Systems CHECKSHEET

Application # 19-187833-000-00-FS

Review Date: July 10, 2019

		5003.7.1	
7.		PFC 5703.6.3 and NFPA30, 21.5	Please state in the drawings that "before being covered, enclosed or placed in use, documentation will be provided that process piping has been tested in accordance with PFC 5703.6.3"
8.		PFC 5704.2.7.3.3 and 5704.2.7.4	Provide an elevation of the Normal Vent a minimum of 12ft above the finished ground and Emergency vent/s with outside termination points.
9.			

To respond to this checksheet, bring to the Fire Marshal's office, 1300 SE Gideon, a complete set of updated plans. Provide with your submittal the attached Checksheet Response form.

If you have questions about the items on this checksheet, call the identified reviewer. To check the status of your project, call (503) 823-3712. We appreciate you helping us help you.

Appeals: Pursuant to City Code Chapters 31.10 and 28.03, you may appeal any code provision cited in this Checksheet to the Administrative Board of Appeals within 180 calendar days of the review date. For information on the appeals process, costs, including forms, appeal fee and payment methods, the following information is available: For Fire Code appeals go to www.portlandoregon.gov/fire/31187, call (503) 823-3712 or come in to the Fire Marshal's Office, 1300 SE Gideon St. For Building Code appeals go to www.portlandoregon.gov/bds/appeals, call (503) 823-7300 or come in to the Development Services Center, 1900 SW 4th Ave. If you have questions or are not sure if your appeal should be a Fire Code or Building Code appeal, please call the Fire Plan Reviewer listed above. Permit application expiration will not be extended pending resolution of any administrative appeal.

Checksheet Response

Permit #: 19-187833-000-00-FS

Date: 8/16/19

Customer name and phone number: IES COMMERCIAL: MATT SAAGER 503-648-1900

Note: Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write **customer** in the last column.

[illegible]

(for office use only)

Application for Permit to Install or Remove Tanks, Cylinders and Related Equipment



Portland Fire & Rescue
Fire Marshal's Office
1300 SE Gideon St.
Portland, OR 97202-2419
Ph: 503-823-3712
Fax: 503-823-3925



Portland Fire & Rescue Use Only			
Total Cost of Permit: \$	<u>2930.80</u>	Date: <u>7-2-19</u>	Permit #: <u>19-187833 FS</u>
Receipt #:	_____	Reference #:	_____
Bldg Permit #:	_____	Appeal	<input type="checkbox"/> Yes <input type="checkbox"/> No

Plans must be submitted to the Fire Prevention Division and approved before installation.

Valuation: \$ 154,073 ☐ Existing Building ☒ New Construction
Building Name: PBHB CANVAS Occupied as: OFFICE BUILDING
Address: 817 SW 17TH AVE PORTLAND, OR 97205 1750 SW Yamhill
Suite # _____ Levels (#) 8

Installation <input checked="" type="checkbox"/> New <input type="checkbox"/> Addition <input type="checkbox"/> Alteration <input type="checkbox"/> Repair	Product <input checked="" type="checkbox"/> Liquids/Tank <input type="checkbox"/> L.P.G. <input type="checkbox"/> Gases <input type="checkbox"/> Cryogenics Other _____	Decommission <input type="checkbox"/> Removal <input type="checkbox"/> Abandon	Location 1. <input type="checkbox"/> Underground 2. <input checked="" type="checkbox"/> Aboveground a. <input checked="" type="checkbox"/> Inside b. <input type="checkbox"/> Outside
LP Gases <input type="checkbox"/> Vapor <input type="checkbox"/> Pump <input type="checkbox"/> Liquid <input type="checkbox"/> Gravity <input type="checkbox"/> Barricades	Compressed Gases Products _____ No. of cylinders _____ Size 1. _____ 2. _____ 3. _____ 4. _____	Tanks Product stored in tank: <u>DIESEL</u> Material <u>Concrete/Steel</u> <input type="checkbox"/> Single wall <input checked="" type="checkbox"/> Double wall Capacity 1. <u>339</u> 2. _____ 3. _____ 4. _____	Piping Material _____ <input type="checkbox"/> Single wall <input type="checkbox"/> Double wall
Description of Work: Fuel storage tank for generator. 339 gallon sub-base diesel fuel, remote fill, fuel piping and exhaust vent piping.			

Installing Company Information

Applicant Name: Matt Saager
Company Name: IES Commercial
Address: 16135 SW 74th Ave
City, State, Zip: Tigard, OR 97224
Phone/Fax: (503) 648-1900
Email: matt.saager@iesci.net

Owner Information

Name: Urban Renaissance
Phone/Fax: (503) 241-3345

Mail permit to

Address: 16135 SW 74th Ave
City, state, zip: Tigard, OR 97224

Applicant: Nathan M. Hill
Inspector: Jenna Krugman

[Signature]
Signature
[Signature]
Signature

7/2/19
Date
8-21-19
Date

Development Services

From Concept to Construction

Phone: 503-823-7300 Email: bds@portlandoregon.gov 1900 SW 4th Ave, Portland, OR 97201
More Contact Info (<http://www.portlandoregon.gov/bds/article/519984>)



APPEAL SUMMARY

Status: Approved/Denied

Appeal ID: 15863

Hearing Date: 9/26/17

Case No.: 17-108

Appeal Type: Fire

Project Type: commercial

Building/Business Name: Press Blocks - Half Block Office

Appeal Involves: Erection of a new structure

Plan Submitted Option: pdf [File 1] [File 2]

Project Address: 817 SW 17th Ave.

Appellant Name: Michelle Schulz

Appellant Phone: 503-224-9656

Plans Examiner/Inspector: Joe Thornton

Stories: 9 **Occupancy:** B, M, A **Construction Type:** 1B

Fire Sprinklers: Yes - Throughout

LUR or Permit Application No.: 17-182179-CO

Proposed use: Office with ground level retail

APPEAL INFORMATION SHEET

Appeal item 1

Code Section Oregon Fire Code - 5704.2.7.5.6

Requires Location of connections that are made or broken.

Filling, withdrawal and vapor recovery connections for Class I, II and IIIA liquids which are made and broken shall be located outside of buildings, not more than 5 feet (1524 mm) above the finished ground level, in an approved location in close proximity to the parked delivery vehicle. Such location shall be away from sources of ignition and not less than 5 feet (1524 mm) away from building openings. Such connections shall be closed and liquid tight when not in use and shall be properly identified.

Proposed Design

The high-rise nature of this project (Type I-B construction, 8 floors) requires an emergency generator installed on site. The generator sits within a 2-HR rated enclosure on a mezzanine located above the garage entry between Level 01 and Level 02. Due to the elevated nature of the generator room, a remote fuel fill station will be installed, as required by code, close to the outside of the building in the loading dock.

The current design would allow in-sight filling of the fuel oil tank from within the loading dock and approximately 6'-5" from the exterior face of the building. The fuel truck can park on the adjacent street (SW 17th Ave.) and extend the fuel transfer hose to the fill port inside the building. The fuel oil tank fill port is equipped with an alarming over-fill preventer with leak detection. The loading dock door will remain open for the duration of the fueling.

Exhibit A: Level 01 Floor plan

Reason for alternative With the exterior of the building being directly adjacent to the public pedestrian zone and two driveways accessing the parking garage and the loading dock, we feel that this proposed fuel fill port location inside the building and behind the loading dock security gates will protect the fuel port and provide an equivalent level of safety.

Remote Fill
Inside - OK
↔

Moreover, the nature of the loading dock space being open and treated as an open exterior space, with only the loading door acting as a barrier to the exterior, makes this location basically on the exterior of the building once the loading door is open. In addition, the door will remain open during fuel filling, and thus exterior.

We respectfully request this appeal be granted.

Appeal item 2

Code Section	NFPA 22 and Portland Fire & Rescue Plan Review Memo
Requires	NFPA 22 and Portland Fire & Rescue require fire water storage tanks to be provided with an overflow (overflow protection) to protect the tank, fire pump & controller, and building contents from damage. The overflow must be sized to exceed the fill capacity of the automatic tank fill. When the tank is located in the sub-basement of the building and the fire pump room is at risk from the overflow, then the overflow rate must be discharged outside the building.
Proposed Design	<p>Due to the location of the storage tank and fire pump in the basement, the overflow will need to be discharged outside the building. The required fill rate of the tank is 825 gpm (per NFPA 22 Section 14.5.3) and the maximum expected automatic fill rate (overflow rate) is 1000 gpm. The tank overflow water will be removed from the building using a 3,000 gallon catch basin with (3) 350 gpm sewage ejector pumps, capable of removing up to 1,050 gpm of storage tank overflow. The sewage ejector pumps will be connected to the emergency generator to ensure operation during a power outage.</p> <p>Exhibits: A100 - Basement Floor Plan (Fire Water Tank Location)</p>
Reason for alternative	<p>Because the building footprint is relatively small, an overflow event would risk damaging the fire pump in a matter of 30 minutes. The location of the storage tank in the basement makes a gravity only drainage system impossible. Utilizing sewage ejector pumps connected to the emergency generator to remove the tank overflow water from the building ensures that the fire pump & controller, as well as building contents, are protected from damage.</p> <p>Exhibits: A100 - Basement Floor Plan (Fire Water Tank Location)</p>

APPEAL DECISION

The Administrative staff has reviewed your appeals regarding the fueling location for combustible liquids and the overflow protection for firefighting water supply and the following are the results:

o Fueling location: Approved as proposed.

o Overflow Protection for Firefighting Water Supply: Denied. Proposal does not provide equivalent fire and life safety. Please contact AFM Gary Boyles at 503-823-3778.

PBHB CANVAS GENERATOR FUEL TANK PERMIT INDEX

SECTION 1: Plans, Pictures, Data

- 1 ARCHITECTURAL COVER PAGE
- 2 G90 CODE SUMMARY
- 3 G101 LIFE SAFETY PLANS – LEVELS 01-01.M
- 4 A101 FLOOR PLANS – LEVELS 01-01.M
- 5 E008d EMERGENCY GENERATOR 152
- 6 H101 FUEL PIPING SHOPS
- 7-8 D101D GENERATOR EXHAUST SHOPS
- 9 GENERATOR COST SUMMARY
- 10 PICTURE OF TANK NAME PLATE WITH SERIAL # UL RATING, CAPACITY, MODEL #
- 11 CALIBRATION CHART FOR FILLING TANK

SECTION 2: Submittals

- A) 1-182 GENERATOR SUBMITTALS CAT
- B) 1-6 FUEL FILL SUBMITTALS
- C) 1-36 FUEL PIPING SUBMITTALS
- D) 1-12 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT SUBMITTAL
- E) 1-5 GENERATOR SEISMIC TESTING SUBMITTALS
- F) 1-13 SEISMIC BRACING FOR SUSPENDED PIPING SYSTEM SUBMITTAL
- G) 1-3 VENTING CALCULATIONS FOR GENERATOR SUBMITTAL

SECTION 3:

IES GENERATOR SPECIFICATION SECTION 26 32 16



Generator Tank Installation Reference Sheet

CITY OF
PORTLAND, OREGON
BUREAU OF FIRE & RESCUE
1300 SE Gideon St
Portland, Oregon 97202



Notes: This document has been provided to you for informational purposes. Please review all applicable aspects of this document prior to requesting inspection. This document is not all-inclusive of all requirements for fuel installations, and it is the responsibility of the designer to research the applicable codes. Code references shall be from: The Portland Fire Code (PFD) 2016 ed., the Oregon Fire Code (OFC) 2014 ed. or NFPA 30 2011ed, unless otherwise noted. You may also be required to complete a **FIRE SAFETY PLAN REVIEW CHECK SHEET** for plan review corrections. More than one check sheet (revision) will be \$50 per hour. On site corrections will be \$150.

Tank Permits & Documentation		Code(s)	Y	N	N/A
1	Permits / Information: visit http://www.portlandoregon.gov/fire/58368 Permit #300.15-application to remove or install tanks, cylinders and equipment. Portland Title 31.	Portland Title 31 31.30.040 (E) # 2 & # 3	Y		
2	Two sets of Plans: Plans should include distances from property lines, buildings, walls, other tank/gas lines and include vehicle impact protection (see PFC/OFC Chapter 312 for vehicle impact protection). Will need to include piping lines for fueling and venting with calculations for normal over 12' and an emergency 12'.	Portland Title 31.30.040 (F) 1 (a) OFC 105.4.2.	Y		
3	Construction of Tank: Shall comply with NFPA 30. Each tank shall bear a permanent nameplate or marking indicating the standard used as the basis of design. Provide serial number of tank. Per PFC/OFC 5704.2.7.	PFC/OFC 5704.2.7. SECTION 1 PG. 10	Y		
4	Applicable Codes: Put on application form and plan submittals all applicable codes and standards used for the system design.		Y		
5	Cut Sheets: Include all cut sheets for tank, spill container, fuel shut off and anti-siphon device with submittal documents. <i>Also see Cut Sheets under Tank Design.</i>	SECTION 2 PGS. A117-120, B1-6	Y		
6	Drain Locations: Plans must show drain locations in the filling area. State if oil separator in drains or not.				N A
7	Label or Placard on Tanks: Required for tanks over 100 gallons, include on tank as well as door to tank room; show on plans. PFC/OFC 5704.2.3.2.	PFC/OFC 5704.2.3.2 SECTION 1 PG. 5	Y		
8	Calibration Chart: Chart for filling of tank (5704.2.9.7.6.1). Will need to be in the fill area so the driver can see it. <i>Also see Filling Rates later in this document.</i>	PFC/OFC 5704.2.9.7.6.1 SECTION 1 PG. 11	Y		
9	Provide documentation of 2hr fuel supply: For life safety systems see PFC/OFC section 604.2.14.1.1 requires 2 hours at full demand. Fire pumps will require 8 hours of fuel supply for electric generator running a fire pump. Diesel motor running fire pump is 1 gal per hour for each HP. plus 10%-2010 NFPA 20 11.4.2. NFPA requires 133% of class or low-fuel sensor – see NFPA 110 Section 5.5.3.	PFC/OFC 604.2.14.1.1 NFPA 110(2013) section 5.5.3 & NFPA 20 section 11.4.2. SECTION 2 PGS. A2, A41, A112	Y		
10	For generator Prime Mover: Will need E-stop located outside the room housing the prime mover. This is for Emergency Power Supply Systems (EPSS) levels 1 and 2. Electrical permit required through BDS. Show on plans. NFPA 110 5.6.5.6.	NFPA 110 (2013) 5.6.5.6 SECTION 1 PG. 5	Y		
11	Valuations: Please provide a breakdown of valuations. BDS has defined fair market value in their fee schedule to read as follows: The Fair Market Value to be used in computing the permit fee for alterations and repair shall be the total value of all construction work for which the permit is issued as well as all finish work, painting, roofing, electrical, plumbing, heating, air conditioning, elevators, fire extinguishing systems and other permanent work or equipment, and contractors' profit. The Oregon Structural Specialty Code, Section 109.3, also notes that permit valuations shall include total value of work, including materials and labor.	SECTION 1 PG. 9	Y		

12	Existing Noncompliant Installations: Must be maintained in accordance with the code requirements that were applicable at the time of installation. If installed in violation of code, it shall be made code compliant to the code applicable to the time of installation or it shall be removed regardless if such tank has been previously inspected . 5704.2.9.1	PFC/OFC 5704.2.9.1			N A
13	Unpermitted Installations: Tanks found to have been installed without permits must go through the permitting process, providing the same documentation and submittals as a new installation, or it shall be removed regardless if such tank has been previously inspected .	PFC/OFC 105.7.8			N A
Tank Location		Code(s)	Y	N	N/A
14	Clearance: Tanks inside of buildings require 36" clearance on all sides of tank . NFPA 110 – 7.9.12.1 applies to EPS for Life Safety Systems. Generators for back-up power / optional systems, see NFPA 37 6.3.5.1.2 & 6.3.6.1.2 - states there must be minimum of 15" of clearance around tank. Since NFPA 37 is not adopted in the PFC/OFC an appeal is required with reasoning. For Fire Code Appeals go to: www.portlandoregon.gov/fire/article/76862	NFPA 110 (2013) section 7.9.12.1 NFPA 37 6.3.5.1.2 & 6.3.6.1.2	Y		
15	Setbacks: For exterior tank installations, not less than 5 feet – this includes a 2085 tank. NFPA 30 table 22.4.1.1 (size and protection) note "a".	NFPA 30 table 22.4.1.1			N A
16	Rated Room: Go to the Bureau of Development Services (BDS) to review for use and occupancy of space for EPS (generator & tank). Per NFPA 110 7.2.1.1, EPS room must be a two (2) hour rated room . Must show documentation.	NFPA 110 7.2.1.1 SECTION 1 PG. 3	Y		
Tank Design		Code(s)	Y	N	N/A
17	Cut Sheets: Add cut sheets with listing (UL) for all tanks and include serial number(s) . Protected tank requirements, see 5704.2.9.7 , for tanks in excess of 660 gallons as per section 603.3.2.1	PFC/OFC 5704.2.9.7 and 603.3.2.1	Y		
18	Vents: Normal Vents for Class I, II or IIIA – Vapors are to be released at a safe point outside, and: <ul style="list-style-type: none"> • 12 feet off the ground • 5 feet from building openings and lot lines • 15 feet from powered intakes • Vapors shall not be trapped by eaves or other obstructions • Vapors shall be discharged upwards or horizontally away from adjacent walls • Vents with over 12 feet of vent pipe between the tank and the open air (ie., to the roof) require an engineering calculation • Vent Sizing Formulas, see NFPA 30 Appendix A.27.8.1.6 (emergency) • Smallest vent will be as large as the largest fill or withdrawal connection, but not less than 1.25 inches. • Flame arrestors required on all protected tanks, 5704.2.9.7.3 • Roof top areas where there is public/tenant access, such as a roof top patio, shall be considered ground level for vent pipe. Vent shall extend 12 feet. • Roof top areas where there is no public/tenant access, vent shall extend 3 feet (this may be in addition to the required 12 feet overall minimum) above the roof, per OSSC 501.2 • Vent lines shall not be used for other purposes other than venting 5704.2.7.3.1 All items noted above must be shown on plans.	PFC/OFC 5704.2.7.3 PFC/OFC 5704.2.7.3.3 NFPA 30 - 27.8.1.1, 2, & 3 NFPA 30 Appendix A.27.8.1.6 PFC/OFC 5704.2.9.7.3 OSSC 501.2 SECTION 1 PG. 6-8, SECTION 2 PG. G1	Y		

19	Vents: Emergency Vents for Class I, II & IIIA <ul style="list-style-type: none"> Stationary, above-ground tanks shall be equipped with additional venting that will relieve excessive internal pressure caused by exposure to fires. Emergency vents for Class I, II and IIIA liquids shall not discharge inside buildings. The venting shall be installed and maintained in accordance with Section 22.7 of NFPA 30 and PFC/OFC 5704.2.7.4. Includes Secondary Tanks. Emergency vents shall be arranged to discharge in a manner which prevents localized overheating or flame impingement on any part of the tank in the event that vapors from such vents are ignited. The outlets of all vents and vent drains on tanks equipped with emergency relief venting that that permits pressures to exceed a gauge pressure of 2.5 psi shall be arranged to discharge so that localized overheating of or flame impingement on any part of the tank will not occur if vapors from the tank are ignited. Vents over 12 inches require an engineering calculation, see NFPA 30 – 22.7.4 and Appendix A.22.7.4. Show extension of vents & max pressure on plans. Vent lines shall not be used for other purposes other than venting 5704.2.7.3.1 All items noted above must be shown on plans.	NFPA 30 Section 22.7 PFC/OFC 5704.2.7.4 NFPA 30 Section 22.7.3.9 PFC/OFC 5704.2.7.3.1 SECTION 1 PG. 6-8, SECTION 2 PG. G1	Y		
20	MAQ is 660 gallons aggregate of all tanks inside building except for protected tanks – PFC/OFC CH 603.3.2.1 (see exceptions for max capacity to 3,000 gallons). For number of control areas see PFC/OFC table 5003.8.3.2.	PFC/OFC 603.3.2.1 & 5003.8.3.2			N A
21	Bonding & Grounding: Piping systems shall be bonded and grounded. NFPA 30 section 27.9	NFPA 30 section 27.9 SECTION 3	Y		
22	Piping Labeled. Compatible building materials, required to withstand the pressure, structural and seismic stress as well as top other exposure. Readily accessible. NFPA 30 section 27.10 and 5003.2.2.1. Need to be identified with accordance to – ASME A13.1.	PFC/OFC 5003.2.2.1 & NFPA 30 27.10 SECTION 2 PGS. D1-D12	Y		
23	Secondary Piping for inside with monitoring. Possible penetrations see NFPA 30 section 27.6.3 <i>This is best practice only.</i>	NFPA 30 27.6.3 NFPA 110 5.5.3			N A
24	Seismic (OFC 5003.2.8) NFPA 30 sections 22.5.1.3. See building code/fire pumps looks at table 1604.5. Show documentation building permit.	PFC/OFC 5003.2.8 SECTION 2 PGS. E1-E5, F1-F13			
Tank Fueling		Code(s)	Y	N	N/A
25	Overfill Prevention: Alarm shall sound when reaching 90% capacity and delivery shall automatically stop (shut off) when reaching 95%, per NFPA 30 – 22.11.4.5. Fuel port needs to be wired into the emergency generator so that it will work in a power outage.	NFPA 30 22.11.4.5 SECTION 2 PGS. B1-B6	Y		
26	Fueling: Fueling of engines needs to be done by pump not gravity per NFPA 37 section 6.9. NFPA 37 is not adopted but is a reference for this.	NFPA 37 section 6.9 SECTION 2 PGS. B1-B6	Y		
27	Location of Remote Fill: Fill outside, 5ft from openings per PFC/OFC 5704.2.7.5.6. An appeal <u>may be possible</u> for remote fills placed just inside a concrete room (Type I or II construction). Go to portlandoregon.gov under the PF&R menu select the permit tab; select fire code appeal, then form 300.13 – cost is \$200 nonrefundable. Show fill line and bucket on plans.	PFC/OFC 5704.2.7.5.6 SECTION 1 PG. 3 & APPEAL 15863	Y		
28	Location of Connections that are Made or Broken: Filling and withdrawal connections which are made and broken shall be located outside of buildings and not less than 5 feet from building openings. Per PFC/OFC 5704.2.7.5.6.	PFC/OFC 5704.2.7.5.6 SECTION 1 PG. 3, 6	Y		
29	Diesel Generator Fill Box: Diesel Generator Fill Box with electronics must be no closer than 36 inches from a natural gas regulator vent, as per NFPA 54 5.8.5.1	NFPA 54 5.8.5.1 SECTION 1 PG. 4	Y		
30	Filling Rates: Delivery trucks pump fuel at up to 65 GPM and have a working pressure of 80 to 100 PSI. Fill lines need to be designed to this standard, meeting the GPM and Pressure requirements.	SECTION 2 PG. C1-C36	Y		

Protection		Code(s)	Y	N	N/A
31	Overfill Protection: For tanks inside of buildings see 5704.2.7.5.8 & 5704.2.9.5. For tanks outside over 1320 gallons see 5704.2.9.6. High alarm at 90% and at 95% fuel shut down. Automatic control needs to be fail-safe see 5005.1.11 design. NFPA 30 - 22.11.4.5 for secondary containment tanks 90% alarm and 95% shut off. Note: Initial Tank Fill <u>Shall Be Witnessed</u> by a PF&R Hazardous Materials Inspector.	PFC/OFC 5704.2.7.5.8 5704.2.9.5 NFPA 30 22.11.4.5 SECTION 2 PG. A117	Y		
32	Vapor Protection: shall be vapor tight/ this will be for the enclosed space having ignition sources-5704.2.7.5.6. See 2012 commentary. NFPA #37 2010 6.6.2 closed pipe system (tank mounted). Dry break and/or cam lock will work to push the vapors up and out the normal vent, away from enclosed hot motor with ignition source.	PFC/OFC 5704.2.7.5.6 SECTION 2 PG. A117-A120	Y		
33	Tank Vents for Normal Venting (other uses): Vent lines from tanks shall not be used for purposes other than venting unless approved See 5704.2.7.3.1.	PFC/OFC 5704.2.7.3.1 SECTION 3	Y		
34	Manifolding: Tank Vent Piping shall not be manifolded except for vapor recovery, vapor conservation or air pollution control as per PFC/OFC 5704.2.7.3.5 and NFPA 30 - 27.8.1.4.	PFC/OFC 5704.2.7.3.5 NFPA 30 - 27.8.1.4 SECTION 3	Y		
35	Locations Subject to Flooding: As per PFA/OFC 5704.2.7.8. Where a tank is located in an area where it is subject to buoyancy because of a rise in the water table, flooding or accumulation of water from the fire suppression operations, uplift protection shall be provided in accordance with sections 22.14 and 23.14 of NFPA 30.	PFC/OFC 5704.2.7.8 NFPA 30 22.14 & 23.14			N A
36	Piping Supports: Piping systems shall be substantially supported and protected against physical damage and excessive stresses. The supports shall be protected against exposure to fire by either draining liquid from piping system at a minimum 1% slope or providing fire-resistive rating of not less than 2 hrs or other approved method. PFC/OFC 5703.6.8	PFC/OFC 5703.6.8 SECTION 2 PGS. C1-C36	Y		
37	Fire Protection of Supports: <u>For above ground tanks</u> , per PFC/OFC section 5704.2.9.2.3, for above ground tanks storing class I, II or IIIA liquids elevated more than 12 inches above grade shall have fire resistance rating of not less than 2 hours. See exceptions for, 1.) 2085 tanks, 2.) stationary tanks located outside that have protection from approved water spray system, and 3.) stationary tanks inside protected by an approved sprinkler system per PFC/OFC - 903.3.1.1.	PFC/OFC section 5704.2.9.2.3 SECTION 2 PGS. C1-C36	Y		
38	Anti-Siphon Device: Required for protected above-ground tanks per PFC/OFC 5704.2.9.7.10 and section 2306.6.2.4 (fueling from). <i>Also see NFPA 30A 4.3.6.4.</i> <u>NFPA 30 22.11.4.2 and .3:</u> Means shall be provided to prevent the release of liquid from the tank by siphon flow. This includes piping. <i>Also note 12 inches from fill, for piping. As per NFPA representative the tanks need excess flow, double wall, curbing or similar.</i>	PFC/OFC 5704.2.9.7.10 and 2306.6.2.4 NFPA 30 22.11.4.2 and .3 NFPA 30A 4.3.6.4 SECTION 2 PG. A117-A120, B1-B6 C1-C36	Y		
39	Extinguishers: For inside installations per PFC/OFC 906 - A minimum of 1 portable fire extinguisher having a rating of not less than 20-B shall be located outside of but not more than ten feet from the door. <i>(an example would be a 3A-20B:C extinguisher)</i>	PFC/OFC 906 SECTION 1 PG. 2-4	Y		
40	Secondary Containment – Protected Tanks: As per PFC/OFC 5704.2.9.7.4 Protected tanks shall be provided with secondary containment, drainage control, or diking in accordance with 5004.2. A means shall be provided to establish the integrity of the secondary containment in accordance with NFPA 30.	PFC/OFC 5704.2.9.7.4 SECTION 2 PG. A117-A120	Y		
41	Impact Protection: As per PFC/OFC sections 5003.9.3 (General), 5703.6.4 (Piping) and 5704.2.9.7.5 (Protected tanks) Guard posts or other approved means shall be provided to protect tanks subject to vehicular damage in accordance with PFC/OFC section 312	PFC/OFC 5003.9.3, 5703.6.4 and 5704.2.9.7.5 go to PFC/OFC sec 312 SECTION 1 PG. 2-4	Y		
42	Spill Containers; Per PFC/IFC 5704.2.9.7.8 For protected tanks, spill containers of not <u>less than 5 gallons</u> shall be provided for each fill connection. <i>Also see 5004.2 Spill control & Secondary Containment, specifically 5004.2.1 for requirements. Also see 5005.2.1.3., this is over the MAQ of 5 gallons noted. Some tanks have 7 to 10 gallon spill containers built into top.</i>	PFC/IFC 5704.2.9.7.8 SECTION 2 PG. B1-B6	Y		
43	Drain Cover: Provide a cover mat for drain in close proximity to drain.				N A

44	Seismic Protection: As per PFC/OFC 5003.2.8, Seismic protection for piping and connections shall be provided in accordance with the Oregon Structural Specialty Code.	PFC/OFC 5003.2.8 SECTION 2 PG. F1-F13	Y		
45	Sprinkler System Design Requirements: <u>Installation and Use of Stationary Combustion Engines and Gas Turbines.</u> Per NFPA 13 (2013) 21.6.1 * Design Requirements. Automatic sprinkler systems shall be designed to provide for a density of 0.3 gpm/ft ² (12.2L/min/m ²) over the most remote 2500 ft ² (230 m ²). [NFPA 37:11.4.5.1]	NFPA 13 (2013) 21.6.1 SECTION 1 PG. 2	Y		
General		Code(s)	Y	N	N/A
46	Standby Power Systems: High rise >75ft. Standby power system shall be located in separate room enclosed with 2hr. fire barriers constructed in accordance with Section 707 of the Oregon Structural Specialty Code & PFC/OFC 604.2.14.1	OSSC Sec 707 PFC/OFC 604.2.14.1 SECTION 1 PG. 3	Y		
47	Tank Testing; Oregon Fire Code (prior to being placed in-service) sends you to NFPA #30-21.5 (Testing), this is broken down into two sections. 1—Initial testing, the label on the tank is for compliance to initial testing and 2—Tightness testing is for after installation and an addition to the initial testing after installation, all tanks and connections shall be tested before being placed in service. There is an exception; Go to NFPA #1—66.21.5.2.1 – factory applied vacuum for conditions met; AST – vacuum maintained until set in plan location. UST – vacuum maintained till, back fill top of tank. Will need documentation that states the test of the inner primary tank and the outer secondary tank	PFC/OFC 5704.2.12.1 NFPA 30 – 21.5 NFPA 1 – 66.21.5.2.1	Y		
48	Sprinkler & Alarms: Prior to requesting tank final, ensure that sprinkler and alarm finals have been completed or provide proof that sprinkler system is working and alarms are centrally monitored.		Y		
49	Distances from Combustion Motor Exhaust to Tank Vents: 3 Feet. Diesel, See PFC/OFC table 5703.1.1. Flammable gasses. NFPA 20/ fire pumps 11.5.3.5 and NFPA 37 install of combustion motors 8.3.2 gives an exception for spark arresting mufflers, are permitted to terminate in the class two areas. Look at the distance of class wiring, see table 5703.1.1 vents. 0 to 3 feet no combustion motor exhaust, 3 to 5 feet needs a spark arrester on the motor exhaust pipe, and no spark arresting will need to be out past five feet. <u>Tank permit does not cover exhaust installations, will need separate Mechanical permit.</u>	PFC/OFC table 5703.1.1 NFPA 20 11.5.3.5 NFPA 37 8.3.2	Y		
50	Fire Code takes precedence PFC/OFC 102.7.1. Also See Portland GPR Memo Hazmat #01	PFC/OFC 102.7.1	Y		

Definitions

EPSS- Emergency Power Supply System- A complete functioning EPS system coupled to a system of conductors, disconnecting means and over-current protective devices, transfer switches, and all control, supervisory, and support devices up to and including the load terminals of the transfer equipment needed for the system to operate as a safe and reliable source of electric power.

Level 1- Includes the following: emergency lighting, exit signs, fire alarm, sprinkler alarm, and detection systems, fire pumps where backup power is required, controls for smoke control equipment required by the Building Code, elevator car lighting. Includes all loads classified as Emergency Systems by the NEC.

Level 2 - Includes elevators requiring emergency power, and could include heating and refrigeration systems, communications systems, ventilation and smoke removal systems (except controls), sewerage disposal, lighting, and industrial processes that, when stopped due to any interruption of the primary electrical supply, could create hazards or hamper rescue or fire-fighting operations. Includes all loads classified as Legally Required Standby by the NEC.

Per PFC/OFC 604.1.1; The Stationary Emergency and Standby Generator Systems are required to be listed in accordance with UL 2200.

Storage Tanks shall meet the requirements of NFPA 30 (2012 ed.) section 21.4.2; Design Standards for Storage Tanks.

For more information, please contact the Portland Fire Marshal's Office at: 503-823-3770 and ask to speak to the Hazardous Materials Plan Reviewer.

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GBD

CANVAS @ PRESS BLOCKS

VOLUME 1

817 SW 17TH AVE
PORTLAND, OR 97205

THE PRESS BLOCK COLLABORATIVE (OFFICE) LLC

ISSUED FOR CONSTRUCTION SET
SEPTEMBER 14, 2018

PROJECT TEAM

CLIENT OWNER
THE PRESS BLOCK COLLABORATIVE (OFFICE) LLC
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34 x 44 ORIGINAL SHEET SIZE

DEFERRED SUBMITTALS

- THE FOLLOWING SYSTEMS ARE SUBJECT TO DEFERRED SUBMITTALS IN ACCORDANCE WITH IBC 107:
- *REFER TO SHEETS S002 AND S003 FOR A LIST OF STRUCTURAL DEFERRED SUBMITTALS
 - 1. AUTOMATIC FIRE SPRINKLER SYSTEM (SEPARATE PERMIT)
 - 2. PRE-FABRICATED STAIRS AND RAILINGS
 - 3. ARCHITECTURAL PRESTRESSED PRECAST CONCRETE PANEL AND EMBEDS
 - 4. EXTERIOR METAL STUD GLAZING BACKUP FRAMING
 - 5. GEOPHORS STONE AGGREGATE COLUMNS
 - 6. POST-TENSIONING TENDONS
 - 7. MECHANICAL EQUIPMENT ANCHORAGE AND BRACING
 - 8. WINDOW WASHING HOODS/MAINTENANCE EQUIPMENT
 - 9. SIGNAGE
 - 10. FIRE & LIFE SAFETY SUMMARY
 - 11. BUILDING INFORMATION CARD
 - 12. FIRE SAFETY PLAN
 - 13. FIRE EVACUATION PLAN
 - 14. STOREROOM & CEILING WALL SYSTEMS ATTACHMENTS
 - 15. FIRE ALARM SYSTEM (SEPARATE PERMIT)
 - 16. FIBERGLASS WINDOW SYSTEMS & ATTACHMENTS
 - 17. GLASS GUARDRAILS
 - 18. METAL WALL PANEL ATTACHMENTS
 - 19. STEEL FIREPROOFING
 - 20. GLAZED ANNEXES
 - 21. SECURITY SYSTEM
 - 22. TELECOM VOICE AND DATA SYSTEMS
 - 23. DEMOLITION (SEPARATE PERMIT)
 - 24. DISTRIBUTED ANTENNA SYSTEM (DAS)

APPEALS

#15312 DEMO APPEAL FOR PARTIAL DEMOLITION OF EXISTING BUILDING. GRANTED PROVIDED THE EXCAVATIONS ON THE SITE WILL BE BACKFILLED IF THE PROPOSED NEW BASEMENT AND FIRST FLOOR SLAB IS NOT CONSTRUCTED, INSPECTED AND APPROVED WITHIN 90 DAYS FROM THE DEMOLITION PERMIT ISSUANCE DATE. IF THE NEW CONSTRUCTION DOES NOT TAKE PLACE WITHIN THIS TIME PERIOD, THE DEMOLITION PERMIT WILL BE REVOKED AND THE EXCAVATION WILL BE BACKFILLED. THE TEMPORARY SHORING CALCULATIONS WILL BE REVIEWED WITH THE BUILDING PERMIT APPLICATION. SITE TO HAVE A FLOOD PERMIT BEFORE FENCE WHILE EXCAVATION IS OPEN. APPEAL MAY BE REVOKED IF SITE IS DETERMINED TO BE A HAZARD.

EXISTING ITEM 1 - FIRE SPRINKLER SYSTEM - FIRE SPRINKLER AND TRENCH SYSTEM IS TO BE SUPPLIED BY A SINGLE CONNECTION TO THE WATER MAIN IN SW YAMHILL BUILDING WILL HAVE ON-SITE WATER STORAGE TANK WITH AUTOMATIC REFILL FROM FIRE SERVICE LINE. CAPABLE OF MEETING FULL SYSTEM DEMAND. GRANTED AS PROPOSED. NOTE THE PROPOSED CAPACITY OF THE SECONDARY ON-SITE WATER SUPPLY IS SUBJECT TO REVIEW UNDER THE BUILDING PERMIT SUBMITTAL.

EXISTING ITEM 2 - OPENING PROTECTIONS - IN lieu of 34 HOUR PROTECTION PROVIDE SPRINKLERS TO PROTECT OPENINGS. GRANTED PROVIDED WINDOWS ARE NON-OPERABLE AND SPRINKLERS ARE INSTALLED A MINIMUM OF 4 INCHES AND A MAXIMUM OF 24 INCHES FROM THE OPENINGS SPACED AT 4 FEET ON CENTER. SPRINKLERS ARE TO BE INSTALLED ON THE OCCUPIED SIDE OF THE OPENINGS AND SHALL BE CAPABLE OF WETTING THE ENTIRE SURFACE. A SEPARATE PERMIT FROM THE FIRE MARSHAL'S OFFICE IS REQUIRED.

EXISTING ITEM 3 - EXISTING ACCESS EGRESS - CLIMARU TROPICAL WOOD CLASS A WALL CLADDING AT EXTERIOR FIRST FLOOR AMENITY SPACE. IN GRANTED PROVIDED OPEN FLAME DEVICES ARE LOCATED WITH A MINIMUM OF TEN FEET SEPARATION FROM THE WOOD CLADDING.

EXISTING ITEM 4 - WOOD ROOF COVERING - CLIMARU TROPICAL WOOD CLASS A SCOTT CLADDING. GRANTED PROVIDED OPEN FLAME DEVICES ARE LOCATED WITH A MINIMUM OF TEN FEET SEPARATION FROM THE WOOD SCOTT.

EXISTING ITEM 5 - INTERNAL FUEL STATION - IN-SITU REMOTE FUEL FILL WITHIN LOADING DOCK APPROVED AS PROPOSED.

EXISTING ITEM 6 - EXISTING THROUGH NON-ACCESSORY AREA - SECOND EGRESS PATH THROUGH NON-ACCESSORY AREA ON THE ROOF THAT IS OPEN AS WITH A CLEARLY DEFINED PATH USING A GUARDRAIL AND EGRESS SIGNAGE. GRANTED AS PROPOSED.

EXISTING ITEM 7 - EMERGENCY GENERATOR ON EXTERIOR WALL - GENERATOR AIR INTAKE NOT ON AN EXTERIOR WALL. INTAKE AIR THROUGH GARAGE ENTRY RAMP. GRANTED AS PROPOSED. 24 SPRINKLER PROTECTION IN LIEU OF FIRE DAMPER AT INTAKE OPENING FOR EMERGENCY GENERATOR. LOCATED IN TWO HOUR ENCLOSURE GRANTED AS PROPOSED.

EXISTING ITEM 8 - EXISTING OVER PROTECTIVE LINE - SECOND EXIT FROM LEVEL B2 THROUGH AN EXISTING TUNNEL TO ADJACENT PROPERTY'S PARKING GARAGE AND ACCESS TO STAIR AREA OF REFUGE PROVIDED ON EXIT SIDE OF TUNNEL. A 2 HOUR FIRE BARRIER ON PROPERTY LINE SEPARATES TUNNEL FROM ADJACENT PROPERTY. GRANTED PROVIDED A RECORDED ACCESS AND EGRESS EASEMENT IS PROVIDED PRIOR TO PLAN REVIEW APPROVAL OF THE PROPOSED BUILDING.

EXISTING ITEM 9 - EXISTING HANDRAIL EXTENSION - IN GRANTED PROVIDED HANDRAIL IS INSTALLED WITHOUT REQUIRED EXTENSION AT TOP AND BOTTOM. 40 HANDRAIL EXTENSION IN THE DIRECTION OF TRAVEL. GRANTED AS PROPOSED. 40 HANDRAIL EXTENSION TURNED AT CORNER. GRANTED.

SEPARATE PERMITS

APPLICATIONS FOR SEPARATE PERMITS SHALL BE OBTAINED FROM THE FIRE MARSHAL'S OFFICE. 1300 SE GRIFFIN STREET. PRIOR TO THE INSTALLATION OF THE FOLLOWING:

- FIRE SPRINKLERS
 - A. SPRINKLER CONTROL VALVES WITH SUPERVISORY INITIATING DEVICES AND WATER FLOW IN-TYPE DEVICES
- FIRE ALARM SYSTEMS
 - FIRE PUMPS
 - UNDERGROUND FIRE LINES
 - BUILDING-RADIO (COMMUNICATION) SYSTEM (DAS)
 - HAZARDOUS MATERIALS DIESEL TANK (IF EMERGENCY GENERATOR)
 - HAZARDOUS ACCESS KEY BOX

ANY INSTALLATION ITEMS FOR THE ABOVE NOTED SYSTEMS ARE FOR REFERENCE ONLY. WITH FINAL INSTALLATION REQUIREMENTS TO BE DETERMINED DURING THE TRADE PLAN REVIEW PROCESS AT THE FIRE MARSHAL'S OFFICE.

INTERIOR WALL AND CEILING FINISH FIRE/SMOKE CLASSIFICATION REQUIRED/PROVIDED (Sprinklered) Table 803.9

Occupancy	Ext Enclosures/Passageways	Corridors	Rooms and Enclosed Spaces
B	B	C	C
M	C	C	C
S-2	C	C	C
A-2 A-3	B	B	C

FIRE PROTECTION SYSTEMS - CHAPTER 9

Level	AS/NFPA 13	AS/NFPA 13R	Standpipes	Fire Alarms	Smoke Detectors
B2	X (D)		X	X	NOTE 2
B1	X (D)		X	X	NOTE 2
1	Wet or Dry		X	X	X
1 M	NOTE 1		X	X	X
2	X		X	X	X
3	X		X	X	X
4	X		X	X	X
5	X		X	X	X
6	X		X	X	X
7	X		X	X	X
8	X		X	X	X
PENTHOUSE	X		X	X	X

NOTES:
1. NOT REQUIRED PER 903.3.1.1 EXCEPT LOCATION 3.
2. NOT REQUIRED PER 903.2.3.3 EXCEPT LOCATIONS 2 AND 4.

PLUMBING FIXTURES

NOTE: REQUIREMENTS FOR PLUMBING FIXTURES AT THE GROUND LEVEL RETAIL SPACE WILL BE CONSIDERED UNDER TENANT IMPROVEMENT BUILD-OUT UNDER A SEPARATE PERMIT.

MINIMUM NUMBER OF SEPARATE PLUMBING FIXTURES (TABLE 705.8)

LEVEL	OCC. GROUP	AREA	FACTOR (TABLE 1004.1.2)	OCC. LOAD	W.C. FACTOR	W.C. REQ.	LAV. FACTOR	LAV. REQ.	FIX. REQ.	D.F.		
1	B	981 SF	1/100 G	10	1.25 x 50	20	20	140 x 80	13	13	NR	
					1.50 x 50			180 x 80				
		2.875 SF	1/300 G	10	1/100	05	05	1/100	05	05	NR	
TOTAL REQUIRED				1	1	1	1	1	1	1		
TOTAL PROVIDED				2	2	2	2	2	2	1		
2, 4	B	16,225 SF	1/100 G	152	1.25 x 50	252	252	140 x 80	2125	2125	NR	
					1.50 x 50			180 x 80				
		2.86 SF	1/300 G	1	1/100	01	01	1/100	01	01	NR	
TOTAL REQUIRED				2	2	2	2	2	2	NR		
TOTAL PROVIDED				3	3	3	3	3	3	NR		
7	B	15,186 SF	1/100 G	152	1.25 x 50	252	252	140 x 80	19	19		
					1.50 x 50			180 x 80				
		A3	963 SF	1/15 N	66	1.125	155	25	31	1200	165	165
				1	1/100	01	01	1/100	01	01	NR	
TOTAL REQUIRED				2	2	2	2	2	2	1		
TOTAL PROVIDED				3	3	4	3	3	3	1		
PENT	A-3	2,896 SF	1/15 N	196	1.125	155	78	151	200	49	49	1
					1	1/100	01	01	1/100	01	01	NR
		2.76 SF	1/300 G	1								
TOTAL REQUIRED				7	7	7	7	7	7	1		
TOTAL PROVIDED				1	1	1	1	1	1	1		

BUILDING AREA AND OCCUPANCY BY FLOOR

FLOOR		AREA (SF)	USE	AREA / OCC	OCC LOAD**	STAIRWAY WIDTH		DOORWAY / OTHER WIDTH		EXITS		TRAVEL DISTANCE	
SECTION 1004.1.1 SECTION 1004 SECTION 1008 (2) PER A-3 OCC SECTION 1008 (2) PER B OCC SECTION 1008 (2) PER M OCC SECTION 1008 (2) PER S-2 OCC													
						REQUIRED	PROVIDED	REQUIRED	PROVIDED	REQUIRED	PROVIDED	REQUIRED	PROVIDED
LEVEL B2		3,710	S-2	300	14	6"	44"	3"	36"	2	2	300' MAX	140'
LEVEL B1		17,764	S-2	200/300	91	28"	82"	19"	72"	2	2	300' MAX	116'
LEVEL 1		14,122	A-3,M,B,S-2	1550/100/200/300	351	[-]	[-]	71"	576"	8	8	200' MAX, 300' MAX (S-2)	175'
LEVEL 1,M		1,210	S-2	300	5	2"	44"	1"	36"	2	2	300' MAX	36'
LEVEL 2		16,929	B	100/300	176	53"	88"	36"	72"	2	2	200' MAX	95'
LEVEL 3		16,929	B	100/300	176	53"	88"	36"	72"	2	2	200' MAX	95'
LEVEL 4		16,929	B	100/300	176	53"	88"	36"	72"	2	2	200' MAX	95'
LEVEL 5		16,929	B	100/300	176	53"	88"	36"	72"	2	2	200' MAX	95'
LEVEL 6		16,929	B	100/300	176	53"	88"	36"	72"	2	2	200' MAX	95'
LEVEL 7		16,909	A-3,B	15/100/300	231	70"	88"	47"	72"	2	2	200' MAX	95'
LEVEL 8		16,929	B	100/300	176	53"	88"	36"	72"	2	2	200' MAX	95'
ROOF		9,162	A-3,B,S-2	15/100/300	224	68"	88"	45"	72"	2	2	200' MAX, 300' MAX (S-2)	145'
BUILDING	NET AREA (SF)	164,451	**Occupancy load takes into account multiple spaces within the overall useable square footage										
	GROSS AREA (SF)	172,750											

*Occupancy load takes into account multiple spaces within the overall useable square footage

SPECIAL PROVISIONS (Section 510)

N/A

CONSTRUCTION TYPES (Table 601)

Level No.	Type*	Structural Frame*	Bearing Walls*	Non-Bearing Walls-Ext. (See Table B02)	Non-Bearing Walls & Part. int.	Floors	Roof
B2	1A	2 HR	3 HR	2 HR	0	2 HR	-
B1	1A	2 HR	3 HR	2 HR	0	2 HR	-
1	1A	2 HR	3 HR	2 HR	0	2 HR	1 HR
2	1A	2 HR	3 HR	2 HR	0	2 HR	-
1 M	1A	2 HR	3 HR	2 HR	0	2 HR	-
3	1A	2 HR	3 HR	2 HR	0	2 HR	-
4	1A	2 HR	3 HR	2 HR	0	2 HR	-
5	1A	2 HR	3 HR	2 HR	0	2 HR	-
6	1A	2 HR	3 HR	2 HR	0	2 HR	-
7	1A	2 HR	3 HR	2 HR	0	2 HR	-
8	1A	2 HR	3 HR	2 HR	0	2 HR	1 HR
PENT	1A	2 HR	3 HR	2 HR	0	2 HR	1 HR

*BASED ON SECTION 403.2.1.1 REDUCTION TO 18 FIRE RATING FOR ALL BUILDING ELEMENTS EXCEPT COLUMNS SUPPORTING FLOORS

403.2.1 REDUCTION IN FIRE-RESISTANCE RATING. THE FIRE RESISTANCE RATING REDUCTIONS LISTED IN SECTIONS 403.2.1.1 AND 403.2.1.2 SHALL BE ALLOWED IN BUILDINGS THAT HAVE SPRINKLER CONTROL VALVES EQUIPPED WITH SUPERVISORY INITIATING DEVICES AND WATER-FLOW INITIATING DEVICES FOR EACH FLOOR.

EXTERIOR WALL FIRE RATING BASED ON FIRE SEPARATION DISTANCE (Table 602) AND MAX. OPENINGS (Table 705.8)

Building Face	Construction Type	Occupancy	Fire Separation Distance	Required Fire Resistance Rating (Table 602)	Max Opening % Allowed (Table 705.8)	Opening % Provided
North	1A	MIA3/S-2	>30"	0	No Limit	N/A
East	1A	MIA3/S-2	>30"	0	No Limit	N/A
South - Level 1	1A	MIA3/S-2	0"	2	Not Permitted	0%
South - Level 2+	1A	B	5-10"	1	25%	25%
West	1A	MIA3/S-2	>30"	0	No Limit	N/A

FIRE WALLS/FIRE BARRIERS/FIRE PARTITIONS

(Table 707.3.10)

OCCUPANCY GROUP: A, M, B, S-2		Construction Type: 1A	
Type		Fire Resistive Rating	Remarks
FIRE WALL - Section 708			
	BUILDING SEPARATION	2 HR	Tunnel: S-2 to S-2 Occupancy
FIRE BARRIERS - Section 707			
	EXIT STAIRWAYS, SHAFT WALLS	2 HR	
	EXIT PASSAGEWAYS	2 HR	PER SEC 1023
	HORIZONTAL EXIT	2 HR	PER SEC 1025.2
	FIRE COMMAND CENTER WALLS	1 HR	PER SEC 911.1.2
FIRE PARTITIONS - Section 708			
	CORRIDORS	0 HR	PER SEC 1018.1

OPENING FIRE PROTECTION ASSEMBLIES (Table 716.5)

Use	Construction Type	Fire Resistive Rating	Opening Protective Rating	Remarks
Ext enclosures, Ext passageway walls	1A	2HR	1 1/2 HR	
Ext Enclosures	1A	2HR	1 1/2 HR	
Utility Rooms	1A	1HR	3/4 HR	Rooms with exposed DAS backbones to be 2HR
Emergency Generator Room	1A	2HR	1 1/2 HR	
Fire Pump Room & Tank	1A	2HR	1 1/2 HR	
Trussing Tunnel Separation	1A	2HR	1 1/2 HR	
Floors Separating Levels	1A	2HR	N/A	

ALLOWABLE HEIGHT AND AREA

ALLOWABLE HEIGHT AND AREA (TABLE 502)		
CONSTRUCTION TYPE	ALLOWABLE HEIGHT	
TYPE 1A	UNLIMITED	
OCCUPANCY GROUP	ALLOWABLE STORIES	ALLOWABLE AREA
M	UNLIMITED	UNLIMITED
B	UNLIMITED	UNLIMITED
A-2 & A-3	UNLIMITED	UNLIMITED
S-2	UNLIMITED	UNLIMITED

BUILDING IS FULLY SPRINKLERED PER SECTION 903.3.1.1

ALLOWABLE HEIGHT AND AREAS (TABLE 503)

Occ/Construction	Basic Allowable Area	Allowable Stories	Allowable Height
A2/1A	N/A	N/A	N/A
Increased for Porridge (Section 506.1.2)	N/A	N/A	N/A
Increased for Sprinklers (Section 506.3)	N/A	+1 Story = N/A	+20 Feet = N/A
Increased for Multiple Stories (Section 506.4)	N/A	N/A	N/A

*Building is fully sprinklered per NFPA 13

Occ/Construction	Basic Allowable Area	Allowable Stories	Allowable Height
B/1A	N/A	N/A	N/A
Increased for Porridge (Section 506.1.2)	N/A	N/A	N/A
Increased for Sprinklers (Section 506.3)	N/A	+1 Story = N/A	+20 Feet = N/A
Increased for Multiple Stories (Section 506.4)	N/A	N/A	N/A

*Building is fully sprinklered per Section 903.3.1.1

*City Code (IBC) 604.1 limits bare allowable area to 12,000 in lieu of 15,000

ACTUAL GROSS AREA AND HEIGHT

Level	Area	Construction Type	Occupancy	Height (per 502.1)
B2	5,510	1A	S-2	9'-3/4"max
B1	119,705	1A	S-2	11'-6"max
1	16,817	1A	A-3,M,B,S-2	18'-11" varies
2	16,817	1A	B	9'-3" max
3	16,817	1A	B	13'-6"
04	16,817	1A	B	13'-6"
05	16,817	1A	B	13'-6"
06	16,817	1A	B	13'-6"
07	17,720	1A	A-3,B,S-2	13'-6"
08	16,817	1A	B	15'-6"
ROOF	3,152	1A	A-3,B,S-2	13'-11"
TOTAL	115,990			119'-3.34"

*Area from underground levels not included in total

*Height measured from lowest grade on site to surface of roof

FIRE CODE NOTES:

FIRE SAFETY AND EVACUATION PLANS (IBC 406)
AN APPROVED FIRE SAFETY AND EVACUATION PLAN SHALL BE PREPARED AND MAINTAINED IN THE FIRE COMMAND CENTER IN ACCORDANCE WITH CHAP. 4 IN THE OREGON FIRE CODE.

ACCESS TO BUILDING OPENINGS AND ROOFS (IBC 504.3)
STAIRWAYS SHALL BE MARKED AT STREET AND FLOOR LEVELS WITH A SIGN INDICATING THAT THE STAIR CONTINUES TO THE ROOF.

PREMISES IDENTIFICATION (IBC 505.1)
BUILDINGS REQUIRED TO HAVE STANDPIPES BY SECTION 903.3.1.1. LESS THAN ONE STANDPIPE SHALL BE PROVIDED FOR USE DURING CONSTRUCTION. SUCH STANDPIPES SHALL BE INSTALLED WHEN THE PROGRESS OF CONSTRUCTION IS NOT MORE THAN 40 FEET IN HEIGHT ABOVE THE LOWEST LEVEL OF FIRE DEPARTMENT VEHICLE ACCESS. SUCH STANDPIPES SHALL BE PROVIDED WITH FIRE DEPARTMENT HOSE CONNECTIONS AT ACCESSIBLE LOCATIONS ADJACENT TO USABLE STAIRS. SUCH STANDPIPES SHALL BE EXTENDED AS CONSTRUCTION PROGRESSES TO WITHIN ONE FLOOR OF THE HIGHEST POINT OF CONSTRUCTION HAVING SECURED DECKING OR FLOORING.

FIRE COMMAND CENTER (IBC 505.1)
FINAL LAYOUT OF FIRE COMMAND CENTER AND REQUIRED FEATURES SHALL BE SUBMITTED AS A DEFERRED SUBMITTAL FOR APPROVAL PRIOR TO INSTALLATION. DETAIL TO BE PROVIDED SHOWING REQUIRED FEATURES:
- INCLUDE LIFE SAFETY REQUIREMENT FOR THE FLSS BINDER
- SHIRT COPY OF BUILDING INFORMATION CARD (BIC)
- FINAL LAMINATED VERSION TO BE PROVIDED PRIOR TO

FIRE FINAL INSPECTION
PRIOR TO FINAL FIRE INSPECTION, THE FIRE DEPARTMENT SHALL RECEIVE SATISFACTORY INSTRUCTION ON THE OPERATION OF THE SMOKE CONTROL SYSTEM.

FIRE PROTECTION AND UTILITY EQUIPMENT (ID AND ACCESS) (IBC 506.1)
BUILDINGS OR STRUCTURES THAT HAVE ROOF OR GARDENS OR LANDSCAPED ROOFS AND THAT ARE EQUIPPED WITH A STANDPIPE SYSTEM SHALL HAVE THE STANDPIPE SYSTEM EXTENDED TO THE ROOF LEVEL ON WHICH THE ROOFTOP GARDEN OR LANDSCAPED ROOF IS LOCATED.

PORTABLE FIRE EXTINGUISHERS (IBC 906)
FIRE EXTINGUISHERS (MINIMUM SIZE) SHALL BE INSTALLED EVERY 75 FEET OF LINEAR TRAVEL.

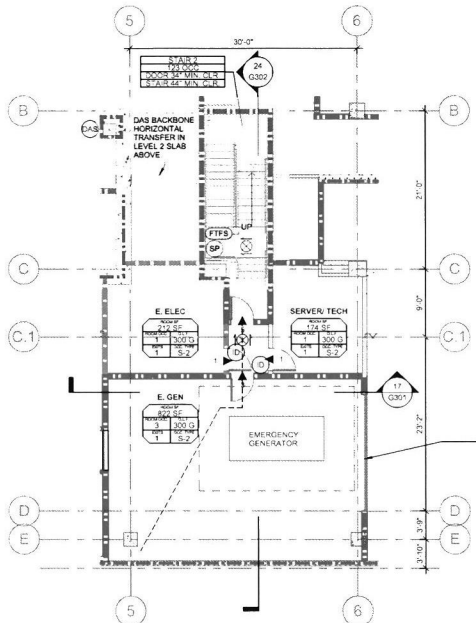
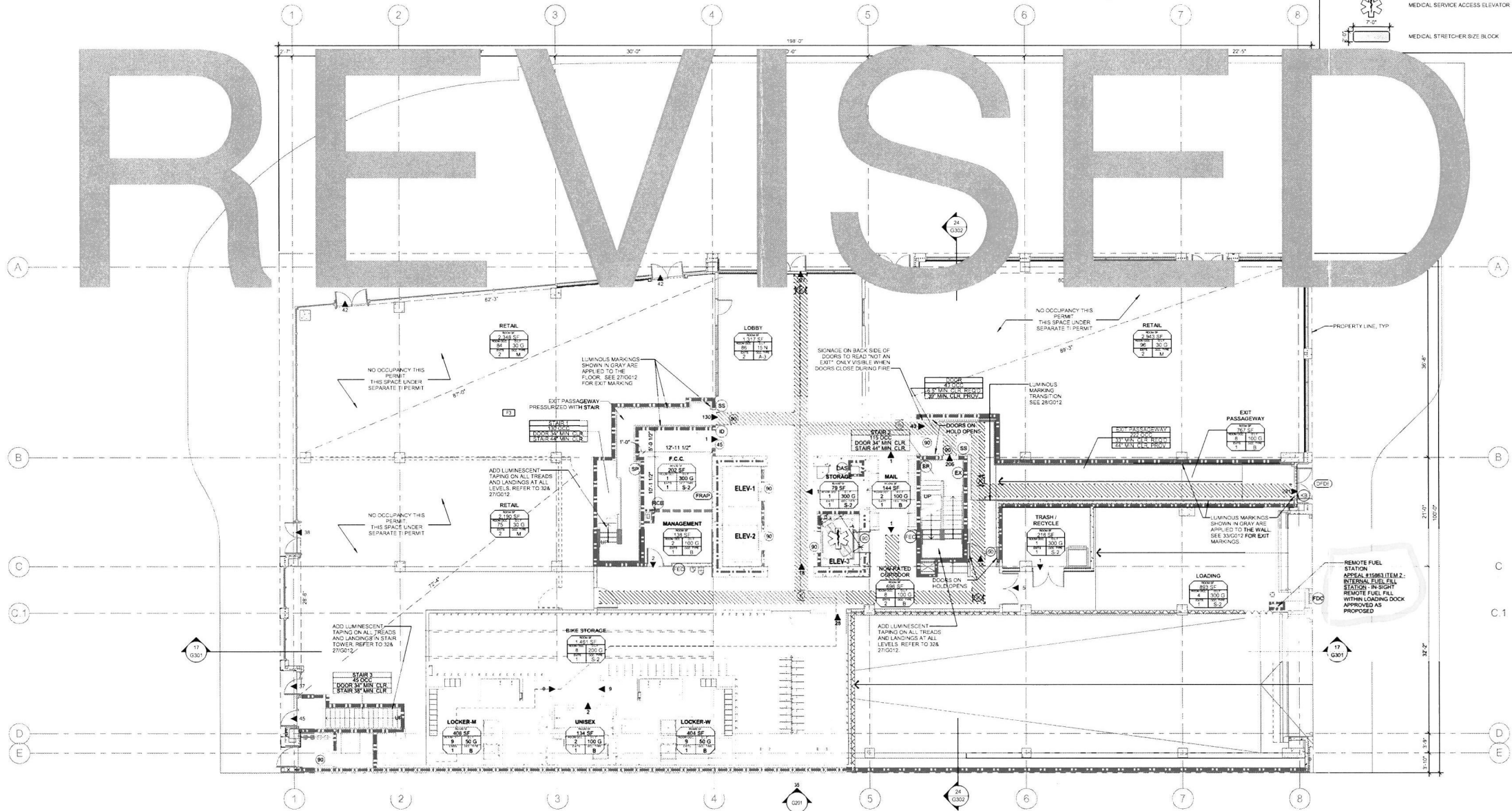
FIRE SAFETY DURING CONSTRUCTION AND DEMOLITION (IBC 903.1.1)
IN BUILDINGS REQUIRED TO HAVE STANDPIPES BY SECTION 903.3.1.1, LESS THAN ONE STANDPIPE SHALL BE PROVIDED FOR USE DURING CONSTRUCTION. SUCH STANDPIPES SHALL BE INSTALLED WHEN THE PROGRESS OF CONSTRUCTION IS NOT MORE THAN 40 FEET IN HEIGHT ABOVE THE LOWEST LEVEL OF FIRE DEPARTMENT VEHICLE ACCESS. SUCH STANDPIPES SHALL BE PROVIDED WITH FIRE DEPARTMENT HOSE CONNECTIONS AT ACCESSIBLE LOCATIONS ADJACENT TO USABLE STAIRS. SUCH STANDPIPES SHALL BE EXTENDED AS CONSTRUCTION PROGRESSES TO WITHIN ONE FLOOR OF THE HIGHEST POINT OF CONSTRUCTION HAVING SECURED DECKING OR FLOORING.

ROOFTOP GARDENS AND LANDSCAPED ROOFS (IBC 903.3.1.1)
BUILDINGS OR STRUCTURES THAT HAVE ROOF OR GARDENS OR LANDSCAPED ROOFS AND THAT ARE EQUIPPED WITH A STANDPIPE SYSTEM SHALL HAVE THE STANDPIPE SYSTEM EXTENDED TO THE ROOF LEVEL ON WHICH THE ROOFTOP GARDEN OR LANDSCAPED ROOF IS LOCATED.

STANDPIPE SYSTEMS (IBC 903.6)
ST

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36 LIFE SAFETY PLAN - LEVEL 01.M
1/8" = 1'-0"



14 LIFE SAFETY PLAN - LEVEL 01.M
1/8" = 1'-0"

LEGEND

- 45 MIN LABELED, SELF CLOSING DOOR
- 90 MIN LABELED, SELF CLOSING DOOR
- 180 MIN LABELED, SELF CLOSING DOOR
- FIREFIGHTER'S REMOTE ANNUNCIATION PANEL
- DESIGNATED FIRE DEPARTMENT ENTRANCE
- FIRE TRIGGERED FAIL SAFE DOOR
- STANDPIPE
- FIRE EXTINGUISHER / FIRE EXTINGUISHER CABINET
- FIRE EXTINGUISHER HOOD
- FIRE DEPARTMENT CONNECTION
- KNOX BOX
- ROOM IDENTIFICATION SIGNAGE PER PFC 509.1
- DIGITAL AMPLIFIED SIGNAL
- DIRECTIONAL EXIT SIGNAGE
- ROOF ACCESS SIGNAGE PER OSGC 1022.9 AND PFC 504.3
- STAIRWAY COMMUNICATION
- RATH CALL BOX TWO-WAY COMMUNICATION TERMINAL
- 1-HOUR FIRE RATED
- 2-HOUR FIRE RATED
- 3-HOUR FIRE RATED
- 4-HOUR FIRE RATED
- SMOKE BARRIER
- 10 1400 PHOTO LUMINESCENT MARKINGS, SEE 0012

OCCUPANCY TAG

Room name
Room area
Occupancy load factor
(assembly uses in net sf and other uses in gross sf)
Room occupancy type
Room occupancy
Min. number of exits
Egress width requirements
Exit path with egress lighting (min. 1 ft. candle)
Exit access travel distance
Exit separation distance
Exit direction and occupancy number
Medical service access elevator
Medical stretcher size block

GBD
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1120 NW Couch St.
3rd Fl.
Portland, OR 97209
Tel: (503) 224-9656
gbdarchitects.com
GBD © 2017

REGISTERED ARCHITECT
MICHELLE SCHULTZ
Portland, OR
License No. 4728
STATE OF OREGON

PROJECT
PRESS BLOCKS -
HALF BLOCK OFFICE
817 SW 11TH AVE.
PORTLAND, OR 97205

CLIENT
THE PRESS BLOCK
COLLABORATIVE
(OFFICE) LLC
1211 SW 5TH AVE, STE. 2230
PORTLAND, OR 97205

DOCUMENT OR ORIGINAL SIZE
34" X 44"

Notice of Extended Payment
Provision: The contract will
allow the owner to make
payment within 30 days after the
date a billing or estimate is
submitted. Notice of a
Billing Cycle: The contract will
allow the owner to make the
submission of billings or
estimates in billing cycles other
than 30-day cycles. Billings or
estimates for the contract shall
be submitted as follows:
calendar month ending on the
last day of the applicable month.

REVISIONS

NO.	DATE	DESCRIPTION
1	10/09/18	PERMIT RESP #1
2	11/02/17	PERMIT RESP #2
3	10/12/17	PERMIT RESP #2

DATE
SEPTEMBER, 14 2018

PROJECT NUMBER
20166042

SCALE
1/8" = 1'-0"

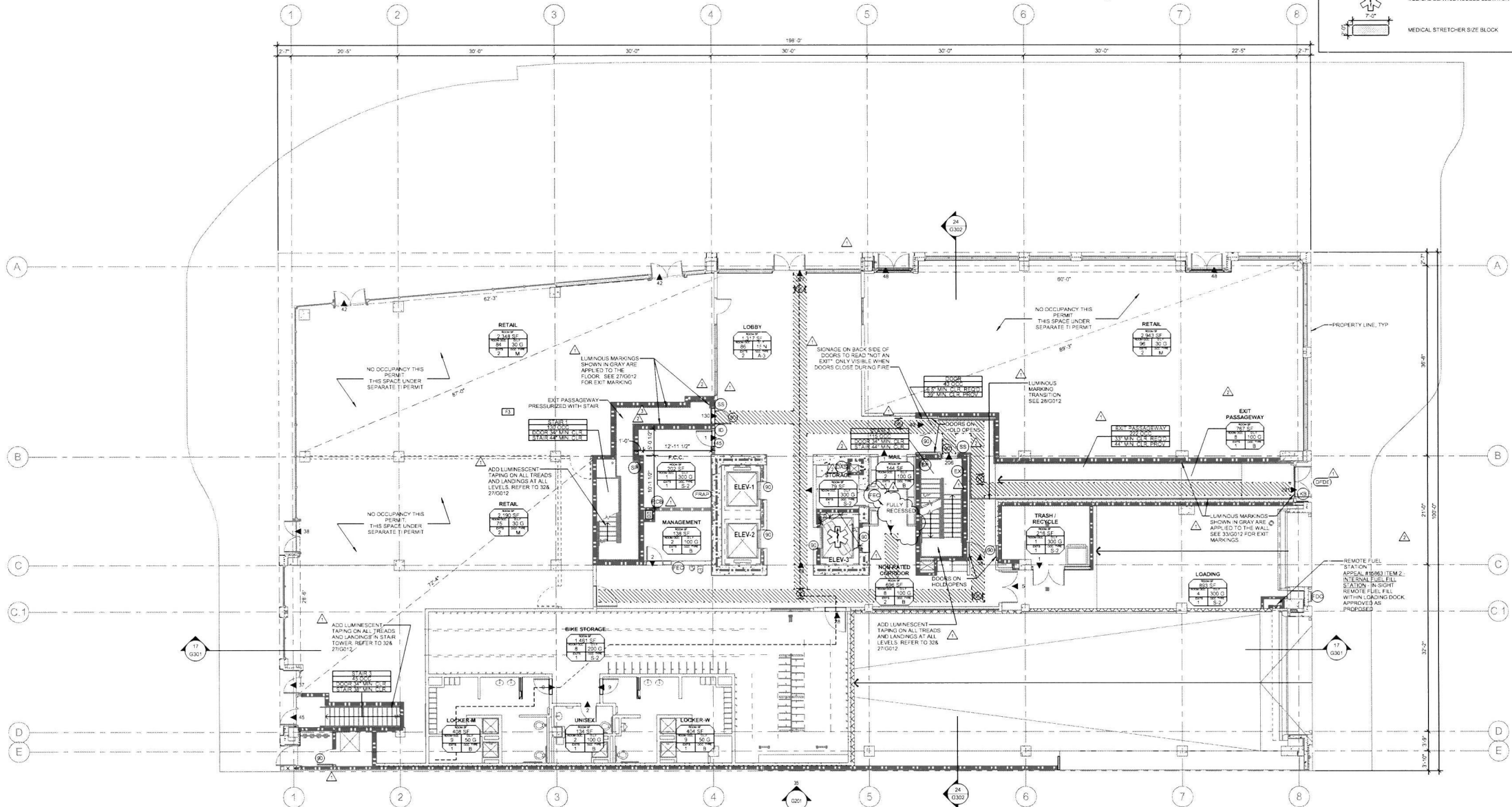
SHEET TITLE
LIFE SAFETY PLANS -
LEVELS 01-01.M

G101

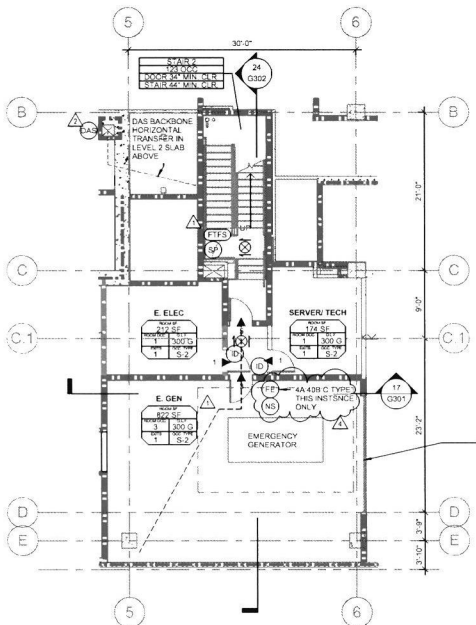
City of Portland
REVIEWED FOR CODE COMPLIANCE
AUG 21 2019
i9-187833FS
Permit Number

ISSUED FOR CONSTRUCTION

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36 LIFE SAFETY PLAN - LEVEL 01
1/8" = 1'-0"



14 LIFE SAFETY PLAN - LEVEL 01-M
1/8" = 1'-0"

LEGEND

- 45 MIN LABELED, SELF CLOSING DOOR
- 90 MIN LABELED, SELF CLOSING DOOR
- 180 MIN LABELED, SELF CLOSING DOOR
- FIREFIGHTER'S REMOTE ANNUNCIATION PANEL
- DESIGNATED FIRE DEPARTMENT ENTRANCE
- FIRE TRIGGERED FAIL SAFE DOOR
- STANDPIPE
- FIRE EXTINGUISHER / FIRE EXTINGUISHER CABINET
- FIRE EXTINGUISHER HOOD
- FIRE DEPARTMENT CONNECTION
- KNOX BOX
- ROOM IDENTIFICATION SIGNAGE PER PFC 509.1
- DIGITAL AMPLIFIED SIGNAL
- DIRECTIONAL EXIT SIGNAGE
- ROOF ACCESS SIGNAGE PER OSGC 1023.9 AND PFC 504.3
- STAIRWAY COMMUNICATION
- BATH CALL BOX TWO-WAY COMMUNICATION TERMINAL
- NO SMOKING SIGNAGE
- 1 HOUR FIRE RATED
- 2 HOUR FIRE RATED
- 3 HOUR FIRE RATED
- 4 HOUR FIRE RATED
- SMOKE BARRIER
- 15 1400 PHOTO LUMINESCENT MARKINGS, SEE 0012

OCCUPANCY TAG

Room name
Room area
Occupancy (load factor)
Assembly uses in net sq and other uses in gross sq
Room occupancy type
Room occupancy
Min. number of exits

EGRESS WIDTH REQUIREMENTS

EXIT PATH WITH EGRESS LIGHTING (MIN. 1 FT. CANDLE)

EXIT ACCESS TRAVEL DISTANCE

EXIT SEPARATION DISTANCE

EXIT DIRECTION AND OCCUPANCY NUMBER

MEDICAL SERVICE ACCESS ELEVATOR

MEDICAL STRETCHER SIZE BLOCK

GBD

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1120 NW Couch St.
Ste. 300
Portland, OR 97209
Tel: (503) 224-9656
gbdarchitects.com
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STAMP

REGISTERED ARCHITECT
MICHELLE SCHULZ
PORTLAND, OR
License No. 4729

PROJECT
CANVAS @ PRESS
BLOCKS
817 SW 17TH AVE
PORTLAND, OR 97205

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COLLABORATIVE
(OFFICE) LLC
1211 SW 5TH AVE, STE 920
PORTLAND, OR 97205

DOCUMENT ORIGINAL SIZE
34" X 44"

Notice of Extended Payment
Provision: The contract will
allow the owner to make
payment within 60 days after the
date a bill or invoice is
submitted. Notice of Alternative
Billing Cycle: The contract will
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submission of billings or
estimates in billing cycles other
than 30-day cycles. Billings or
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calendar month ending on the
last day of the applicable month.

REVISIONS

NO.	DATE	DESCRIPTION
1	08/09/2019	GEN RESP #1
2	08/09/2019	PROJ RESP #1
3	08/09/2019	PROJ RESP #2
4	08/09/2019	GEN RESP #2

DATE
SEPTEMBER 14, 2018

PROJECT NUMBER
20166042

SCALE
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SHEET TITLE
LIFE SAFETY PLANS -
LEVELS 01-01 M

G101

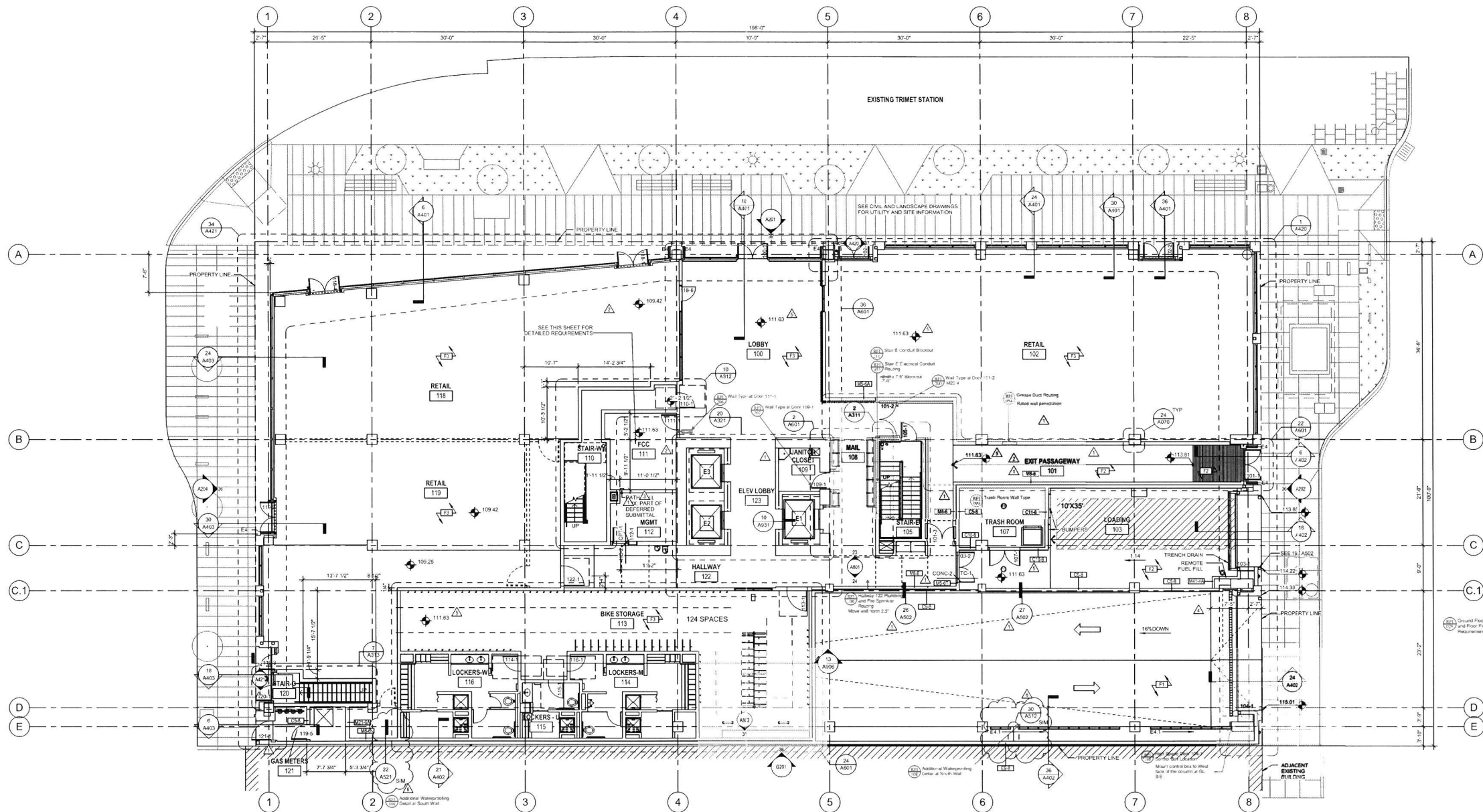
SECTION 1
Page 3 of 11

ISSUED FOR CONSTRUCTION

FIRE COMMAND CENTER NOTES:

- FINAL LAYOUT OF FIRE COMMAND CENTER AND REQUIRED FEATURES SHALL BE SUBMITTED AS A DEFERRED SUBMITTAL FOR APPROVAL PRIOR TO INSTALLATION. DETAIL TO BE PROVIDED SHOWING REQUIRED FEATURES.
- PORTLAND FIRE CODE 2018 - SECTION 909
- 909.1 FIRE COMMAND CENTER REQUIRED FEATURES. THE FIRE COMMAND CENTER SHALL COMPLY WITH NFPA 72 AND SHALL CONTAIN THE FOLLOWING FEATURES:
1. THE EMERGENCY VOICE/ALARM COMMUNICATION SYSTEM CONTROL UNIT.
 2. THE FIRE DEPARTMENT COMMUNICATIONS SYSTEM.
 3. FIRE DETECTION AND ALARM SYSTEM ANNUNCIATOR.
 4. ANNUNCIATOR UNIT VISUALLY INDICATING THE LOCATION OF THE ELEVATORS AND WHETHER THEY ARE OPERATIONAL.
 5. STATUS INDICATORS AND CONTROLS FOR AIR DISTRIBUTION SYSTEMS.
 6. THE FIRE-FIGHTER'S CONTROL PANEL REQUIRED BY SECTION 909.15 FOR SMOKE CONTROL SYSTEMS INSTALLED IN THE BUILDING.
 7. CONTROLS FOR UNLOCKING STAIRWAY DOORS SIMULTANEOUSLY.
 8. SPRINKLER VALVES AND WATERFLOW DETECTOR DISPLAY PANELS.
 9. EMERGENCY AND STANDBY POWER STATUS INDICATORS.
 10. A TELEPHONE FOR FIRE DEPARTMENT USE WITH CONTROLLED ACCESS TO THE PUBLIC TELEPHONE SYSTEM.
 11. FIRE PUMP STATUS INDICATORS.
 12. SCHEMATIC BUILDING PLANS INDICATING THE TYPICAL FLOOR PLAN AND DETAILING THE BUILDING CORE, MEANS OF EGRESS, FIRE PROTECTION SYSTEMS, FIRE FIGHTING EQUIPMENT AND FIRE DEPARTMENT ACCESS AND THE LOCATION OF FIRE WALLS, FIRE BARRIERS, FIRE PARTITIONS, SMOKE BARRIERS AND SMOKE PARTITIONS.
 13. AN APPROVED BUILDING INFORMATION CARD THAT CONTAINS, BUT IS NOT LIMITED TO, THE FOLLOWING INFORMATION:
 - a. GENERAL BUILDING INFORMATION THAT INCLUDES: PROPERTY NAME, ADDRESS, THE NUMBER OF FLOORS IN THE BUILDING (ABOVE AND BELOW GRADE), USE AND OCCUPANCY CLASSIFICATION (FOR MIXED USES, IDENTIFY THE DIFFERENT TYPES OF OCCUPANCIES ON EACH FLOOR), ESTIMATED BUILDING POPULATION (I.E., DAY, NIGHT, WEEKEND).
 - b. BUILDING EMERGENCY CONTACT INFORMATION THAT INCLUDES: A LIST OF THE BUILDING'S EMERGENCY CONTACTS (E.G., BUILDING MANAGER, BUILDING ENGINEER, ETC.) AND THEIR RESPECTIVE WORK PHONE NUMBER, CELL PHONE NUMBER, EMAIL ADDRESS.
 - c. BUILDING CONSTRUCTION INFORMATION THAT INCLUDES: THE TYPE OF BUILDING CONSTRUCTION (E.G., FLOORS, WALLS, COLUMNS, AND ROOF ASSEMBLY).
 - d. EXIT STAIR INFORMATION THAT INCLUDES: NUMBER OF EXIT STAIRS IN BUILDING, EACH EXIT STAIR DESIGNATION AND FLOORS SERVED, LOCATION WHERE EACH EXIT STAIR DISCHARGES, EXIT STAIRS THAT ARE PRESSURIZED, EXIT STAIRS PROVIDED WITH EMERGENCY LIGHTING, EACH EXIT STAIR THAT ALLOWS REENTRY, EXIT STAIRS PROVIDING ROOF ACCESS, ELEVATOR INFORMATION THAT INCLUDES: NUMBER OF ELEVATOR BANKS, ELEVATOR BANK DESIGNATION, ELEVATOR CAR NUMBERS AND RESPECTIVE FLOORS THAT THEY SERVE, LOCATION OF ELEVATOR MACHINE ROOMS, LOCATION OF SHUT LOBBY, LOCATION OF FREIGHT ELEVATOR BANKS.
 - e. BUILDING SERVICES AND SYSTEM INFORMATION THAT INCLUDES: LOCATION OF MECHANICAL ROOMS, LOCATION OF BUILDING MANAGEMENT SYSTEM, LOCATION AND CAPACITY OF ALL FUEL OIL TANKS, LOCATION OF EMERGENCY GENERATOR, LOCATION OF NATURAL GAS SERVICE.
 - f. FIRE PROTECTION SYSTEM INFORMATION THAT INCLUDES: LOCATIONS OF STANDPIPES, LOCATION OF FIRE PUMP ROOM, LOCATION OF FIRE DEPARTMENT CONNECTIONS, FLOORS PROTECTED BY AUTOMATIC SPRINKLERS, LOCATION OF DIFFERENT TYPES OF SPRINKLER SYSTEMS INSTALLED (E.G., DRY, WET, PRE-ACTION, ETC.), AND HAZARDOUS MATERIAL INFORMATION THAT INCLUDES: LOCATION OF HAZARDOUS MATERIAL, QUANTITY OF HAZARDOUS MATERIAL.
 14. WORK TABLE.
 15. GENERATOR SUPERVISION DEVICES, MANUAL START AND TRANSFER FEATURES.
 16. PUBLIC ADDRESS SYSTEM WHERE SPECIFICALLY REQUIRED BY OTHER SECTIONS OF THIS CODE.
 17. ELEVATOR FIRE RECALL SWITCH IN ACCORDANCE WITH ASME A17.1.
 18. ELEVATOR EMERGENCY OR STANDBY POWER SELECTOR SWITCHES, WHERE EMERGENCY OR STANDBY POWER IS PROVIDED.
 19. ON-SITE FIRE PROTECTION WATER TANK FILL VALVE CONTROL SWITCH, TANK LEVEL INDICATORS, TANK LOW LEVEL ALARM, AND TANK FILL SIGNALS.

14 LEVEL 01.M



36 LEVEL 01

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gbdarchitects.com
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License No. 4728
STATE OF OREGON

PROJECT

CANVAS @ PRESS
BLOCKS
817 SW 11TH AVE
PORTLAND, OR 97205

CLIENT

THE PRESS BLOCK
COLLABORATIVE
(OFFICE) LLC
1211 SW 5TH AVE, STE 2230
PORTLAND, OR 97205

DOCUMENT ORIGINAL SIZE:

34" x 44"

Notice of Extended Payment
Provision: The contract will
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NO.	DATE	DESCRIPTION
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99	08/14/2018	ISSUED FOR CONSTRUCTION
100	08/14/2018	ISSUED FOR CONSTRUCTION

DATE

SEPTEMBER 14, 2018

PROJECT NUMBER

20166042

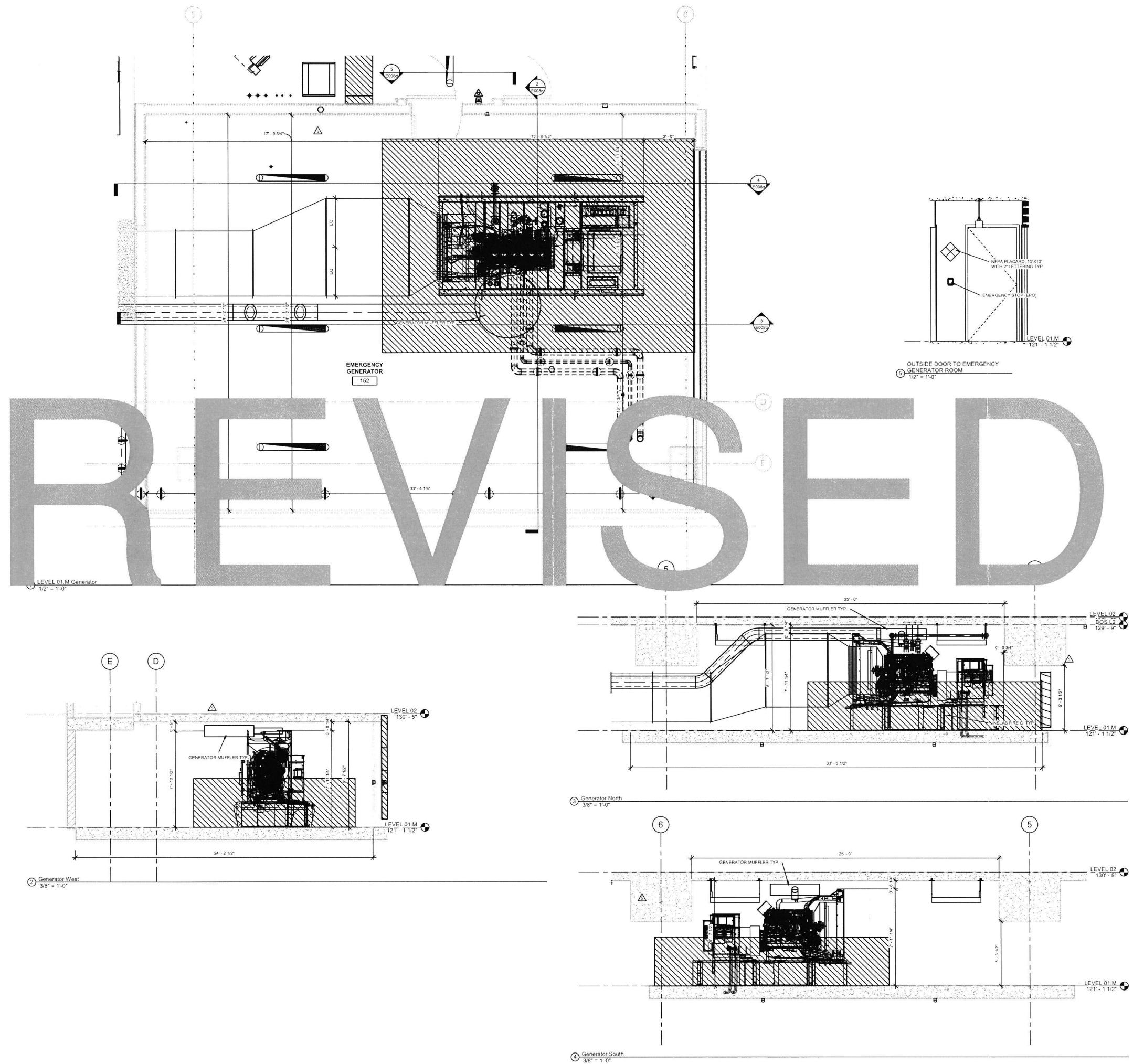
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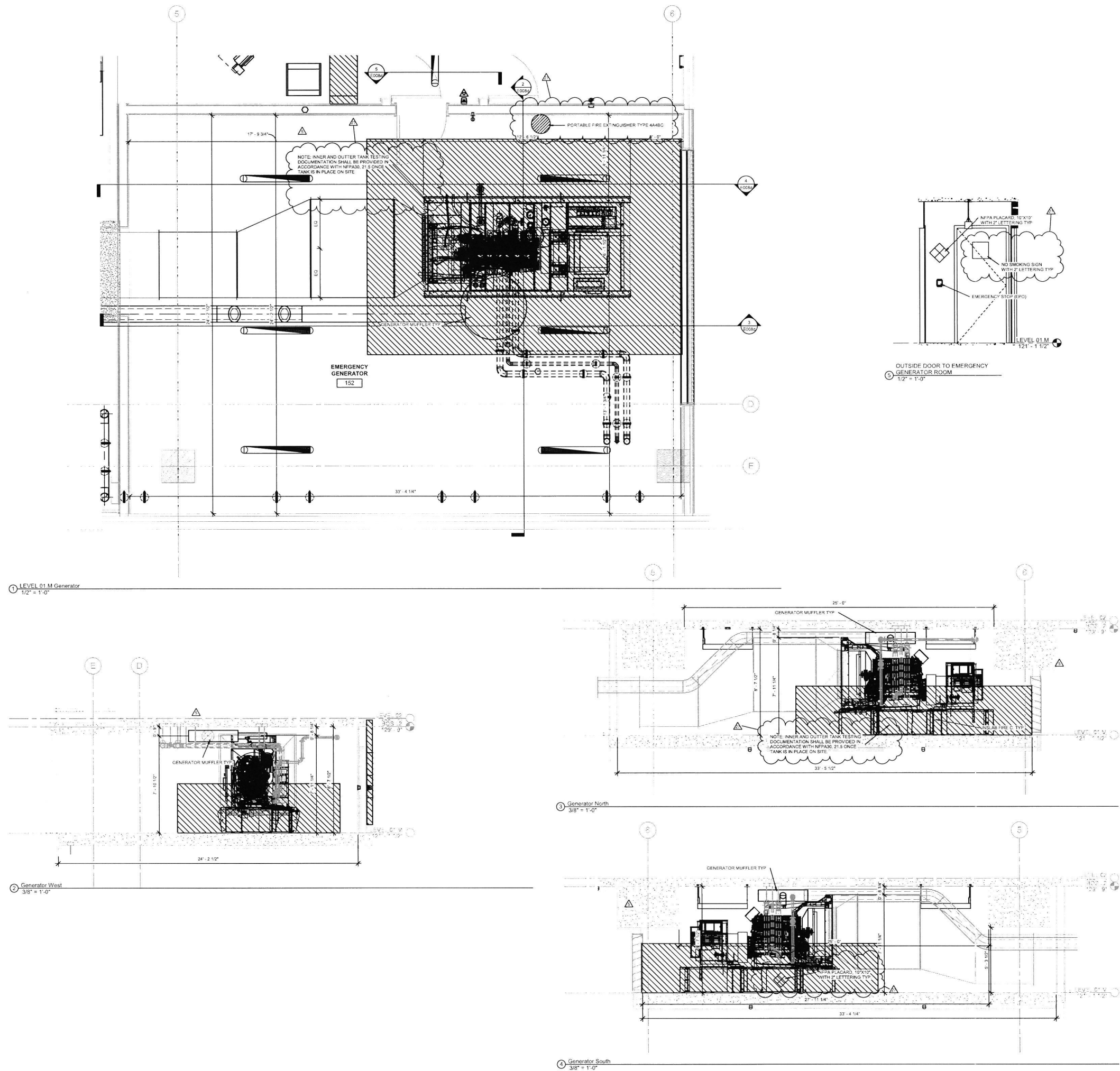
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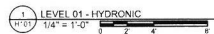
SHEET TITLE

FLOOR PLANS -
LEVELS 01-01.M

A101







Date	Description
	SS BLOCKS - HALF CK OFFICE
	SW 17TH AVE TILAND, OR 97205
12/24/19	General: Sean Murray ing: Alex Povodilo
12/24/19	General: Gary Payne ing: Tony Purvis, Adam Thomas
12/24/19	
12/24/19	EL 01 - HYDRON/C
12/24/19	
12/24/19	STALL
12/24/19	
12/24/19	
12/24/19	H101

SHEET NUMBER

D101A

D101B



Project PBHB CANVAS
IES Job# 311 170 029
Subject Generator Cost Summary

Date 06/10/19

Below is a summary of the electrical installation costs for the generator at the PBHB Canvas project.

Mechanical/Plumbing/Fire Protection	\$ 63,000.00
Electrical/Generator	\$ 91,073.00
Total Cost	\$ 154,073.00



Warning



1. Max. Test Pressure - 3 psi (21 kPa)
2. Max. Operating Pressure - 1.02 psi (7 kPa)
3. Max. Operating Vacuum - 0.04 psi (300 Pa)
4. For Diesel Fuel Only
5. This tank may contain combustible liquid.
Do not use any heat producing equipment or welding equipment to mount generator to this tank.
6. Follow manufacturer's instructions for mounting of generator and ancillary equipment.
7. Consult with Authority having jurisdiction prior to installation.
8. Do not fill tank when dispensing is in operation.
9. This tank is intended for stationary installation only.
10. Pressurize primary tank when pressure testing annular space.
11. Complies with - UL 142 & or CAN ULC-S601
12. CAUTION - Do not locate electrical parts or terminate exhaust near fill or vent openings

Rev. B



engineered smart. built strong.

4100 Kennedy Road
Janesville, WI 53545
608-758-4717
www.unitedalloy.com



Part Number: CAT 419-6625
Serial Number: C-54023360
Order Number: 923303
Manufacture Date: 10/2/2018
Total Tank Capacity (gal): 333 (1,260 L)
Usable Tank Capacity (gal): 321 (1,215 L)
Min. Dike Tank Capacity: 110 %
Max Lift Lug Capacity (lbs/pt): N/A
Max Weight of Generator (lbs): N/A
Height (in): 25 (635 mm)

This tank requires emergency relief venting capacity not less than:

- ☐ 2" NPT - 31,600 ft³/hr
- ☐ 3" NPT - 63,200 ft³/hr
- ☒ 4" NPT - 105,000 ft³/hr
- ☐ 5" NPT - 190,000 ft³/hr
- ☐ 6" NPT - 265,000 ft³/hr
- ☐ 8" NPT - 493,000 ft³/hr

FOR SECONDARY CONTAINMENT ONLY:

The annular space requires emergency venting capacity not less than 105,000 feet/hour

MH 28847



Secondary Containment Generator Base Tank

NO. C54023360

This Tank is intended for Stationary Installation only.

**This tank requires emergency
and normal venting capacity
not less than
66.00 cubic meters/min**

CANVAS	
DIPSTICK CHART FOR GENERATOR FUEL TANK	
INCHES OF FUEL ON DIPSTICK	MEASURED GALLONS
0.5	7.5
1.0	15.0
1.5	22.6
2.0	30.2
2.5	37.7
3.0	45.3
3.5	52.8
4.0	60.3
4.5	67.9
5.0	75.4
5.5	83.0
6.0	90.5
6.5	98.1
7.0	105.6
7.5	113.1
8.0	120.7
8.5	128.2
9.0	135.8
9.5	143.3
10.0	150.9
10.5	158.4
11.0	165.9

CANVAS	
DIPSTICK CHART FOR GENERATOR FUEL TANK	
INCHES OF FUEL ON DIPSTICK	MEASURED GALLONS
11.5	173.5
12.0	181.0
12.5	188.6
13.0	196.1
13.5	203.7
14.0	211.2
14.5	218.7
15.0	226.3
15.5	233.8
16.0	241.4
16.5	248.9
17.0	256.5
17.5	264.0
18.0	271.5
18.5	279.1
19.0	288.6
19.5	294.2
20.0	301.7
20.5	309.3
21.0	316.8
21.5	324.3
22.0	331.9
22.5	339.4

Press Blocks - Half Block

Electrical Equipment Submittals

Date Submitted 02/06/19

IES Submittal # 10.3 & 11.3 Revised w/markup

(Sect 26 32 13) Generator

(Sect 26 36 31) Automatic Transfer Switch

SUBMITTAL NO. 26 3213 -

THIS DOCUMENT HAS BEEN REVIEWED FOR GENERAL CONFORMANCE WITH CONTRACT DOCUMENTS. THIS REVIEW DOES NOT RELIEVE SUBCONTRACTOR OR SUPPLIER OF RESPONSIBILITY FOR ADHERENCE TO CONTRACT DOCUMENTS



APPROVED



APPROVED AS NOTED



FOR RECORD ONLY



REJECTED



REVISE AND RE-SUBMIT



VOID

By Levi Aldrich

Date: 2/7/2019

LEWIS CRUTCHER
LEWIS

Please note changes from previous Revision occur on pages: 2,10,11,14,32,112-120,152-177

GBD

This review is for general conformance with design concept only. Any deviation from plans or specifications not clearly noted by the contractor has not been reviewed. Review shall not constitute a complete check of all detailed dimensions or count or serve to relieve the contractor of contractual responsibility for any error or deviation from contract requirements.

SUBMITTAL IS:

☐ ACCEPTABLE

☐ REVISE, RESUBMIT

☒ ACCEPTABLE AS NOTED

☐ REJECTED

Date 02/12/2019

By danieln

GBD Architects Incorporated
1120 NW Couch St., Suite 300 Portland, OR 97209

SEE NOTES FROM GLUMAC ON NEXT PAGE;
NONE OF THESE NEED TO BE RE-CHECKED
BEFORE SUBMITTING TO THE CITY;

IES Commercial
16135 SW 74th Ave
Tigard, OR 97224

Ph: (503) 648-1900

Project Manager - Matt Saager

IES®

Commercial Section 2A
Page 1 of 182
XXXXXXXXXXXX

SUBMITTAL REVIEW

To: Daniel Nowell
GBD Architects
1120 NW Couch Street, Suite 300
Portland, OR 97209
503.224.9656
danieln@gbdachitects.com

Date: February 12, 2019
From: Dan Slavik
cc:

Project Name: Press Blocks Half Block
Project Number: 02.16.00745
Subject: Generator & AT
Specification Number: 26 3213
Glumac Submittal Number: 02.19.S0276
Contractor Submittal Number: 26 3213 IES-10.2 & 11.2

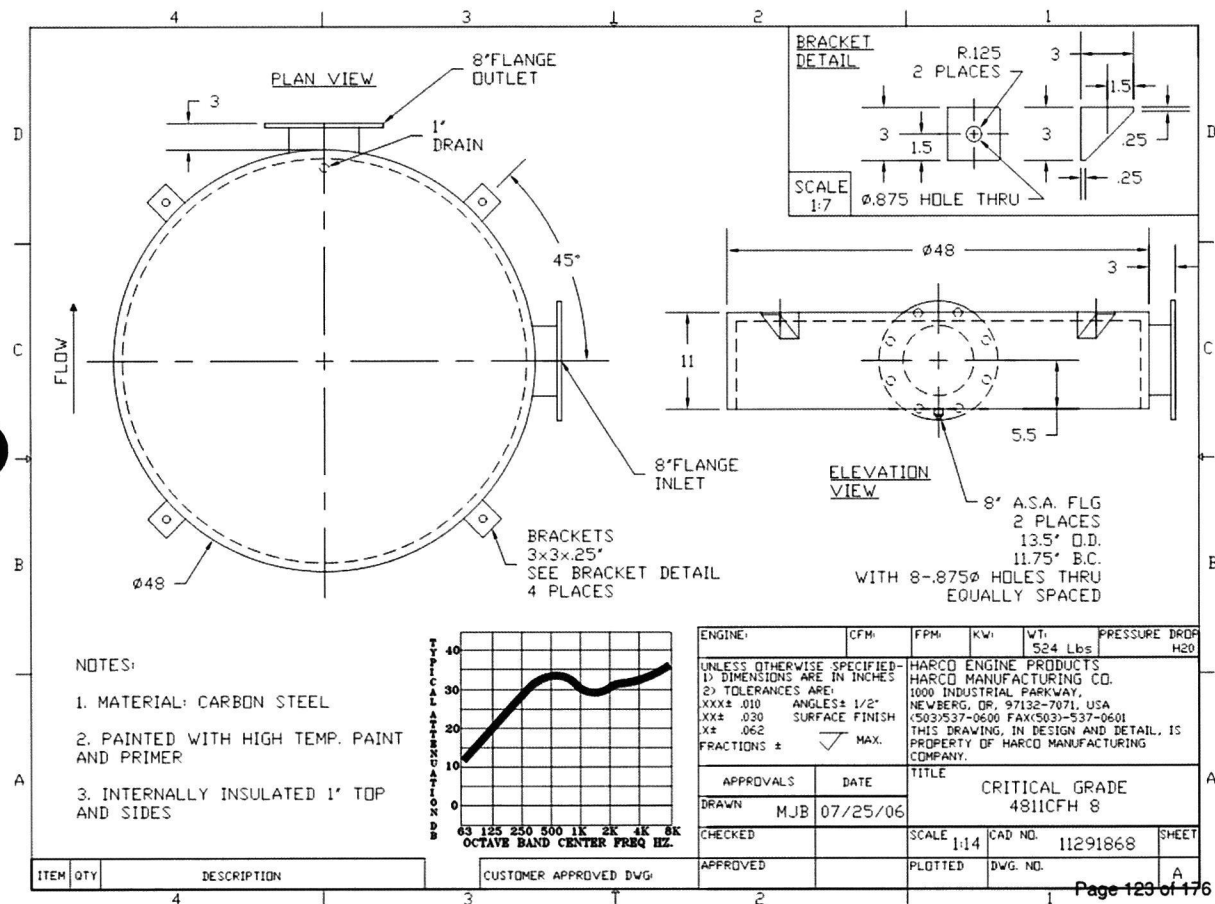
The subject submittal, returned herewith, has been reviewed for general design and compliance with contract documents to the extent shown. Contractor is responsible for dimensions, quantities, field conditions, performance and coordinating with other trades and is not relieved from responsibility for unauthorized deviation from contract documents. GBD Architects has requested that Glumac review project submittals in connection with the Press Blocks Half Block. Glumac has made a general review of this information. However, Glumac is not the Engineer of record and is not responsible for the preparation of detailed design being reviewed. As a result, while Glumac will exercise the degree of care that is standard in the industry for these services, Glumac's liability for any and all claims arising out of or relating to the services, irrespective of whether such claims are based on negligence, any other tort, breach of contract or otherwise, shall be limited to the total amount of the fee for service.

#	SUBMITTAL DESCRIPTION	REVIEW COMMENT	ACTION
1	General	***No short circuit study or breaker coordination study was provided. Ensure equipment meets available short circuit current and breakers coordinate per code requirements (NEC 700 and 701).***	
2	Updated Integral Tank	1) Confirm 9 hour run time is all that is required. (Per code, 8 hours is sufficient, owner to confirm no additional time is desired)	REVIEWED
3	Generator	1) Confirm 8 hour run time is all that is required. (Per code, 8 hours is sufficient, owner to confirm no additional time is desired) 2) Confirm breaker locations meet separation requirement of NEC 700 and 701 loads. (Confirmed by contractor) 3) Confirm power is provided to all equipment as required (jacket water heater, battery charger, remote annunciator, etc.). (Confirmed by contractor) 4) Genset shore power and jacket water heater power listed at 240V. System is 208V. (Contractor indicated no issue) 5) Provide starting current calculations. 6) Review location of remote annunciator panel with architect. (Confirmed same as IFC set) 7) Previous update includes updated breakers. Ensure code required coordination is achieved. 8) Update indicates day tank. Confirm all fuel system requirements are provided for functional fuel system. See note above	REVIEWED
4	Automatic Transfer Switches	1) Specs note delayed transition, 4-pole ATS. Submittal notes open transition, 4-pole ATS. Confirm desired type of ATS. 2) Confirm withstand ratings and SCCR match available calculations. (Confirmed by contractor)	REVIEWED

Daniel Nowell

From: Tobin Cooley <tobin@listenacoustics.com>
Sent: Friday, February 8, 2019 10:23 AM
To: Daniel Nowell; James Woods; Slavik, Dan
Cc: GTT.Construction Admin PDX
Subject: RE: Press Blocks - Half Block: Action Required for Submittal (#26 3213-8.02: Generator & ATS Revised)

Muffler looks acceptable, in terms of sound reduction (critical grade).



Tobin Cooley, P.E.
President
LISTEN ACOUSTICS, INC.
Portland - Lake Oswego - Seattle
P: 503-888-7741 (OR)
P: 206-595-8791 (WA)

tobin@listenacoustics.com

From: Daniel Nowell <DanielN@gbdarchitects.com>
Sent: Thursday, February 7, 2019 12:47 PM
To: Tobin Cooley <tobin@listenacoustics.com>; James Woods <jwoods@glumac.com>; Slavik, Dan

<dslavik@glumac.com>

Cc: GTT.Construction Admin PDX <Const.AdminPDX@glumac.com>

Subject: FW: Press Blocks - Half Block: Action Required for Submittal (#26 3213-8.02: Generator & ATS Revised)

I'm using Mimecast to share large files with you. Please see the attached instructions.

Dan & James,

Attached is a revised submittal for the generator. They have reverted back to a belly tank set-up like you initially reviewed, with a few items modified. Can you do a quick turn-around of this!? They're on the rope to get the deferred submittal for this out in time.

Tobin: Can you review the muffler submitted with the generator. See pages 42-43 for generator db output and pages 122-124 regarding the muffler. I quick review of these items would be appreciated.

Thanks,

DANIEL A. NOWELL, AIA

Associate, LEED AP BD+C

From: Levi Aldrich (Lease Crutcher Lewis, LLC) <Lease_Crutcher_Lewis@procoretech.com>

Sent: Thursday, February 7, 2019 11:59 AM

To: Daniel Nowell <DanielN@gbdarchitects.com>

Subject: Press Blocks - Half Block: Action Required for Submittal (#26 3213-8.02: Generator & ATS Revised)

Press Blocks - Half Block

More details: [View online](#) [View PDF](#)

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Need help responding to this Submittal? Learn how in under a minute by watching [this short training video](#).

Levi Aldrich requires action from you on this submittal.

Project:	Press Blocks - Half Block
Spec Section:	26 3213 - ENGINE GENERATORS
Submittal #:	26 3213-8.02
Title:	Generator & ATS Revised

Type: **Product Information**

Responsible Contractor: **IES Commercial, Inc.**

Received From: **Cathi Burton**

Ball In Court: **Daniel Nowell**

Submitter: **Burton, Cathi (IES Commercial, Inc.)**

Approvers: **Aldrich, Levi (Lease Crutcher Lewis, LLC)
Nowell, Daniel (GBD Architects)**

Distribution: **Aldrich, Levi (Lease Crutcher Lewis, LLC)
Browne, Ryan (Lease Crutcher Lewis, LLC)
Kline, Chris (Lease Crutcher Lewis, LLC)
Krieg, Josh (Lease Crutcher Lewis, LLC)
Murray, Justin (Lease Crutcher Lewis (SPW))
Reiff, Katie (Urban Renaissance Group, LLC)
Sager, Mike (Lease Crutcher Lewis, LLC)
Town, Chris (Lease Crutcher Lewis, LLC)**

Final Due Date: **02/14/19**

Description: **Attached is the revised submittal for Generator and ATS.
Markup is provided to show difference from previous
submittal.**

Attachments: **(Sect 26 32 13 IES-10.2 & 11.2) - Generator & ATS - Revised
with Markup.pdf**

Design Team Review Time: **14 day(s)**

Internal Review Time: **30 day(s)**

Submitter: **Burton, Cathi (IES Commercial, Inc.)**

Date: **Sent: 02/06/19
Returned: 02/07/19**

Response: **Submitted**

Attachments: **(Sect 26 32 13 IES-10.2 & 11.2) - Generator & ATS - Revised
with Markup.pdf**

Comments: **None**

Approver: **Aldrich, Levi (Lease Crutcher Lewis, LLC)**

Date: **Sent: 02/07/19
Returned: 02/07/19**

Response: **Approved**

Attachments: (Sect 26 32 13 IES-10.2 & 11.2) - Generator & ATS - Revised with Markup LCL Review.pdf

Comments: **Please note that changes to previous revision occur on pages: 2,10,11,14,32,112-120,152-177**

Approver: **Nowell, Daniel (GBD Architects)**

Date: **Sent:**
Returned:

Response: **Pending**

Attachments: **None**

Comments: **None**

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PETERSON
POWER SYSTEMS



**PRESS BLOCK HALF
EQUIPMENT SUBMITTAL FOR APPROVAL
REVISION No.6**

PREPARED FOR
IES COMMERICAL, INC.



**NEW CATERPILLAR MODEL C15 EPA TIER II
500kW/625kVA, 480/277VAC, THREE PHASE FOUR WIRE 0.8 PF, 60Hz
STANDBY DIESEL ENGINE GENERATOR SET
INCLUDES TWO (2) AUTOMATIC TRANSFER SWITCHES**

Removed Remote Fill panel, Day Tank

PROVIDED BY
PETERSON POWER SYSTEMS, INC.
PROJECT NUMBER 170337
FEBRUARY 05, 2019

Since 1936

5290 NE Five Oaks Dr. ↗ Hillsboro, OR 97214 ↗ Telephone (503) 288-6411 ↗ www.petersonpower.com
Project Manager: Scott Posey ↗ 503.718.8650 ↗ Fax 503.280.1552 ↗ SMPosey@PetersonPower.com

SECTION 2A
Page 7 of 182
XXXXXXXXXXXX

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● WE'RE READY



Peterson Power Systems, Inc. is the authorized Cat® Power Systems dealer in Northern California, Oregon and southern Washington. Headquartered in San Leandro, Peterson Power offers a wide array of power generation and engine services including sales, rental, parts, and repair. Peterson Power's full-service protection programs feature annual or monthly service options including load-bank and meggar testing. The dealership offers marine and OEM engines, generators, UPS (uninterruptible power supplies), turbines, truck engines, and used equipment as well as a full-service truck shop. Peterson Power Systems has been a family-owned Caterpillar dealership for more than 70 years.

Our experienced sales and engineering teams provide Powerful Solutions and the expert technical support necessary to address your unique power requirements. For temporary power needs, our rental fleet stands ready to provide over 200 megawatts of quiet portable power from 15kW to 5.7 MW. Portable chillers from 5-800 tons, Sullair oil-free and oil-injected air compressors, cooling towers and pumps, load banks, and transformers

compliment our line-up of state-of-the-art equipment and industry recognized expertise. With immediate availability, we can deliver, set-up and support your rental equipment needs 24/7/365.

Power Systems manufactured by Caterpillar and engineered, installed and serviced by Peterson Power, supply emergency stand-by power for hospitals, data and telecommunication centers, office buildings and industrial applications. Our engine systems also power workboats, pleasure craft, on-highway trucks, and provide clean dependable prime power for distributed generation used in local businesses and remote construction projects.

Peterson Power Systems has reviewed and revised our operating procedures relating to vehicle fleet maintenance, office recycling programs, facilities upkeep, and purchasing options to better reflect our commitment to sound environmental practices. A major component of our program is a parts remanufacturing option we offer in conjunction with Caterpillar Inc., where replaced parts are returned to the factory for retooling and

reuse, and which significantly reduces the amount of scrap material discarded each year.

As a result of our green efforts, Peterson Power Systems is now a certified Bay Area Green Business. This certification demonstrates our dedication to reducing our impact on the environment with the following programs: solid waste reduction, energy efficiency, water conservation, and pollution prevention. We have received recognition for each of these sustainability efforts, and, more importantly, we've made significant steps toward reducing our environmental footprint. In 2012, Peterson diverted 640 tons of waste from the landfill through recycling and waste reduction programs; in 2009, we reduced our water consumption by 30,000 gallons over the previous year; and we are happy to announce that Peterson University now composts its food scraps from customer training classes. Visit our website to learn more about our green programs and how you can receive Cat Dealer support from a company that cares about the community it serves—your community.

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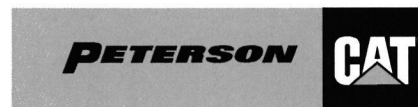
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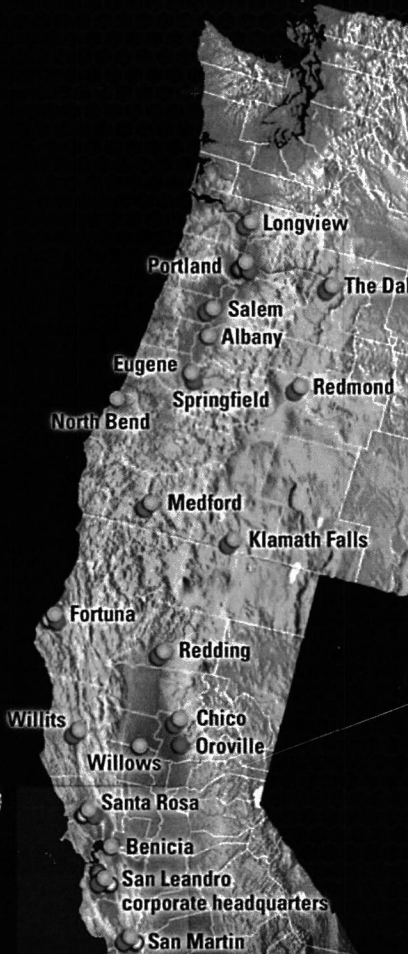
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Peterson Cat is our earthmoving and construction company, and is the official Cat equipment dealer for the San Francisco Bay Area, the Northern California coast, western Oregon, and southern Washington.

Peterson Power Systems also serves our entire territory of Northern California, western Oregon, and southern Washington, offering Cat generators and industrial engines; parts and service for all makes and models of industrial power equipment and on-highway trucks; and rental power systems including generators, air compressors, dewatering pumps, and temperature control systems.

Peterson Trucks became the authorized International Trucks dealership in 2011 and offers new and used International Trucks for sale; International Truck lease and rental services; International Truck repair services; and an all makes, all models on-highway truck parts department. Peterson Trucks serves the San Francisco Bay Area, with locations in San Leandro, Santa Rosa, San Martin, and Fortuna.

Cresco, which serves Northern California, and **Peterson - The Cat Rental Store**, which serves Oregon and southern Washington, provides equipment rental to contractors and homeowners throughout Northern California for projects as diverse as remodeling, major construction, movie and concert productions.

SITECH NorCal & SITECH Oregon (your dealer for Trimble, Apache, Crain, Seco and Laserline products) serves the construction and agriculture markets technology needs from our San Leandro, CA and Portland, OR offices. SITECH NorCal & SITECH Oregon are independent Trimble dealers and factory direct stores.

With 20 locations and over 1,000 employees, Peterson's reputation is built upon solving our customer's problems and providing world-class service. Peterson's heritage of innovation and relentless pursuit of continuous improvement is focused on improving our customer's business and being an asset to the communities that we serve.

Peterson's efforts to support the stewardship of the environment through our Green Business Initiatives as well as our ongoing support of community events through Peterson in the Community, demonstrates our belief that we give back to the communities we are a part of.

AWARDS AND CERTIFICATIONS



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I

BILL OF MATERIALS

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Bill of Materials

Project Name: Press Block Half

Date: February 05, 2019

Peterson Project No.: 170337

Caterpillar Standby Generator Set Model: C15-500kW

500ekW, 625kVA, 480 V, 3Ø, 60Hz

Generator Set Package – Please Refer to Drawings for Dimensions and Weights

Item	Qty	Description
C15 PGAM	1	C15-450KW 480VAC
60H0480	1	60HZ 480VOLT (WYE)
BAT2456	1	OVERSIZED WET BATTERY (PART NO. 153-5710 1400CCA GROUP 4D)
C15DECF	1	C15 60HZ PKG 500 CERTESE
CATDEC	1	CAT DECALS
CBAUX1	1	1 ST BREAKER AUXILIARY CONTACTS
CBAUX2	1	2 ND BREAKER AUXILIARY CONTACTS
CBAUX3	1	3 RD BREAKER AUXILIARY CONTACTS
CBK0706	1	1 ST 600A CIRCUIT BREAKER LSI (600AF/400AT)
CBK0710	1	2 ND 400A CIRCUIT BREAKER LSI (400AF/400AT)
CBK0714	1	3 RD 250A CIRCUIT BREAKER LSI (250AF/150AT)
CBKPLT1	1	BREAKER SEPARATION PLATE
CBLG002	1	1 ST CB CABLE GP ABB/T6-800/600
CBLG203	1	2 ND CB CABLE GP ABB/T5-400
CBLG304	1	3 RD CB CABLE GP ABB/T4-250
CERTESE	1	EPA STATIONARY EMERGENCY
CT1005A	1	1000:5 CT RATIO
EMCCAS3	1	GEN RUNNING & FAULT RELAY
EMCCPLH	1	CONTROL PANEL MOUNTING LEFT
EMCLAM1	1	LOCAL ANNUN NFPA99-110/CSA282
EMCP42	1	EMCP4.2 CONTROL PANEL
EMCSDP2	1	DISCRETE I/O MODULE
ESCNONE	1	STANDARD WARRANTY
FFLCK	1	FUEL TANK FILL PIPE & LOCK CAP
FTDW002	1	INTEGRAL TANK BASE (330 GAL) – COLOR BLACK
GENMTG	1	GEN MOUNTING DUCT PLATE
GENT105	1	105°C TEMP RISE OVER 40°C AMBIENT
HTRCG01	1	HEATER CONTROL GROUP
IBSCCB	1	IBC SEISMIC CERT OF COMPLIANCE
KW00500	1	60 HZ, 500 KW W/FAN
MSEPGGN	1	GENERAL EPG
MWCODEF	1	STANDBY POWER
NCBG002	1	1 ST NEUTRAL CABLE GP 800A
NCBG201	1	2 ND NEUTRAL CABLE GP 400A
NCBG301	1	3 RD NEUTRAL CABLE GROUP 01
NDTS1	1	NEUTRAL BAR NDTS1
NDTS4	1	NEUTRAL BAR NDTS400
NDTS5	1	3 RD CB NEUTRAL BAR
OGNAR59	1	LC7024J AREP ALT 59

PMEXCI4	1	PERMANENT MAGNET EXCITATION 04
PWRCTRH	1	POWER CENTER - RH MOUNTED
SGTF	1	RADIATOR GUARD AND DUCT FLANGE
STANDBY	1	STANDBY POWER
STDAIR	1	STD AIR CLEANER - LIGHT DUTY
STDIVR	1	INTEGRATED VOLTAGE REGULATOR
STDRAD	1	STANDARD RADIATOR
STDTEST	1	STD TEST - PKG GEN SET 0.8 PF
ULLIST	1	UL 2200 LISTED PACKAGE GEN SET
WESTERN	1	AUTHORIZED APPROVAL NUMBER
BTC1028	1	*BATTERY CHARGER 10 AMP DUAL (960W-120VAC)
JWH0059	1	*JACKET WATER HEATER 240 VAC (3000W-240VAC)
*SHORE POWER		CUSTOMER SUPPLIED 20A - 240/120VAC MINIMUM CIRCUIT

Auxiliary Equipment (Shipped Loose)

Item	Qty	Description
ANNR001	1	RS485 REMOTE ANNUNCIATOR PANEL
EXCFF25	1	FLEXIBLE EXHAUST CONNECTION 25
FLMSUSE	1	SUSE DECALS & FILMS
4811CFH	1	HARCO EXHAUST CRITICAL GRADE
HSPF68	1	EXHAUST FLANGE ASA (8-IN / 6-IN) 90 DEGREE
EMGSTP1	1	PILLA REMOTE E-STOP BUTTON
CTS000B00022E	1	ATS: 225A-480/277V FOUR POLE, FOUR WIRE, THREE PHASE, NEMA1, MX250 CONTROLLER – OPEN TRANSITION
CTS000B00040E	1	ATS: 400A-480/277V FOUR POLE, FOUR WIRE, THREE PHASE, NEMA1, MX250 CONTROLLER – OPEN TRANSITION

Service and Start-Up

Item	Qty	Description
4 HR LOAD TEST	1	NFPA 110 LEVEL 1, FOUR (4) HOUR LOAD TEST ON SITE WITH (TECHNICIAN AND TESTING EQUIPMENT WITHIN 80' OF THE GENERATOR SET CONNECTIONS @ LEVEL GRADE). INCLUDES FACILITY TRANSFER TEST (ATS TEST) WITH AVAILABLE LOAD.
4 HR TRAINING	1	ON SITE TRAINING – UP TO FOUR HOURS ALLOWED.

Caterpillar A&I Guides

Caterpillar Application and Installation Guides are available, which provide information regarding the system design and installation considerations to which you must adhere in order for this equipment to function properly. Please consult with the project specific design engineer and / or your Caterpillar representative if you have any questions.

Disclaimer: Scope of Work, and Scope of Supply

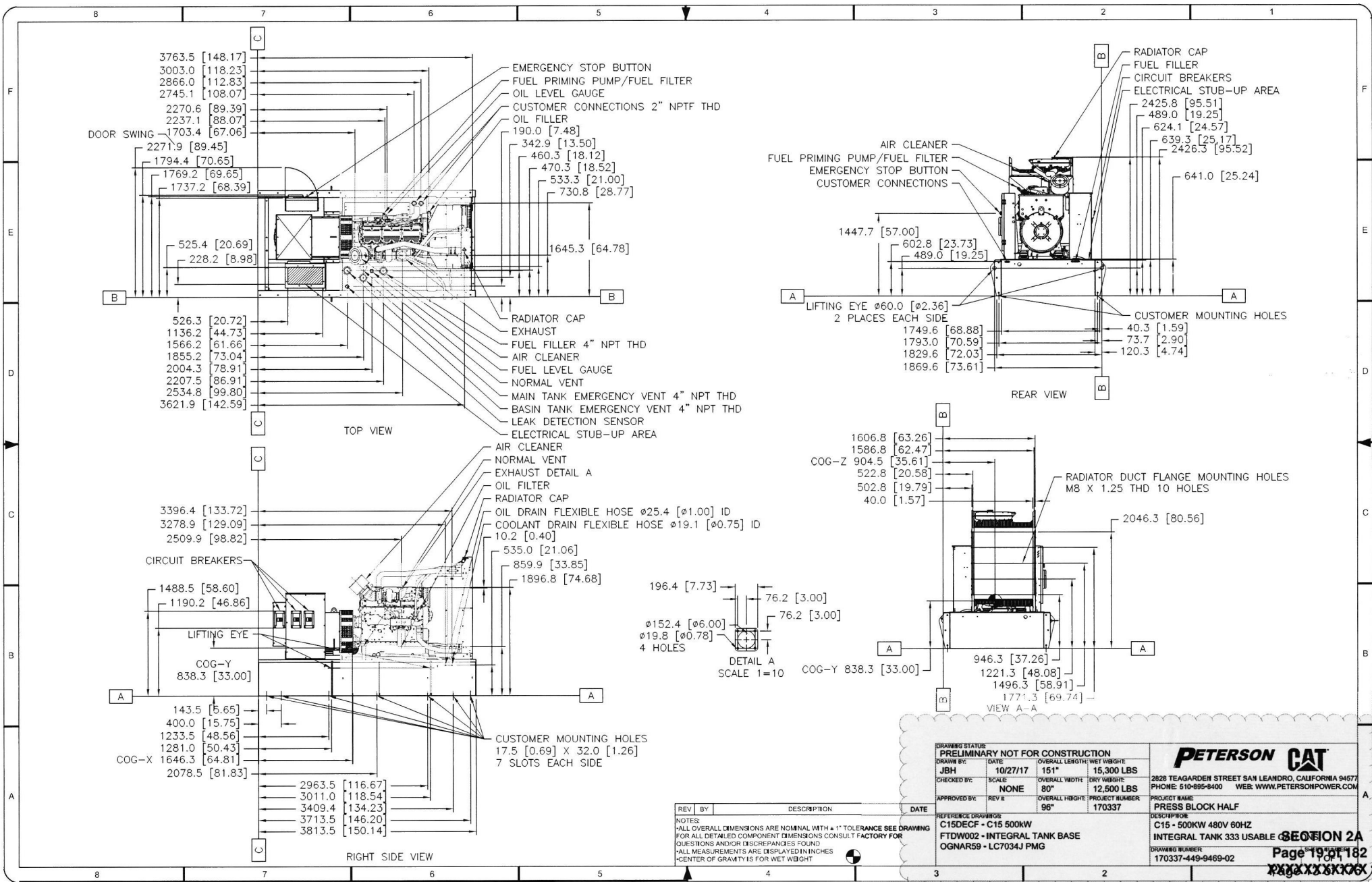
Any 3rd party specialized testing and PE; engineering services are NOT provided. Additional testing or selective coordination study, arc flash study, breaker trip unit adjusting, breaker testing, contact or insulation resistance testing, ground fault testing, IR scans. FOB Jobsite, off-loading (including crane and rigging), and fueling ARE ALL BY OTHERS. Concrete pad, design, anchors, and anchor calculations are by others. Exhaust pipe or modifications, conductors and cable are all by others.

Note: Any requested changes from submitted equipment may be subject to additional cost.

II

GENERATOR SET DRAWINGS

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DRAWING STATUS			
PRELIMINARY NOT FOR CONSTRUCTION			
DRAWN BY:	DATE:	OVERALL LENGTH:	WEIGHT:
JBH	10/27/17	151"	15,300 LBS
CHECKED BY:	SCALE:	OVERALL WIDTH:	DRY WEIGHT:
	NONE	80"	12,500 LBS
APPROVED BY:	REV #:	OVERALL HEIGHT:	PROJECT NUMBER:
		96"	170337

REFERENCE DRAWINGS
 C15DEC - C15 500KW
 FTDW002 - INTEGRAL TANK BASE
 OGNAR59 - LC7034J PMG

PETERSON CAT

2828 TEAGARDEN STREET SAN LEANDRO, CALIFORNIA 94577
 PHONE: 510-895-8400 WEB: WWW.PETERSONPOWER.COM

PROJECT NAME:
 PRESS BLOCK HALF

DESCRIPTION:
 C15 - 500KW 480V 60HZ
 INTEGRAL TANK 333 USABLE

DRAWING NUMBER:
 170337-449-9469-02

SECTION 2A

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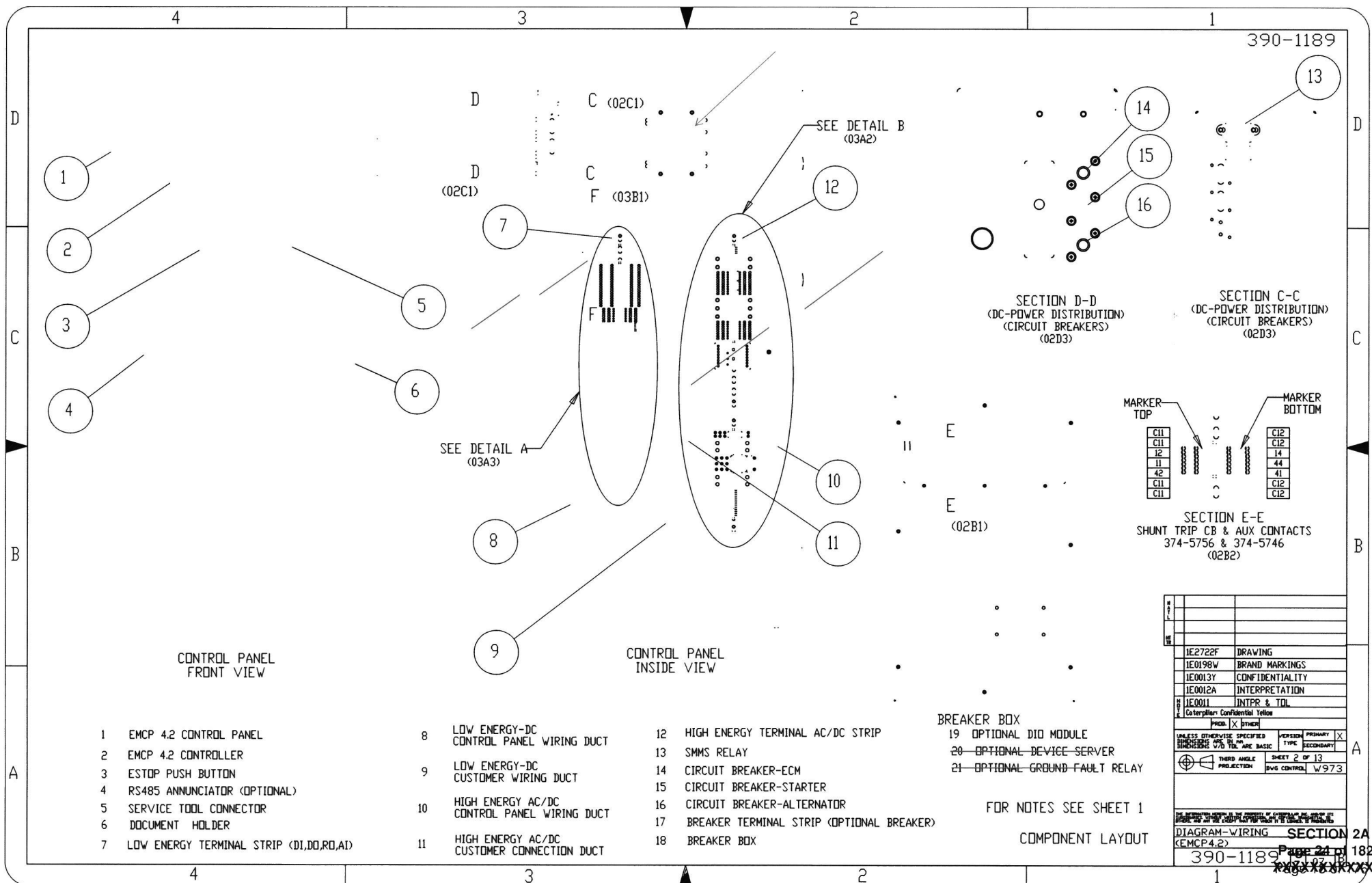
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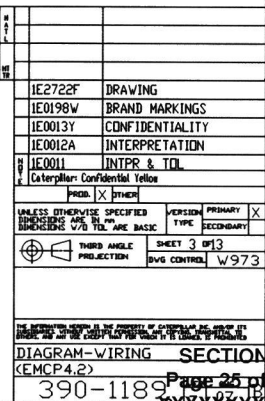
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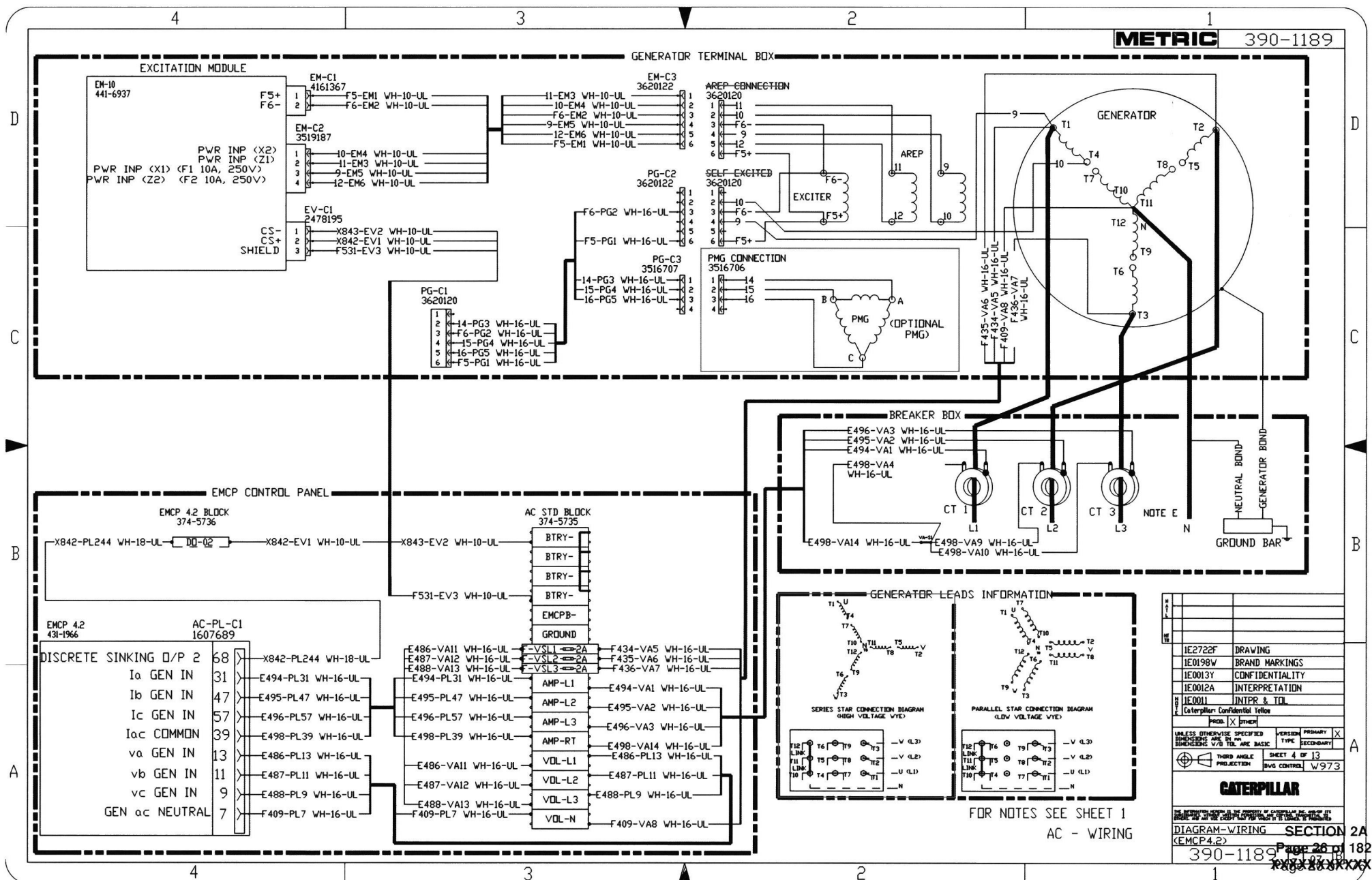
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CATERPILLAR

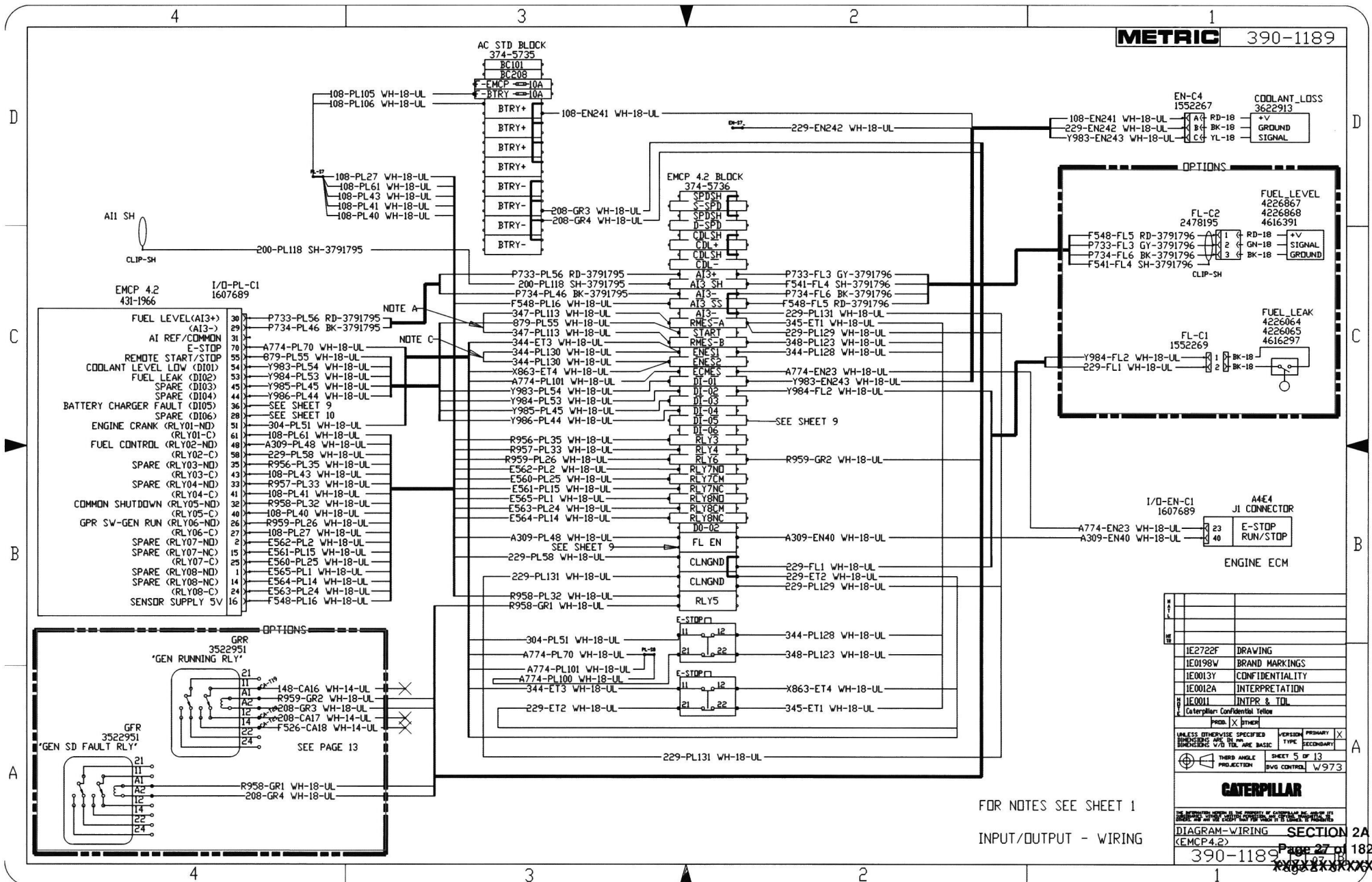
CROSS REF, SHEET INDEX & NOTES

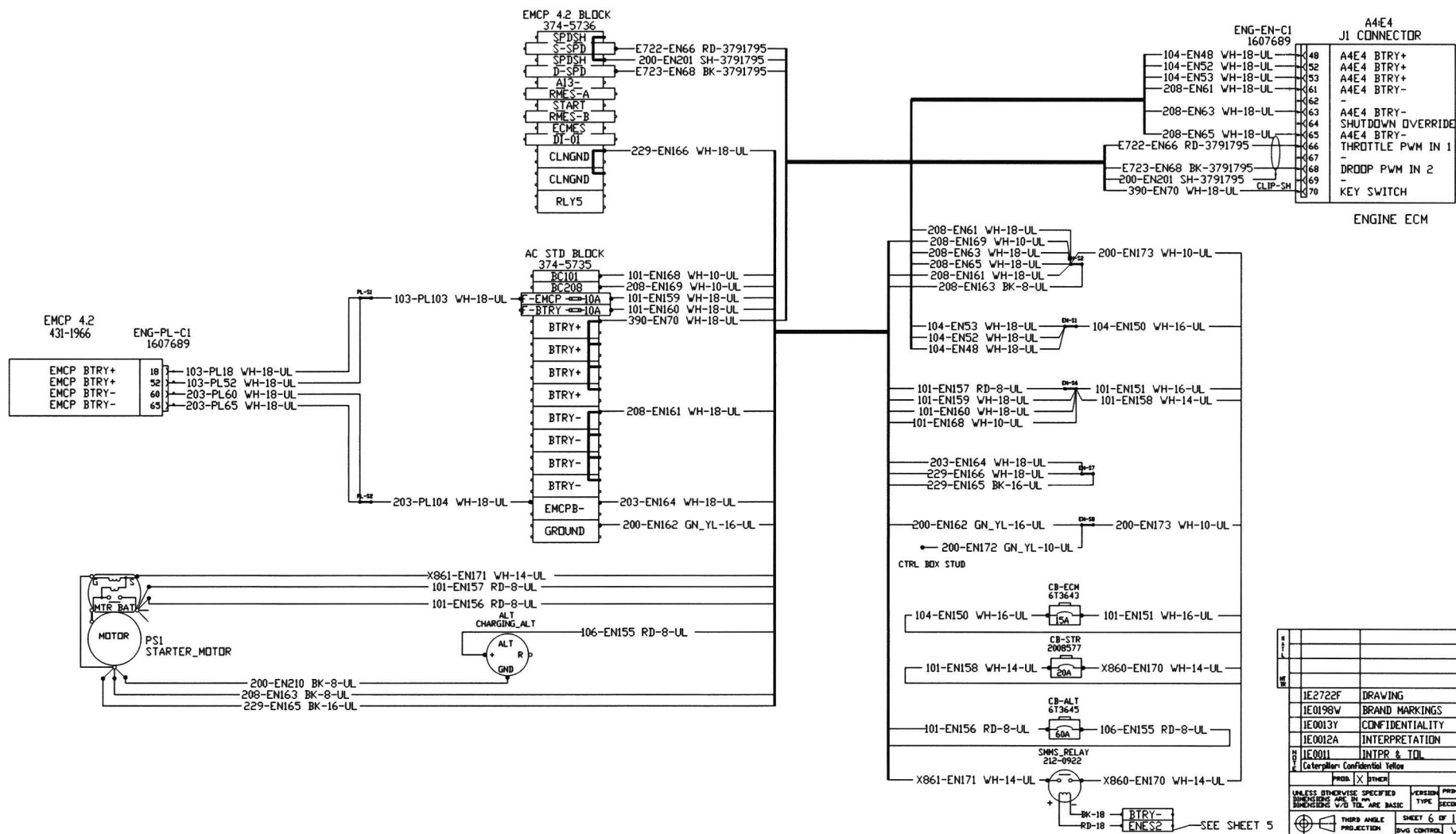






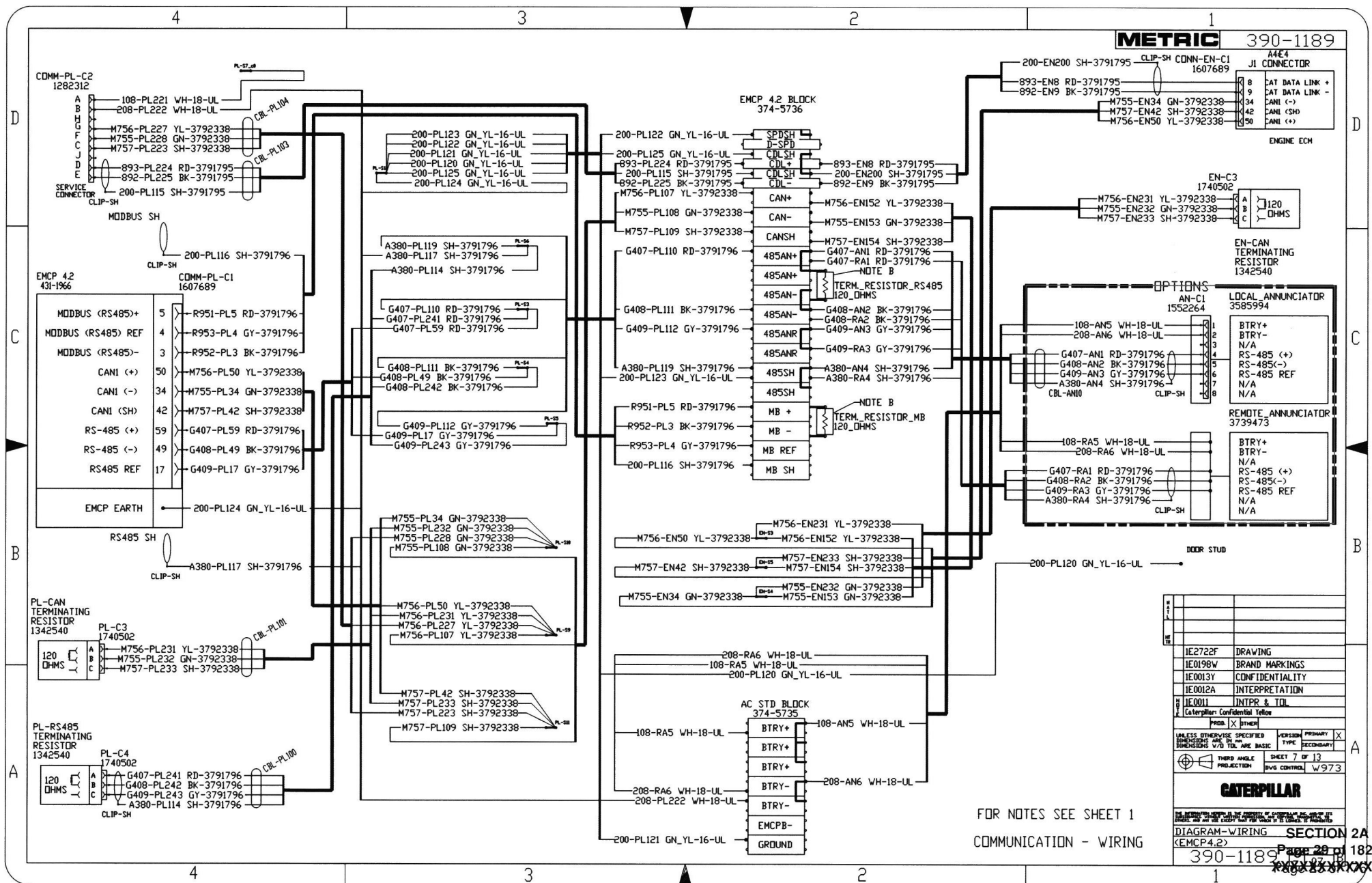
1E2722F	DRAWING
1E0198W	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
1E0001I	INTPR & TOL
Caterpillar Confidential Yellow	
PROD. X OTHER	
UNLESS OTHERWISE SPECIFIED	VERSION PRIMARY
REVISIONS ARE IN PENCIL	TYPE SECONDARY
THIRD ANGLE PROJECTION	SHEET 4 OF 13
DIAGRAM-WIRING	W973
CATERPILLAR	
SECTION 2A	
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390-1189	

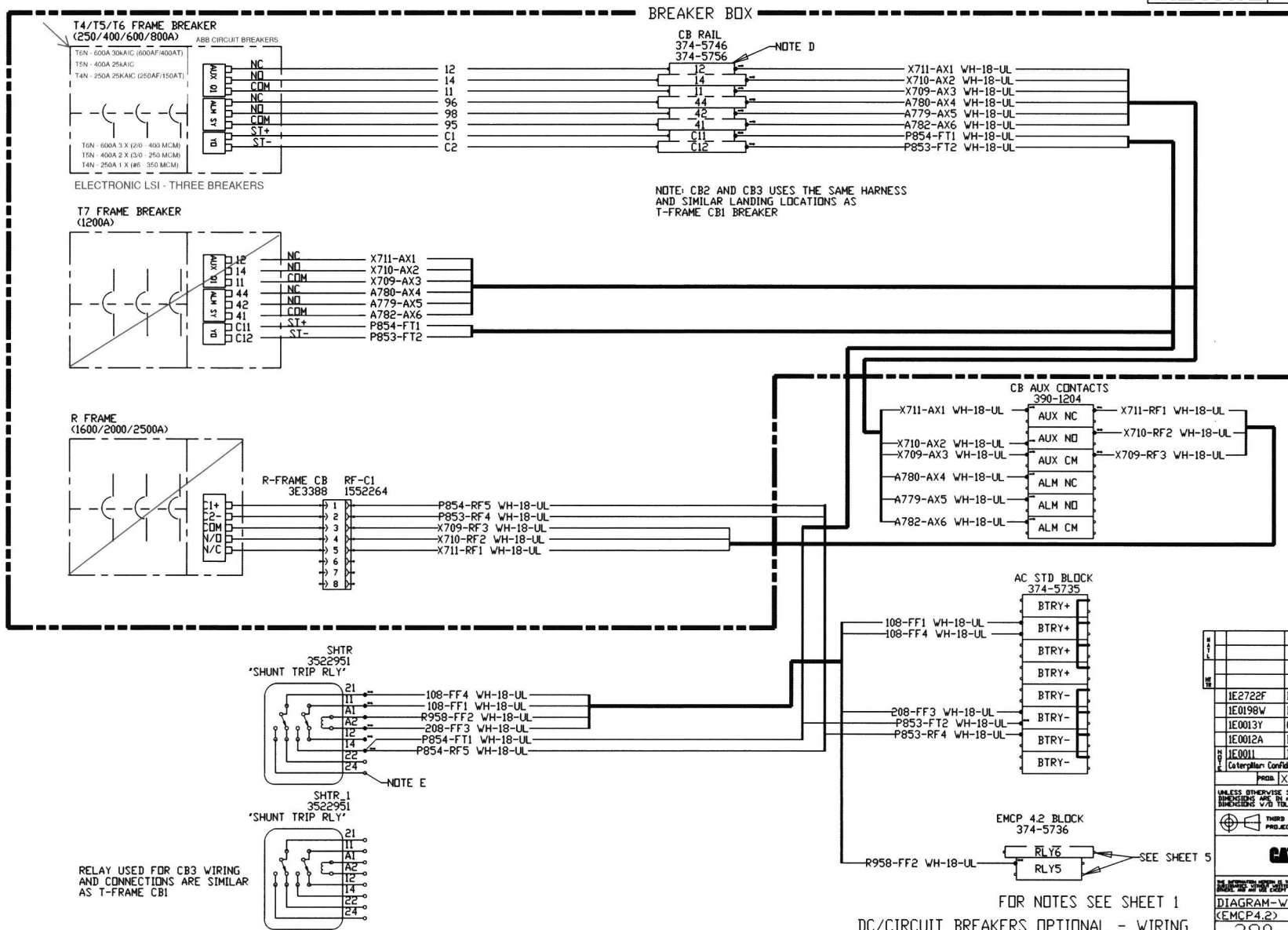




FOR NOTES SEE SHEET 1
ENGINE INTERFACE - WIRING

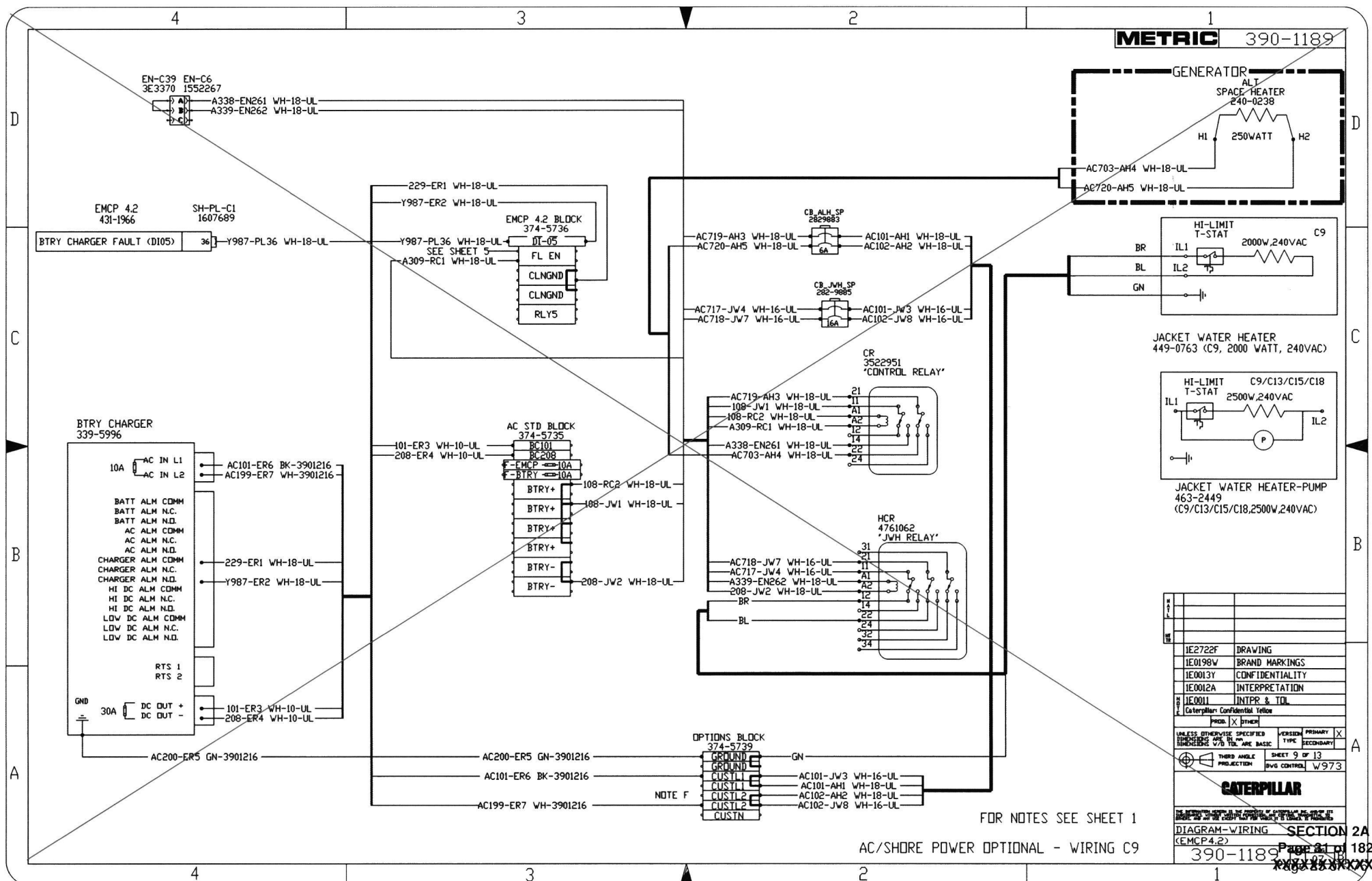
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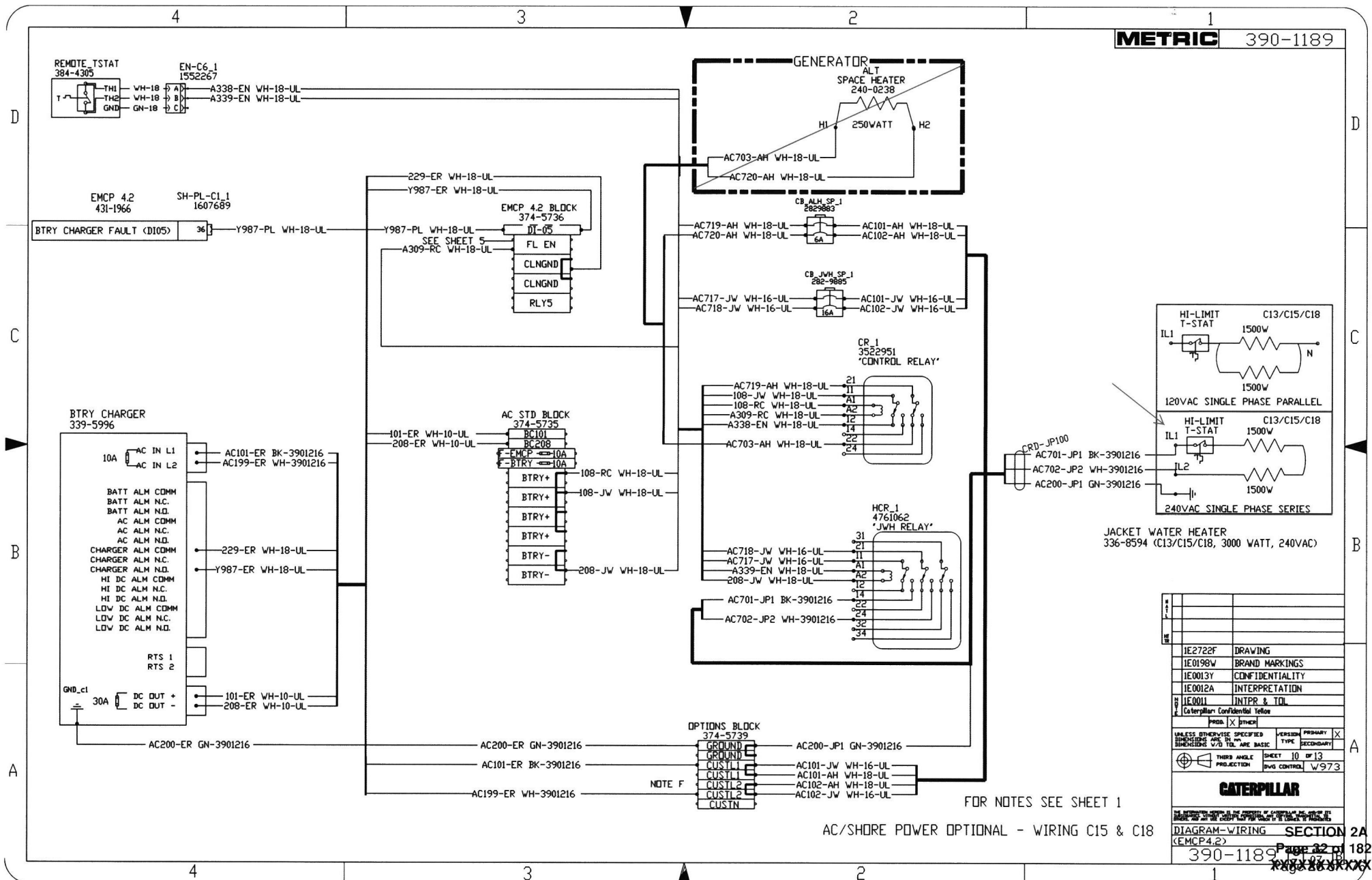




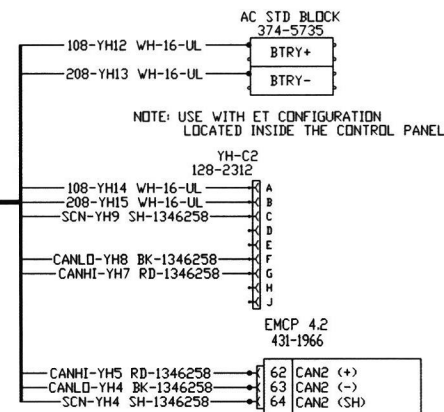
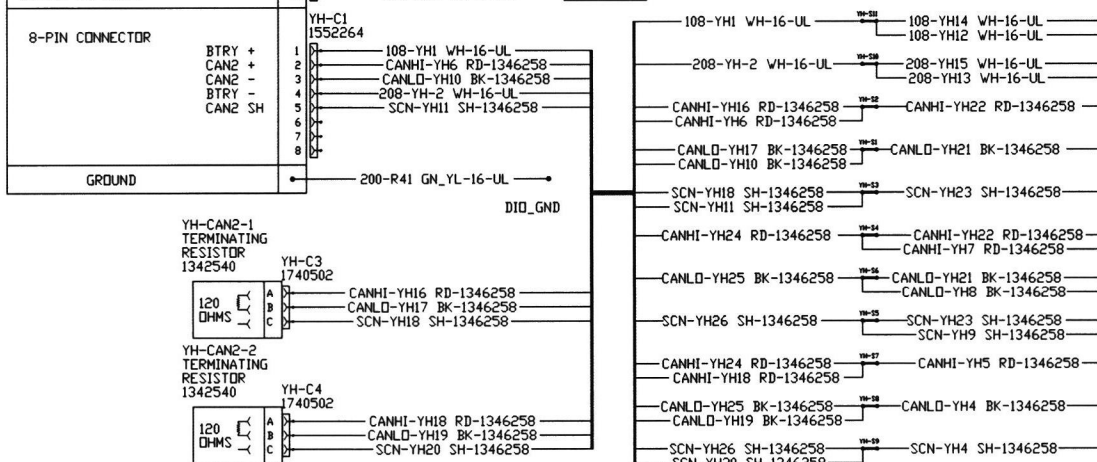
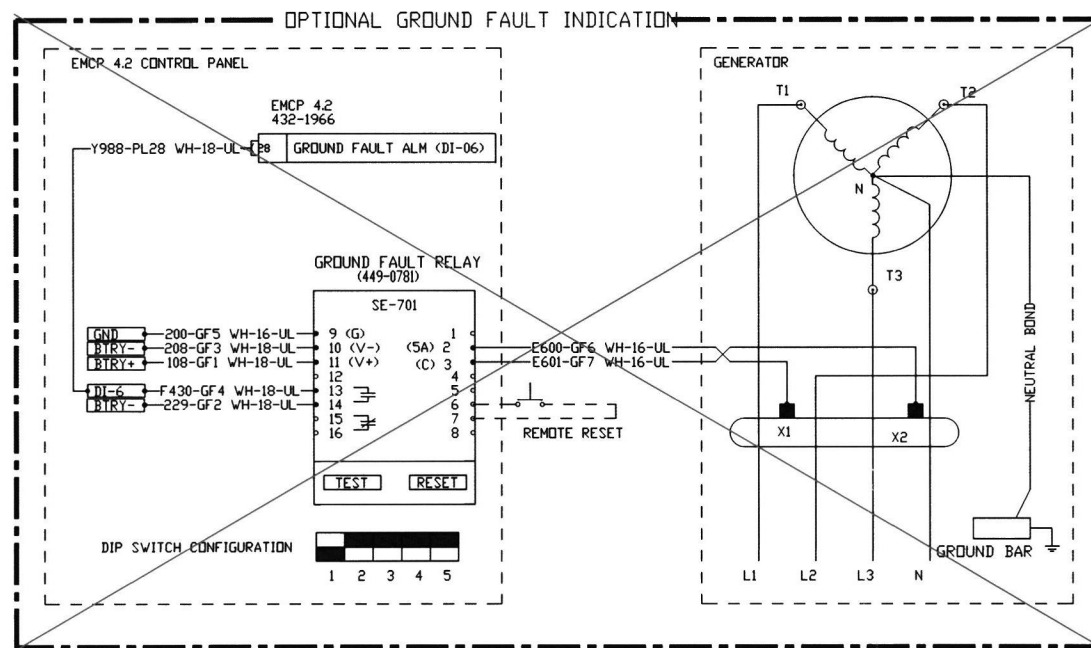
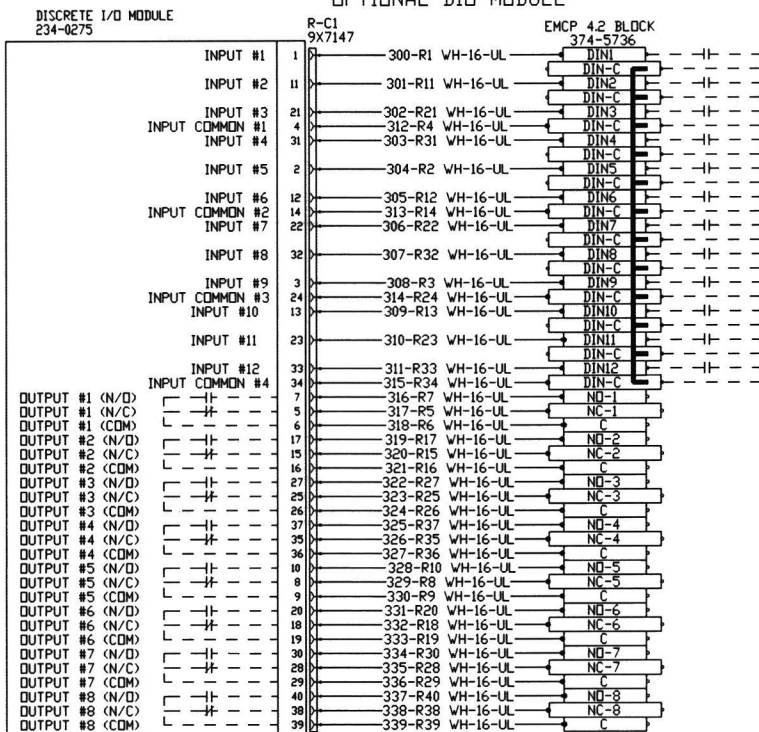
IE2722F	DRAWING
IE0198W	BRAND MARKINGS
IE0013Y	CONFIDENTIALITY
IE0012A	INTERPRETATION
IE0011	INTPR & TOL
Caterpillar Confidential Yellow	
PROB [X] OTHER	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DIMENSIONS IN MILLIMETERS ARE BASIC	
THIRD ANGLE PROJECTION	SHEET 8 OF 13
DWG CONTROL W/973	
CATERPILLAR	
DIAGRAM-WIRING SECTION 2A	
(EMCP4.2)	
390-1189	

FOR NOTES SEE SHEET 1
 DC/CIRCUIT BREAKERS OPTIONAL - WIRING





IE2722F	DRAWING
IE0198W	BRAND MARKINGS
IE0013Y	CONFIDENTIALITY
IE0012A	INTERPRETATION
IE0011	INTPR & TOL
Caterpillar Confidential Yellow	
PROB	OTHER
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DIMENSIONS V/D TOL ARE BASIC	VERSION TYPE PRIMARY
THIRD ANGLE PROJECTION	SHEET 10 OF 13
	DWG CONTROL W973
CATERPILLAR	
DIAGRAM-WIRING SECTION 2A	
(EMCP4.2)	
390-1189	



FOR NOTES SEE SHEET 1

OPTIONS-DIO MODULE AND GROUND FAULT

1E272ZF DRAWING
 1E0198W BRAND MARKINGS
 1E0013Y CONFIDENTIALITY
 1E0012A INTERPRETATION
 1E001I INTP & TOL
 Caterpillar Confidential Yellow

PROJ.	X OTHER	VERSION TYPE	PRIMARY SECONDARY
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS DIMENSIONS W/O TOL ARE BASIC		SHEET 11 OF 13	DWG CONTROL W973

THIRD ANGLE PROJECTION

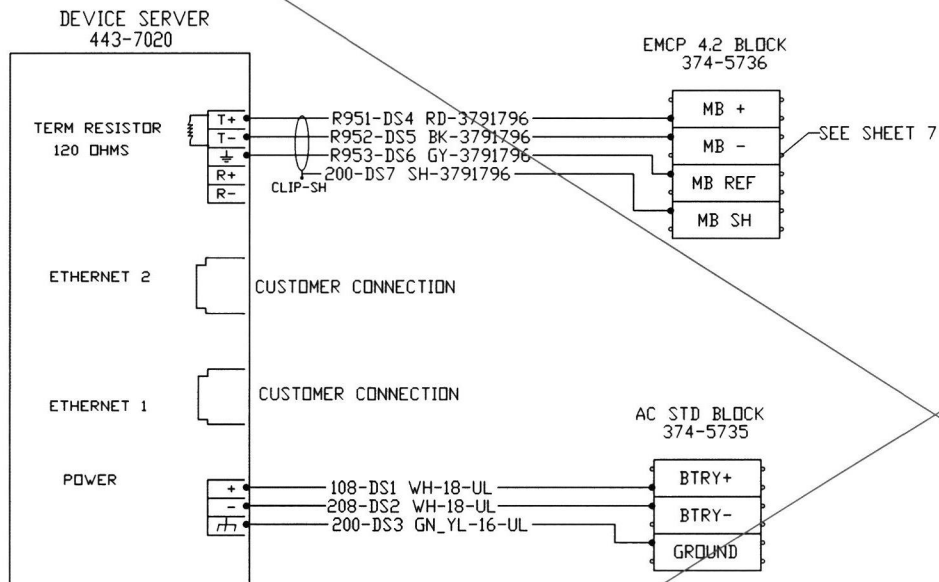
CATERPILLAR

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DIAGRAM-WIRING SECTION 2A

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OPTIONAL DEVICE SERVER - 1



1E2722F	DRAWING
1E0198W	BRAND MARKINGS
1E0013Y	CONFIDENTIALITY
1E0012A	INTERPRETATION
1E0001	INTPR & TOL
Caterpillar Confidential Yellow	
PROD. <input checked="" type="checkbox"/> OTHER <input type="checkbox"/>	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN IN. DIMENSIONS W/D TOL. ARE BASIC	VERSION <input checked="" type="checkbox"/> PRIMARY <input type="checkbox"/> TYPE SECONDARY
THIS ANGLE PROJECTION	SHEET 12 OF 13 DWG CONTROL W973
CATERPILLAR	
DIAGRAM-WIRING SECTION 2A	
(EMCP4.2)	
390-1189-10-07-18	

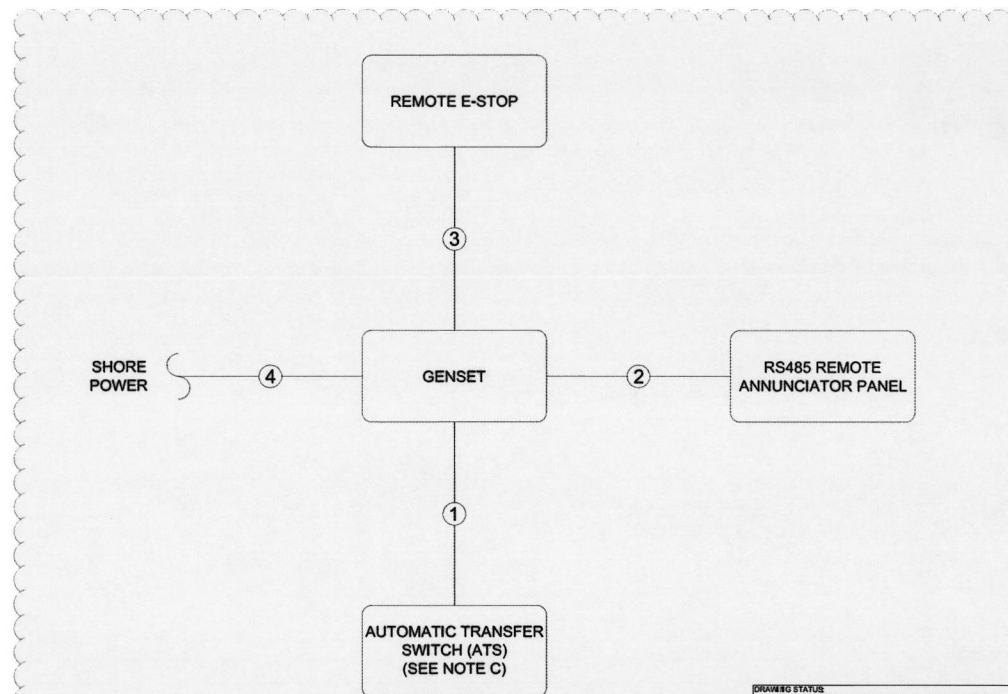
FOR NOTES SEE SHEET 1
OPTIONAL DEVICE SERVER

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WIRING SCHEDULE			
ITEM	FROM - TO	DESCRIPTION	QTY-SIZE
1	GENSET - ATS	GENSET START SIGNAL	4 - #14 AWG THHN
		EMERGENCY POSITION	2 - #14 AWG THHN
		SPARES	2 - #14 AWG THHN
2	GENSET - RS485 ANNUNCIATOR PANEL	DC POWER	2 - #14 AWG THHN
		RS485 COMMUNICATIONS	BELDEN 8618 3 CONDUCTORS, SHIELD OR EQUAL BY CUSTOMER
3	REMOTE E-STOP BUTTON	2x#12 AWG FED FROM GENSET	BY CUSTOMER
4	GENSET - SHORE POWER	20 AMP, 240/120 V, 1 Ø	BY CUSTOMER

NOTES:

- AC AND DC WIRES MUST BE IN SEPARATE CONDUITS.
- PLEASE REFER TO DESIGN ENGINEER AND ELECTRICAL ONE-LINE DIAGRAMS FOR ACTUAL PROJECT SPECIFIC REQUIREMENTS.
- GENERATOR START CONTACTS, PER NEC 700.10.D.3, TO BE CONTINUOUSLY MONITORED REQUIRES NORMALLY OPEN (N.O.) CONTACTS WIRED IN PARALLEL AND NORMALLY CLOSED (N.C.) CONTACTS WIRED IN SERIES PER ATS.
- PETERSON TECHNICIAN WILL CONFIGURE THE START SIGNAL MONITORING.
- LAYOUT IS SHOWN FOR TYPICAL LAYOUT - NOT PROJECT SPECIFIC.
- ALL WIRES MUST BE CLEARLY IDENTIFIED WITH LABELS ON BOTH ENDS.



REV	BY	DESCRIPTION	DATE
C	JBH	REMOTE REMOTE FUEL PANEL AND DAY TANK	02-04-19
B	JBH	INCLUDE DAY TANK POWER AND CONTROL WIRING	01-09-19
A	JBH	REVISED TO NEW STANDARD	09-29-18

NOTES:
 -ALL OVERALL DIMENSIONS ARE NOMINAL WITH $\pm 1"$ TOLERANCE SEE DRAWING
 -FOR ALL DETAILED COMPONENT DIMENSIONS CONSULT FACTORY FOR
 -QUESTIONS AND/OR DISCREPANCIES FOUND
 -ALL MEASUREMENTS ARE DISPLAYED IN INCHES
 -CENTER OF GRAVITY IS FOR WET WEIGHT

DRAWING STATUS PRELIMINARY NOT FOR CONSTRUCTION			
DRAWN BY	DATE	OVERALL LENGTH	WET WEIGHT
NMA	06/14/2017	-	-
CHECKED BY	SCALE	OVERALL WIDTH	DRY WEIGHT
NONE	NONE	-	-
APPROVED BY	REV E	OVERALL HEIGHT	PROJECT NUMBER
C	C	-	-

REFERENCE DRAWINGS

PETERSON CAT	
2828 TEAGARDEN STREET SAN LEANDRO, CALIFORNIA 94577	
PHONE: 510-895-9400 WEB: WWW.PETERSONPOWER.COM	
PROJECT NAME	C9-C18 STANDARD
DESCRIPTION	CUSTOMER INTERCONNECT

DRAWING NUMBER
PPSE1201

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III

GENERATOR SET FEATURES

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ELECTRIC POWER - Technical Spec Sheet STANDARD

C15

500 ekW/ 625 kVA/ 60 Hz/ 1800 rpm/ 480 V/ 0.8 Power Factor



Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency
Use Only (Tier 2 Nonroad Equivalent Emission Standards)

C15

500 ekW/ 625 kVA
60 Hz/ 1800 rpm/ 480 V

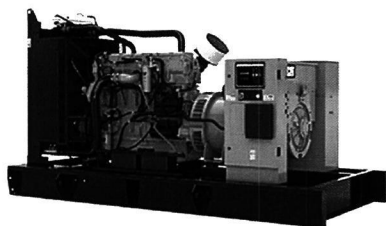


Image shown may not reflect actual configuration

Metric

English

Package Performance		
Genset Power Rating with Fan @ 0.8 Power Factor	500 ekW	
Genset Power Rating	625 kVA	
Aftercooler (Separate Circuit)	N/A	N/A

Fuel Consumption		
100% Load with Fan	137.0 L/hr	36.2 gal/hr
75% Load with Fan	110.5 L/hr	29.2 gal/hr
50% Load with Fan	71.3 L/hr	18.8 gal/hr
25% Load with Fan	41.9 L/hr	11.1 gal/hr

Cooling System ¹		
Engine Coolant Capacity	20.8 L	5.5 gal

Inlet Air		
Combustion Air Inlet Flow Rate	38.2 m ³ /min	1347.7 cfm
Max. Allowable Combustion Air Inlet Temp	49 ° C	120 ° F

Exhaust System		
Exhaust Stack Gas Temperature	531.1 ° C	988.0 ° F
Exhaust Gas Flow Rate	102.1 m ³ /min	3605.5 cfm
Exhaust System Backpressure (Maximum Allowable)	10.0 kPa	40.0 in. water

ELECTRIC POWER - Technical Spec Sheet STANDARD

C15

500 ekW/ 625 kVA/ 60 Hz/ 1800 rpm/ 480 V/ 0.8 Power Factor



Rating Type: STANDBY

Emissions: U.S. EPA Certified for Stationary Emergency
Use Only (Tier 2 Nonroad Equivalent Emission Standards)

Heat Rejection		
Heat Rejection to Jacket Water	182 kW	10375 Btu/min
Heat Rejection to Exhaust (Total)	493 kW	28039 Btu/min
Heat Rejection to Aftercooler	121 kW	6860 Btu/min
Heat Rejection to Atmosphere from Engine	91 kW	5182 Btu/min
Heat Rejection to Atmosphere from Generator	29 kW	1655 Btu/min

Alternator ² - Refer to Generator Data Sheets		
Motor Starting Capability @ 30% Voltage Dip	1428 skVA	
Current	752 amps	
Frame Size	LC6114F	
Excitation	SE	
Temperature Rise	130 ° C	

Emissions (Nominal) ³		
NOx	2129.1 mg/Nm ³	4.6 g/hp-hr
CO	301.5 mg/Nm ³	0.6 g/hp-hr
HC	8.8 mg/Nm ³	0.0 g/hp-hr
PM	9.5 mg/Nm ³	0.0 g/hp-hr

DEFINITIONS AND CONDITIONS

1. For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.
2. UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40° C ambient per NEMA MG1-32.
3. Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77° F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

ELECTRIC POWER - Technical Spec Sheet
STANDARD



C15

500 ekW/ 625 kVA/ 60 Hz/ 1800 rpm/ 480 V/ 0.8 Power Factor

Rating Type: STANDBY

**Emissions: U.S. EPA Certified for Stationary Emergency
Use Only (Tier 2 Nonroad Equivalent Emission Standards)**

Applicable Codes and Standards:

AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200,
NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528,
NEMA MG1-22, NEMA MG1-33, 2006/95/EC, 2006/42/EC, 2004/108/EC.

Note: Codes may not be available in all model configurations. Please consult your local Cat Dealer representative for availability.

STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions

Fuel Rates are based on fuel oil of 35° API [16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements, contact your Cat representative for details. For information regarding Low Sulfur fuel and Biodiesel capability, please consult your Cat dealer.

www.Cat-ElectricPower.com

Performance No.: DM8155-04

Feature Code: C15DECF

Generator Arrangement: 4183867

Date: 06/26/2017

Source Country: U.S.

The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, their respective logos, ADEM, EUI, S-O-S, "Caterpillar Yellow" and the "Power Edge" trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.

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Systems Data

Reference Number: DM8155



October 26, 2017
For Help Desk Phone
Numbers [Click Here](#)

AIR INTAKE SYSTEM

THE INSTALLED SYSTEM MUST COMPLY WITH THE SYSTEM LIMITS BELOW FOR ALL EMISSIONS CERTIFIED ENGINES TO ASSURE REGULATORY COMPLIANCE.

MAXIMUM ALLOWABLE INTAKE RESTRICTION WITH CLEAN ELEMENT	15	IN-H2O
MAXIMUM ALLOWABLE INTAKE RESTRICTION WITH DIRTY ELEMENT	25	IN-H2O
MAXIMUM PRESSURE DROP FROM COMPRESSOR OUTLET TO MANIFOLD INLET (OR MIXER INLET FOR EGR)	4.4	IN-HG

COOLING SYSTEM

ENGINE ONLY COOLANT CAPACITY	5.5	GAL
MAXIMUM ALLOWABLE JACKET WATER OUTLET TEMPERATURE	219	DEG F
REGULATOR LOCATION FOR JW (HT) CIRCUIT	OUTLET	
MAXIMUM UNINTERRUPTED FILL RATE	5.0	G/MIN

ENGINE SPEC SYSTEM

CYLINDER ARRANGEMENT	INLINE	
NUMBER OF CYLINDERS	6	
CYLINDER BORE DIAMETER	5.4	IN
PISTON STROKE	6.7	IN
TOTAL CYLINDER DISPLACEMENT	928	CU IN
STANDARD CRANKSHAFT ROTATION FROM FLYWHEEL END	CCW	
STANDARD CYLINDER FIRING ORDER	1-5-3-6-2-4	
NUMBER 1 CYLINDER LOCATION	FRONT	
STROKES/COMBUSTION CYCLE	4	

EXHAUST SYSTEM

THE INSTALLED SYSTEM MUST COMPLY WITH THE SYSTEM LIMITS BELOW FOR ALL EMISSIONS CERTIFIED ENGINES TO ASSURE REGULATORY COMPLIANCE.

MAXIMUM ALLOWABLE SYSTEM BACK PRESSURE	40	IN-H2O
MANIFOLD TYPE	DRY	

FUEL SYSTEM

MAXIMUM FUEL FLOW FROM TRANSFER PUMP TO ENGINE	69.2	G/HR
MAXIMUM ALLOWABLE FUEL SUPPLY LINE RESTRICTION	8.9	IN-HG
MAXIMUM ALLOWABLE FUEL TEMPERATURE AT TRANSFER PUMP INLET	140	DEG F
MAXIMUM ALLOWABLE FUEL RETURN LINE RESTRICTION	8.0	IN-HG
NORMAL FUEL PRESSURE IN A CLEAN SYSTEM	90.1	PSI
FUEL SYSTEM TYPE	MEUI	
MAXIMUM TRANSFER PUMP PRIMING LIFT WITHOUT PRIMING PUMP	12.1	FT

LUBE SYSTEM

CRANKCASE VENTILATION TYPE	TO ATM	
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SECTION 2A

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XXXXXXXXXX

MOUNTING SYSTEM

CENTER OF GRAVITY LOCATION - X DIMENSION - FROM REAR FACE OF BLOCK - (REFERENCE TM7077)	22.2	IN
CENTER OF GRAVITY LOCATION - Y DIMENSION - FROM CENTERLINE OF CRANKSHAFT - (REFERENCE TM7077)	9.4	IN
CENTER OF GRAVITY LOCATION - Z DIMENSION - FROM CENTERLINE OF CRANKSHAFT - (REFERENCE TM7077)	0	IN
STARTING SYSTEM		
MINIMUM CRANKING SPEED REQUIRED FOR START	115	RPM
LOWEST AMBIENT START TEMPERATURE WITHOUT AIDS	32	DEG F

PACKAGE DATA [C15DECF]**OCTOBER 26, 2017**For Help Desk Phone Numbers [Click here](#)

Feature Code:	C15DECF	Rating Type:	STANDBY	Sales model Package:	PGS500
Engine Sales Model:	C15	Engine Arrangement Number:	4206876	Hertz:	60
EKW W/F:	500.0	Noise Reduction:	0 dBA	Back Pressure:	0.0 inH2O

Package Cooling Information**Open Cooling Data**

% Load	Airflow Rate scfm			Ambient Capability Sea Level (Deg F)			Ambient Capability 300 m (Deg F)			Ambient Capability 600 m (Deg F)			Ambient Capability 900 m (Deg F)		
	0	1/2	3/4	0	1/2	3/4	0	1/2	3/4	0	1/2	3/4	0	1/2	3/4
	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O	inH2O
100.0	29770	27827	26909	140	140	136	131	131	131	113	113	113	95	95	95
75.0	29770	27827	26909	140	140	140	140	140	140	140	140	140	140	140	140

Package Sound Information

Sound Comments : 1m - ISO 8528-10, 15-Pt. grid; 7m - SAE J1074, 4-Pt. spatial average; 15m - calculated from 7m data (free field dispersion)

Open Sound Data

Distance: 3.3 Feet

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 63HZ DB	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
500.0	100.0	105.0	102.0	95.0	99.0	98.0	100.0	98.0	93.0	100.0
375.0	75.0	104.0	101.0	94.0	99.0	98.0	99.0	96.0	92.0	97.0
250.0	50.0	102.0	99.0	93.0	98.0	98.0	98.0	95.0	90.0	91.0
125.0	25.0	102.0	98.0	92.0	99.0	98.0	98.0	94.0	90.0	87.0

Distance: 23.0 Feet

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 63HZ DB	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
500.0	100.0	95.0	92.0	85.0	89.0	88.0	90.0	88.0	83.0	90.0
375.0	75.0	94.0	91.0	84.0	89.0	88.0	89.0	86.0	82.0	87.0
250.0	50.0	92.0	89.0	83.0	88.0	88.0	88.0	85.0	70.0	81.0
125.0	25.0	92.0	88.0	82.0	89.0	88.0	88.0	84.0	80.0	77.0

Distance: 49.2 Feet

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 63HZ DB	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
500.0	100.0	89.0	86.0	79.0	83.0	82.0	84.0	82.0	77.0	84.0
375.0	75.0	88.0	85.0	78.0	83.0	82.0	83.0	80.0	76.0	81.0
250.0	50.0	86.0	83.0	77.0	82.0	82.0	82.0	79.0	74.0	75.0
125.0	25.0	86.0	82.0	76.0	83.0	82.0	82.0	78.0	74.0	71.0

Open Exhaust Sound Data**Distance:** 3.3 Feet

EKW W/F	% LOAD	OVERALL SOUND DB(A)	OBCF 63HZ DB	OBCF 125HZ DB	OBCF 250HZ DB	OBCF 500HZ DB	OBCF 1000HZ DB	OBCF 2000HZ DB	OBCF 4000HZ DB	OBCF 8000HZ DB
500.0	100.0	121.0	118.0	115.0	120.0	114.0	110.0	106.0	100.0	93.0
375.0	75.0	121.0	118.0	115.0	119.0	114.0	109.0	105.0	100.0	91.0
250.0	50.0	117.0	91.0	99.0	111.0	109.0	105.0	104.0	96.0	80.0
125.0	25.0	112.0	89.0	93.0	108.0	104.0	101.0	99.0	88.0	60.0

Performance Number: DM8155

Change Level: 04

SALES MODEL:	C15	COMBUSTION:	DI
BRAND:	CAT	ENGINE SPEED (RPM):	1,800
ENGINE POWER (BHP):	762	HERTZ:	60
GEN POWER WITH FAN (EKW):	500.0	FAN POWER (HP):	33.7
COMPRESSION RATIO:	16.1	ASPIRATION:	TA
RATING LEVEL:	STANDBY	AFTERCOOLER TYPE:	ATAAC
PUMP QUANTITY:	1	AFTERCOOLER CIRCUIT TYPE:	JW+OC, ATAAC
FUEL TYPE:	DIESEL	INLET MANIFOLD AIR TEMP (F):	120
MANIFOLD TYPE:	DRY	JACKET WATER TEMP (F):	192.2
GOVERNOR TYPE:	ELEC	TURBO CONFIGURATION:	SINGLE
CAMSHAFT TYPE:	STANDARD	TURBO QUANTITY:	1
IGNITION TYPE:	CI	TURBOCHARGER MODEL:	GTA5518BS-56T-1.58
INJECTOR TYPE:	EUI	CERTIFICATION YEAR:	2006
REF EXH STACK DIAMETER (IN):	6	PISTON SPD @ RATED ENG SPD (FT/MIN):	2,025.0
MAX OPERATING ALTITUDE (FT):	3,281		

INDUSTRY	SUBINDUSTRY	APPLICATION
OIL AND GAS	LAND PRODUCTION	PACKAGED GENSET
ELECTRIC POWER	STANDARD	PACKAGED GENSET

General Performance Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
EKW	%	BHP	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
500.0	100	762	361	0.333	36.2	68.2	120.4	1,296.3	46.8	988.0
450.0	90	683	324	0.348	34.0	67.0	119.4	1,280.7	45.9	973.8
400.0	80	607	288	0.358	31.0	61.6	115.2	1,250.1	42.3	956.6
375.0	75	570	271	0.358	29.2	56.4	111.0	1,229.5	38.8	947.8
350.0	70	534	253	0.356	27.2	50.1	106.0	1,205.6	34.6	938.3
300.0	60	462	219	0.347	22.9	36.6	95.5	1,148.6	25.6	915.7
250.0	50	392	186	0.336	18.8	24.0	86.2	1,080.0	17.4	887.9
200.0	40	323	153	0.339	15.6	16.9	83.6	1,003.8	13.3	838.1
150.0	30	253	120	0.347	12.5	11.3	81.0	910.6	10.2	768.4
125.0	25	218	103	0.355	11.1	9.1	79.8	857.1	9.0	725.6
100.0	20	182	86	0.368	9.6	7.0	78.6	795.3	8.0	674.7
50.0	10	109	52	0.420	6.5	3.3	76.2	639.0	6.1	542.9

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
EKW	%	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
500.0	100	762	73	405.8	1,347.7	3,605.5	6,001.8	6,255.3	1,224.6	1,109.4
450.0	90	683	72	402.2	1,345.2	3,558.0	5,981.4	6,219.2	1,220.4	1,110.6
400.0	80	607	66	381.3	1,283.7	3,364.8	5,686.7	5,904.2	1,168.1	1,066.0
375.0	75	570	61	361.0	1,219.4	3,187.1	5,381.2	5,585.8	1,113.3	1,016.3
350.0	70	534	54	336.1	1,139.2	2,970.6	5,001.5	5,191.7	1,044.7	953.4
300.0	60	462	40	282.1	965.5	2,500.8	4,183.5	4,344.1	894.0	815.5
250.0	50	392	27	229.6	799.0	2,040.7	3,407.8	3,539.6	744.6	679.6
200.0	40	323	19	195.0	697.8	1,729.1	2,959.9	3,069.2	655.1	600.0
150.0	30	253	13	165.5	615.8	1,447.5	2,601.3	2,689.1	579.6	534.1
125.0	25	218	11	152.7	581.8	1,317.2	2,454.7	2,532.1	546.4	505.6
100.0	20	182	9	140.6	551.1	1,190.0	2,322.2	2,389.2	515.8	479.7
50.0	10	109	5	118.5	497.4	940.2	2,088.6	2,134.4	461.1	434.6

Heat Rejection Data

GENSET POWER WITH FAN	PERCENT LOAD	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
EKW	%	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN

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500.0	100	762	10,375	5,182	28,039	17,119	4,138	6,860	32,301	77,688	82,757
375.0	75	570	7,631	3,786	20,798	12,843	3,027	5,175	24,226	60,516	65,068
250.0	50	392	5,087	2,524	13,860	8,562	2,083	3,450	16,151	40,345	43,378
125.0	25	218	2,963	1,465	8,319	4,931	1,264	2,087	9,239	23,729	25,277
100.0	20	182	2,414	1,212	6,879	4,182	1,093	1,771	7,727	20,530	21,869
50.0	10	109	1,207	606	3,424	2,081	547	911	4,019	10,265	10,934

Emissions Data

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

GENSET POWER WITH FAN		EKW	500.0	375.0	250.0	125.0	50.0
PERCENT LOAD		%	100	75	50	25	10
ENGINE POWER		BHP	762	570	392	218	109
TOTAL NOX (AS NO2)		G/HR	3,707	1,682	1,937	1,368	803
TOTAL CO		G/HR	877	987	558	317	377
TOTAL HC		G/HR	30	45	33	31	39
PART MATTER		G/HR	38.1	59.8	79.3	48.8	31.4
TOTAL NOX (AS NO2)		(CORR 5% O2) MG/NM3	2,299.5	1,358.3	2,369.2	2,773.4	2,656.6
TOTAL CO		(CORR 5% O2) MG/NM3	563.8	767.7	677.2	661.9	1,406.0
TOTAL HC		(CORR 5% O2) MG/NM3	16.6	30.0	34.1	56.2	121.3
PART MATTER		(CORR 5% O2) MG/NM3	18.5	41.0	80.1	84.7	94.9
TOTAL NOX (AS NO2)		(CORR 5% O2) PPM	1,120	662	1,154	1,351	1,294
TOTAL CO		(CORR 5% O2) PPM	451	614	542	530	1,125
TOTAL HC		(CORR 5% O2) PPM	31	56	64	105	226
TOTAL NOX (AS NO2)		G/HP-HR	4.94	2.98	4.97	6.30	7.37
TOTAL CO		G/HP-HR	1.17	1.75	1.43	1.46	3.46
TOTAL HC		G/HP-HR	0.04	0.08	0.08	0.14	0.35
PART MATTER		G/HP-HR	0.05	0.11	0.20	0.22	0.29
TOTAL NOX (AS NO2)		LB/HR	8.17	3.71	4.27	3.01	1.77
TOTAL CO		LB/HR	1.93	2.18	1.23	0.70	0.83
TOTAL HC		LB/HR	0.07	0.10	0.07	0.07	0.09
PART MATTER		LB/HR	0.08	0.13	0.17	0.11	0.07

RATED SPEED NOMINAL DATA: 1800 RPM

GENSET POWER WITH FAN		EKW	500.0	375.0	250.0	125.0	50.0
PERCENT LOAD		%	100	75	50	25	10
ENGINE POWER		BHP	762	570	392	218	109
TOTAL NOX (AS NO2)		G/HR	3,432	1,558	1,793	1,266	743
TOTAL CO		G/HR	469	528	298	170	202
TOTAL HC		G/HR	16	24	17	17	20
TOTAL CO2		KG/HR	357	287	186	110	65
PART MATTER		G/HR	19.6	30.6	40.7	25.0	16.1
TOTAL NOX (AS NO2)		(CORR 5% O2) MG/NM3	2,129.1	1,257.7	2,193.7	2,567.9	2,459.9
TOTAL CO		(CORR 5% O2) MG/NM3	301.5	410.5	362.1	354.0	751.9
TOTAL HC		(CORR 5% O2) MG/NM3	8.8	15.9	18.0	29.7	64.2
PART MATTER		(CORR 5% O2) MG/NM3	9.5	21.1	41.1	43.4	48.7
TOTAL NOX (AS NO2)		(CORR 5% O2) PPM	1,037	613	1,068	1,251	1,198
TOTAL CO		(CORR 5% O2) PPM	241	328	290	283	602
TOTAL HC		(CORR 5% O2) PPM	16	30	34	55	120
TOTAL NOX (AS NO2)		G/HP-HR	4.58	2.76	4.60	5.83	6.82
TOTAL CO		G/HP-HR	0.63	0.93	0.76	0.78	1.85
TOTAL HC		G/HP-HR	0.02	0.04	0.04	0.08	0.19
PART MATTER		G/HP-HR	0.03	0.05	0.10	0.12	0.15
TOTAL NOX (AS NO2)		LB/HR	7.57	3.43	3.95	2.79	1.64
TOTAL CO		LB/HR	1.03	1.16	0.66	0.37	0.44
TOTAL HC		LB/HR	0.04	0.05	0.04	0.04	0.05
TOTAL CO2		LB/HR	786	633	410	243	144
PART MATTER		LB/HR	0.04	0.07	0.09	0.06	0.04
OXYGEN IN EXH		%	8.3	9.6	9.4	11.4	14.3

Regulatory Information

EPA TIER 2				
2006 - 2010				
Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
U.S. (INCL CALIF)	EPA	NON-ROAD	TIER 2	CO: 3.5 NOx + HC: 6.4 PM: 0.20

EPA EMERGENCY STATIONARY				
2011 - ----				
Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
U.S. (INCL CALIF)	EPA	STATIONARY	EMERGENCY STATIONARY	CO: 3.5 NOx + HC: 6.4 PM: 0.20

Altitude Derate Data

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	762	762	762	762	762	762	762	762	762	762	762	762	762
1,000	762	762	762	762	762	762	762	762	762	762	757	744	762
2,000	762	762	762	762	762	762	762	762	754	741	728	716	762
3,000	762	762	762	762	762	762	752	739	726	713	701	689	762
4,000	762	762	762	762	751	737	724	711	698	686	674	663	759
5,000	762	762	750	736	722	709	696	683	671	660	649	638	735
6,000	751	736	722	708	694	681	669	657	646	634	624	613	712
7,000	722	707	693	680	667	655	643	632	620	610	599	589	689
8,000	693	680	666	653	641	629	618	607	596	586	576	566	666
9,000	666	653	640	628	616	604	593	583	572	563	553	544	644
10,000	639	627	614	602	591	580	570	559	550	540	531	522	623
11,000	614	601	589	578	567	557	547	537	527	518	509	501	602
12,000	588	577	565	555	544	534	524	515	506	497	489	481	582
13,000	564	553	542	532	522	512	503	494	485	477	469	461	562
14,000	541	530	520	510	500	491	482	473	465	457	449	442	542
15,000	518	508	498	488	479	470	462	453	445	438	430	423	523

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
OK6281	PP5612	2864923	GS282	-	FTE02794	
OK6281	PP5612	2864924	GS282	-	FTE02794	

Performance Parameter Reference

Parameters Reference:DM9600-09
PERFORMANCE DEFINITIONS

PERFORMANCE DEFINITIONS DM9600

APPLICATION:

Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS (PLUS/MINUS):

Power 3%

Torque 3%

Exhaust stack temperature 8%

Inlet airflow 5%

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Intake manifold pressure-gage 10%

Exhaust flow 6%

Specific fuel consumption 3%

DEF rate 5%

Specific DEF consumption 3%

DEF rate 5%

Heat rejection 5%

Heat rejection exhaust only 10%

Heat rejection CEM only 10%

Heat Rejection values based on using treated water.

Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.

On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.

These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS (PLUS/MINUS):

Heat rejection 10%

Heat rejection to Atmosphere 50%

Heat rejection to Lube Oil 20%

Heat rejection to Aftercooler 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS (PLUS/MINUS):

Torque 0.5%

Speed 0.2%

Fuel flow 1.0%

Temperature 2.0 C degrees

Intake manifold pressure 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR

FOR 3500 ENGINES AND SMALLER

SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity;

A lower heating value is 42,780 KJ/KG (18,390 BTU/LB)

when used at 29 deg C (84.2 deg F), where the density is 838.9 G/Liter (7.001 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS

EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on 2001.

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for

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atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a rating change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE

TMI Emissions Information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.

Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSIONS DEFINITIONS:

Emissions : DM1176

HEAT REJECTION DEFINITIONS:

Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS:

3500: EM1500

RATING DEFINITIONS:

Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS:

Sound Power : DM8702

Sound Pressure : TM7080

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GENERATOR DATA**OCTOBER 26, 2017**For Help Desk Phone Numbers [Click here](#)**Selected Model**

Engine: C15 **Generator Frame:** LC7034J **Genset Rating (kW):** 500.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 4183887 **Genset Rating (kVA):** 625.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.8 **Rated Current:** 751.8
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version:
 41205 /40001 /41431 /8568

Spec Information

Generator Specification			Generator Efficiency		
Frame: LC7034J	Type: LC	No. of Bearings: 1	Per Unit Load	kW	Efficiency %
Winding Type: RANDOM WOUND	Flywheel: 14.0		0.25	125.0	91.0
Connection: SERIES STAR	Housing: 1		0.5	250.0	93.5
Phases: 3	No. of Leads: 12		0.75	375.0	94.4
Poles: 4	Wires per Lead: 2		1.0	500.0	94.4
Sync Speed: 1800	Generator Pitch: 0.6667				

Reactances	Per Unit	Ohms
SUBTRANSIENT - DIRECT AXIS X''_d	0.1028	0.0379
SUBTRANSIENT - QUADRATURE AXIS X''_q	0.1183	0.0436
TRANSIENT - SATURATED X'_d	0.1289	0.0475
SYNCHRONOUS - DIRECT AXIS X_d	2.6302	0.9696
SYNCHRONOUS - QUADRATURE AXIS X_q	1.5788	0.5820
NEGATIVE SEQUENCE X_2	0.1107	0.0408
ZERO SEQUENCE X_0	0.0076	0.0028

Time Constants	Seconds
OPEN CIRCUIT TRANSIENT - DIRECT AXIS T'_{d0}	2.0390
SHORT CIRCUIT TRANSIENT - DIRECT AXIS T'_d	0.1000
OPEN CIRCUIT SUBTRANSIENT - DIRECT AXIS T''_{d0}	0.0130
SHORT CIRCUIT SUBTRANSIENT - DIRECT AXIS T''_d	0.0100
OPEN CIRCUIT SUBTRANSIENT - QUADRATURE AXIS T''_{q0}	0.1330
SHORT CIRCUIT SUBTRANSIENT - QUADRATURE AXIS T''_q	0.0100
EXCITER TIME CONSTANT T_e	0.0300
ARMATURE SHORT CIRCUIT T_a	0.0150

Short Circuit Ratio: 0.45	Stator Resistance = 0.0089 Ohms	Field Resistance = 0.357 Ohms
---------------------------	---------------------------------	-------------------------------

Voltage Regulation		Generator Excitation		
Voltage level adjustment: +/-	5.0%	No Load	Full Load, (rated) pf	
Voltage regulation, steady state: +/-	0.5%		Series	Parallel
Voltage regulation with 3% speed change: +/-	0.5%	Excitation voltage:	9.96 Volts	39.15 Volts Volts
Waveform deviation line - line, no load: less than	2.0%	Excitation current	0.83 Amps	2.68 Amps Amps
Telephone influence factor: less than	50			

Selected Model

Engine: C15 **Generator Frame:** LC7034J **Genset Rating (kW):** 500.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 4183887 **Genset Rating (kVA):** 625.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.8 **Rated Current:** 751.8
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version:
 41205 /40001 /41431 /8568

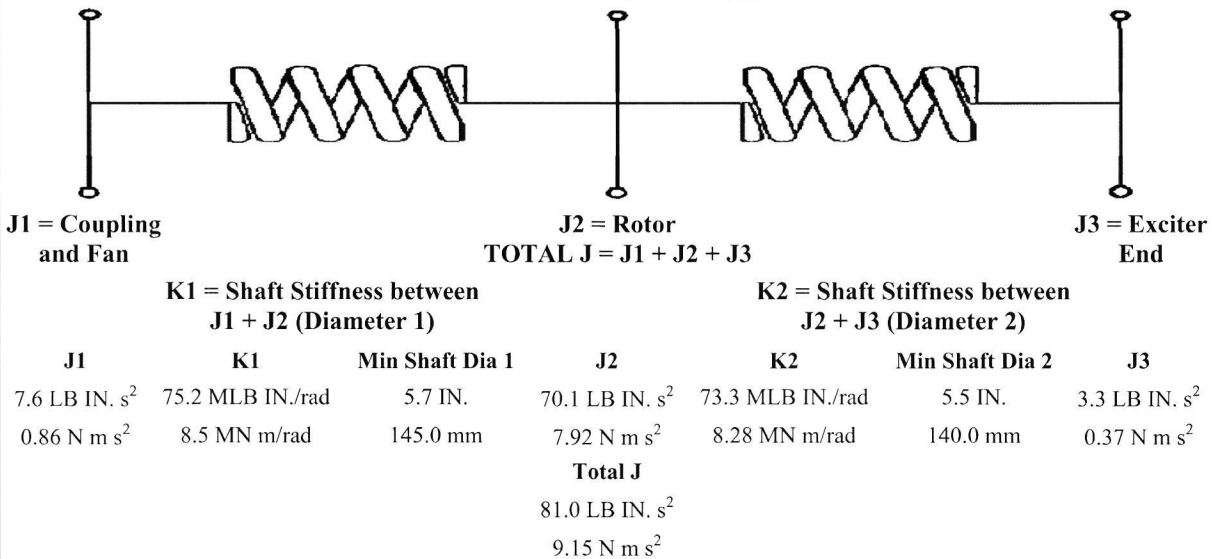
Generator Mechanical Information**Center of Gravity**

Dimension X	-643.0 mm	-25.3 IN.
Dimension Y	0.0 mm	0.0 IN.
Dimension Z	0.0 mm	0.0 IN.

- "X" is measured from driven end of generator and parallel to rotor. Towards engine fan is positive. See General Information for details
- "Y" is measured vertically from rotor center line. Up is positive.
- "Z" is measured to left and right of rotor center line. To the right is positive.

Generator WT = 1550 kg * Rotor WT = 579 kg * Stator WT = 971 kg
 3,417 LB 1,276 LB 2,141 LB

Rotor Balance = 0.0508 mm deflection PTP
 Overspeed Capacity = 125% of synchronous speed

Generator Torsional Data**Selected Model**

Engine: C15 **Generator Frame:** LC7034J **Genset Rating (kW):** 500.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 4183887 **Genset Rating (kVA):** 625.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.8 **Rated Current:** 751.8
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version:
 41205 /40001 /41431 /8568

Generator Cooling Requirements - Temperature - Insulation Data			
Cooling Requirements:		Temperature Data: (Ambient 40 °C)	
Heat Dissipated: 29.7 kW		Stator Rise:	105.0 °C
Air Flow: 72.0 m ³ /min		Rotor Rise:	105.0 °C
Insulation Class: H			
Insulation Reg. as shipped: 100.0 MΩ minimum at 40 °C			
Thermal Limits of Generator			
Frequency:	60 Hz		
Line to Line Voltage:	480 Volts		
B BR 80/40	704.0 kVA		
F BR -105/40	800.0 kVA		
H BR - 125/40	880.0 kVA		
F PR - 130/40	880.0 kVA		
H PR - 150/40	933.0 kVA		
H PR27 - 163/27	968.0 kVA		

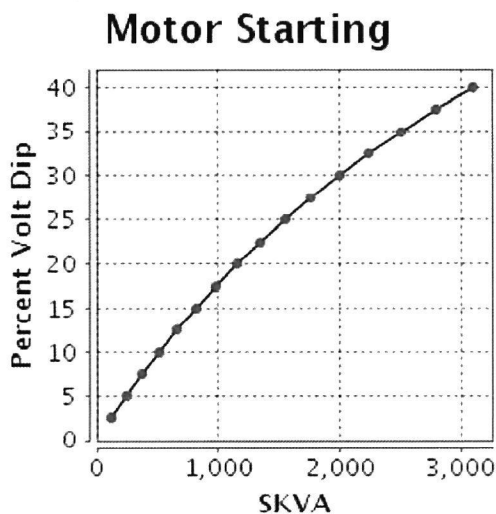
Selected Model

Engine: C15 **Generator Frame:** LC7034J **Genset Rating (kW):** 500.0 **Line Voltage:** 480
Fuel: Diesel **Generator Arrangement:** 4183887 **Genset Rating (kVA):** 625.0 **Phase Voltage:** 277
Frequency: 60 **Excitation Type:** Permanent Magnet **Pwr. Factor:** 0.8 **Rated Current:** 751.8
Duty: STANDBY **Connection:** SERIES STAR **Application:** EPG **Status:** Current

Version:
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Starting Capability & Current Decrement Motor Starting Capability (0.6 pf)

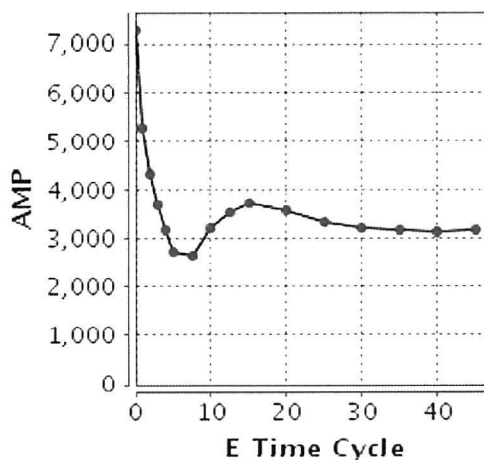
SKVA	Percent Volt Dip
119	2.5
245	5.0
377	7.5
517	10.0
664	12.5
821	15.0
987	17.5
1,163	20.0
1,350	22.5
1,550	25.0
1,764	27.5
1,993	30.0
2,239	32.5
2,504	35.0
2,791	37.5
3,101	40.0



Current Decrement Data

E Time Cycle	AMP
0.0	7,275
1.0	5,267
2.0	4,327
3.0	3,680
4.0	3,161
5.0	2,726
7.5	2,636
10.0	3,186
12.5	3,516
15.0	3,701
20.0	3,575
25.0	3,320
30.0	3,190
35.0	3,146
40.0	3,140
45.0	3,147

Current Decrement



Instantaneous 3 Phase Fault Current: 7275 Amps Instantaneous Line - Line Fault Current: 6070 Amps

Instantaneous Line - Neutral Fault Current: 10157 Amps

Selected Model

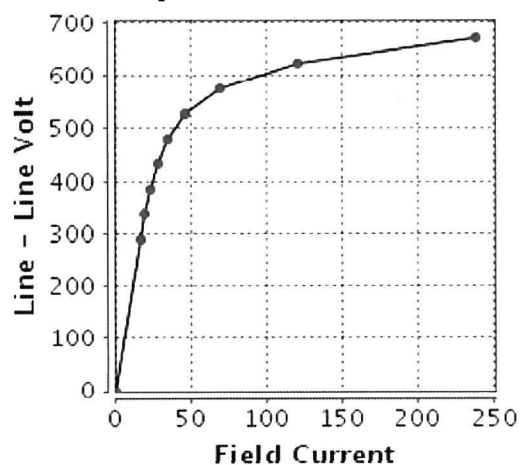
Engine: C15 Generator Frame: LC7034J Genset Rating (kW): 500.0 Line Voltage: 480
 Fuel: Diesel Generator Arrangement: 4183887 Genset Rating (kVA): 625.0 Phase Voltage: 277
 Frequency: 60 Excitation Type: Permanent Magnet Pwr. Factor: 0.8 Rated Current: 751.8
 Duty: STANDBY Connection: SERIES STAR Application: EPG Status: Current

Version:
41205 /40001 /41431 /8568

Generator Output Characteristic Curves
Open Circuit Curve

Field Current	Line - Line Volt
0.0	0
17.2	288
20.3	336
23.8	384
28.2	432
34.6	480
46.1	528
69.5	576
120.9	624
238.6	672

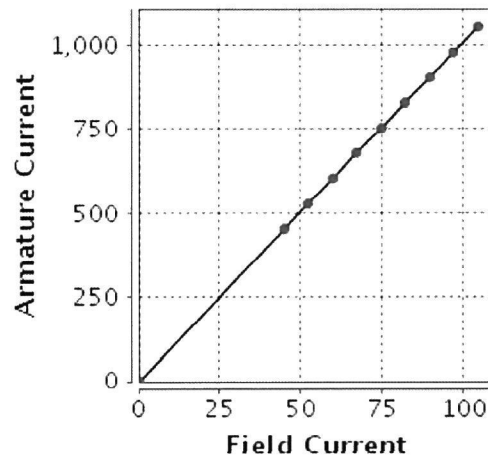
Open Circuit



Short Circuit Curve

Short Circuit

Field Current	Armature Current
0.0	0
44.8	451
52.3	526
59.8	601
67.3	677
74.7	752
82.2	827
89.7	902
97.1	977
104.6	1,052



Selected Model

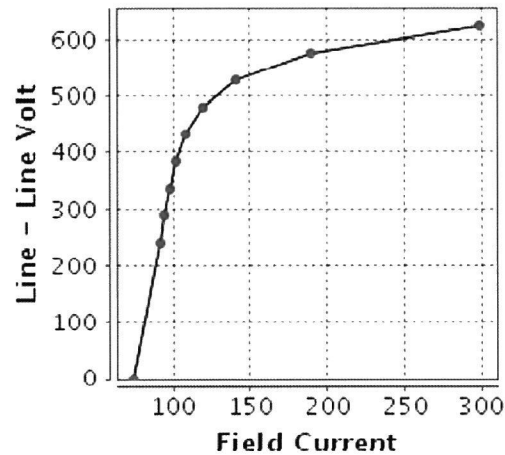
Engine: C15 Generator Frame: LC7034J Genset Rating (kW): 500.0 Line Voltage: 480
Fuel: Diesel Generator Arrangement: 4183887 Genset Rating (kVA): 625.0 Phase Voltage: 277
Frequency: 60 Excitation Type: Permanent Magnet Pwr. Factor: 0.8 Rated Current: 751.8
Duty: STANDBY Connection: SERIES STAR Application: EPG Status: Current

Version:
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Generator Output Characteristic Curves
Zero Power Factor Curve

Zero Power

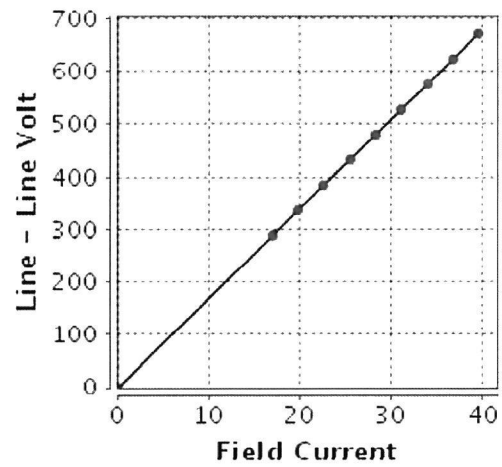
Field Current	Line - Line Volt
74.7	0
91.5	240
94.6	288
98.1	336
102.3	384
108.6	432
119.4	480
141.3	528
189.1	576
298.4	624



Air Gap Curve

Air Gap

Field Current	Line - Line Volt
0.0	0
17.0	288
19.8	336
22.6	384
25.5	432
28.3	480
31.1	528
34.0	576
36.8	624
39.6	672



General Information

GENERATOR INFORMATION (DM7900)

1. Motor Starting

Motor starting curves are obtained in accordance with IEC60034, and are displayed at 0.6 power factor.

2. Voltage Dip

Prediction of the generator synchronous voltage dip can be made by consulting the plot for the voltage dip value that corresponds to the desired motor starting kVA value.

3. Definitions

A) Generator Keys

Frame: abbreviation of generator frame size

Freq: frequency in hertz.

PP/SB: prime/standby duty respectively

Volts: line - line terminal voltage

kW: rating in electrical kilo watts

Model: engine sales model

B) Generator Temperature Rise

The indicated temperature rises are the IEC/NEMA limits for standby or prime power applications. The quoted rise figures are maximum limits only and are not necessarily indicative of the actual temperature rise of a given machine winding.

C) Centre of Gravity

The specified centre of gravity is for the generator only. For single bearing, and two bearing close coupled generators, the center of gravity is measured from the generator/engine flywheel-housing interface and from the centreline of the rotor Shaft.

For two bearing, standalone generators, the center of gravity is measured from the end of the rotor shaft and from the centerline of the rotor shaft.

D) Generator Current Decrement Curves

The generator current decrement curve indicates the generator armature current arising from a symmetrical three-phase fault at the generator terminals. Generators equipped with AREP or PMG excitation systems will sustain 300% of rated armature current for 10 seconds.

E) Generator Efficiency Curves

The efficiency curve is displayed for the generator only under the given conditions of rating, voltage, frequency and power factor. This is not the overall generating set efficiency curve.

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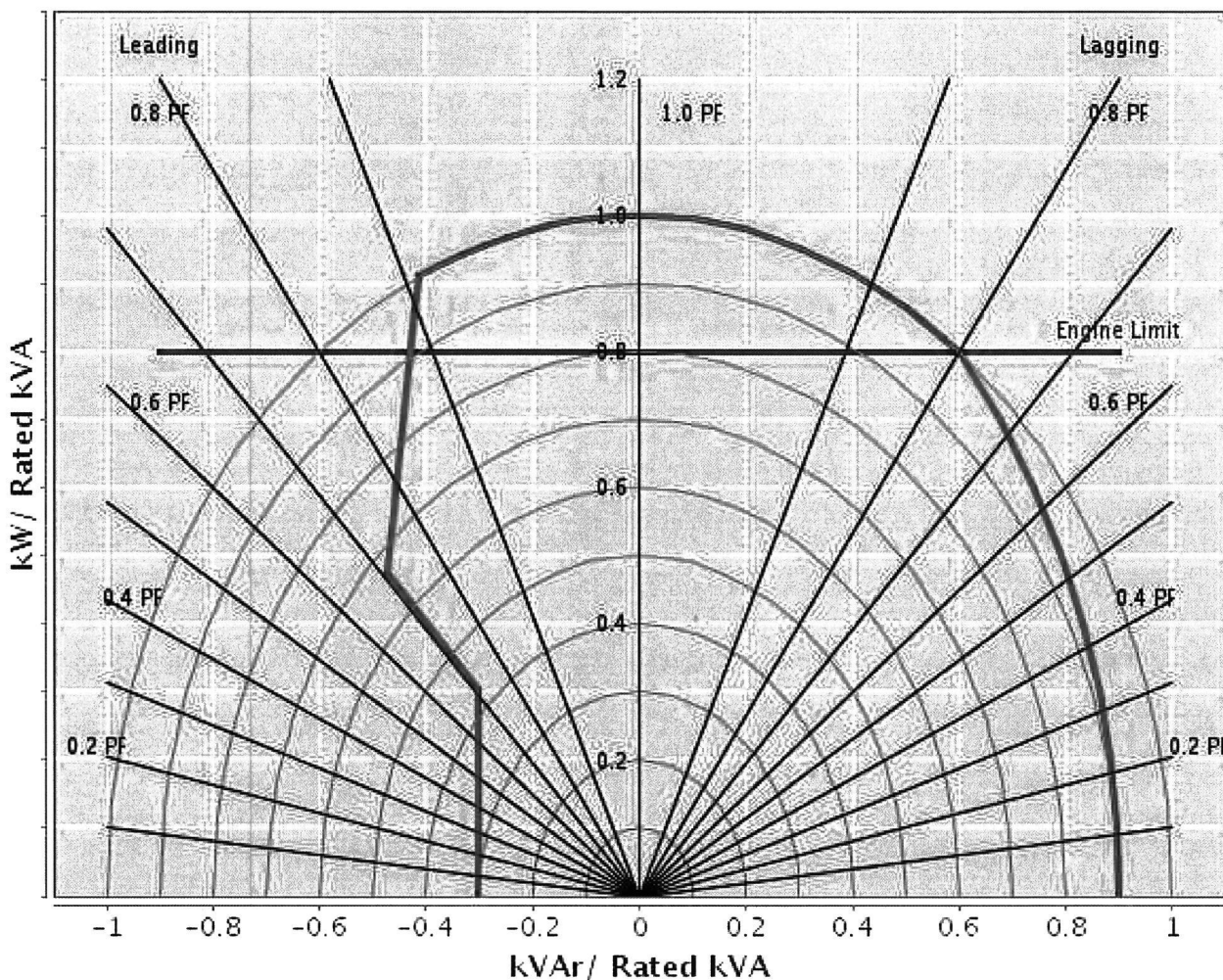
Reactive Capability Curve

Selected Model

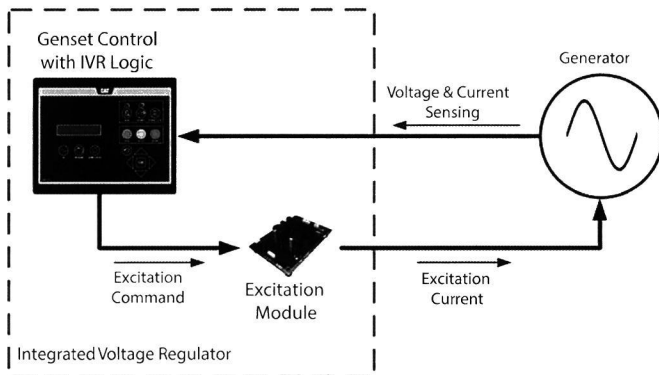
Engine: C15	Generator Frame: LC7034J	Genset Rating (kW): 500.0	Line Voltage: 480
Fuel: Diesel	Generator Arrangement: 4183887	Genset Rating (kVA): 625.0	Phase Voltage: 277
Frequency: 60	Excitation Type: Permanent Magnet	Pwr. Factor: 0.8	Rated Current: 751.8
Duty: STANDBY	Connection: SERIES STAR	Application: EPG	Status: Current

Version:
41205 /40001 /41431 /8568

Operating Chart



INTEGRATED VOLTAGE REGULATOR



INTEGRATED VOLTAGE REGULATOR

The Integrated Voltage Regulator (IVR) is designed to provide robust, precise closed-loop control of the generator voltage, optimized transient performance and industry leading feature specification.

Caterpillar is leading the power generation marketplace with power solutions engineered to deliver unmatched flexibility, expandability, reliability and cost-effectiveness.

FEATURES

When used with an Excitation Module, EMCP 4.3/4.4 and IVR-compatible EMCP 4.1/4.2 controllers offer:

- Automatic Voltage Regulation (AVR)
- Programmable stability settings
- Soft start control with an adjustable time setting in AVR control mode
- Dual Slope, Configurable Under Frequency (Volts/Hz) regulation
- Three-phase or single-phase generator voltage (RMS) sensing/regulation in AVR mode
- Setpoint adjustment from the EMCP display or Cat® ET ServiceTool
- IVR Operating Status and Voltage Bias Overview screens to provide an enhanced level of user interface
- Integrated Voltage Regulator event monitoring

EMCP 4.3/4.4 and IVR-compatible EMCP 4.2 controllers also offer:

- Power Factor Regulation (PF)
- Reactive Droop compensation
- Line drop compensation

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Cat dealer network
- Over 1,800 dealer branch stores operating in 200 countries
- The best product support record in the industry
- Cat dealers provide extensive post sale support including maintenance and repair agreements

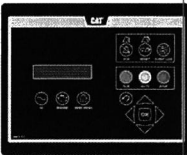
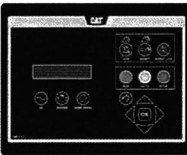


COMPLETE SYSTEM INTEGRATION

Fully designed and factory tested to work seamlessly with Cat generators using Self Excitation (SE), Internal Excitation (IE) or Permanent Magnet (PMG) excitation systems and EMCP controls.

INTEGRATED VOLTAGE REGULATOR




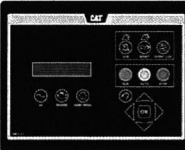


INTEGRATED VOLTAGE REGULATOR FEATURE SPECIFICATION

	EMCP 4.1	EMCP 4.2	EMCP 4.3	EMCP 4.4
				
SPECIFICATIONS				
No Load to Full Load Regulation	±0.5%	±0.25%	±0.25%	±0.25%
Configurable Volts / Hz Characteristic	•	•	•	•
Configurable Knee Frequency	•	•	•	•
Regulator Response Time	10 ms	10 ms	5 ms	5 ms
Single and Three Phase Sensing	•	•	•	•
Voltage Adjustment Range (Configurable up to)	± 30%	± 30%	± 30%	± 30%
CONTROL				
Dual Slope Configurable Volts / Hz Characteristic	•	•	•	•
Excitation Enable / Disable Selection	•	•	•	•
Line Loss (I ² R) Compensation	–	•	•	•
Reactive Droop Compensation	–	•	•	•
Power Factor Control Mode	–	•	•	•
PROTECTION / ALARMS				
Generator Overvoltage	•	•	•	•
Generator Undervoltage	•	•	•	•
Over Excitation	•	•	•	•
Loss of Sensing	•	•	•	•
Generator Reverse VARs	–	•	•	•
Event Log	•	•	•	•
METERING				
EMCP AC Metering	•	•	•	•
EMCP Power Metering	–	•	•	•
Excitation Command Percentage	•	•	•	•
Operating Mode Status Indication	•	•	•	•

INTEGRATED VOLTAGE REGULATOR



INTEGRATED VOLTAGE REGULATOR FEATURE SPECIFICATION (continued)

	EMCP 4.1	EMCP 4.2	EMCP 4.3	EMCP 4.4
				
VOLTAGE ADJUSTMENT				
EMCP 4 Display Voltage Bias	•	•	•	•
Digital Input (Raise / Lower) Voltage Bias ¹	•	•	•	•
Potentiometer Voltage Bias ¹	•	•	•	•
Analog Voltage Bias – Voltage Range ¹	0V to 5V	0V to 5V	-10V to +10V	-10V to +10V
Analog Voltage Bias – Current Range ¹	–	–	0mA to 20mA	0mA to 20mA
Analog Voltage Bias – PWM Range ¹	–	–	0% to 100%	0% to 100%
SCADA (Modbus) Voltage Bias	–	•	•	•

¹Requires an available input on the EMCP 4.

INTEGRATED VOLTAGE REGULATOR

EXCITATION MODULE SPECIFICATION



The Integrated Voltage Regulator consists of an EMCP 4 interfacing with an Excitation Module. There are a range of Excitation Modules available to match Cat generator sets.

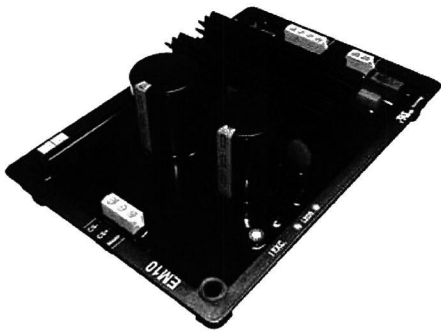


Figure 1:
EM10 Excitation Module

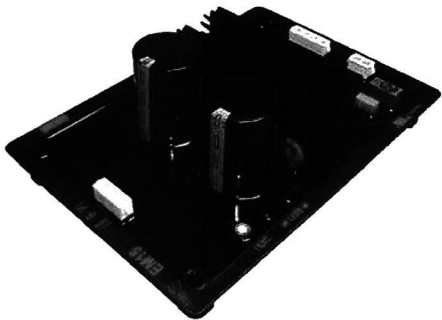


Figure 2:
EM15 Excitation Module

EXCITATION MODULE TECHNICAL SPECIFICATION

	EM10	EM15
Compatible Generator ExcitationTypes	Self Excitation (SE) Internal Excitation (IE) Permanent Magnet (PMG)	
Nominal Field Current Output	6 Amps	7 Amps
Maximum (forcing) Field Current Output	10 Amps	15 Amps
Maximum AC Voltage Input	180Vrms	240Vrms

For more information on the Excitation Module refer to the component spec sheet.

INTEGRATED VOLTAGE REGULATOR

EMCP 4 DISPLAY



EXAMPLE SCREENS – EMCP 4.1/4.2

VOLTS / Hz	
TARGET VOLT	480 V
EXCITATION CMD	4.5 %

Figure 3: IVR Overview Screen

VOLTAGE BIAS OVERVIEW	
MANUAL	10.0%
ANALOG	2.0%

DROOP	-2.0%
TOTAL	10.0%

Figure 4: Voltage Bias Overview Screens

EXAMPLE SCREENS – EMCP 4.3/4.4

IVR OVERVIEW	
OPERATING MODE:	
	VOLTS / Hz
TARGET VOLTAGE	480 V
EXCITATION COMMAND	4.5 %
COMPENSATION	DROOP
GENSET	
	PAGE DOWN

Figure 5: IVR Overview Screen

VOLTAGE BIAS OVERVIEW	
ACTIVE VOLTAGE BIASING:	
MANUAL	10.0%
ANALOG INPUT	2.0%
DROOP	-2.0%
TOTAL BIAS	10.0%
GENSET	
	PAGE UP

Figure 6: Voltage Bias Overview Screen

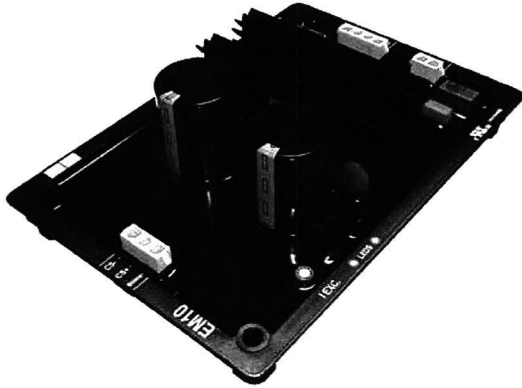
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EXCITATION MODULE



EM10

The EM10 Excitation Module is a power electronics component designed to provide excitation current to the generator that is controlled by the Integrated Voltage Regulator (IVR) feature in the EMCP 4 controls.

Caterpillar is leading the power generation marketplace with power solutions engineered to deliver unmatched flexibility, expandability, reliability and cost-effectiveness.

FEATURES

- Over-excitation protection – limit can be adjusted via a potentiometer (IEXC.)
- Green status LED indicating unit is powered on
- Red status LED indicating excitation current limiting (flashing) or shutdown (solid)

When used with EMCP 4.3/4.4 and IVR-compatible EMCP 4.1/4.2 controllers, the Integrated Voltage Regulator system offers:

- Automatic Voltage Regulation (AVR)
- Programmable stability settings
- Soft start control with an adjustable time setting in AVR control mode
- Dual Slope Under Frequency (Volts / Hz) regulation
- Three-phase or single-phase generator voltage (RMS) sensing/regulation in AVR mode

EMCP 4.3/4.4 and IVR-compatible EMCP 4.2 controllers also offer:

- Power Factor Regulation (PF)
- Generator paralleling with reactive droop compensation
- Line drop compensation

WORLDWIDE PRODUCT SUPPORT

- Worldwide parts availability through the Cat® dealer network
- Over 1,800 dealer branch stores operating in 200 countries
- The best product support record in the industry
- Cat dealers provide extensive post sale support including maintenance and repair agreements

COMPLETE SYSTEM INTEGRATION

Fully designed and factory tested to work seamlessly with Cat generators using Self Excitation (SE), Internal Excitation (IE) or Permanent Magnet (PMG) excitation systems and EMCP controls.

EXCITATION MODULE – EM10



SPECIFICATIONS

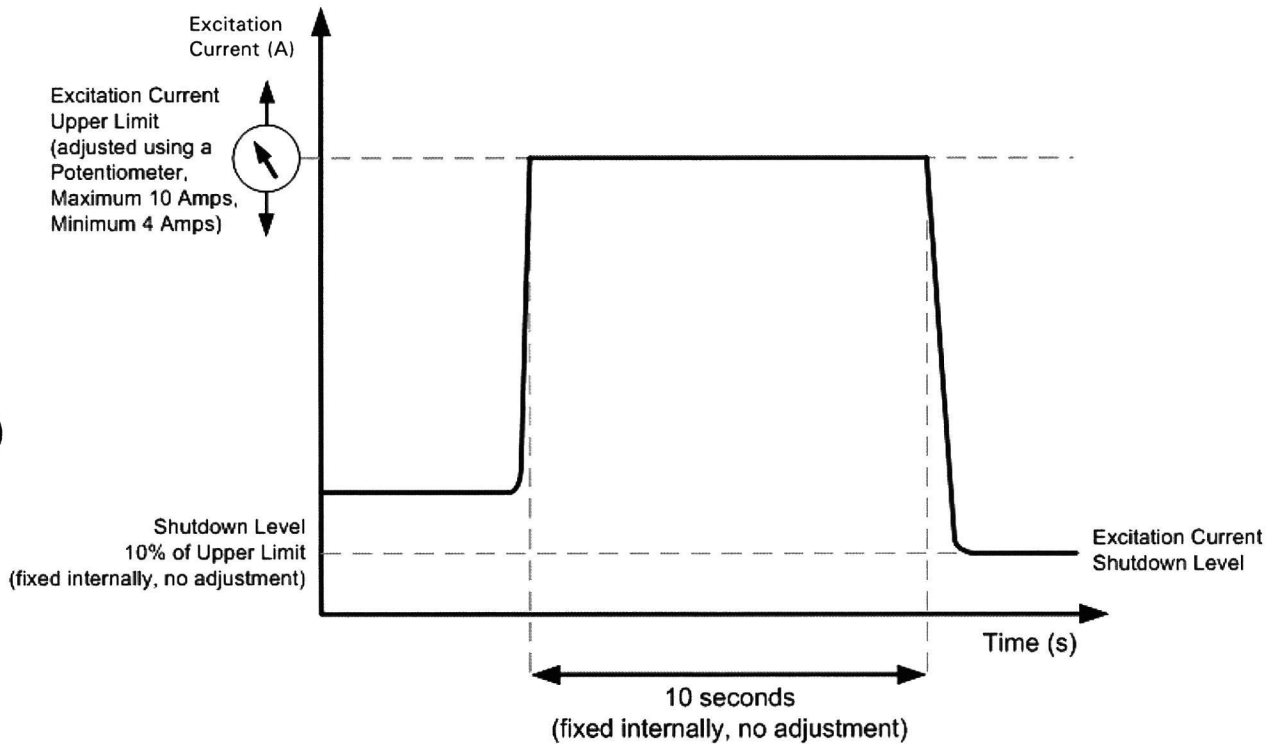
ELECTRICAL	
Generator Excitation Types	Self Excitation / Internal Excitation / Permanent Magnet (PMG)
Max. Continuous Field Current Output	6 Amps
Max. Forcing Field Current Output	10 Amps
Max. AC Voltage Input (X1:X2, Z1:Z2)	180Vrms
ENVIRONMENTAL	
Operating Temperature Range	–40 °C (–40 °F) to +70 °C (+158 °F)
Storage Temperature Range	–40 °C (–40 °F) to +85 °C (+185 °F)
Relative Humidity Tolerance	95% non-condensing humidity
Salt Spray	5% salt (NaCl) solution for 120 hrs
Vibration	4.5 G-rms, 24-2000 Hz in 3 orthogonal planes
Electromagnetic Compatibility	RF Immunity (Radiated & Conducted) RF Emissions (Radiated & Conducted) Electrical Transients
Weight	770 g ± 30 g
Power Consumption (at Max. Continuous Rating)	<450 VA
CONFORMITY	
UL	UL Recognized (U.S. and Canada) File No. E334232
CE Integration Certificate	In conformity with the applicable requirements of the following Standards: EN 50178 EN 60204-1 EN 61000-6-2 EN 61000-6-4

EXCITATION MODULE – EM10



OVER-EXCITATION PROTECTION

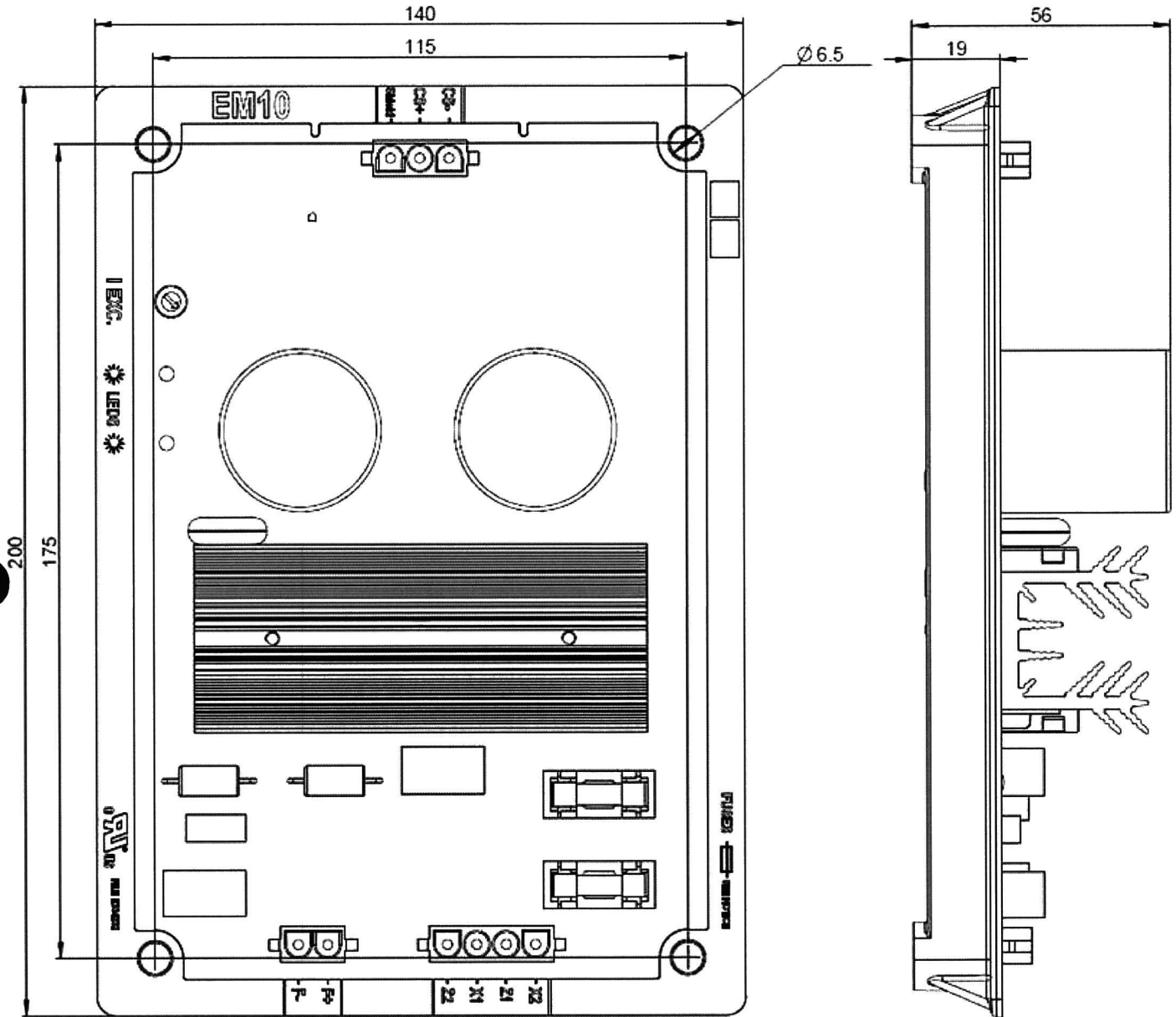
- If a short-circuit fault occurs at the generator terminals, the EM10 will allow the excitation current to rise to the upper limit value set by the adjustment potentiometer (max. 10 Amps).
- The excitation current will be clamped at the upper limit value for 10 seconds (fixed internally).
- After 10 seconds, the excitation current is reduced to a value of 10% of the potentiometer setting.



EXCITATION MODULE – EM10



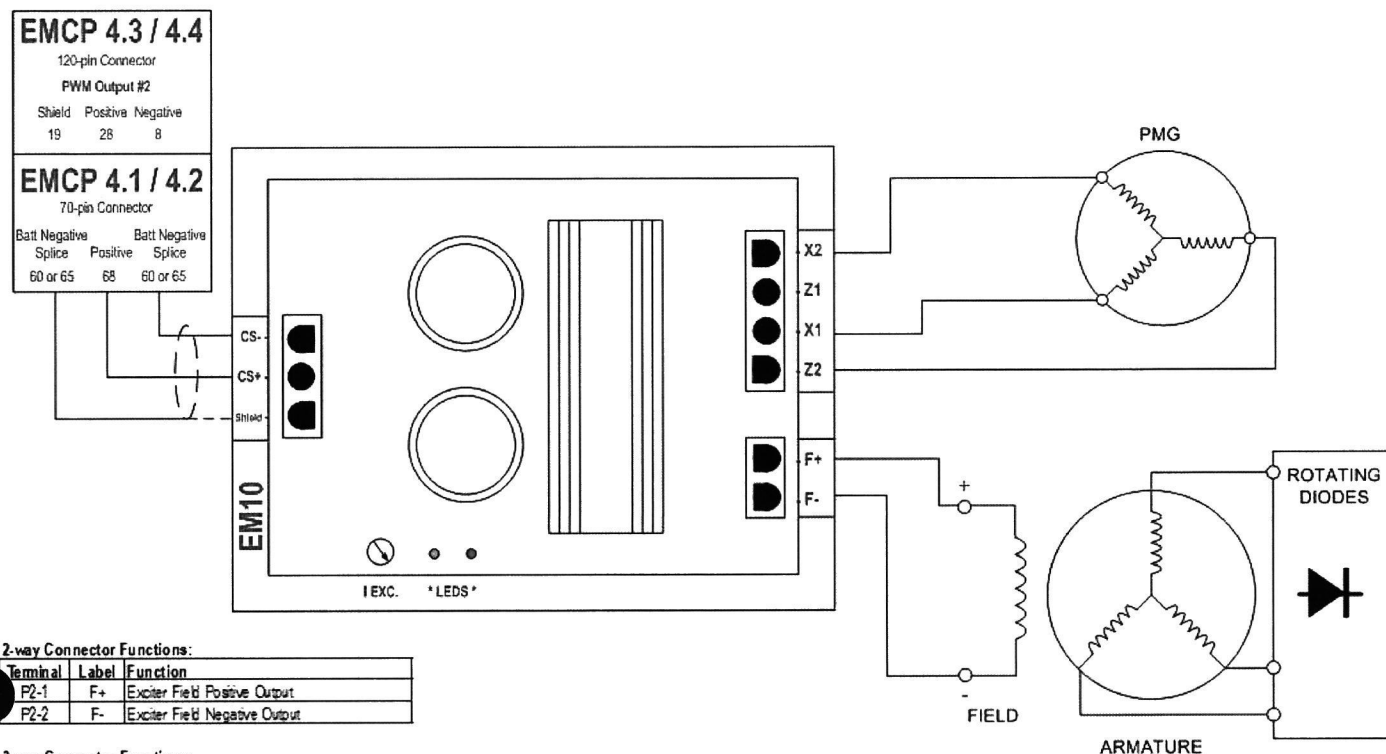
OUTLINE DRAWING (Dimensions in mm)



EXCITATION MODULE – EM10



EXAMPLE CONNECTION DIAGRAM (Permanent Magnet Excitation)



2-way Connector Functions:

Terminal	Label	Function
P2-1	F+	Exciter Field Positive Output
P2-2	F-	Exciter Field Negative Output

3-way Connector Functions:

Terminal	Label	Function
P3-1	Shield	Excitation Command Shield
P3-2	CS+	Excitation Command Positive Input
P3-3	CS-	Excitation Command Negative Input

4-way Connector Functions (PMG Excitation):

Terminal	Label	Function
P4-1	X2	Excitation Power Supply Input (PMG Phase B)
P4-2	Z1	Not Connected
P4-3	X1	Excitation Power Supply Input (PMG Phase A)
P4-4	Z2	Excitation Power Supply Input (PMG Phase C)

4-way Connector Functions (Self-Excitation):

Terminal	Label	Function
P4-1	X2	Excitation Power Supply Input (single-phase)
P4-2	Z1	Not Connected
P4-3	X1	Excitation Power Supply Input (single-phase)
P4-4	Z2	Not Connected

4-way Connector Functions (Internal Excitation):

Terminal	Label	Function
P4-1	X2	Excitation Power Supply Input (Aux Winding 1 - Positive)
P4-2	Z1	Excitation Power Supply Input (Aux Winding 2 - Positive)
P4-3	X1	Excitation Power Supply Input (Aux Winding 1 - Negative)
P4-4	Z2	Excitation Power Supply Input (Aux Winding 2 - Negative)

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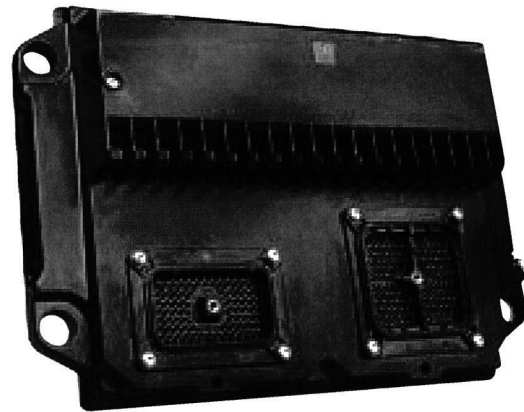
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ADEM™ A4 Engine Controller

The ADEM™ A4 is the main Electronic Control Module (ECM) used on select diesel engines. The ADEM A4 is an integral part of the innovative ACERT® Technology that provides higher degree of control over a large number of combustion variables than ever before. The ADEM A4 is designed to control/interface Electronic Unit Injector (EUI) equipped engines. The ADEM A4 engine system is composed of the ADEM A4 ECM, control software, sensors, actuators, fuel injectors, and interface to the generator system. The prime benefit of an ADEM A4 engine system is to better control and maintain the particulate emissions, both steady state and transient, while improving engine performance.



FEATURES

RELIABLE, DURABLE

All ADEM A4 controllers are designed to survive the harshest environments.

- Environmentally sealed, die-cast aluminum housing isolates and protects electronic components from moisture and dirt contamination.
- Rigorous vibration testing ensures product reliability and durability.
- Accuracy maintained from -40° C to 85° C
- Electrical noise immunity to 100 volts/meter
- Internal circuits are designed to withstand shorts to +battery and -battery.
- Atmosphere cooled

SIMPLE SERVICING

Each ADEM A4 system works in combination with the Caterpillar® ET service tool software to keep the engine operating at peak performance.

- Displays measured parameters
- Retrieves active and logged event code documenting abnormal system operation
- Performs calibrations and diagnostic tests
- Supports flash programming of new software into the ADEM A4 ECM

SELF DIAGNOSTICS

Each ADEM A4 ECM has a full compliment of diagnostics. The ECM can detect faults in the electrical system and report those faults to the service technician for quick repair.

- Self-diagnostic capability pinpoints operational problems in need of attention.

ADVANCED FEATURES

- Isochronous or droop speed control
- Enhanced performance from fuel injection timing and limiting
- Adjustable monitoring of vital engine parameters
- Idle/rated speed setting
- Programmable speed acceleration ramp rate
- Adjustable cooldown duration
- Data link interfaces
- Cat Data link
- CAN J1939

OPTIONAL FEATURES

- Ether control system support
- Remote monitoring and control support

DESCRIPTION

The ECM is housed in an environmentally sealed casting. All wiring connections to the ECM are made using two sealed connectors: a single seventy-pin connector and a single one hundred twenty-pin connector.

ENGINE SPEED GOVERNING

Desired engine speed is calculated by the ECM and held within ± 0.2 Hz for isochronous and droop mode. The ECM accounts for droop that is requested. The proper amount of fuel is sent to the injectors due to these calculations. The ECM also employs cooldown/shutdown strategies, acceleration delays on startup, acceleration ramp times, speed reference and a low/high idle switch is also available via communications to the EMCP 3.

FUEL LIMITING

Warm and cold fuel-air ratio control limits are controlled by the ECM. Electronic monitoring system derates, torque limit, and cranking limit, programmable torque scaling, and cold cylinder cutout mode are standard features.

FUEL INJECTION TIMING

Master timing for injection is controlled by the ECM control. Temperature dependencies are accounted for in the fuel injection calculations.

ELECTRONIC MONITORING

Electronic monitoring of vital engine parameters can be programmed. Warning, derate, and shutdown event conditions may be customized by the user.

INFORMATION MANAGEMENT

The ECM stores information to assist with electronic troubleshooting. Active and logged diagnostic codes, active events, logged events, fuel consumption, engine hours, and instantaneous totals aid service technicians when diagnosing electronic faults and scheduling preventive maintenance.

CALIBRATIONS

Engine performance is optimized through injection timing. Auto/manual sensor calibrations are standard features.

ON-BOARD SYSTEM TESTS

System tests are available to assist in electronic troubleshooting. These tests include: injector activation, injector cutout, and override of control outputs.

DATA LINK INTERFACES

The ADEM A4 communicates with the EMCP 3 via the J1939 Communication network. Additionally, the ADEM A4 can communicate with the Cat ET electronic service tool and the PL1000E, PL1000T.

ELECTRONIC SENSING

The following sensing is available on the ADEM A4: oil pressure, fuel pressure, fuel temperature, atmospheric pressure, air inlet temperature, turbo outlet pressure, engine coolant temperature, engine speed, throttle, position, exhaust temperature, engine control switch position, oil filter pressure differential, fuel filter pressure differential, air filter pressure differential, crankcase pressure, and remote e-stop switch position.

SPECIFICATIONS

Humidity tolerance

0 to 90% relative humidity over operating temperature range

Impervious to:

salt spray, fuel, oil and oil additives, coolant, spray cleaners, chlorinated solvents, hydrogen sulfide and methane gas, and dust

Input and output protection

all inputs and outputs are protected against short circuits to +battery and -battery

Input voltage range (24 VDC nominal)

18 to 32 VDC

Mounting

engine mounted

Reverse polarity protected

Shock, withstands 20 g

Temperature range

Operating: -40° C to 85° C (-40° F to 185° F)

Storage: -50° C to 120° C (-58° F to 248° F)

Vibration

withstands 8.0 g @ 24 to 2 kHz

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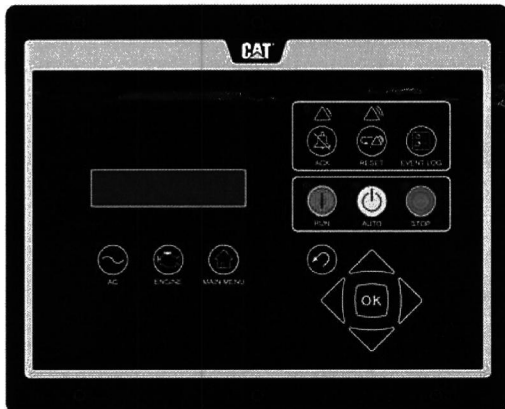


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EMCP 4.2 GENERATOR SET CONTROLLER

Caterpillar is leading the power generation market place with power solutions engineered to deliver unmatched performance, reliability, durability and cost-effectiveness.

FEATURES

GENERAL DESCRIPTION

The Cat® EMCP 4.2 offers fully featured power metering, protective relaying and engine and generator control and monitoring. Engine and generator controls, diagnostics, and operating information are accessible via the control panel keypads; diagnostics from the EMCP 4 optional modules can be viewed and reset through the EMCP 4.2.

FULL RANGE OF ATTACHMENTS

- Wide range of system expansion attachments, designed specifically to work with the EMCP 4.
- Flexible packaging options for easy and cost effective installation.

WORLD WIDE PRODUCT SUPPORT

- Cat dealers provide extensive pre and post sale support.
- Cat dealers have over 1,600 dealer branch stores operating in 200 countries.

FEATURES

- A 33 x 132 pixel, 3.8 inch, graphical display denotes text alarm/event descriptions, set points, engine and generator monitoring, and is visible in all lighting conditions.
- Textual display with support for 28 languages, including character languages such as Arabic, Chinese, and Japanese.
- Advanced engine monitoring is available on systems with an electronic engine control module.
- Integration with the Cat Digital Voltage Regulator (CDVR) provides enhanced system performance.
- Fully featured power metering, protective relaying, engine and generator parameter viewing, and expanded AC metering are all integrated into this controller.

- Real-time clock allows for date and time stamping of diagnostics and events in the control's logs as well as service maintenance reminders based on engine operating hours or calendar days.
- Up to 40 diagnostic events are stored in the non-volatile memory.
- Ability to view and reset diagnostics on EMCP 4 optional modules via the control panel removes the need for a separate service tool for troubleshooting.
- Set points and software stored in non-volatile memory, preventing loss during a power outage.
- Reduced power mode offers a low power state to minimize battery power requirements.
- Three levels of security allow for configurable operator privileges.
- Selectable units
 - Temperature: °C or °F
 - Pressure: psi, kPa, bar
 - Fuel Consumption: Gal/hr or Liter/hr

STANDARDS

- UL Recognized
- CSA C22.2 No.100,14, 94
- Complies with all necessary standards for CE Certification
 - 98/37/EC Machinery Directive
 - BS EN 60204-1 Safety of Machinery
 - 89/336/EEC EMC Directive
 - BS EN 50081-1 Emissions Standard
 - BS EN 50082-2 Immunity Standard
 - 73/23/EEC Low Voltage Directive
 - EN 50178 LVD Standard
- IEC529, IEC60034-5, IEC61131-3
- MIL STND 461

STANDARD FEATURES

Generator Monitoring	<ul style="list-style-type: none"> • Voltage (L-L, L-N) • Current (Phase) • Average Volt, Amp, Frequency • kW, kVA, kVA (Average, Phase, %) • Power Factor (Average, Phase) • kW-hr, kVA-hr (total) • Excitation voltage and current (with CDVR) • Generator stator and bearing temp (with optional module)
Generator Protection	<ul style="list-style-type: none"> • Generator phase sequence • Over/Under voltage (27/59) • Over/Under frequency (81 O/U) • Reverse Power (kW) (32) • Reverse Reactive Power (kVA) (32RV) • Overcurrent (50/51)
Engine Monitoring	<ul style="list-style-type: none"> • Coolant temperature • Oil pressure • Engine speed (RPM) • Battery voltage • Run hours • Crank attempt and successful start counter • Enhanced engine monitoring (with electronic engines)
Engine Protection	<ul style="list-style-type: none"> • Control switch not in auto (alarm) • High coolant temp (alarm and shutdown) • Low coolant temp (alarm) • Low coolant level (alarm) • High engine oil temp (alarm and shutdown) • Low, high, and weak battery voltage • Overspeed • Overcrank
Control	<ul style="list-style-type: none"> • Run / Auto / Stop control • Speed and voltage adjust • Local and remote emergency stop • Remote start/stop • Cycle crank
Inputs & Outputs	<ul style="list-style-type: none"> • Two dedicated digital inputs • Six programmable digital inputs • Six programmable form A dry contacts • Two programmable form C dry contacts • Two digital outputs
Communications	<ul style="list-style-type: none"> • Primary and accessory CAN data links • RS-485 annunciator data link • Modbus RTU (RS-485 Half duplex)
Language Support	Arabic, Bulgarian, Chinese, Czech, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Icelandic, Italian, Latvian, Lithuanian, Japanese, Norwegian, Polish, Portuguese, Romanian, Russian, Slovak, Slovene, Spanish, Swedish, Turkish
Environmental	<ul style="list-style-type: none"> • Control module operating temperature: -40°C to 70°C • Display operating temperature: -20°C to 70°C • Humidity: 100% condensing 30°C to 60°C • Storage temperature: -40°C to 85°C • Vibration: Random profile, 24-1000 Hz, 4.3G rms

EMCP 4 CAN
ANNUNCIATOR

The EMCP 4 CAN annunciator serves to display generator set system alarm conditions and status indications. The annunciator has been designed for use on the EMCP 4 accessory communication network for local applications, but may be used for either local or remote applications, providing customers with enhanced site flexibility.

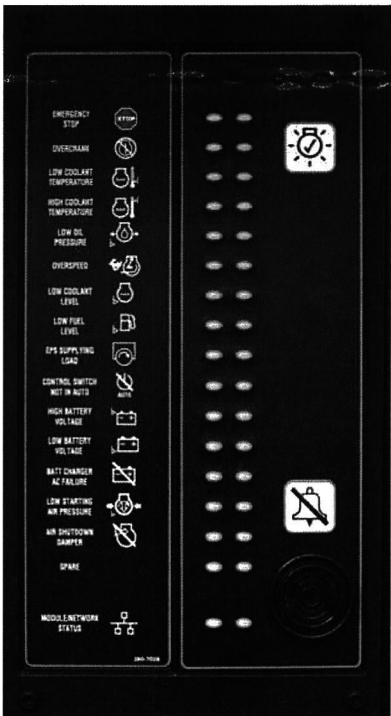
In local applications, the annunciator may be mounted on the package generator set with the EMCP 4 Controller to provide a complete package-mounted monitoring solution.

The annunciator may also be mounted separate from the generator set to provide remote indication of system operating and alarm conditions.

The EMCP 4 annunciator is configurable to the standards of NFPA 99/110 for emergency standby generator systems.

FEATURES

- The EMCP 4 annunciator provides sixteen (16) individual points of annunciation, with two (2) LED's included for each point.
- An additional pair of LED's provides status indication of the accessory communication network.
- Includes alarm horn with lamp test and alarm acknowledge pushbuttons.
- Configurable using standard Cat® Service Tool
- Configurable to NFPA 99/110 requirements for local and remote annunciation on emergency standby generator systems.
- Provides custom label kit including software for customer's specific alarms and arrangement
- Designed and tested to meet stringent impulse shock and operating vibration requirements
- Uses high quality shielded twisted-pair cable for robust remote communications
- Graphic symbols are provided next to each pair to indicate various alarms and events
- The annunciator can be mounted either locally, on the package generator set, or remotely (up to 240 m (800 ft).
- Provides superior visibility of the LED's in direct sunlight



Local Annunciator Panel

SPECIFICATIONS

Technical Data

- Electrical
 - Battery Voltage Functional Range: 9 to 32 VDC
 - Power Consumption
 - Maximum: ≈ 12 watt at 24 VDC
 - Standby: ≈ 5 watt at 24 VDC
 - Control Power: 12-24 VDC
 - Communication: Accessory Data Link
 - Single, 6-pin Connector
 - Alarm
 - Sound Level 80 db

PHYSICAL

- Weight2.5 lb or ≈ 1.13 kg

ENVIRONMENTAL

- Operating Temperature
 - 40° C to 70° C
 - 40° F to 158° F
- Storage Temperature
 - 50° C to 70° C
 - 58° F to 158° F
- Relative Humidity90%

CERTIFICATIONS



LED COLOR SCHEME

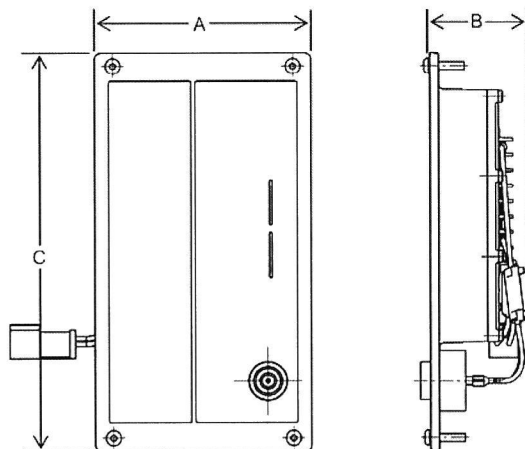
Each pair of LED's on the annunciator consists of two of three colors: green, yellow and red, which allows for custom configuration of status, warning and shutdown conditions.

The available colors and combinations are:

Row	LED 1	LED 2
1	Red	Yellow
2	Red	Yellow
3	Red	Yellow
4	Red	Yellow
5	Red	Yellow
6	Red	Green
7	Red	Yellow
8	Red	Yellow
9	Red	Yellow
10	Red	Yellow
11	Red	Yellow
12	Red	Yellow
13	Green	Yellow
14	Green	Yellow
15	Red	Green
16	Red	Yellow

STANDARD LED CONFIGURATION

- Emergency stop shutdown
- Overcrank shutdown
- Low coolant temperature warning
- High coolant temperature warning/shutdown
- Low oil pressure warning/shutdown
- Overspeed warning/shutdown
- Low coolant level warning/shutdown
- Low fuel level warning/shutdown
- EPS supplying load status
- Control switch not in auto warning
- High battery voltage warning/shutdown
- Low battery voltage warning/shutdown
- BATT charger AC failure warning/shutdown
- Low cranking voltage
- Engine running
- Tier 4 SCR



Annunciator Dimensions		
A	158 mm	6.22 in
B	60 mm	2.37 in
C	288 mm	11.34 in

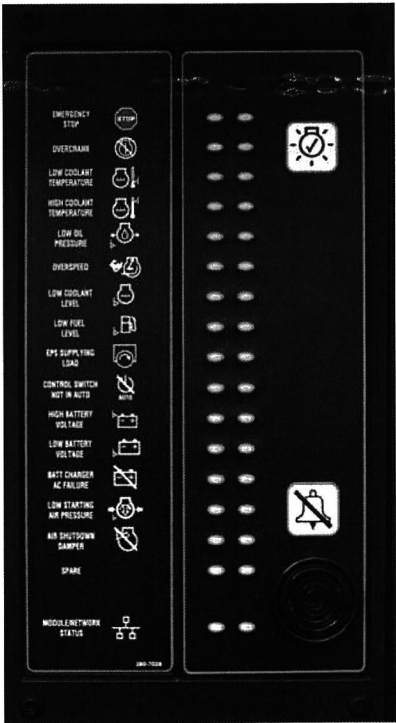
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www.Cat-ElectricPower.com

EMCP 4 RS-485 ANNUNCIATOR

The EMCP 4 RS-485 annunciator serves to display generator set system alarm conditions and status indications. The annunciator has been designed for use on the EMCP 4 RS-485 annunciator data link for remote applications, providing customers with enhanced site flexibility.

The EMCP 4 annunciator is configurable to the standards of NFPA 99/110 for emergency standby generator systems.



Remote Annunciator Panel

FEATURES

- The EMCP 4 annunciator provides sixteen (16) individual points of annunciation, with two (2) LED's included for each point.
- An additional pair of LED's provides status indication of the RS-485 communication network.
- Includes alarm horn with lamp test and alarm acknowledge pushbuttons.
- Configurable to NFPA 99/110 requirements for local and remote annunciation on emergency standby generator systems.
- Provides custom label kit including software for customer's specific alarms and arrangement
- Designed and tested to meet stringent impulse shock and operating vibration requirements
- Uses high quality shielded twisted-triad cable for robust remote communications
- Graphic symbols are provided next to each pair to indicate various alarms and events
- The annunciator can be mounted remotely up to 1200 m (4,000 ft).
- Provides superior visibility of the LED's in direct sunlight

SPECIFICATIONS

Technical Data

- Electrical
 - Battery Voltage Functional Range: 9 to 32 VDC
 - Power Consumption
 - Maximum: ≈ 12 watt at 24 VDC
 - Standby: ≈ 5 watt at 24 VDC
 - Control Power: 12-24 VDC
 - Communication: RS-485
 - Single, 8-pin Connector
 - Alarm
 - Sound Level 80 db

PHYSICAL

- Weight2.5 lb or ≈ 1.13 kg

ENVIRONMENTAL

- Operating Temperature
 - 40° C to 70° C
 - 40° F to 158° F
- Storage Temperature
 - 50° C to 70° C
 - 58° F to 158° F
- Relative Humidity90%

CERTIFICATIONS



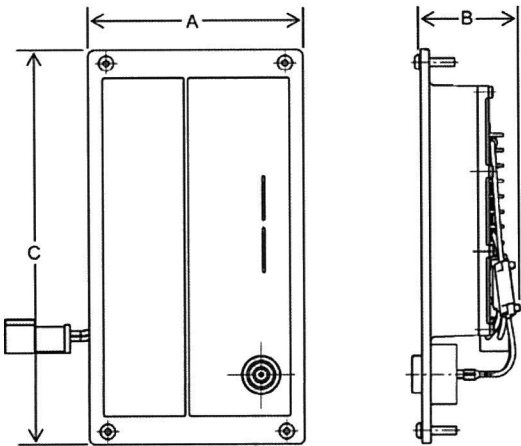
LED COLOR SCHEME

Each pair of LED's on the annunciator consists of two of three colors: green, yellow and red, which allows for custom configuration of status, warning and shutdown conditions.
The available colors and combinations are:

Row	LED 1	LED 2
1	Red	Yellow
2	Red	Yellow
3	Red	Yellow
4	Red	Yellow
5	Red	Yellow
6	Red	Green
7	Red	Yellow
8	Red	Yellow
9	Red	Yellow
10	Red	Yellow
11	Red	Yellow
12	Red	Yellow
13	Green	Yellow
14	Green	Yellow
15	Red	Green
16	Red	Yellow

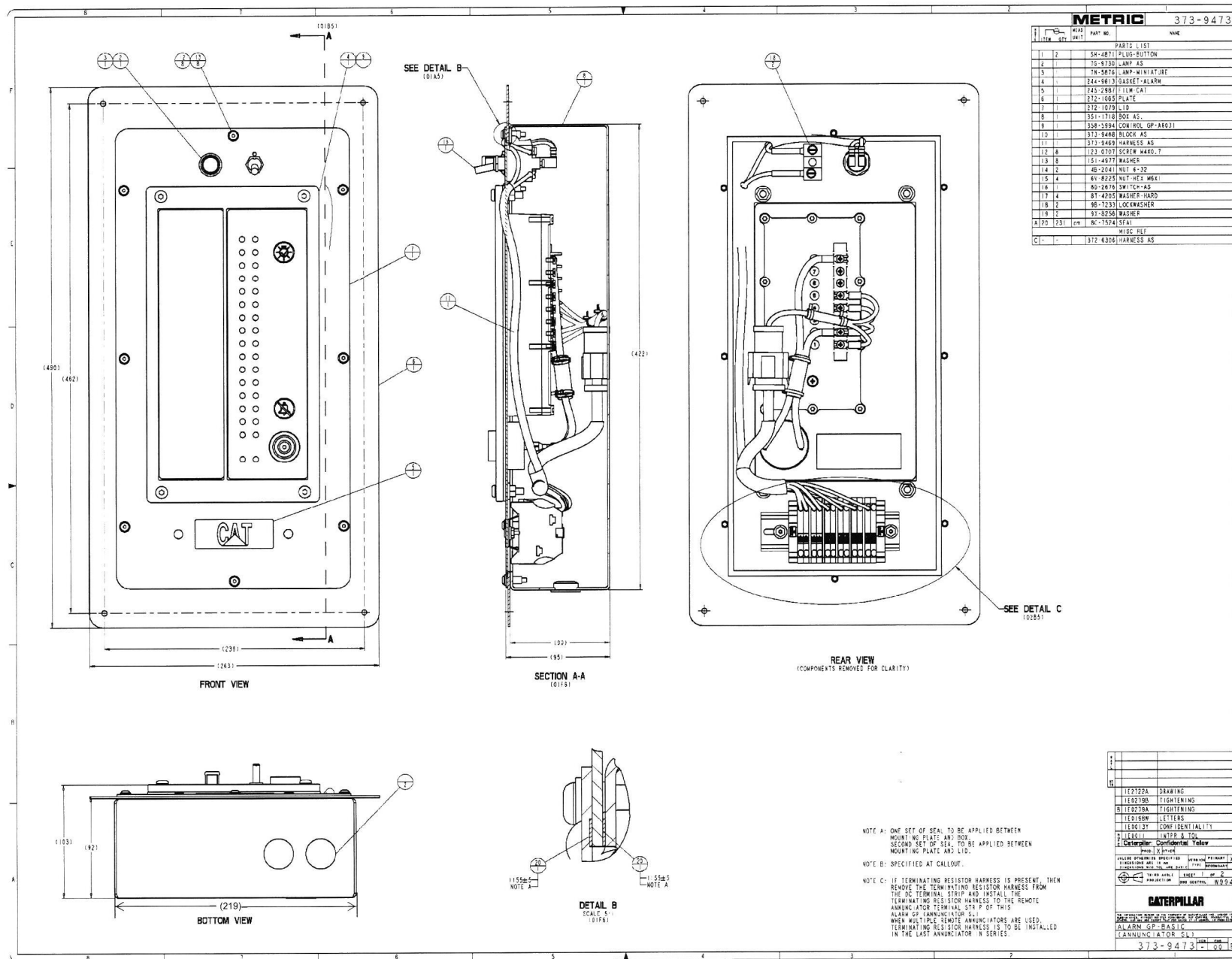
STANDARD LED CONFIGURATION

- Emergency stop shutdown
- Overcrank shutdown
- Low coolant temperature warning
- High coolant temperature warning/shutdown
- Low oil pressure warning/shutdown
- Overspeed warning/shutdown
- Low coolant level warning/shutdown
- Low fuel level warning/shutdown
- EPS supplying load status
- Control switch not in auto warning
- High battery voltage warning/shutdown
- Low battery voltage warning/shutdown
- BATT charger AC failure warning/shutdown
- Low cranking voltage
- Engine running
- Tier 4 SCR



Annunciator Dimensions		
A	158 mm	6.22 in
B	60 mm	2.37 in
C	288 mm	11.34 in

Remote Annunciator is mounted in black sheet metal box for surface mounting with approximate insert dimensions: 16.75" H x 8.75" W x 6.25" D





CATERPILLAR

Detailed Specifications & Technical Data

ENGLISH MEASUREMENT VERSION



8618 Multi-Conductor - Audio, Control and Instrumentation Cable

Provided by customer



For more Information
please call

1-800-Belden1



General Description:

16 AWG stranded (19x29) tinned copper conductors, conductors cabled, polyethylene insulation, overall Beldfoil® shield (100% coverage), 18 AWG stranded tinned copper drain wire, PVC jacket.

Physical Characteristics (Overall)

Conductor

AWG:

# Conductors	AWG	Stranding	Conductor Material
3	16	19x29	TC - Tinned Copper

Total Number of Conductors:

3

Insulation

Insulation Material:

Insulation Material	Wall Thickness (in.)
PE - Polyethylene	0.032

Outer Shield

Outer Shield Material:

Outer Shield Trade Name	Type	Outer Shield Material	Coverage (%)
Beldfoil® (Z-Fold®)	Tape	Aluminum Foil-Polyester Tape	100

Outer Shield Drain Wire AWG:

AWG	Stranding	Drain Wire Conductor Material
18	16x30	TC - Tinned Copper

Outer Jacket

Outer Jacket Material:

Outer Jacket Material	Nom. Wall Thickness (in.)
PVC - Polyvinyl Chloride	.031

Overall Cable

Overall Cabling Color Code Chart:

Number	Color
1	Black
2	Red
3	Clear

Overall Nominal Diameter:

0.327 in.

Mechanical Characteristics (Overall)

Operating Temperature Range:	-20°C To +80°C
UL Temperature Rating:	80°C (UL AWM Style 20253)
Bulk Cable Weight:	60 lbs/1000 ft.
Max. Recommended Pulling Tension:	110 lbs.
Min. Bend Radius/Minor Axis:	3.500 in.

Applicable Specifications and Agency Compliance (Overall)

Applicable Standards & Environmental Programs

NEC/(UL) Specification:	CL3
AWM Specification:	UL Style 20253 (600 V 80°C)
EU Directive 2011/65/EU (RoHS II):	Yes
EU CE Mark:	Yes
EU Directive 2000/53/EC (ELV):	Yes
EU Directive 2002/95/EC (RoHS):	Yes
EU RoHS Compliance Date (mm/dd/yyyy):	01/01/2004

SECTION 2A

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XXXXXXXXXX

Detailed Specifications & Technical Data



ENGLISH MEASUREMENT VERSION

8618 Multi-Conductor - Audio, Control and Instrumentation Cable

EU Directive 2002/96/EC (WEEE): Yes

EU Directive 2003/11/EC (BFR): Yes

CA Prop 65 (CJ for Wire & Cable): Yes

MII Order #39 (China RoHS): Yes

Flame Test

UL Flame Test: UL1685 UL Loading

Plenum/Non-Plenum

Plenum (Y/N): No

Electrical Characteristics (Overall)

Nom. Capacitance Conductor to Conductor:

Capacitance (pF/ft)

26

Nom. Capacitance Cond. to Other Conductor & Shield:

Capacitance (pF/ft)

50

Nom. Conductor DC Resistance:

DCR @ 20°C (Ohm/1000 ft)

4.8

Max. Operating Voltage - UL:

Voltage	Description
600 V RMS	AWM Style 2107
300 V RMS	CL3

Max. Recommended Current:

Current

7 Amps per conductor @ 25°C

Put Ups and Colors:

Item #	Putup	Ship Weight	Color	Notes	Item Desc
8618 060U500	500 FT	31.500 LB	CHROME		3 #16 LDPE FS PVC
8618 0601000	1,000 FT	67.000 LB	CHROME	C	3 #16 LDPE FS PVC
8618 060500	500 FT	33.000 LB	CHROME	C	3 #16 LDPE FS PVC
8618 0605000	5,000 FT	325.000 LB	CHROME		3 #16 LDPE FS PVC

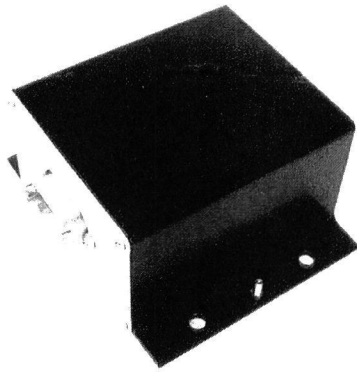
Notes:

C = CRATE REEL PUT-UP.

Revision Number: 3 Revision Date: 08-03-2012

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DIGITAL INPUT/ OUTPUT (I/O) MODULE

GENERAL DESCRIPTION

The Cat® Digital Input/Output (I/O) module serves to provide expandable Input and Output capability for your package generator set. The Digital I/O Module is capable of reading 12 digital inputs and setting eight (8) relay outputs.

The Cat Service Tool (ET) is used to configure the Digital I/O module, while all monitored Input and Output status conditions are viewable on the EMCP 4 control panel.

The Digital I/O Module can be Package or Remote mounted (up to 800 feet) and features rugged packaging and watertight Deutsch IPD connectors.

These features all add to the sense of value and dependability that comes with your purchase of Caterpillar products.

OPERATOR INTERFACE

- All Digital I/O status conditions are available for viewing with the EMCP 4.2, 4.3 & 4.4 Controllers.

FEATURES/BENEFITS

- Capable of reading twelve (12) digital inputs and setting eight (8) relay outputs.
- CAN communication network eliminates the need for multiple relays, which translates to less wiring and fewer opportunities for mechanical failures.
- Remote customer communications are supported by MODBUS protocol (via EMCP 4.2 or higher), which easily interfaces with existing plant systems and equipment.
- Set points are stored in nonvolatile memory, preventing loss during a power outage.

COMMUNICATION

- Single, standard 40-pin connector
- CAN Accessory Data Link
- MODBUS RS-485 (Customer Communication) via the EMCP 4.2 or higher controllers

GENERAL SPECIFICATIONS

- Reads twelve (12) digital inputs and sets eight (8) Form C relay outputs rated for rated resistive loads of:
 - 2A @ 30 VDC for Normally Closed (NC) relays
 - 2A @ 125 VAC for Normally Closed (NC) relays
 - 2A @ 30 VDC for Normally Open (NO) relays
 - 2A @ 125 VAC for Normally Open (NO) relays

GENERAL SPECIFICATIONS (CONT'D)

- Encapsulated in a rugged aluminum housing with watertight connectors (IP67 rating)
- Suitable for moist, high shock and vibration environments
- Modules are designed for package mounting on power generator sets or remotely, up to 800 ft.
- Configuration is accomplished with Cat ET Service Tool.
- Multiple Digital I/O modules can be used on a CAN communications network.
- Protected against 95% humidity non-condensing, 30° C to 60° C.
- Operating temperature range of -40° C to 85° C (-40° F to 185° F) – for ambient temperatures exceeding 85° C, the temperature scanner may deviate in accuracy an additional $\pm 1^\circ$ C.
- Storable temperature range is -50° C to +120° C.
- Designed to meet relevant European standards for EMI/RFI/Immunity without the use of external filtering.
- Maximum level of current draw of 400 mA + 50 mA per energized relay @ 12 VDC
- Isolation voltage: 4000 VAC (RMS), 50/60 Hz for 1 min. between coil and contacts, 750 VAC, 50/60 Hz for 1 min. between contacts of the same polarity
- System throughput: All channels are scanned in 100 mSec.
- Input level characteristics:
 - Low-Level input voltage: 0 to 0.8V
 - High-Level input voltage: 3.75 to 24V
 - Inputs have internal pull-up resistors.
- Inputs that generate a warning message auto-reset whenever the input returns to non-active state.
- Inputs that generate a shutdown message continue to broadcast that message until the input returns to non-active state and a reset message is received from the EMCP 4.2, 4.3 or 4.4.
- Each output is configured to activate based upon the message that is received on the accessory and can be configured to activate on Alarm, Shutdown or Diagnostic condition – or a combination of all three.
- Optical isolation is provided for the CAN line
- Retains current date and time relative to synchronization every 24 hours (or upon boot up) with equipment system time via an explicit command from the EMCP 4.2 or higher – synchronization time is accurate to within 1 sec.
- Monitored parameters and diagnostics as well as setpoints are customizable to customer specification
- Module operates normally with loss of communication link, retaining configured values in non-volatile memory.
- Remains energized during engine cranking.

Digital I/O Module Configuration Parameters:

The Digital I/O Module is configurable to display the following parameters for each of the available Inputs:

- Active State (Active High or Active Low)
- Input Time Delay (0-120 seconds).

DIGITAL INPUT/ OUTPUT (I/O) MODULE

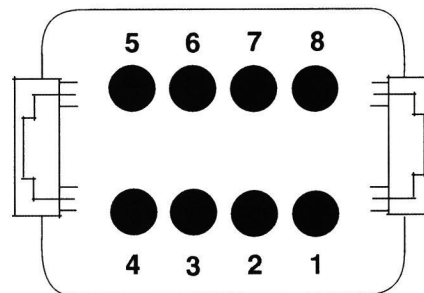


Available Inputs/Outputs:

The Digital I/O Module is configured to accept inputs for the following conditions, with the listed condition displayed at the EMCP 4 controller:

Description	Input	Output
Fuel Level Secondary Tank	X	X
Starting Air Pressure		X
Fuel Pressure		X
Fuel Filter Differential Pressure		X
Fuel Level (Primary Tank)	X	X
Engine Oil Level		X
Oil Filter Differential Pressure		X
Engine Oil Pressure		X
Crankcase Pressure		X
Air Filter Differential Pressure		X
Engine Coolant Temperature		X
Engine Coolant Level	X	X
Extinguisher System Pressure	X	X
Battery Voltage		X
Ambient Air Temperature		X
Inlet Air Temperature		X
Exhaust Temperature		X
Fuel Temperature		X
Engine Oil Temperature		X
Engine Overspeed		X
Emergency Stop Shutdown		X
Gen. Bearing Temperature #1		X
Gen. Winding Temperature (1-3)		X
Ruptured Fuel Basin-Primary Tank	X	X
Engine Failure to Start Shutdown		X
Generator Frequency		X
Generator Voltage		X
Generator Reactive Power (VAR)		X
Generator AC Current		X
Generator Reverse Power (kW)		X
Voltage Regulator Failure		X
Service Interval Warning		X
Air Shutoff Damper Close	X	X
Gen. Supplying Load	X	X
Battery Charger Failure	X	X
Gen. Breaker Closed	X	X
Utility Breaker Closed	X	X
Engine in Cooldown		X
Generator Control Not in Auto		X
Unexpected Engine Shutdown		X
User Defined Input (1-12)	X	

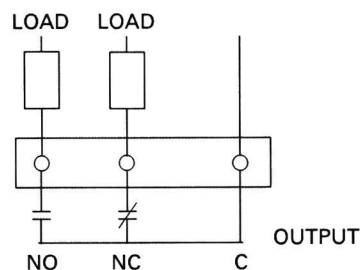
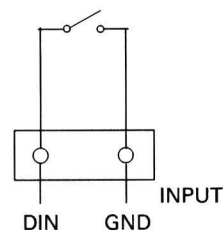
TYPICAL CONNECTIONS – POWER AND CAN BUS:



FRONT VIEW
MODULE MOUNTED CONNECTOR
DEUTSCH P/N: DT13-08PA

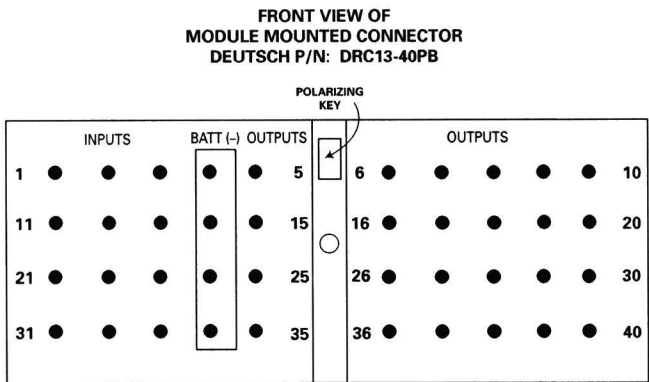
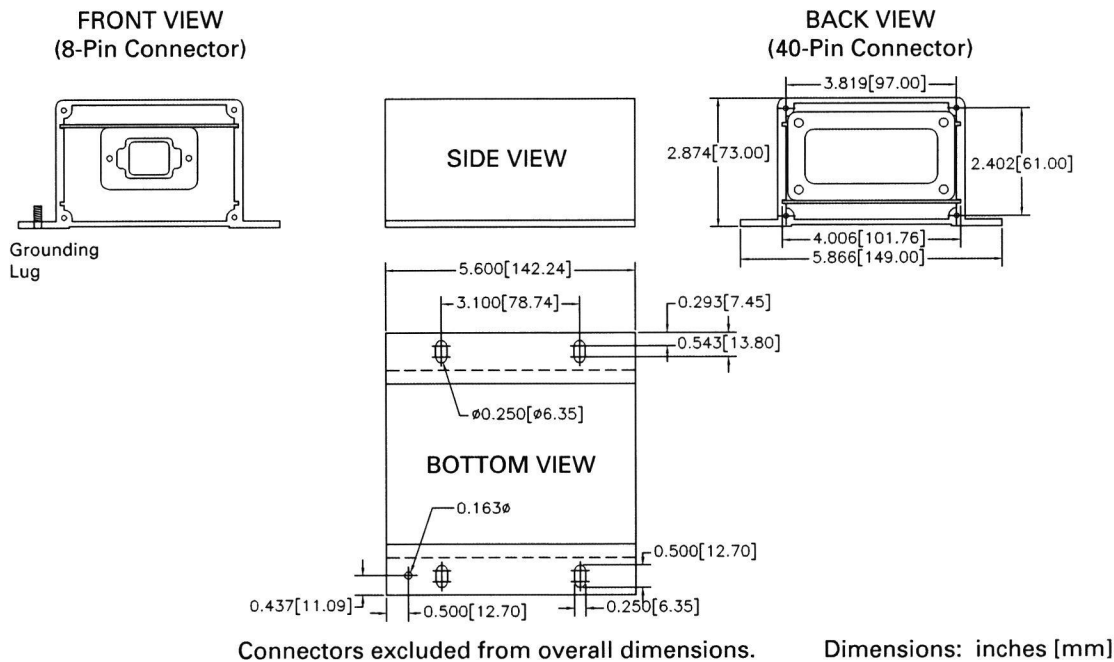
1 = PWR+ 5 = SHIELD
2 = CAN-H 6,7,8 = NOT USED
3 = CAN-L
4 = PWR-

TYPICAL CONNECTIONS – DIGITAL I/O MODULE:





DIMENSIONS



NO - Normally Open
NC - Normally Closed
C - Common

INPUTS	Pin	OUTPUTS	Pin
DIN1	1	NC_1	5
DIN2	11	C_1	6
DIN3	21	NO_1	7
DIN4	31	NC_2	15
DIN5	2	C_2	16
DIN6	12	NO_2	17
DIN7	22	NC_3	25
DIN8	32	C_3	26
DIN9	3	NO_3	27
DIN10	13	NC_4	35
DIN11	23	C_4	36
DIN12	33	NO_4	37
BATT (-)	4	NC_5	8
BATT (-)	14	C_5	9
BATT (-)	24	NO_5	10
BATT (-)	34	NC_6	18
		C_6	19
		NO_6	20
		NC_7	28
		C_7	29
		NO_7	30
		NC_8	38
		C_8	39
		NO_8	40

~~C9 ACERT™, C13 ACERT, C15 ACERT,
C18 ACERT Circuit Breakers~~

Manually Operated Circuit Breakers

Current (A)	Frame	Number of Poles	Interrupting Ratings (kA rms)			Trip Units	(Lugs) Cable Size Range / Phase	Auxiliary Options
			240V	480V	600V			
QTY: 1EA 250*	T4N	3	65	25	18	Electronic LS/I (S or I) or LSI	(1) 6 AWG – 350 kcmil	1 Form C + 1 Bell Alarm 250VAC/VDC Shunt Trip 24VDC
QTY: 1EA 400	T5N	3	65	25	18		(2) 3/0 – 250 kcmil	
QTY: 1EA 600*	T6N	3	65	35	20		(3) 2/0 – 400 kcmil	
800	T6N	3	65	35	20	Electronic LSI	(3) 2/0 – 400 kcmil	1 Form C + 1 Bell Alarm 400VAC / 250VDC Shunt Trip 24VDC
1200	T7S	3	65	50	25		(4) 4/0 – 500 kcmil	
1600	R	3	65	35	18		BUS BAR	
2000	R	3	65	35	18	Electronic LSI	BUS BAR	Form C (1NO + 1NC) Shunt Trip 24VDC
2500	R	3	65	35	18		BUS BAR	

*NOTE: 250AF/150AT & 600AF/400AT

Electrically Operated Circuit Breakers

Current (A)	Frame	Number of Poles	Interrupting Ratings (kA rms)			Trip Units	(Lugs) Cable Size Range / Phase	Auxiliary Options
			240V	480V	600V			
800	T7M-S	3	65	50	25	Electronic LSI	(4) 4/0 – 500 kcmil	2 Form C + 1 Bell Alarm 24VDC
1200	T7M-S	3	65	50	25		(4) 4/0 – 500 kcmil	2 Form C + 1 Bell Alarm 24VDC

THIRD PARTY SERVICE

Any 3rd party specialized testing or Professional Engineering (PE) services are NOT provided. These include, but are not limited to selective coordination study, arc flash study, breaker trip unit adjusting, breaker testing, contact or insulation resistance testing, ground fault testing, IR scans. Any requested changes from submitted equipment may be subject to additional cost.

Single Breaker Options (250 – 2500A)

Model	Current (A)	Operation
C9 ACERT™	250	Manually Operated
C9 ACERT	400	Manually Operated
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	600	Manually Operated
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	800	Manually Operated or Electrically Operated
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	1200	Manually Operated or Electrically Operated
C13 ACERT, C15 ACERT, C18 ACERT	1600	Manually Operated
C15 ACERT, C18 ACERT	2000	Manually Operated
C18 ACERT	2500	Manually Operated

Multiple Breaker Options

Model	Main Breaker Box		Auxiliary Box
	1st Breaker (Amps)	2nd Breaker (Amps)	Breaker (Amps)
	Manually Operated	Manually Operated	Manually Operated
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	250	250*, 400, 600, 800, or 1200	3rd Breaker: 250 or 400 (Not available if 1st & 2nd Breaker = 1200A)
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	400		
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	600		
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	800		
C9 ACERT, C13 ACERT, C15 ACERT, C18 ACERT	1200	Not Available	2nd Breaker: 250 or 400
C13 ACERT, C15 ACERT, C18 ACERT	1600		
C15 ACERT, C18 ACERT	2000		
C18 ACERT	2500		

*NOTE: 250A CIRCUIT BREAKER WILL BE ADJUSTED TO 150A

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Trip curves for power distribution

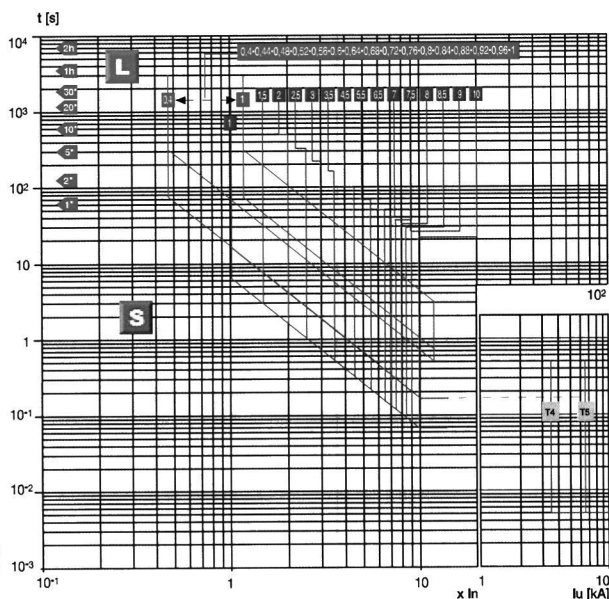
Circuit breakers with electronic trip units

T4 250A / T5 400A/600A LSI

T4 250 / T5 400/600 - PR221DS

L-S Functions

Note: For T5 In = 600 A $\Rightarrow I_{2max} = 9.5 \times I_n$



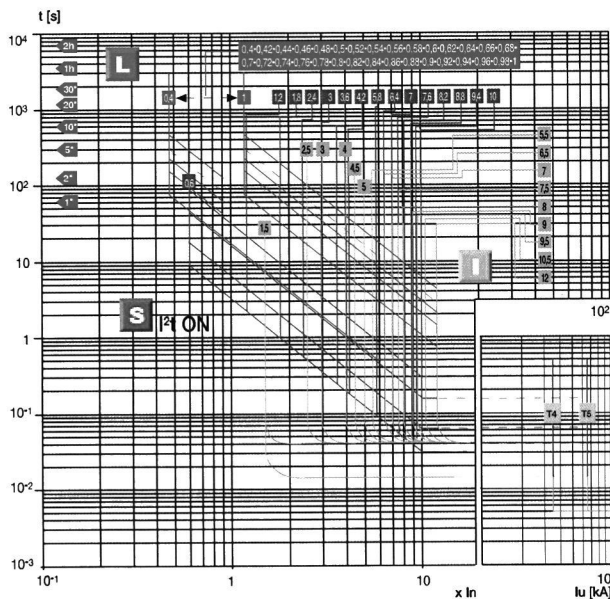
150C21002310001

T4 250 / T5 400/600

PR222DS/P and PR222DS/PD-A

L-S-I Functions (I^2t const = ON)

Note: For T5 In = 600 A $\Rightarrow I_{2max} = 9.5 \times I_n$, $I_{2max} = 9.5 \times I_n$



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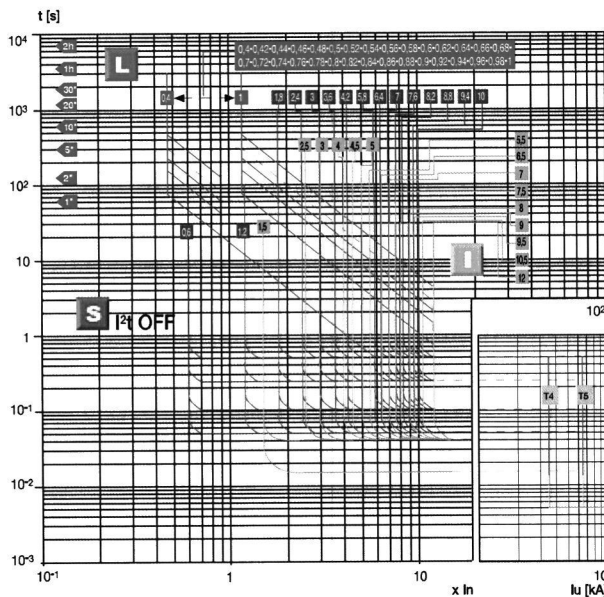
4

T4 250 / T5 400/600

PR222DS/P and PR222DS/PD-A

L-S-I Functions (I^2t const = OFF)

Note: For T5 In = 600 A $\Rightarrow I_{2max} = 9.5 \times I_n$, $I_{2max} = 9.5 \times I_n$

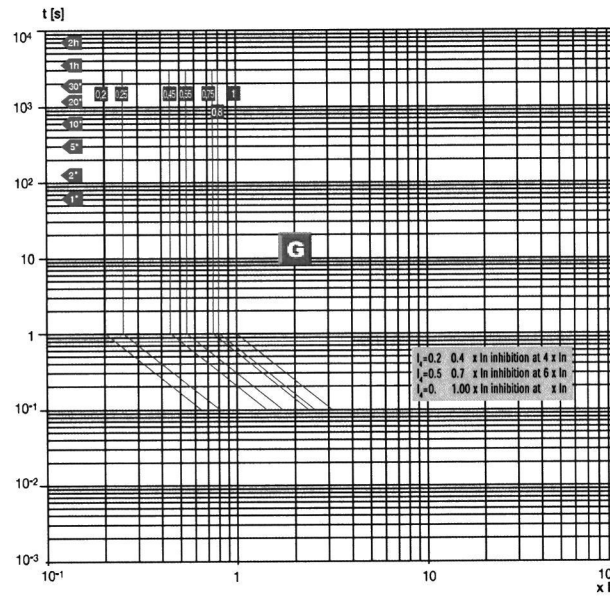


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T4 250 / T5 400/600

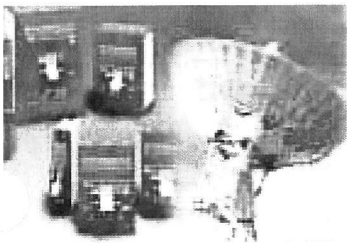
PR222DS/P and PR222DS/PD-A

G Function



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Circuit-breakers for power distribution

Electronic releases

PR222DS/P

Protection S

Against short-circuit
with delayed trip

Protection L

Against overload

Socket for test
SACE TT1 test unit

Socket for connection of
SACE PR010/T test unit

Protection I

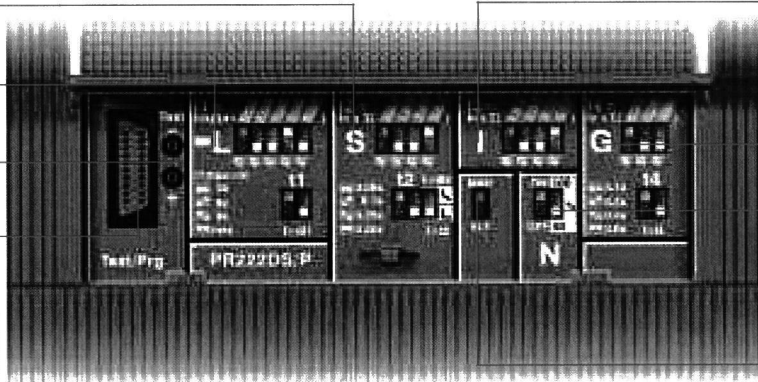
Against short-circuit
with instantaneous trip

Protection G

Against earth fault

Dip-switches for
setting the neutral

Selection for electronic
or manual setting



150C2101890004

PR222DS/PD

Protection S

Against short-circuit
with delayed trip

Protection L

Against overload

Socket for test
SACE TT1 test unit

Socket for connection of
SACE PR010/T test unit

Protection I

Against short-circuit
with instantaneous trip

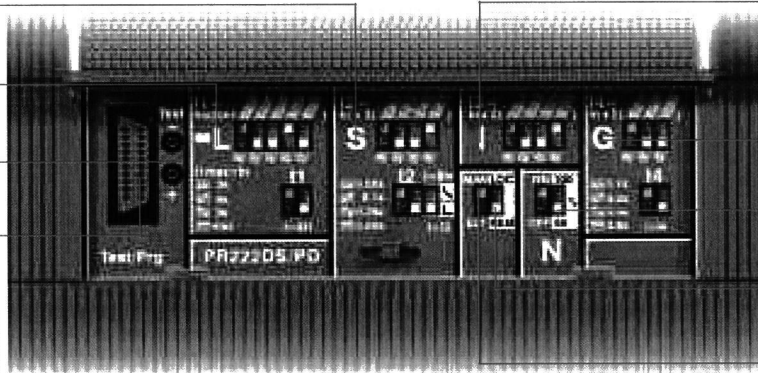
Protection G

Against earth fault

Dip-switches for
setting the neutral










Selection for local
or remote setting

Selection for electronic
or manual setting



150C2101890004

PR222DS/P and PR222DS/PD - Protection functions and parameterisations

Protection functions		Trip threshold		Trip curves ⁽¹⁾			
 NOT EXCLUDABLE	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve ($I^2t = \text{constant}$)		Manual setting $I_1 = 0.40 - 0.42 - 0.44 - 0.46 - 0.48 - 0.50 - 0.52 - 0.54 - 0.56 - 0.58 - 0.60 - 0.62 - 0.64 - 0.66 - 0.68 - 0.70 - 0.72 - 0.74 - 0.76 - 0.78 - 0.80 - 0.82 - 0.84 - 0.86 - 0.88 - 0.90 - 0.92 - 0.94 - 0.96 - 0.98 - 1 \times I_n$	Manual setting at $6 \times I_1$ at $6 \times I_1$ at $6 \times I_1$ at $6 \times I_1$ $t_1 = 3s$ $t_1 = 6s$ $t_1 = 9s$ $t_1 = 18s^{(2)}$			
				Electronic setting $I_1 = 0.40 \dots 1 \times I_n$ (step $0.01 \times I_n$) Release between $1.1 \dots 1.3 \times I_1$ (IEC 60947-2)			
 EXCLUDABLE	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time ($I^2t = \text{constant}$) or definite time		Manual setting $I_2 = 0.6 - 1.2 - 1.8 - 2.4 - 3.0 - 3.6 - 4.2 - 5.8 - 6.4 - 7.0 - 7.6 - 8.2 - 8.8 - 9.4 - 10 \times I_n$	Manual setting at $8 \times I_n$ at $8 \times I_n$ at $8 \times I_n$ at $8 \times I_n$ $t_2 = 0.05s$ $t_2 = 0.1s$ $t_2 = 0.25s$ $t_2 = 0.5s$			
				Electronic setting $I_2 = 0.60 \dots 10 \times I_n$ (step $0.1 \times I_n$) Tolerance: $\pm 10\%$			
			Manual setting $I_2 = 0.6 - 1.2 - 1.8 - 2.4 - 3.0 - 3.6 - 4.2 - 5.8 - 6.4 - 7.0 - 7.6 - 8.2 - 8.8 - 9.4 - 10 \times I_n$	Manual setting $t_2 = 0.05s$ $t_2 = 0.1s$ $t_2 = 0.25s$ $t_2 = 0.5s$			
				Electronic setting $I_2 = 0.60 \dots 10 \times I_n$ (step $0.1 \times I_n$) Tolerance: $\pm 10\%$			
 EXCLUDABLE	Against short-circuit with instantaneous trip		Manual setting $I_3 = 1.5 - 2.5 - 3 - 4 - 4.5 - 5 - 5.5 - 6.5 - 7 - 7.5 - 8 - 9 - 9.5 - 10.5 - 12 \times I_n^{(3)}$	Electronic setting $I_3 = 1.5 \dots 12 \times I_n$ (step $0.1 \times I_n$) ⁽³⁾ Tolerance: $\pm 10\%$			
				instantaneous $\leq 25 \text{ ms}$			
 EXCLUDABLE	Against earth fault with inverse short time delay trip and trip characteristic according to an inverse time curve ($I^2t = \text{constant}$)		Manual setting $I_4 = 0.2 - 0.25 - 0.45 - 0.55 - 0.75 - 0.8 - 1 \times I_n$	Manual setting up to $3.15 \times I_4$ up to $2.25 \times I_4$ up to $1.6 \times I_4$ up to $1.10 \times I_4$ $t_4 = 0.1s$ $t_4 = 0.2s$ $t_4 = 0.4s$ $t_4 = 0.8s$			
				Electronic setting $I_4 = 0.2 \dots 1 \times I_n$ (step $0.01 \times I_n$) Tolerance: $\pm 10\%$			

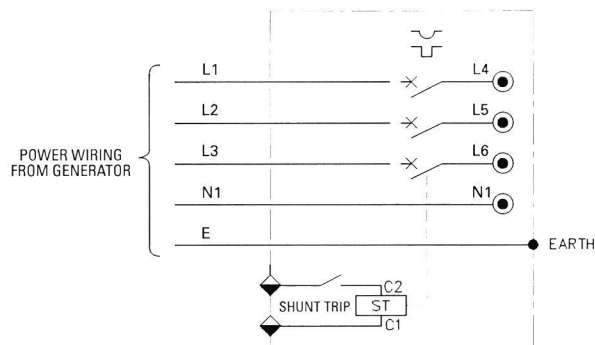
⁽¹⁾ These tolerances hold in the following conditions:
 - self-powered relay at full power and/or auxiliary supply;
 - two or three-phase power supply
 - sinusoidal wave forms with peak factor 1.41
 - peak factor $\left(\frac{\text{peak}}{\text{rms}}\right) = \sqrt{2}$ ($L \geq 3 \text{ In}$; S, I, G)

⁽²⁾ for $T4 \text{ In} = 320 \text{ A}$ and $T5 \text{ In} = 630 \text{ A} \Rightarrow t_1 = 12s$
⁽³⁾ for $T4 \text{ In} = 320 \text{ A}$ and $T5 \text{ In} = 630 \text{ A} \Rightarrow I_{\text{max}} = 10 \times I_n$
⁽⁴⁾ tolerance: $\pm 10 \text{ ms}$

- the letter H identifies the interrupting rating of the circuit breaker which in the example under examination is 65kA at 480V;
- 250A is the frame size of the circuit breaker;
- In is the rated current of the circuit breaker which in this specific case is 150A.

As an example let's consider now some generic settings for the protections L and I.

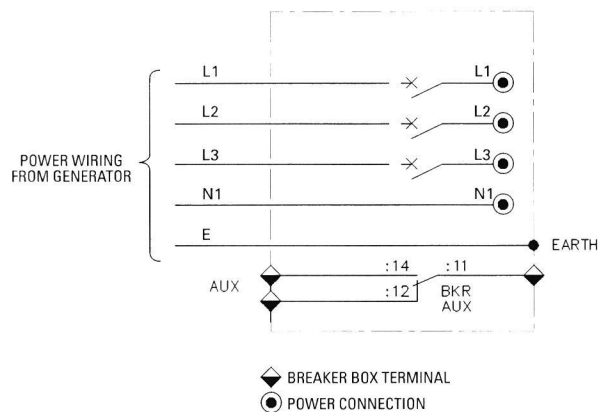
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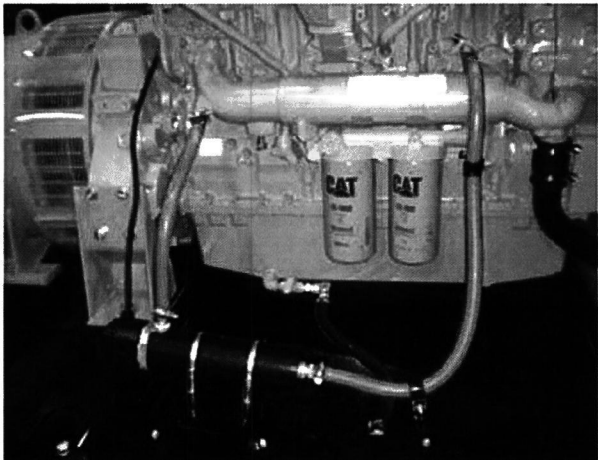
AUX - AUXILIARY CONTACTS SHT2 - 12/24 V SHUNT TRIP

Option SHT2 adds a DC operated shunt trip which can be used to automatically open the circuit breaker upon activation of a generator set shut down signal from the generator set control panel, or from a remote signal (supplied by others).

Option AUX adds an auxiliary changeover switch which can be used for remote indication of the circuit breaker status.



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Reference illustration

C13, C15 and C18 Jacket Water Heater

Factory installed jacket water heater for increased cold-starting capability. The system includes a tank-style metal heater with an integral high limit thermostat and a remote engine mounted control thermostat, durable silicone hoses and heater control relay wired to a common connection point in the control panel. The heater and thermostat location is optimized for maximum coolant flow and heating power efficiency.

FEATURES

FACTORY INSTALLED

- Complete with silicone hoses
- Isolated tank heater vibration and shock tested to extreme limits to guarantee durability
- Optimized location of the heater on the genset base for maximum coolant flow
- Remote pilot thermostat located on the engine for optimized power cycle efficiency is factory set to 100° F (37.8°C)
- Automatically disconnected when engine is running via a dedicated heater relay located in the control panel.
- Supplied with UL recognized components
- Compatible with Cat® ELC and all chemicals
- All parts are serviceable and field replaceable
- Incoloy heater element for longer service life

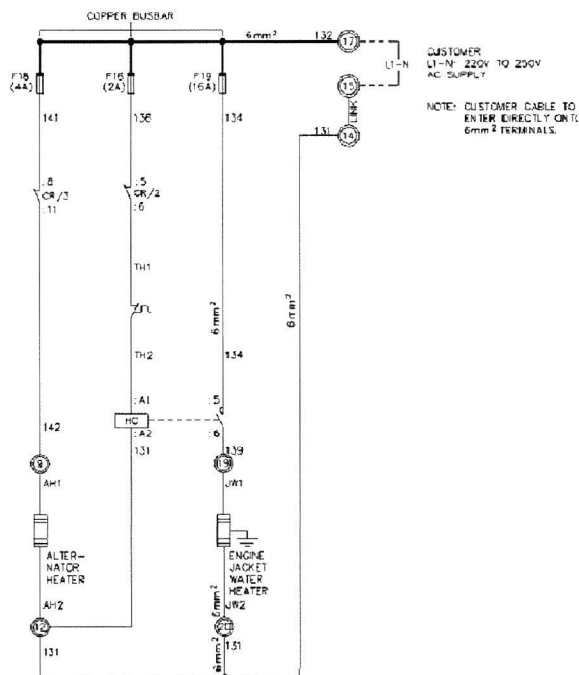
SPECIFICATIONS

Unit Specifications			
	Design Voltage		
	208	220	240
Rating	2250	2520	3000
Frequency	50/60 Hz	50/60 Hz	50/60 Hz
Phase	1	1	1
Amps	10.82	11.45	12.5
Feature Code	JWH0059		

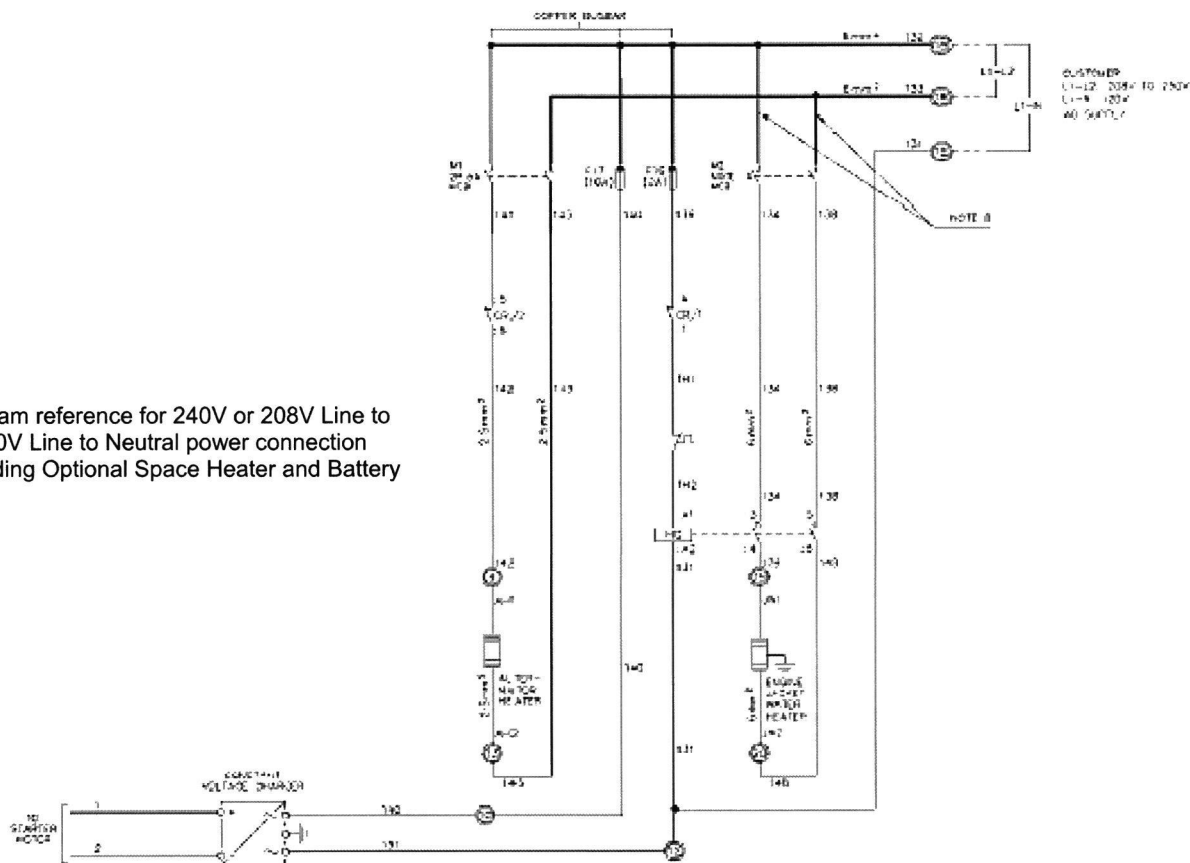
Note: The jacker water heater has a multi-volt input from 120-240V. 240VAC is the preferred operating voltage.

WIRING DIAGRAMS

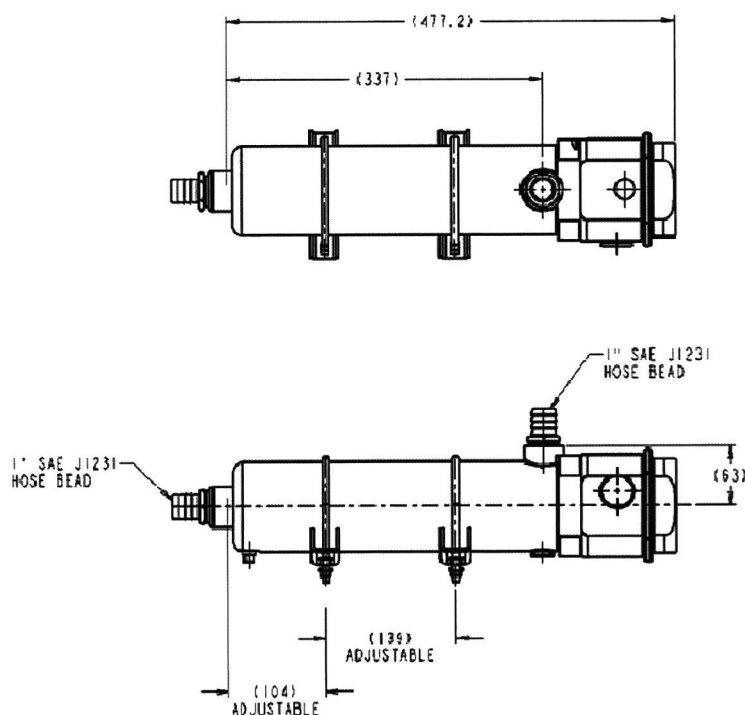
Wiring diagram reference for 240V
Line to Neutral power connection



Wiring diagram reference for 240V or 208V Line to
Line and 120V Line to Neutral power connection
(Note: Including Optional Space Heater and Battery
Charger)



HEATER DETAIL



HEATER OPERATION

The heater uses compliant components to UL and CSA, and is both CSA and UL approved.

When the generator set is not running, the heater is automatically connected to the AC supply through a power relay mounted in the control panel. Upon receiving a start signal, the AC supply is automatically disconnected by the power relay and automatically reconnected when the start signal is removed and the engine has stopped.

Pilot thermostat located on the engine precisely monitors and controls the engine coolant temperature and is wired to energize and de-energize heater power cycles.

A high-limit thermostat is built into the heater to regulate the output temperature to within safe limits.

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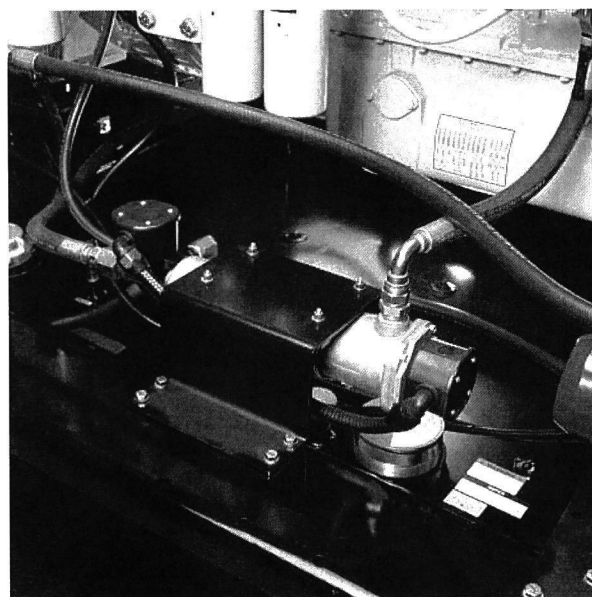
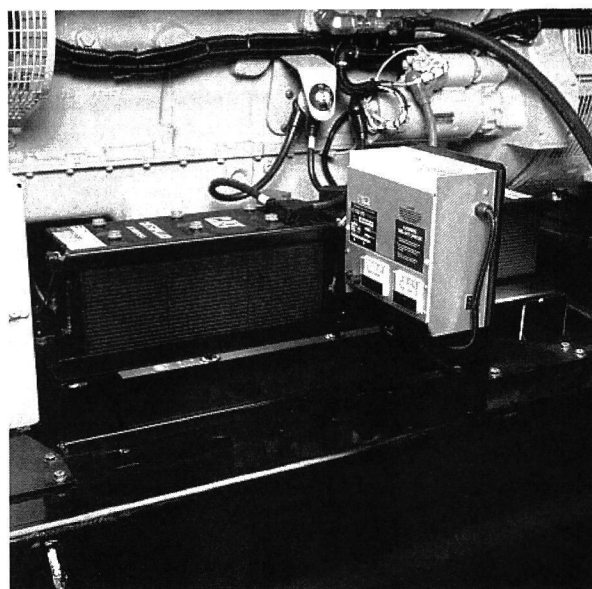
STARTING AND CHARGING SYSTEM

Features

- Energize to run fuel shutoff solenoid
- 24 V heavy-duty starting motor
- Battery/rack/cables for starting down to 20° C ambient — rack designed to hold oversize batteries
- 45 amp charging alternator
- Battery disconnect switch

Options

- Remove standard battery — rack and cables provided
- Oversize battery — uses same rack and cables
- Jacket water heater
 - Automatic disconnect
 - Completely installed and wired
 - Isolation valves
 - Base mounted to prevent vibration
- Battery charger: 10 amp)



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Cat® Batteries



Cat Batteries — Greater Starting Power — Lower Maintenance — Longer Life

Cat Premium High Output (PHO) batteries are used in all Caterpillar Machines and Engine Gen-Sets. They are designed to meet stringent Caterpillar design specifications, which provide industry leading cold cranking amp (CCA) capability and maximum vibration resistance.

Maintenance Free or low maintenance designs are available in wet and dry configurations.

General Service Line batteries are available in Maintenance Free or low maintenance designs and in wet or dry configurations. Wide selections of BCI group sizes are available for automotive, light truck, bus, industrial, agricultural, marine, recreational and valve regulated (VRLA-AGM & Gel) applications.

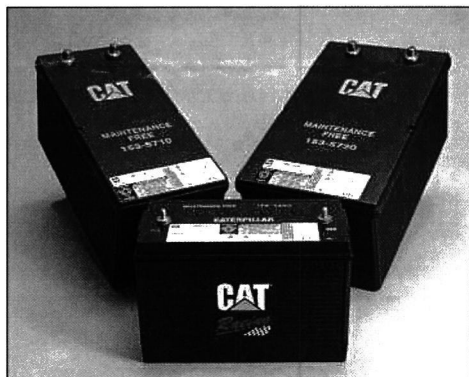
Caterpillar. The difference counts.™

Cat Dealers define world – class product support. We offer you the right parts and service solutions, when and where you need them.

The Cat Dealer network of highly trained experts keeps your entire fleet up and running to maximize your equipment investments.

CATERPILLAR®

World's Toughest Batteries



Premium High Output – Maximum Vibration Resistance

- Vibration Resistance...five times the Industry Standard
- Exclusive “flat top” BCI group 4D & 8D batteries are Maintenance Free and have the industries highest cold cranking amps (CCA)
- Popular BCI group 31 Maintenance Free batteries with industry leading cold cranking amps...up to 1000 (CCA), for electric power, machine or on-highway truck and bus applications. Deep cycle models available for truck, marine or recreational usage

Specifications for Cat Premium High Output Batteries – Available Worldwide

QTY: 2EA

BCI Group Size	Part No.	Cold Cranking Amps*	Reserve Capacity Minutes'	Volts	Amp Hr. Capacity @ 20 Hrs.	Construction	Add Water Maintenance Check Hours	BCI Overall Dimensions				Nominal Weight	
								Length In (mm)	Width In (mm)	Height In (mm)	Wet Lb (kg)	Dry Lb (kg)	Nominal Acid to Fill Qt (liter)
8D	153-5720	1500	465	12	210	C	MF	20.47 (520)	10.8 (275)	9.76 (248)	132 (60)	—	—
8D	101-4000	1400	400	12	190	LAC+	1000	20.7 (526.5)	10.96 (278)	9.76 (248)	132 (60)	86 (39)	18.0 (17.0)
4D	153-5710	1400	425	12	200	C	MF	20.47 (520)	8.58 (218)	9.76 (248)	119 (54)	—	—
4D	153-5700	1125	305	12	145	C	MF	20.47 (520)	8.58 (218)	9.76 (248)	101 (46)	—	—
4D	9X-9730	1300	400	12	190	LAC+	1000	20.75 (527)	8.58 (218)	9.76 (248)	119 (54)	81 (37)	14.8 (14.0)
4D	9X-9720	1000	275	12	140	LAC+	1000	20.75 (527)	8.58 (218)	9.76 (248)	101 (46)	59 (27)	15.9 (15.0)
31	175-4390	1000	180	12	90	C/S	MFA	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	175-4370	825	190	12	100	C/S**	MFA	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	175-4360	710	185	12	100	C/S***	MFA	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	250-0480	710	185	12	100	C/SDT***	MF	12.9 (328.4)	6.74 (171.2)	9.29 (236)	60 (27)	—	—
31	115-2422	1000	170	12	90	C SAE	MFA	12.9 (328.4)	6.74 (171.2)	9.46 (240.3)	60 (27)	—	—
31	115-2421	950	170	12	90	C SAE +	MFA	12.9 (328.4)	6.74 (171.2)	9.46 (240.3)	60 (27)	44 (20)	6.6 (6.2)
31	9X-3404	950	165	12	100	C SAE	MF	13 (330.2)	6.77 (172)	9.46 (240.3)	58 (26)	—	—
31	3T-5760	750	165	12	100	C SAE	MF	13 (330.2)	6.77 (172)	9.46 (240.3)	55 (25)	—	—
24	153-5656	650	110	12	52	SC	MF	10.98 (278.9)	6.85 (174)	9.0 (229.1)	39 (18)	—	—
65	230-6368	880	140	12	80	SC	MF	11.9 (303.4)	7.5 (190.8)	7.5 (191.4)	45.5 (21)	—	—
74	153-5660	650	110	12	52	SC*	MF	10.98 (278.9)	7.0 (178.2)	8.15 (206.9)	39 (18)	—	—
58	175-4280	500	70	12	35	SC	MF	9.96 (253.1)	7.2 (182.5)	6.9 (176)	31 (14)	—	—
2	153-5690	765	210	6	90	LAC+	1000	10.24 (260)	6.8 (173)	8.72 (221.6)	37 (17)	22 (10)	4.8 (4.5)

Construction Notes:

LAC = Low Maintenance, Hybrid Construction

C = Calcium Lead Alloy Grid Design

MF = Maintenance Free

MFA = Maintenance Free with Accessible Vent Caps

S = Stud Terminals

+ = Shipped Dry Only

* = Side Terminals

** = Starting and Deep Cycle Battery

*** = Deep Cycle and Starting Battery

" = For 30 seconds at 0° F (-18° C)

' = Minimum of 25 amp output at 80° F (27° C)

SAE = Uses SAE Posts

SDT = Dual, Top mounted Terminals, Stud and SAE Post, Marine Deep Cycle/Starting Battery

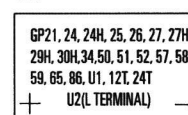
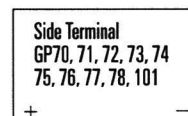
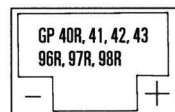
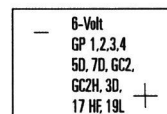
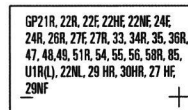
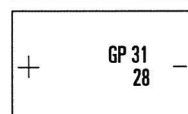
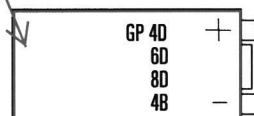
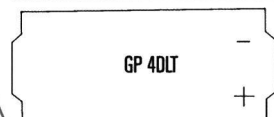
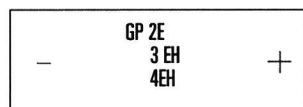
SC = Silver (Ag) Calcium Alloy Grids for resistance to high underhood temperatures

Rugged Design – Built Tough – Reliable Starting

- Positive and Negative plates are anchored to container bottom and locked at the top of cell element for maximum vibration resistance.
- Heavy-duty forged terminal post bushings provide maximum strength and resistance to acid seepage.
- Hefty full-frame grids, no sharp edges, optimum acid/paste combination provides better charge acceptance after deep discharge.
- Manifold vented cover with built-in Flame Arrestor...a safety feature that directs corrosive gases away from the battery and hold-downs.
- Thick, robust container resists rugged treatment typical of heavy-duty commercial use. Embossed part number & descriptors for easy serviceability.

Battery Information

BCI Terminal Locations



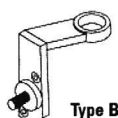
Transit Bus Terminal for 8D Part # 250-0473

One piece end terminal.

Right end of Battery.

1/2" - 13 Steel Positive Stud

3/8" - 16 Steel Negative Stud



Cat Premium High Output Batteries – Built Tough to Exceed Demanding Performance Test Requirements:

100 hour Vibration Testing – Five Times the Industry Standard

- Battery must be able to withstand vibration forces without suffering mechanical damage, loss of capacity, loss of electrolyte or without developing internal/external leaks
- Battery must pass a high rate discharge test after the vibration testing

Five 72-hour Deep Discharge/Recharge Test Cycles

- Battery must recover to 25 charging amps within 20 minutes and meet Industry Electrical Performance Standards

30 Day Complete Discharge Test

- Battery must recover to 25 charging amps within 60 minutes and meet Industry Electrical Performance Standards after recharging

SAE J2185 Life Cycle Test

- Battery subject to deeper discharge and charge cycles at extreme temperatures not normally encountered in starting a machine or vehicle

Cold Soak Test

- Battery cold soaked at sub-freezing temperatures and then tested by starting an equally cold engine



Battery Accessories

Group 31 – Charging Posts for Stud Terminals – Part # 4C-5637

Screw-in Charging Posts for Side Terminals – Part # 4C-5638

Wing Nut – Part # 2B-9498 for Part #'s 175-4390/175-4370/175-4360/8C-3628

Wing Nut – Part # 3B-0723 for Part #'s 8C-3638 and 8C-3639

Digital Battery Analyzer – Part # 177-2330

Battery Voltmeter – Part # 4C-6600

Battery Load Tester – Part # 4C-4911

Booster Cable 12' (3.66 m) – Part # 4C-4933

Booster Cable 20' (6.00 m) – Part # 4C-4937

Heavy Duty Commercial Fast Charger (110V) – Part # 4C-4921

Heavy Duty Commercial Fast Charger (220V) – Part # 4C-4910

Extra Vent Caps (6) for Dry Batteries – Part # 7N-0060

Note: Ratings and Part Numbers are subject to change without notice.



Recycle all scrap batteries.
We accept lead-acid batteries
for recycling.

Cat Batteries

Heavy-duty Forged Terminal Post Bushings

Built-in Flame Arrestor

Robust Reinforced Case

Vibration Resistant Plates & Elements

Heavy-duty Grids

Rugged Separators

Robust Components = Long Life + Reliable Starts

- Heavy-duty forged terminal post bushings provide maximum strength and resistance to acid seepage that causes corrosion and black posts. Thicker internal terminal posts provide lower electrical resistance and higher cold cranking amp output.
- Rugged microporous polyethylene envelope separators protect against “shorts” and vibration damage. Deep Cycle batteries utilize double insulated Glass mat separators for longer cycling life.
- Maintenance Free batteries utilize calcium lead alloy on both positive and negative plates that reduces gassing and water consumption. Automotive batteries have Silver (Ag) Calcium Alloy Grids for resistance to high underhood temperatures.
- Heavy-duty, full frame battery grids with no sharp edges. An optimum acid/paste combination provides better charge acceptance after a deep discharge.
- Positive and Negative plates are anchored to the container bottom and the cell element is locked at the top for maximum vibration resistance. Straps are thicker, heavier and cast (not welded) into the plates.
- Manifold vented cover with built-in Flame Arrestor...a safety feature that directs corrosive gases away from the battery and hold-downs.
- Robust reinforced case provides extra strength in all temperature extremes. Brickwork design on sides reduces chance of punctures and case flexing. Embossed part number and descriptors for easy serviceability.

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For more information, see us today or visit our web site at www.cat.com

Caterpillar. The difference counts.™

CATERPILLAR®

Effective with sales to the first user on or after January 1, 2016

CATERPILLAR LIMITED WARRANTY BATTERY

Worldwide

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants new batteries sold by it (excluding Caterpillar Brazil Limited dealers) to be free from failures caused by defects in material and workmanship.

This warranty does not apply to:

- Cat® Energy Storage Systems

This warranty is subject to the following:

- The warranty period is identified in the following table, starting from the date of battery sale or product delivery to the first user.

Application	Battery Type			
	Premium, High Output (PHO)		General Service Line	
	Warranty Period	Free Replacement Period	Warranty Period	Free Replacement Period
On-Highway vehicles over 680 kilograms (3/4-ton) capacity with engine-driven charging systems.	36 Months	24 Months	30 Months	12 Months
Earthmoving, construction, materials handling, paving and off-highway equipment, agricultural, industrial engine, electric power generation and marine products with engine-driven charging systems. Electric power generation standby applications with separate charging systems (except with respect to the Battery Council International (BCI) Group size 4D, 8D, and 31 batteries used in these applications)*.	36 Months	18 Months	24 Months	12 Months
*For BCI group size 4D, 8D, and 31 batteries used in the above applications.	*36 Months	*12 Months	*24 Months	*12 Months
For Uninterruptible Power Supply (UPS), telecommunications, and electric power generation standby applications with separate charging systems (with respect to valve-regulated AGM (Absorbed Glass Mat) batteries).	N/A	N/A	60 Months	12 Months
For deep cycle applications or applications without constant battery charging systems (i.e., auxiliary batteries for marine pleasure craft or recreational vehicles; electric trolling motor or golf cart applications which use batteries as their motive power; lawn garden applications, etc.).	3 Months (All BCI Group sizes except GP31 Deep Cycle) 30 Months (BCI GP 31 Deep Cycle Batteries)	3 Months	BCI group sizes U-1R, U-1, 8V and GC-2: 18 Months BCI Group sizes 24M and 27M: 30 Months All other BCI groups sizes: 3 Months	3 Months
For all other applications covered by this warranty.	72 Months	24 Months	72 Months	18 Months

Caterpillar Responsibilities

- Within the periods stated in the table under "Free Replacement Period," Caterpillar will replace a battery, which it finds to be defective in material or workmanship with a new comparable battery at no cost to the user. After the "Free Replacement Period" has expired, the user cost is determined by the following formula:

$$\frac{\text{Current Consumer's Battery Price}}{\text{Months in Warranty Period}} \times \text{Months of Service} = \text{User Cost}$$

- This warranty will be honored upon return of the battery, during normal working hours, to a Cat dealer or other source approved by Caterpillar.

User Responsibilities

The user is responsible for:

- Providing proof of the date of battery sale or product delivery date to the first user.
- Taxes, installation, or transportation costs, which may result from replacement, are not included in this warranty.
- Expense identified as user cost under "Caterpillar Responsibilities".
- Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.
- Performance of the required maintenance.

Limitations

Caterpillar is not responsible for:

- Failures resulting from any use or installation that Caterpillar judges improper.
- Failures resulting from abuse, neglect and/or improper repair.
- Failures resulting from user's delay in making the product available after being notified of a potential product problem.
- Failures resulting from unauthorized repairs or adjustments.

(Continued on reverse side...)

This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Caterpillar dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N.E. Adams St., Peoria, IL USA 61629.

Caterpillar's obligations under this Limited Warranty are subject to, and shall not apply in contravention of, the laws, rules, regulations, directives, ordinances, orders, or statutes of the United States, or of any other applicable jurisdiction, without recourse or liability with respect to Caterpillar.

A) For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands, and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS, OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

B) For products operating in Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands, and Tahiti, the following is applicable:

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED, OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED. WITHOUT LIMITING THE FOREGOING PROVISIONS OF THIS PARAGRAPH, WHERE A PRODUCT IS SUPPLIED FOR BUSINESS PURPOSES, THE CONSUMER GUARANTEES UNDER THE CONSUMER GUARANTEES ACT 1993 (NZ) WILL NOT APPLY.

NEITHER THIS WARRANTY NOR ANY OTHER CONDITION OR WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED (SUBJECT ONLY TO THE MANDATORY RIGHTS), IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

IF THE MANDATORY RIGHTS MAKE CATERPILLAR LIABLE IN CONNECTION WITH SERVICES OR GOODS, THEN TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, THAT LIABILITY SHALL BE LIMITED AT CATERPILLAR'S OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS, OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

C) For products supplied in Australia:

IF THE PRODUCTS TO WHICH THIS WARRANTY APPLIES ARE:

I. PRODUCTS OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION; OR

II. PRODUCTS THAT COST AUD 40,000 OR LESS,

WHERE THOSE PRODUCTS WERE NOT ACQUIRED FOR THE PURPOSE OF RE-SUPPLY OR FOR THE PURPOSE OF USING THEM UP OR TRANSFORMING THEM IN THE COURSE OF PRODUCTION OR MANUFACTURE OR IN THE COURSE OF REPAIRING OTHER GOODS OR FIXTURES, THEN THIS SECTION C APPLIES.

THE FOLLOWING MANDATORY TEXT IS INCLUDED PURSUANT TO THE AUSTRALIAN CONSUMER LAW AND INCLUDES REFERENCES TO RIGHTS THE USER MAY HAVE AGAINST THE DIRECT SUPPLIER OF THE PRODUCTS: OUR GOODS COME WITH GUARANTEES THAT CANNOT BE EXCLUDED UNDER THE AUSTRALIAN CONSUMER LAW. YOU ARE ENTITLED TO A REPLACEMENT OR REFUND FOR A MAJOR FAILURE AND COMPENSATION FOR ANY OTHER REASONABLY FORESEEABLE LOSS OR DAMAGE. YOU ARE ALSO ENTITLED TO HAVE THE GOODS REPAIRED OR REPLACED IF THE GOODS FAIL TO BE OF ACCEPTABLE QUALITY AND THE FAILURE DOES NOT AMOUNT TO A MAJOR FAILURE. THE INCLUSION OF THIS TEXT DOES NOT CONSTITUTE ANY REPRESENTATION OR ACCEPTANCE BY CATERPILLAR OF LIABILITY TO THE USER OR ANY OTHER PERSON IN ADDITION TO THAT WHICH CATERPILLAR MAY HAVE UNDER THE AUSTRALIAN CONSUMER LAW.

TO THE EXTENT THE PRODUCTS FALL WITHIN THIS SECTION C BUT ARE NOT OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION, CATERPILLAR LIMITS ITS LIABILITY TO THE EXTENT IT IS PERMITTED TO DO SO UNDER THE AUSTRALIAN CONSUMER LAW TO, AT ITS OPTION, THE REPAIR OR REPLACEMENT OF THE PRODUCTS, THE SUPPLY OF EQUIVALENT PRODUCTS, OR THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT PRODUCTS.

THE WARRANTY SET OUT IN THIS DOCUMENT IS GIVEN BY CATERPILLAR INC. OR ANY OF ITS SUBSIDIARIES, 100 N. E. ADAMS ST, PEORIA, IL USA 61629, TELEPHONE 1 309 675 1000, THE USER IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH MAKING A CLAIM UNDER THE WARRANTY SET OUT IN THIS DOCUMENT, EXCEPT AS EXPRESSLY STATED OTHERWISE IN THIS DOCUMENT, AND THE USER IS REFERRED TO THE BALANCE OF THE DOCUMENT TERMS CONCERNING CLAIM PROCEDURES, CATERPILLAR RESPONSIBILITIES AND USER RESPONSIBILITIES.

TO THE EXTENT PERMISSIBLE BY LAW, THE TERMS SET OUT IN THE REMAINDER OF THIS WARRANTY DOCUMENT (INCLUDING SECTION B) CONTINUE TO APPLY TO PRODUCTS TO WHICH THIS SECTION C APPLIES.

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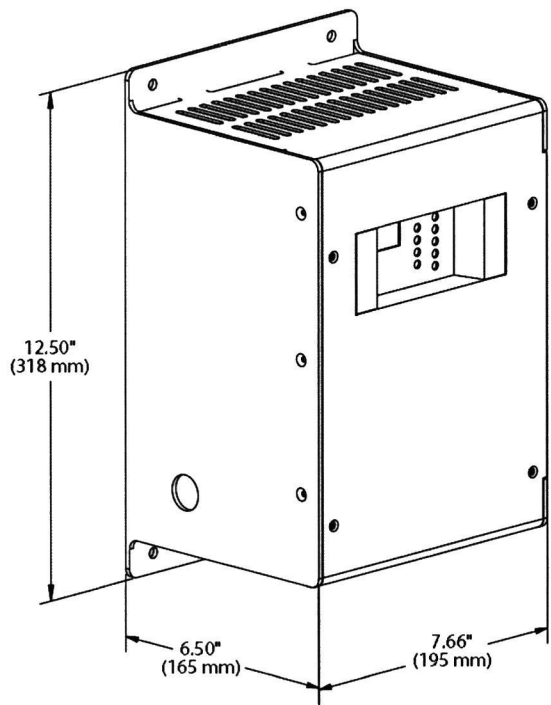


Image Shown may not Reflect Actual Package

UL 10 AMP
BATTERY CHARGER

This battery charger offers accurate, automatic charging of lead-acid and nickel cadmium batteries. The output voltage automatically adjusts to changing input, load, battery and ambient conditions. This prevents battery over-charging and consequent loss of battery electrolyte.

Standard features include AC line compensation, precision voltage regulation, current limiting, automatic 2-rate charging, voltmeter and ammeter, temperature compensation and UL Listing.

The user interface is easy to understand with digital metering, NFPA 110 alarms and a battery fault alarm.

SPECIFICATION

Input Supply	110-120 V
AC and DC Fuses	2 input and 2 output)
Output voltage	24V
Frequency	50/60 Hz
Operating temperature	-20°C (-4°F) to +60°C (140°F)

Housing constructed of rustproof anodized aluminum.

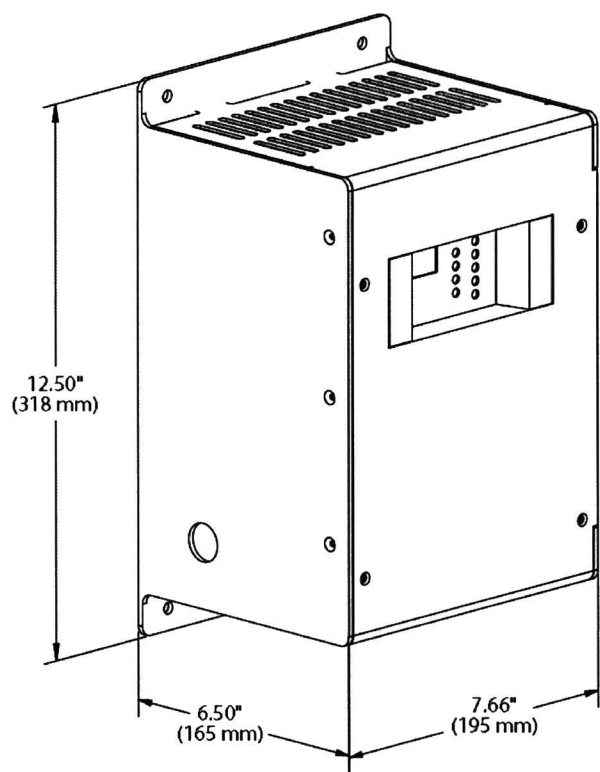
STANDARDS

- C-UL listed to UL 1236
- NFPA 70, NFPA 110
- CSA 22.2 No 107 certified
- UL 1564
- CE DOC to EN 60335
- IBC Seismic Certification

FEATURES

- Electronically current limited at 105% of rated output
- Alarm system
- Digital Display
- Lightning and voltage transient protection
- Protection of connected equipment against load dump protection
- Constant voltage, current limited, 4-rate automatic equalization
- IP 20 housing
- AC isolated from DC
- Temperature Compensation
 - On board temperature sensor with remote port
- Auto AC line compensation
- Output regulated by sensed battery voltage

BATTERY CHARGER



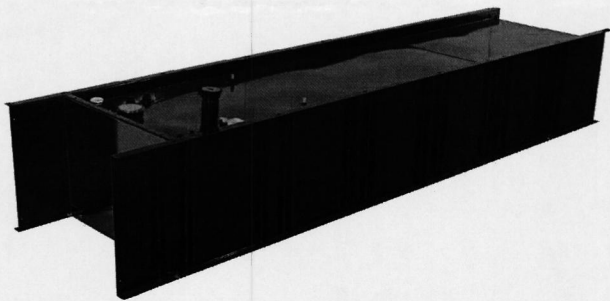
Output		Input	
Amps	Volts	Hz	Volts
10	24	50/60	110-120
Width	Depth	Height	Weight
195 mm (7.66")	165 mm (6.50")	318 mm (12.50")	10.4 kg (23 lb)
Feature codes			
BTC1024	BTC1028	BTC1035	

NFPA 110 alarm package as follows:

- | | |
|---|---------------------------------|
| ▪ AC on | Green led (indication) |
| ▪ AC fail | Red led and form C contact (2A) |
| ▪ Float mode | LED |
| ▪ Fast charge | LED |
| ▪ Temp comp active | LED |
| ▪ Low battery volts | Red led and Form C contact |
| ▪ High Battery Volts | Red led and Form C contact |
| ▪ Charger fail | Red led and Form C contact |
| ▪ Battery fault | Red led and Form C contact |
| - Battery disconnected | |
| - Battery polarity reversed | |
| - Mismatched charger battery voltage | |
| - Open or high resistance charger to battery connection | |
| - Open battery cell or excessive internal resistance | |

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www.Cat-ElectricPower.com



C13 / C15 / C18 Integral and Sub-Base Fuel Tanks

US Sourced
Diesel Generator Set
350 – 600 kW 60 Hz

Picture shown may not represent actual package

Features

- UL Listed for United States (UL 142) and Canada (CAN/ULC S601)
- Facilitates compliance with NFPA 30 code, NFPA 37 and 110 standards and CSA C282 code
- Dual wall
- Lockable fuel fill cap, 4" (101.6 mm) NPT
- Low fuel level warning standard, customer configurable warning or shutdown
- Primary tank leak detection switch in containment basin
- Tank design provides capacity for thermal expansion of fuel
- Fuel supply dip tube is positioned so as not to pick up fuel sediment
- Fuel return and supply dip tube is separated by an internal baffle to prevent immediate re-supply of heated return fuel
- Pressure washed with an iron phosphate solution
- Interior tank surfaces coated with a solvent-based thin-film rust preventative
- Heavy gauge steel gussets with internal lifting rings
- Primary and secondary tanks are leak tested at 20.7 kPa (3 psi) minimum
- Compatible with open packages and enclosures
- Gloss black polyester alkyd enamel exterior paint
- Welded steel containment basin (minimum of 110% of primary tank capacity)
- Direct reading fuel gauge with variable electrical output
- Emergency vents on primary and secondary tanks are sized in accordance with NFPA 30

Sub Base

- The sub-base fuel tank mounts below the generator set wide base

Integral

- Integral diesel fuel tank is incorporated into the generator set base frame
- Robust base design includes linear vibration isolators between tank base and engine generator

Options

- Audio/visual fuel level alarm panel
- 5 gal (18.9 L) spill containment
- 5 gal (18.9 L) spill containment with fuel fill drop tube with in 6" (152 mm) from bottom of tank
- 5 gal (18.9 L) spill containment with overfill prevention valve and fuel fill drop tube with in 6" (152 mm) from bottom of tank
- ULC Listed 7.5 gal (28.4 L) spill containment with vent extensions, vent whistle, and drop tube facilitating compliance with CSA B139-09
- ULC Listed 7.5 gal (28.4 L) spill containment with overfill prevention valve, vent extensions, vent whistle and drop tube facilitating compliance with CSA B139-09

Integral & Sub-Base Fuel Tank Base Useable Capacities with Fuel Tank Dimensions & Weights

Integral – Width (W) 2014 mm (79.3 in)

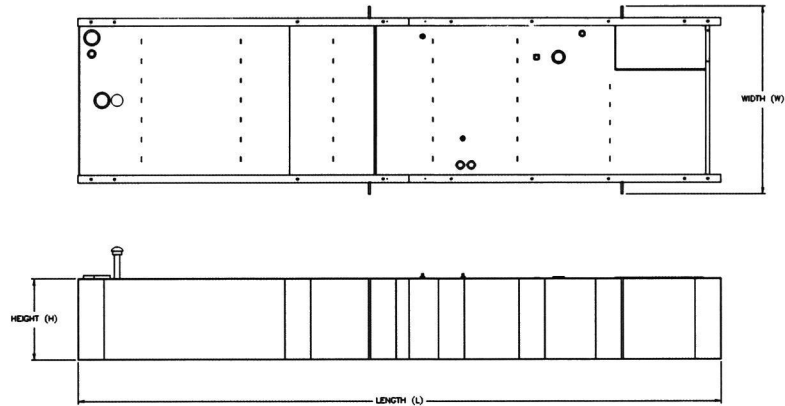
Sub-base – Width (W) 2056 mm (81.0 in)

Open Set & Weather Protective Enclosure

C13 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW013	2646	699	2540	671	1569	3450	762	30.0	5461	215	2552	100.5	2743	108.0
Sub-Base	FTDW005	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	2763	108.8	2955	116.3
Sub-Base	FTDW006	7643	2019	7556	1996	2228	4483	889	35.0	6184	243.5	3017	118.8	3209	126.3
Sub-Base	FTDW007	8339	2203	8244	2178	2150	5052	889	35.0	7074	278.5	2291	117.8	3789	149.2
Sub-Base	FTDW011	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	2763	108.8	2955	116.3

C15 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW002	1283	339	1262	333	1015	2237	635	25.0	3814	150.1	2426	95.5	2619	103.0
Sub-Base	FTDW005	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	2763	108.8	2955	116.3
Sub-Base	FTDW006	7643	2019	7556	1996	2228	4912	889	35.0	6184	243.5	3017	118.8	3209	126.3
Sub-Base	FTDW008	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	2763	108.8	2955	116.3

C18 Tank Design	Feature Code	Total Capacity		Useable Capacity		Tank Only						Overall Package Height with Tank			
						Dry Weight		Height 'H'		Length 'L'		Open		Enclosure	
		Liter	Gallon	Liter	Gallon	kg	lb	mm	in	mm	in	mm	in	mm	in
Integral	FTDW004	1446	382	1422	376	1015	2237	635	25.0	3814	150.1	2426	95.5	2560	100.8
Sub-Base	FTDW005	3941	1041	3876	1024	1659	3657	635	25.0	5550	218.5	2763	108.8	2955	116.3
Sub-Base	FTDW007	8339	2203	8244	2178	2150	4134	889	35.0	7074	278.5	2291	117.8	3159	124.4
Sub-Base	FTDW008	2476	654	2435	643	1468	3236	635	25.0	3810	150.0	2739	107.9	2905	114.4



The heights listed above do not include lumber used during manufacturing and shipping.

Estimated Run Times (Hours) at 100% Load

C13 Tank Design	Feature Code	Standby Ratings (ekW)				Prime Ratings (ekW)			
		400	350	—	—	350	320	—	—
Integral Tank	FTDW013	24	27	—	—	25	29	—	—
Sub-Base	FTDW005	36	41	—	—	38	43	—	—
Sub-Base	FTDW006	71	80	—	—	74	85	—	—
Sub-Base	FTDW007	77	87	—	—	81	93	—	—
Sub-Base	FTDW011	23	25	—	—	24	27	—	—

C15 Tank Design	Feature Code	Standby Ratings (ekW)				Prime Ratings (ekW)			
		500	450	400	350	455	410	365	320
Integral Tank	FTDW001 / FTDW002	9	9	11	11	10	10	11	12
Sub-Base	FTDW005	28	29	32	36	30	31	35	38
Sub-Base	FTDW006	54	57	62	70	60	62	68	74
Sub-Base	FTDW008 / FTDW011	17	18	20	22	19	20	22	24

C18 Tank Design	Feature Code	Standby Ratings (ekW)				Prime Ratings (ekW)			
		600	550	—	—	545	500	—	—
Integral	FTDW003 / FTDW004	8	9	—	—	9	10	—	—
Sub-Base	FTDW005	24	25	—	—	25	27	—	—
Sub-Base	FTDW007	51	54	—	—	54	59	—	—
Sub-Base	FTDW008 / FTDW011	15	16	—	—	16	17	—	—

Tanks with full electrical stub-up area include removable end channel. Tanks with RH stub-up include stub-up area directly below the circuit breaker or power terminal strips. Dimensions include weather-protective enclosure exhaust system.

Dual wall sub-base tanks are UL Listed and constructed in accordance with UL Standard for Safety UL 142, Steel Aboveground Tanks for Flammable and Combustible Liquids and Canada CAN/ULC S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.

Fuel tanks and applicable options facilitate compliance with the following United States NFPA Code and Standards:

NFPA 30: Flammable and Combustible Liquids Code

NFPA 37: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines

NFPA 110: Standard for Emergency and Standby Power Systems

Fuel tanks and applicable options facilitate compliance with the following Canadian Standard and Code:

CSA C282 – Emergency Electrical Power Supply for Buildings

CSA B139-09 – Installation Code for Oil-Burning Equipment

The following sub-base fuel tanks meet Chicago code for containment and labelling:

FTDW005

FTDW008

FTDW011

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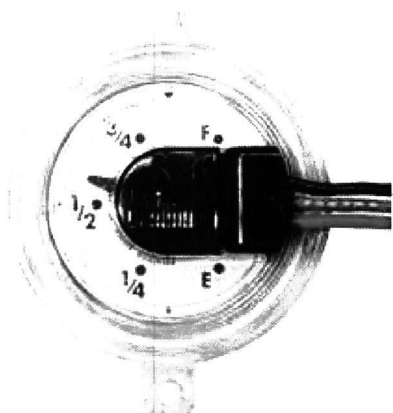


Image shown may not reflect actual configuration

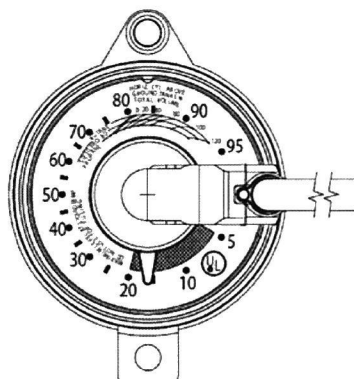
Fuel Level Gauge and Sender

The unit consists of a magnetically driven dial for direct reading with a snap fit Hall Effect Module attached to the lens. This module sends an electrical signal to a remote fuel level monitor.

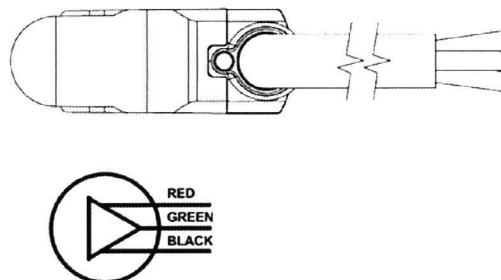
The module can provide ratiometric voltage output proportional to the liquid volume inside the tank.

Features

- A magnetic drive allows a signal from the float mechanism inside the tank to be transmitted through a solid bulkhead.
- The dial is designed to allow a second magnetic coupling. This is a coupling from the pointer magnet, through the sealed lens and into the Hall Effect Module.
- The magnetic connection of the Hall Effect sensor is more reliable than systems that depend on the sliding contact of variable resistor devices.
- Hall Effect is a solid state technology with no moving contacts. It counts on the fact that a magnet bends the path of electrons moving through a semiconductor. The bending of the electrons can be detected and converted into an electrical signal.
- The dial is able to provide an electrical output which can be utilized for remote monitoring of tank levels.
- The dial case is hermetically sealed by ultrasonic welding to melt and fuse the case into one solid piece. This keeps weather out, ensuring "no-fog" read ability while greatly extending mechanical life.
- The seal is a high reliability, no-gasket design.
- The plastic case is far more resistant to corrosion than any metal-cased version and is capable of withstanding broad variations in temperature. The lens and case are a special, UV stabilized plastic material.



Remote-ready Dial, with Hall Effect Module



Hall Effect Module

General and Functional Specifications*

- Conformity: $\pm 3\%$ at 5 VDC
- Operating temperature: -40° to 80°C (-40°F to 176°F)
- Accuracy: $\pm 4\%$ of full scale. (float gauge errors not included.)
- Repeatability: $\pm 1\%$.
- Operational voltage range: 3.5 to 6.0 VDC
- Output voltage: ratiometric 10–90% of input voltage @ 10–90% volume
- Resolution – infinite
- Operating current: 4.5 mA
- Output current: ± 1 mA
- Hall Effect modules are UL classified as intrinsically safe for Class 1, Division 1, Groups C and D (hazardous locations)

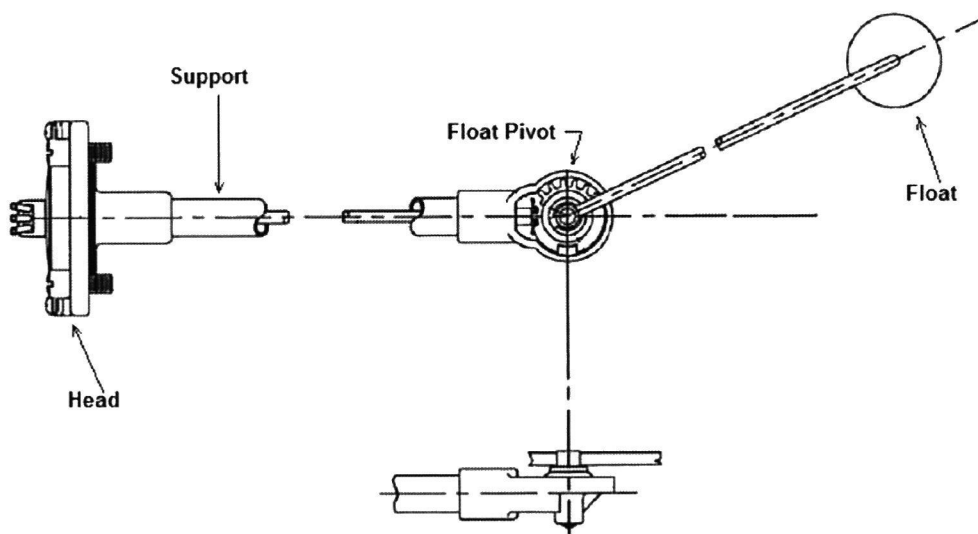
Gauge Materials of Construction*

- Head – die cast aluminum.
- Center shaft, support tube, and float rod – tempered aluminum
- Gears, cross stud, and bearing – stainless steel
- Drive magnet – alnico
- Gear housing – acetal
- Float – nitrile rubber

Dial Materials of Construction*

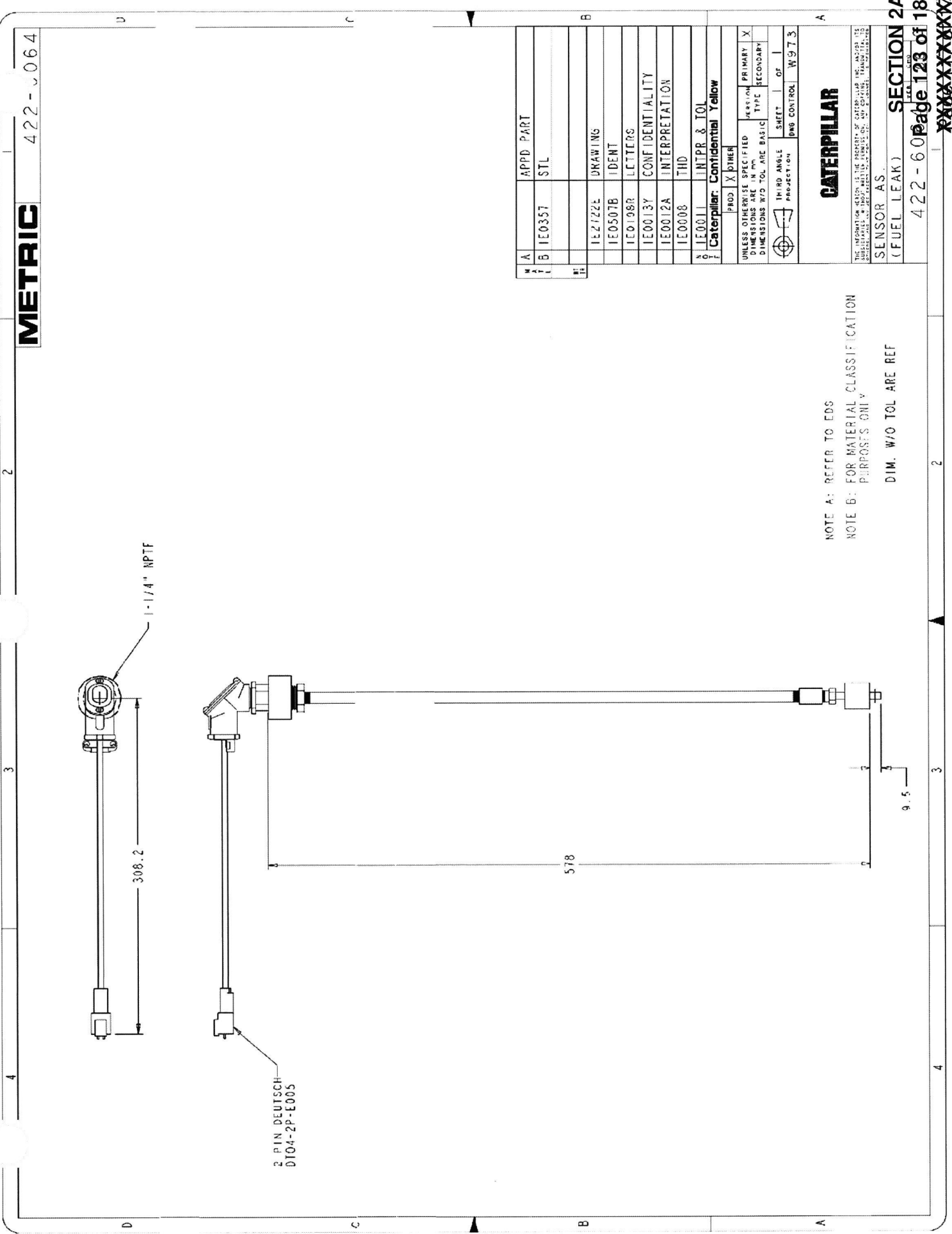
- Crystal and case: polycarbonate.
- Dial – painted aluminum

*Materials and specifications are subject to change without notice. Ratings subject to change due to temperature and other environmental considerations.



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METRIC

422-064

NOTE A: REFER TO EDS

NOTE B: FOR MATERIAL CLASSIFICATION
PURPOSES ONLY

DIM. W/O TOL ARE REF

MATERIAL	APPD PART	DESCRIPTION
1E0357	STL	
1E2122E	DRAWING	
1E0507B	IDENT	
1E0198R	LETTERS	
1E0013Y	CONFIDENTIALITY	
1E0012A	INTERPRETATION	
1E0008	THD	
1E0011	INTPR & TOL	
Caterpillar: Confidential Yellow		
PROD X OTHER		
UNLESS OTHERWISE SPECIFIED		
DIMENSIONS W/O TOL ARE BASIC		
DIMENSIONS W/O TOL ARE BASIC		
PROJ X OTHER		
THIRD ANGLE		
PROJECTION		
DWS CONTROL		
W973		
SHEET 1 OF 1		
PRIMARY X		
SECONDARY		

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SENSOR AS

(FUEL LEAK)

SECTION 2A

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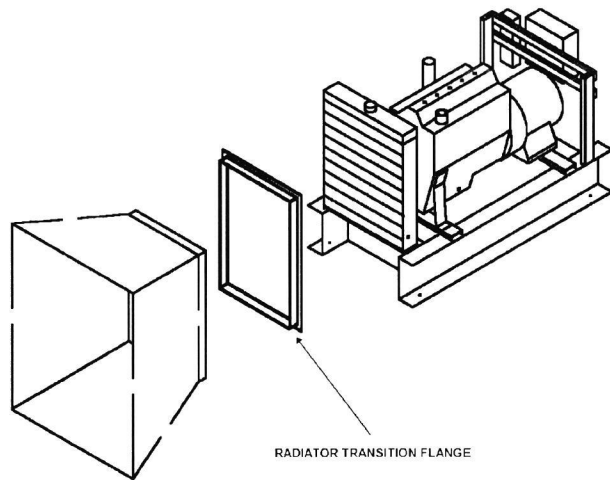
C13/C15/C18 Dip Charts for Fuel Tanks

U.S. Sourced
Diesel Generator Set
350-600 kW 60 Hz

Integral Tanks

C13 Integral Fuel Tank FTDW013				C15 Integral Tanks FTDW001/2			
Inches of Fuel on Dipstick	Measured Gallons	Inches of Fuel on Dipstick	Measured Gallons	Inches of Fuel on Dipstick	Measured Gallons	Inches of Fuel on Dipstick	Measured Gallons
0.5	18.4	13.0	477.6	0.5	7.5	13.0	196.1
1.0	36.7	13.5	496.0	1.0	15.1	13.5	203.7
1.5	55.1	14.0	514.4	1.5	22.6	14.0	211.2
2.0	73.5	14.5	532.7	2.0	30.2	14.5	218.7
2.5	91.9	15.0	551.1	2.5	37.7	15.0	226.3
3.0	110.2	15.5	569.5	3.0	45.3	15.5	233.8
3.5	128.6	16.0	587.8	3.5	52.8	16.0	241.4
4.0	147.0	16.5	606.2	4.0	60.3	16.5	248.9
4.5	165.3	17.0	624.6	4.5	67.9	17.0	256.5
5.0	183.7	17.5	643.0	5.0	75.4	17.5	264.0
5.5	202.1	18.0	661.3	5.5	83.0	18.0	271.5
6.0	220.4	18.5	679.7	6.0	90.5	18.5	279.1
6.5	238.8	19.0	698.1	6.5	98.1	19.0	286.6
7.0	257.2			7.0	105.6	19.5	294.2
7.5	275.6			7.5	113.1	20.0	301.7
8.0	293.9			8.0	120.7	20.5	309.3
8.5	312.3			8.5	128.2	21.0	316.8
9.0	330.7			9.0	135.8	21.5	324.3
9.5	349.0			9.5	143.3	22.0	331.9
10.0	367.4			10.0	150.9	22.5	339.4
10.5	385.8			10.5	158.4		
11.0	404.1			11.0	165.9		
11.5	422.5			11.5	173.5		
12.0	440.9			12.0	181.0		
12.5	459.3			12.5	188.6		

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WTF1 – RADIATOR TRANSITION FLANGE

A steel frame is mechanically secured to the front of the cooling radiator to which transition ducting can be attached to ensure heated radiator air is fully discharged away from the generating set room to prevent recirculation and possible overheating.

The radiator transition flange is constructed from sheet steel components pre-treated with zinc phosphate prior to polyester powder coating at 200° C (392° F).

Not required on generating sets fitted with enclosures, which include transition ducting inside the enclosure as part of the standard supply.

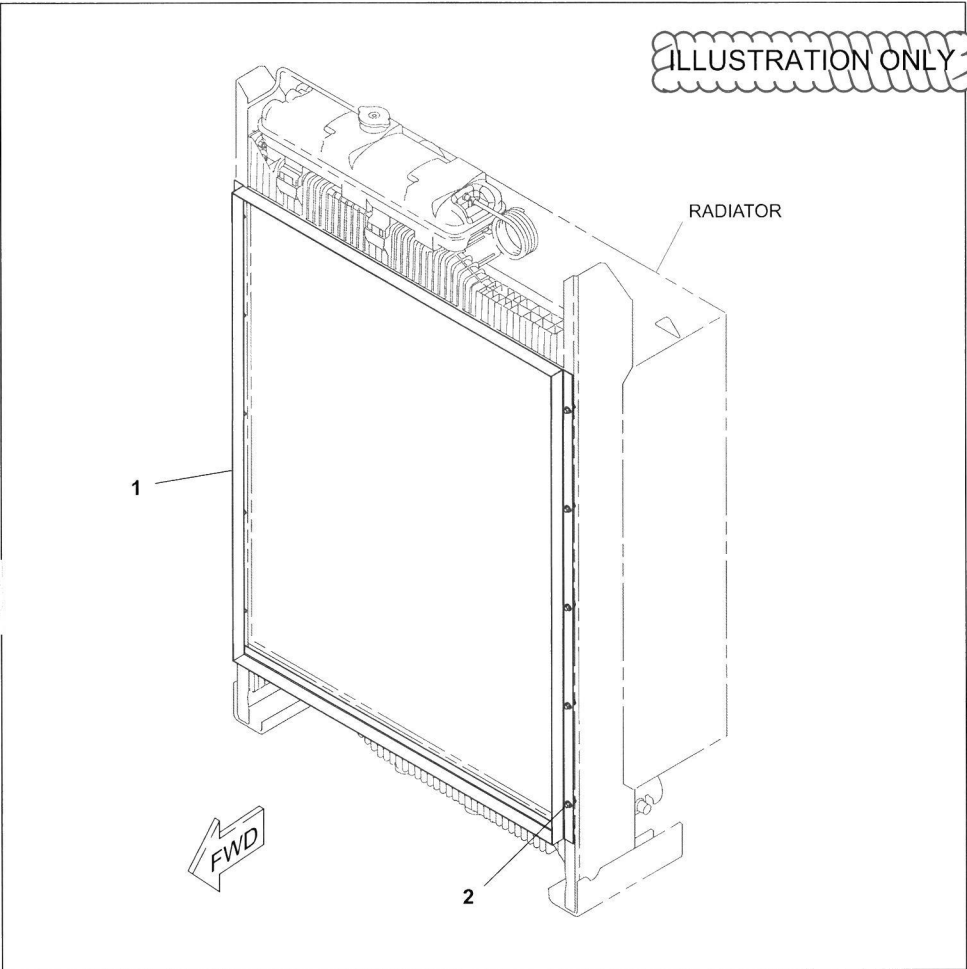


Service Information System

Previous Screen

Welcome: h180jbh

Product: GENERATOR SET
Model: C15 GENERATOR SET T33
Configuration: C15 I6 Generator Set T3300001-UP



GRAPHIC #1
g02848905

C15 I6 Generator Set
Media Number - M0085545-09 | Publication Date - 01/11/2018 | Date
Updated - 05/11/2018

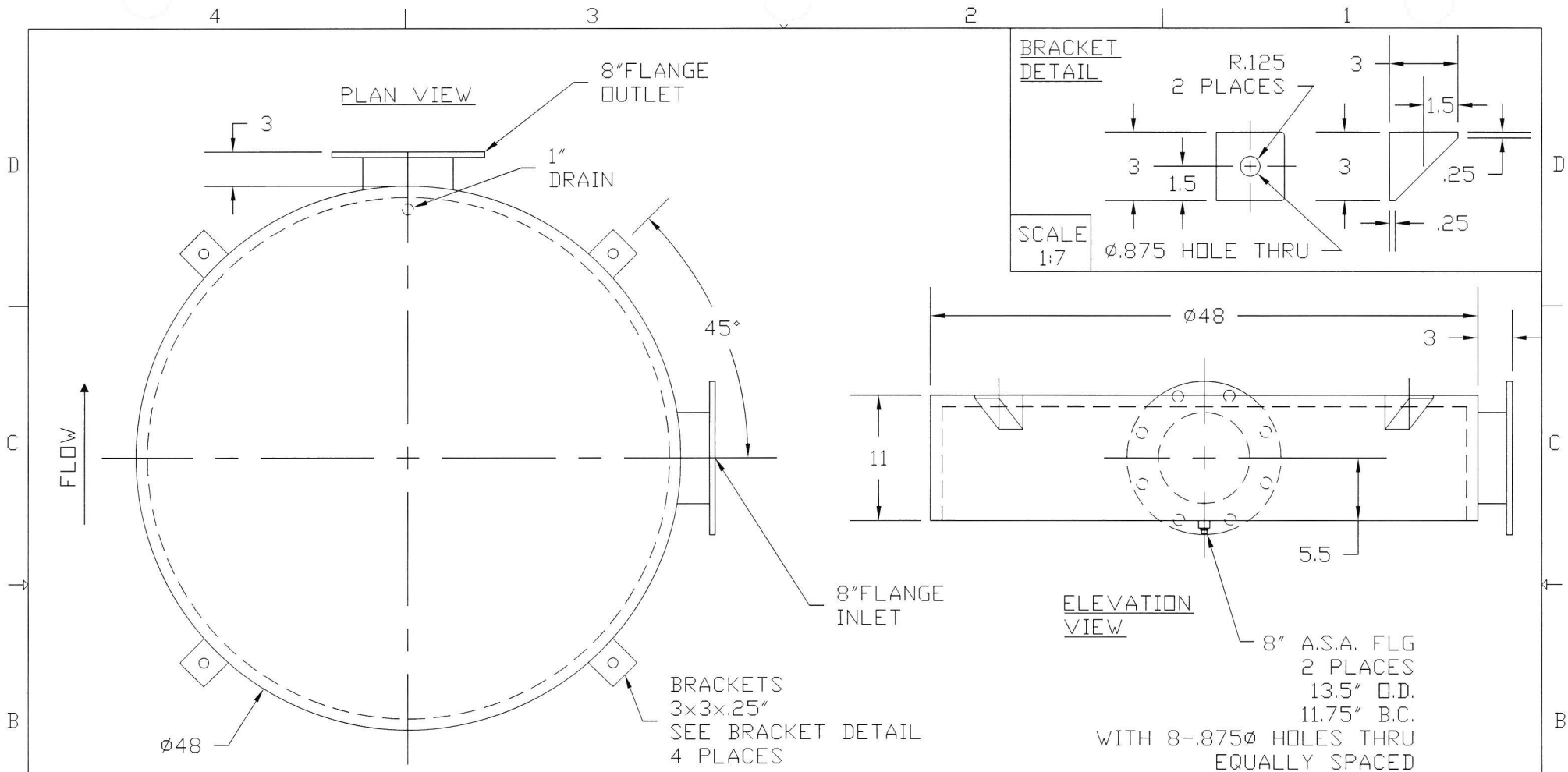
i07140310

384-2221 FLANGE GP-AIR INLET
S/N T331-UP
15-LITERS
AN ATTACHMENT

ENTIRE GROUP

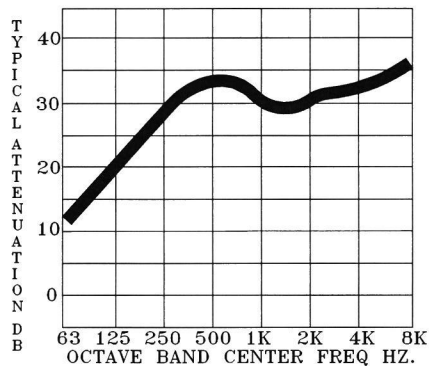
Ref. Qty.	NPR Note	Part No.	Part Name
Grp <input type="text"/>	<u>NPR</u>	384-2221	FLANGE GP-AIR INLET

INDIVIDUAL PARTS



NOTES:

1. MATERIAL: CARBON STEEL
2. PAINTED WITH HIGH TEMP. PAINT AND PRIMER
3. INTERNALLY INSULATED 1" TOP AND SIDES



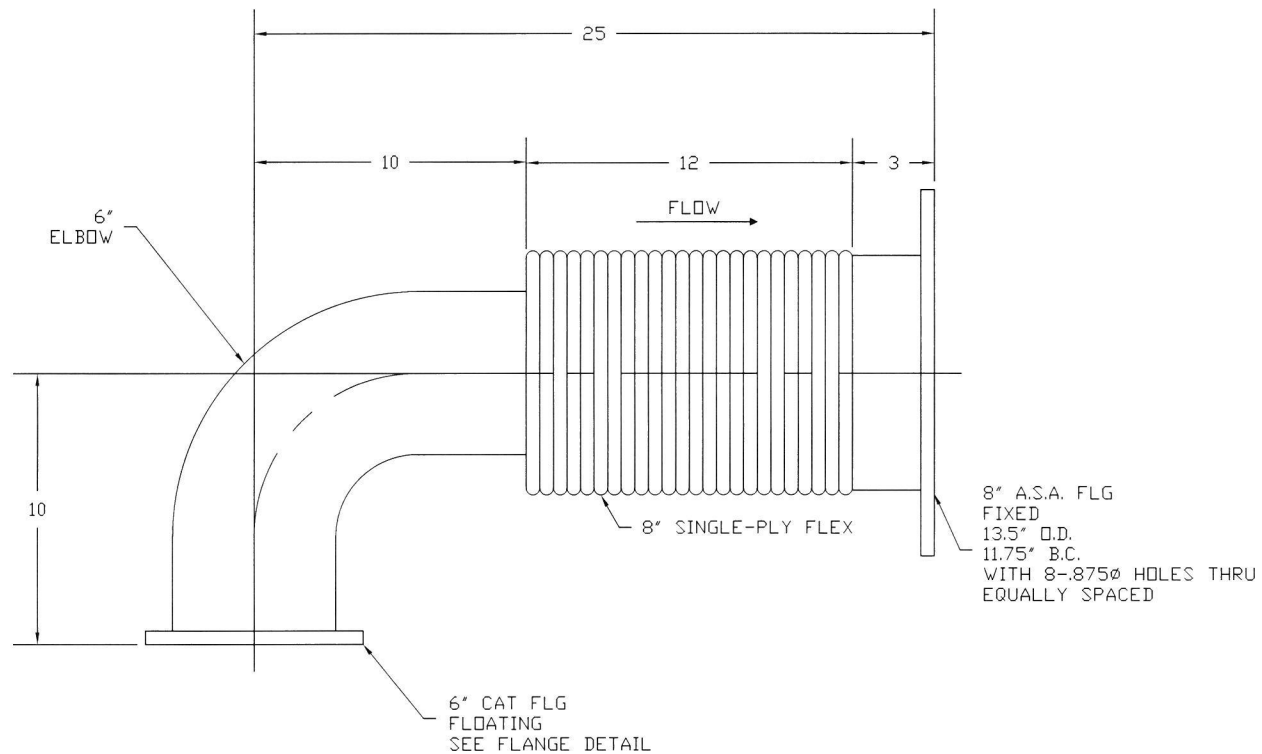
ENGINE:	CFM:	FPM:	KW:	WT: 524 Lbs	PRESSURE DROP H2O
UNLESS OTHERWISE SPECIFIED- 1) DIMENSIONS ARE IN INCHES 2) TOLERANCES ARE: .XXX± .010 ANGLES± 1/2° .XX± .030 SURFACE FINISH .X± .062 FRACTIONS ± MAX.					
HARCO ENGINE PRODUCTS HARCO MANUFACTURING CO. 1000 INDUSTRIAL PARKWAY, NEWBERG, OR, 97132-7071, USA (503)537-0600 FAX(503)-537-0601 THIS DRAWING, IN DESIGN AND DETAIL, IS PROPERTY OF HARCO MANUFACTURING COMPANY.					
APPROVALS		DATE		TITLE	
DRAWN MJB		07/25/06		CRITICAL GRADE 4811CFH 8	
CHECKED		SCALE 1:14		CAD NO. 1129	
APPROVED		PLOTTED		DWG. NO. 1129	

ITEM	QTY	DESCRIPTION
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CUSTOMER APPROVED DWG:

4 3 2 1

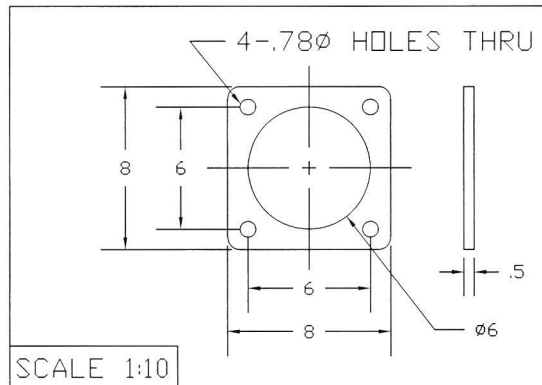
REV	DATE	REVISION	BY
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FLANGE DETAIL

NOTES:

1. MATERIAL: FLEX IS 321 STAINLESS STEEL, FLANGES AND PIPE ARE CARBON STEEL
2. PAINTED WITH HIGH TEMP. PAINT AND PRIMER



ENGINE:	CFM:	FPM:	KW:	WT:	PRESSURE DROP H2O
UNLESS OTHERWISE SPECIFIED- 1) DIMENSIONS ARE IN INCHES 2) TOLERANCES ARE: .XXX \pm .010 ANGLES \pm 1/2° .XX \pm .030 SURFACE FINISH .X \pm .062 FRACTIONS \pm <input checked="" type="checkbox"/> MAX.					
HARCO ENGINE PRODUCTS HARCO MANUFACTURING CO. 1000 INDUSTRIAL PARKWAY, NEWBERG, OR, 97132-7071, USA (503)537-0600 FAX(503)-537-0601 THIS DRAWING, IN DESIGN AND DETAIL, IS PROPERTY OF HARCO MANUFACTURING COMPANY.					
APPROVALS		DATE		TITLE	
DRAWN MJB		09/25/07		HSPF 6x8 CAT	
CHECKED				SCALE 1:5	CAD NO. 11295
APPROVED				PLOTTED	DWG. NO. 11295

ITEM	QTY	DESCRIPTION	CUSTOMER APPROVED DWG:
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4 3 2 1

IV

AUTOMATIC TRANSFER SWITCHES

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PRESS BLOCK HALF BILL OF MATERIALS

BILL OF MATERIALS:

CTS Series Open Transition Automatic Transfer Switch		
Quantity:	One (1)	One (1)
Catalog Number:	CTS000B00022E	CTS000B00040E
*Serial Number:		
Enclosure Type:	NEMA1	NEMA1
Amps:	225A	400A
Poles:	4	4
Phase:	3	3
Wire:	4	4
Voltage:	480/277V	480/277V
Frequency	60Hz	60Hz
Controller Type:	MX250	MX250
Withstand:	50kAIC/35kAIC (Any)	50kAIC/35kAIC (Any)
*Serial Number to be updated upon install		

MX250 MICROPROCESSOR PANEL

Multipurpose Display:

LEDs for continuous monitoring of switch position and source availability; a four-line by 20-character, backlit LCD display for settings, functions, programming and annunciation.

Through-the-door programming and display

- Simplified Keypad Entry – Menu-driven system is designed for ease of use.
- Built-in diagnostics with displays for ease of troubleshooting.
- Pass code protected to limit user access.
- Timer countdown display for ease of operation.
- User settings unaffected by power outages

Timer and Sensor Settings: Transfer Commit / No Commit Selection Feature

- Engine Start (Adjustable from 0 to 10 Seconds)
- Transfer to Emergency (Adjustable from 0 to 5 Minutes)
- Retransfer to Normal (Adjustable from 0 to 60 Minutes)
- Engine Cool Down (Adjustable from 0 to 60 Minutes)

Sensing:

Close differential 3-phase under-voltage sensing of the normal source - factory standard setting 90% pickup, 80% dropout (adjustable); under-frequency sensing of the normal source factory setting 95% pickup (adjustable).

Voltage and frequency sensing of the emergency source - factory standard setting 90% pickup voltage, 95% pickup frequency (adjustable)

In-Phase Monitoring

Capability To Support a Network Serial Communication Module

Pushbutton Bypass of Time Delay Transfer / Retransfer:

- In Phase Monitor - Self Adjusting (Open Transition Switches Only)
- Auxiliary Contact (Form A): Closed When The Switch is in the Emergency Position
- Auxiliary Contact (Form A): Closed When The Switch is in the Normal Position
- Engine Start Contact
- UL1008 Listed
- Double throw, mechanically interlocked contactor mechanism
- Electrically operated, mechanically held
- Designed for emergency and standby applications
- AL/CU Mechanical Screw-Type Lugs



PRESS BLOCK HALF BILL OF MATERIALS

Metering:

- Normal and Emergency - Voltage (Line to Line) and Frequency

Test Switch:

- Test switch (fast test/load/no load) to simulate normal source failure automatically bypassed should the emergency source fail

MX-250 STANDARD SPES PACKAGE:

6	Test Switch (Momentary)
6/P	Test Switch (On Controller)
A1	Emergency Failure Source 1 Auxiliary Contact
A1E	Emergency Failure Source 2 Auxiliary Contact
A3(2)	Emergency Source position auxiliary contact
A4(2)	Normal Source position auxiliary contact
CD/P	Clock Exerciser Load/ No Load: Allows the Generator to start and run unloaded or to simulate a power failure, start Generator and run under load
DT	Time Delay From Neutral Switch Position to Normal on Retransfer (Only for Delay Transition Switches)
DS	Disconnect Switch (Auto/Inhibit)
DW	Time Delay From Neutral Switch Position to Emergency on Retransfer (Only for Delay Transition Switches)
E	Engine Start Contact
EL/P	Event Log: Sequentially Numbered Log of 16 Events That Track Date, Time, Reason and Action Taken
J2E	Adjustable over/under frequency sensor (source 2 or emergency)
J2N	Adjustable over/under frequency sensor (source 1 or normal)
K/P	Frequency Indication (On The Controller)
L1	LED Source 2 (Emergency) Position Indication
L2	LED Source 1 (Normal) Position Indication
L3	LED Source 1 (Normal) Source Availability Indication
L4	LED Source 2 (Emergency) Source Availability Indication
LN	LCD Indicator – Center Off Position
LN/P	Center off position/LCD indication on controller (only for Delay Transition Switches)
P1	Time Delay Start for Emergency Source (Adj. From 0 -10 Seconds)
Q2	Peak Shave/Remote Load Test/Area Protection
Q3	Inhibit Transfer to Emergency (load add relay)
Q7	Inhibit Transfer to Normal Relay
R1-1/R1-3	Source 1 Over Voltage sensing for single and three phase systems.
R16	Phase Rotation Sensing of Source 1 and Source 2
R17	Under voltage Sensing for Emergency Source three phase)
R2E	Under-Voltage Sensing of Emergency Source (Single Phase)
R50	In-Phase Monitor
R7	Overvoltage Sensing of Emergency Source (single-phase)
R8	Overvoltage Sensing of Emergency Source (three phase)
S5/P	Auto / Semi Manual selector In "Auto" position, retransfer to Source 1 is automatic after the timer has timed out.
S13/P	Microprocessor Activated Commit/No Commit on Transferring to Emergency Source
T	Retransfer to Normal Time Delay (Adj. 0-60 Mins)
T3/W3	Pre-signal contact on transfer to Source 1 (Normal) or Source 2 (Emergency) during test
U	Engine Cooldown Run Timer (Adj. 0-60min)
UMD	Motor disconnect and staged restart (2 circuits)
VI	Voltage Imbalance - monitors phase voltages. Initiates transfer upon selected phase to phase voltage differential
W	Adjustable Time Delay on Transfer to Emergency Source
YEN/P	Bypass Timers Key (On Keypad). Bypasses (T) or (W) Time Delay Settings
CALIBRATE	Source 1 & Source 2 Calibrate capabilities for voltage an frequency

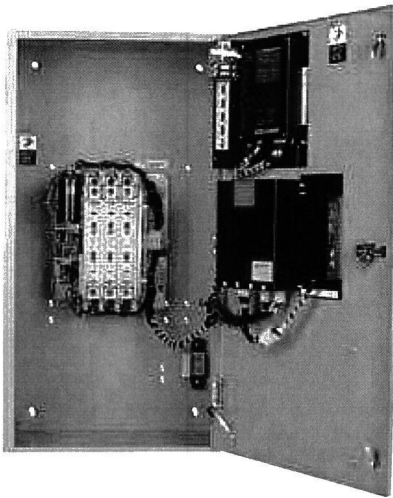


Image shown may not reflect actual configuration

CTS Series Automatic Transfer Switch (ATS)

The Cat® CTS Series ATS is configurable for applications requiring the dependability and ease of operation found in a full featured power contactor-type transfer switch.

The CTS Series is equipped with the MX250 controller that is designed for the most demanding transfer or bypass switch applications.

Features

Electrical Ratings

- Ratings 40 to 4000 amperes
- 2, 3, or 4 poles
- NEMA 1, 3R, 4, 4X and 12
- Available to 600 VAC, 50 or 60 Hz
- Suitable for emergency and standby applications on all classes of load, 100% tungsten rated through 400 amps
- UL 1008 listed at 480 VAC
- CSA C22.2 No. 178 certified at 600 VAC
- IEC 947-6-1 listed through 480 VAC

Performance Features

- Contact transfer speed less than 100 milliseconds
- High close-in and withstand capability
- Temperature rise test per UL 1008 conducted after overload and endurance tests in unventilated enclosure – exceeds UL requirements
- Equipped with the MX250 control package

Design And Construction Features

- Double throw, interlocked operation
- Electrically operated, mechanically held by a simple, over-center mechanism
- Silver alloy contacts with separate arcing contacts on 600 amp and above
- Arc quenching grids, enclosed arc chambers, and wide contact air gap for superior source to-source isolation on all units
- Control circuit disconnect plug and drive inhibit switch for safe maintenance
- Components accessible for inspection and maintenance without removal of the switch or the power conductors
- Mechanical indicator and contact chamber cover designed for inspection, safety and position designation

CTS Series of Automatic Transfer Switches

The Cat CTS series power contactor-type transfer switch makes use of a fully programmable/configurable microprocessor-based controller to allow the utmost in application flexibility. Further, the CTS series is offered in a wide array of configurations enabling it to meet the needs of even the most highly critical load.

Available configurations include:

40-4000 Amps:

- CTS automatic transfer switches
- CTSD delayed transition transfer switches
- CTSM manual transfer switches

100-4000 Amps:

- CTSC closed transition transfer switches
- CBTS automatic transfer/bypass switches
- CBTSD delayed transition bypass switches
- CBTSCT closed transition bypass switches

All CTS products meet or exceed industry requirements to allow specification and installation with confidence.

- UL 1008 listed through 480 VAC
- CSA C22.2 No. 178 listed through 600 VAC
- IEC 947-6-1 listed through 480 VAC
- Codes and standards
 - NFPA 70, 99, 101, 110
 - NEC 517, 700, 701, 702
 - IEEE 446, 241
 - NEMA ICS2-447
- Controls tested in accordance with:
 - IEEE 472 (ANSI C37.90A)
 - EN 55022 Class B (CISPR 22)
 - (Exceeds EN 55011 & MILSTD 461 Class 3)
 - EN 61000-4-2 Class B (Level 4)
 - EN 61000-4-3 (ENV50140) 10v/m
 - EN 61000-4-4
 - EN 61000-4-5, IEEE C62.41
 - EN 61000-4-6 (ENV50141)
 - EN 61000-4-11
- Equipment (controls and power section)
 - Seismic test qualified to: IBC-2003, IEEE-2003, OSP-0035-10
- Enclosures meet the requirements of: UL 508, UL 50, ICS 6, ANSI C33.76 and NEMA 250
- Quality system: ISO 9001 registered

This ruggedly built family of power contactor switches has been specifically designed for transfer switch duty with dependability, versatility, and user friendliness of prime concern.

The CTS power panel components, consisting of power switching contacts, drive mechanism, and terminal lugs, are mounted on a specially formed backplane. Logic devices including microprocessor control auxiliary time delays and special accessory equipment are assembled on the door for ease of maintenance and separation from the power section. They are connected with a numbered wiring harness equipped with a disconnect plug that allows isolation of the control panel for maintenance.

CTS Series Method of Operation

When the normal source fails or the voltage drops to a predetermined point (usually 80% of nominal), if required, a circuit is closed to start the engine generator set. When the emergency source reaches 90% of rated voltage and 95% of rated frequency, the drive solenoid is energized through the emergency coil control relay, causing the main contacts to disconnect the load from the normal source and connect it to the emergency source. After the drive solenoid has completed its electrical stroke and is seated, the emergency coil control relay opens to disconnect it. The transfer switch is now mechanically locked in the emergency position. When normal voltage is restored to a predetermined point (usually 90% of nominal), the control voltage sensing energizes. The normal side coil relay closes, and after the drive solenoid has completed its electrical stroke and is seated, the coil control relay opens to disconnect it. The transfer switch is now mechanically locked in the normal position.

Drive Mechanism

All CTS switches employ the simple "over-center" principle to achieve a mechanically locked position in either normal or emergency and a high-speed drive assures contact transfer in 100 ms or less. High contact pressure and positive mechanical lock allow for high withstand and closing ratings, far exceeding UL requirements.

Neutral Switching

The CTS Series is available in true four-pole designs for multi-source power systems that require switching the neutral. The neutral contact is on the same shaft as the associated main contacts. This design ensures positive operation and prevents any possibility that the neutral contact will fail to open or close, as is possible when the neutral pole is an add-on accessory. The neutral contacts are identical to the main contacts, having the same current carrying and high withstand/closing ratings as the mains. They are designed to break last and make first to negate the possibility of transients while switching the neutral.

Safe Manual Operation

The CTS manual operator consists of a large, easy-to-use handle that fits securely for manual operation during installation and maintenance or in an emergency.

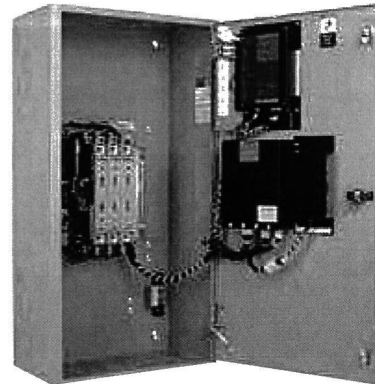
Every CTS is provided with an operator inhibit switch to disconnect the electrical drive prior to maintenance. Fully enclosed wrap-around arc covers shield the main contacts and mechanical components, preventing operator exposure during manual operation.

Transferring Large Motor or Highly Inductive Loads

The CTS manual operator consists of a large, easy-to-use handle that fits securely for manual operation during installation and maintenance or in an emergency.

1. Optional Universal Motor Disconnect

Contact: This load control disconnects a large motor via its control circuit for an adjustable period of time prior to transfer in either direction. For switching multiple motors, the motor disconnect contact with staged restart disconnects the motors prior to transfer and brings them back on line sequentially.



**CTS Series ATS
400A**

2. **Accessory R50 Phase Monitor:** This feature compares the phase angle between both sources of power and prevents transfer until the two are approximately in phase (within a self adjusting range). The CTS's high speed transfer action coupled with the MX series microprocessor control logic ensure closures at or near zero degree phase difference.
3. **Series CTSD:** The CTSD offers a delayed transition on transfer switches 40A and above. This programmed center-off position allows for the full decay of rotating motors or transformer fields. It can also be used for load shedding of selected circuits or other applications which require a means to disconnect the load from either source. Many Uninterruptible Power Supply (UPS) system manufacturers recommend delayed transition switches to support sequencing of their systems. Reference the CTSD supplement for further details.
4. **Series CTSC:** Cat closed transition switches combine CTSD operation during a source failure with a highly engineered control system that allows momentary paralleling (100 ms) of two acceptable sources, thereby limiting the impact of transfer on the load. Reference the CTSC supplement for further details.

Standard Features (MSTD Package)

Feature	Function	Feature	Function
6/P	Momentary test Switch	S13/P	Transfer commit
J2E/J2N	Adj. over/under freq (S1 and S2)	DW	Time delay – neutral to S2*
A3	Aux contact (S2 position)	T	Source 1 stable time delay
L1/L2	Source position LEDs	E	Engine start contact
A4	Aux contact (S1 position)	U	Source 2 stop time delay
L3/L4	Source available LEDs	EL/P	Log of last 16 events and system data
Calibrate	Volt. and freq. calibration	VI	Voltage imbalance
LN/P	Center-off position LCD*	K/P	S1 and S2 freq. indication
CDT	Load/no-load exerciser	W	S2 stable time delay
P1	Source 2 start time delay	YEN	Bypass T and W Time Delays
DS	Auto/inhibit switch (> 600A)		
R50	In-phase monitor		
DT	Time delay – neutral to S1*		

Optional Packages

Exerciser (MEXE) Package includes:

- STDS functions
- A1/A1E – S1/S2 failure aux contact
- A3/A4 – One additional contact each
- CDP – Programmable exerciser
- Q2 – Remote peak shave/load test
- R16 – Phase rotation sensing

Controls (MCON) Package includes:

- EXES functions
- Q3 – Remote inhibit transfer to emergency
- Q7 – Inhibit transfer to normal
- T3/W3 – Elevator pre-signal aux contacts
- UMD – Universal Motor Load Disconnect

Sensing (MSEN) Package includes:

- EXES functions
- Normal source over voltage sensing (3 phase)
- Q7 – Inhibit transfer to normal
- S12P – Auto/manual selector switch

Special (MSPE) Package includes:

- CONS functions
- SENS functions
- S5P – Manual transfer to normal switch (replaces S12P)

Switchgear (MPSG) Package includes:

- SPES functions
- Additional set of A3/A4 contacts
- R15 – Load shed to “dead normal” or
- R15D – Load shed to neutral position*
- S12/P – Auto-manual selector switch

Combined with the Optional Modbus communication card, the PSGS package allows for integration with Cat switchgear. This feature allows ATS operating parameters to be displayed on the touchscreen as well as on the optional remote monitoring software. Supply of this feature set affords real-time monitoring of the ATS as well as direct control over the following parameters from the switchgear HMI:

- Timer settings
- Pickup/dropout settings
- Testing functions
- Alarm functions
- Manual operation

**Available with delayed transition switches only.*

CTS Series Accessory Definitions

6P – Microprocessor activated test switch (momentary)

6A – Hardwired test switch (maintained)

6AP – Microprocessor activated test switch (maintained)

6BK – Hardwired test switch (maintained auto – momentary test) key operated

6CK – Hardwired test switch (maintained auto – maintained test) key operated

A1 – Auxiliary contact S.P.D.T. – normal (source 1) failure

A1E – Auxiliary contact S.P.D.T. – emergency (source 2) failure

A3 – Auxiliary contact – closed in emergency (source 2) additional available (10 max.) on CTS series and need to be specified

A4 – Auxiliary contact – closed in normal (source 1) additional available (10 max.) on CTS Series and need to be specified

A62 – Motor disconnect and staged restart (1 contact)

AB3 – Auxiliary contact – closed in bypass emergency (source 2) (S.P.D.T.) (standard up to 400a) additional available (10 max.) on CBTS Series and need to be specified

AB4 – Auxiliary contact – closed in bypass emergency (source 1) (S.P.D.T.) (standard up to 400A) additional available (10 max.) on CBTS Series and need to be specified

CALIBRATE – Microprocessor activated calibration feature CDP programmable exerciser daily, 7/14/28/365 days user-selectable, with or without load

CDT – Exerciser no load timer

CTAP – Chicago transfer alarm panel mounted in door of enclosure. Includes 3 aux. contacts and fuse.

DS – Disconnect switch – disconnects source voltage to transfer power panel.

DT (DELAYED TRANSITION ONLY) – time delay from neutral switch position to source 2 on retransfer

DW (DELAYED TRANSITION ONLY) – time delay from neutral switch position to source 2 on retransfer

E – engine start relay

EL/P – event log of last 16 events

ETHERNET – Ethernet communication adapter – requires modbus communication module.

F – Fan contact, closed when engine runs.

HT(1)(2) – Heater and thermostat 208/240V (1) 380/600V (2) mounted and inter-wired in enclosure. (requires larger enclosure for 40-200A)

K – Frequency meter (analog) – door mounted

K/P – Frequency indication on the controller

LNP – Center-off position LCD-indicator

L1 – LED light indicates switch in Source 2 position

L2 – LED light indicates switch in Source 1 position

L3 – LED light indicates source 1 available

L4 – LED light indicates source 2 available

LonWorks – LonWorks communication module

M1 – Single-phase amp meter (analog)

M2 – Three-phase amp meter (analog)

M90 – EPM2000 true RMS digital meter with display (amps, volts, power, energy, power factor and frequency). 3-line LED display. 50/60 Hz universal operation. 1 or 3 phase. Standard modbus RTU RS485 communications capability.

M90A – Includes modbus communication card and factory wiring between EPM2000 and modbus communication card.

M90B – Includes modbus communication card, Ethernet communication adapter and factory wiring between EPM2000 and modbus communication card.

M91 – EPM6000 true RMS digital meter with display (amps, volts, power, energy, power factor and frequency, THD). Certified energy and demand metering. Meets ANSI C12.20 and IEC 687 accuracy classes. Front IrDA port laptop connection. Standard modbus RTU RS485 or DNP 3.0 communications capability.

M91A – Includes modbus communication card and factory wiring between EPM6000 and modbus communication card.

M91B – Includes Modbus communication card, Ethernet communication adapter and factory wiring between EPM6000 and modbus communication card.

Modbus – Modbus RTU communication module

N1 – Running time indicator – door mounted

N2 – Operation Counter – Door Mounted

P1 – Engine start timer (adjustable to 6 seconds)

P2 – Engine start timer – extended time delay (adjustable to 300 seconds)

CTS Series Accessory Definitions continued

Q2 – Peak shave/remote load test/area protection – relay (S.P.D.T.) (need to specify voltage – 120 VAC, 24 VAC, 24 VDC – 120V default standard)

Q3 – Inhibit transfer to emergency (source 2) (load add relay) – relay (S.P.D.T.) (need to specify voltage – 120 VAC, 24 VAC, 24 VDC – 120V default standard)

Q7 – Inhibit transfer to normal (source 1) – relay (S.P.D.T.) (need to specify voltage – 120 VAC, 24 VAC, 24 VDC – 120V default standard)

R1-1/R1-3 – Overvoltage sensing for normal (source 1) single (R1-1) or three (R1-3) phase

R15/R15D – Load shed – should source 2 become overloaded, a signal can be given to switch to the neutral position.

R16 – Phase rotation sensing of normal (source 1) and emergency (source 2)

R26/R26D – Interruptible power rate provisions. Allow transfer out of source 1 position to mid-position or dead source 2. Alarm and pre-signal circuit included (need to specify voltage – 120 VAC, 24 VAC, 24 VDC)

R50 – In phase monitor between normal (source 1) and emergency (source 2) to allow transfer

S5P – Microprocessor activated auto/manual retransfer selector switch for transferring to normal (source 1) (includes microprocessor activated YN accessory)

S12P – Microprocessor activated auto/manual retransfer selector switch for transferring to normal (source 1) (includes microprocessor activated YN & YE accessory)

S13P – Microprocessor activated commit/no commit on transferring to emergency (source 2) (with enable/disable settings)

S14K – Keyed selector switch for retransfer to normal-test-auto

SW1 – Auto/off/start engine control selector – door mounted (keyed or non-keyed operation available)

SW2 – Auto/off engine control selector – door mounted (keyed or non-keyed operation available)

SW3 – Source priority selector switch – door mounted. Allows selection of source 1 or source 2 to be the prime source. Transfer switch will transfer to selected prime source if that source is available. (keyed or non-keyed operation available)

T – Retransfer to normal (source 1) adjustable time delay

T3/W3 – Pre-signal contact on transfer to normal (source 1) or emergency (source 2) during test

U – Engine stop/cool adjustable cool down timer

UMD – Pre and post transfer output adjustable time range. Functions in both directions. Includes 2 circuits (additional circuits available).

VI – Voltage imbalance between phases (3-phase only)

W – Adjustable time delay on transfer to emergency (source 2)

YEN – Bypass transfer timers function (soft key switch in microprocessor)

CTS Series Dimensional Specifications

CTS Series Transfer Switches							
Ampere Rating	Poles	NEMA 1 Enclosed					Application Notes
		Height (A)	Width (B)	Depth (C)	Reference Figure	Weight	
40, 80, 100 & 150	2, 3 4	24 (610) 24 (610)	18 (457) 18 (457)	11 (279) 11 (279)	A A	57 (26) 60 (27)	1-7
1x225A 1x400A	2, 3 4	46 (1168) 46 (1168)	24 (610) 24 (610)	14 (356) 14 (356)	A A	165 (75) 170 (68)	1-7
600	2, 3 4	74 (1880) 74 (1880)	40 (1016) 40 (1016)	20 (508) 20 (508)	B B	380 (172) 430 (195)	1-8
800, 1000 & 1200	2, 3 4	74 (1880) 74 (1880)	40 (1016) 40 (1016)	20 (508) 20 (508)	B B	455 (206) 540 (245)	1-8
1600 & 2000	3 4	90 (2286) 90 (2286)	36 (914) 36 (914)	48 (1219) 48 (1219)	C C	1010 (458) 1160 (526)	1-8
3000	3 4	90 (2286) 90 (2286)	36 (914) 36 (914)	48 (1219) 48 (1219)	C C	1130 (513) 1395 (633)	1-8
4000	3 4	90 (2286) 90 (2286)	47 (1194) 47 (1194)	62 (1575) 62 (1575)	C C	1595 (723) 1850 (839)	1-11

Application Notes:

1. Dimensions are listed in inches (mm) and weights in pounds (kg).
2. Includes 1.25" door projection beyond base depth. Allow a minimum of 3" additional depth for projection of handle, light, switches, pushbuttons, etc.
3. All dimensions and weights are approximate and subject to change without notice and are not for construction use.
4. Special enclosures (NEMA 3R, 4, 12, etc.) may include mounting tabs, etc. Consult the published dimension drawings for details.
5. Normal and emergency may be ordered inverted on any switch. The load may be inverted 500-1200 amps. Consult the factory for details.
6. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact Caterpillar.
7. Packing materials must be added to weights shown. Allow 15% additional weight for cartons, skids, crates, etc.
8. Add 4" in height for removable lifting lugs.
9. 4000 amp depth dimension shown is standard. Depending on your cable/conduit requirements you may desire a deeper enclosure. Consult Caterpillar for further details.
10. Lug adapters for 3000-4000 amp limits may be staggered length for ease of entrance. Consult Caterpillar for details.
11. Ventilation louvers on side/rear of enclosure at 3000 and 4000A. One side or rear must be clear to afford proper airflow.

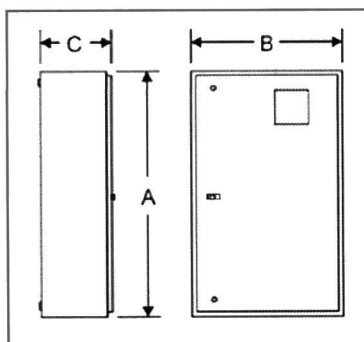


Figure A

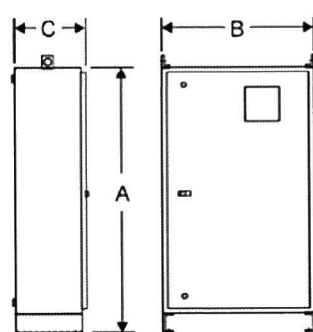


Figure B

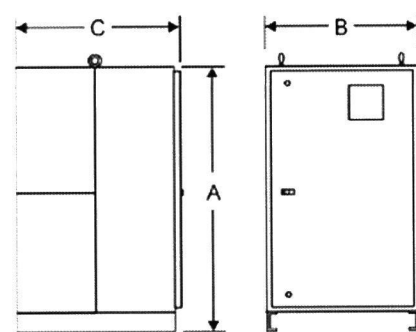


Figure C

AL-CU UL Listed Solderless Screw-Type Terminals for External Power Connections

Switch Size Amps	Normal, Emergency & Load Terminals		Switch Size Amps	Normal, Emergency & Load Terminals	
	Cables per Pole	Range of Wire Sizes		Cables per Pole	Range of Wire Sizes
40-80		#8 to 3/0 AWG	800/1000/1200	4	#2 AWG to 600 MCM
1x225A 100-225	1	#6 AWG to 250 MCM	1600	8	600 MCM
260		#6 AWG to 350 MCM	2000		
1x400A 400		#4 AWG to 600 MCM	3000		
600	2	#2 AWG to 600 MCM	4000		

Line and load terminals are located in rear and arranged for bus bar connection.

Notes:

1. Special terminal lugs and neutral bars are available at additional cost. Contact factory and advise cable sizes and number of conductors per pole.
2. Fully rated solid neutral (3x standard normal power connector) provided when required by system voltage.
3. Normal and emergency may be ordered inverted on any switch. Load may be inverted 600-1200 amps. Consult the factory for details.
4. Lug adapters for 3000-4000 amp units may be staggered length for ease of entrance. Consult the factory for details.
5. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact Caterpillar.

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MX250 MICROPROCESSOR CONTROLLER

The MX250 microprocessor is standard with the entire CTS product family. The MX250 Series includes all the standard features of the MX150 Controller while offering expanded programmability and field adaptability. The high reliability and ease of unattended operation makes it ideal to use in a wide range of mission critical applications.

FEATURES AND BENEFITS

- Available to support ALL transfer modes:
 - Open, Delayed and Closed Transition
- User-friendly programmable engine exerciser, with or without load, at ANY interval in a one-year period
- A wide variety of operating voltages available in a single controller for most domestic and international applications
- Real-time display of ATS status, including active timer(s)
- Multiple levels of user-defined password protection
- Serial communications allowing connectivity with other ATS's, Caterpillar® Switchgear, and SCADA systems
- Time-tested synchronous logic automatically measures phase angle and frequency allowing disturbance-free transfer
- Unsurpassed statistical ATS/System monitoring available in real-time
- Elevator pre-signal contacts automatically bypassed if the selected source fails, minimizing time an elevator is without power
- Universal Motor Disconnect (UMD) sends a pre-signal, post-signal or both to any motor control center. Not bypassed in an outage, the UMD ensures safety in the event of a single phase loss
- Voltage unbalance detection standard
- Also includes all standard MX150 features
- Back-lit/temperature compensated LCD display (includes the display of source voltage and frequency, exercise time, delay options and source condition)
- Close differential 3-phase under-voltage sensing of source 1, factory standard setting 90% pickup, 80% dropout; under-frequency sensing of source 1 factory setting 95% pickup; voltage and frequency sensing of source 2, factory standard setting 90% pickup voltage, 95% pickup frequency. All factory settings are operator adjustable (see table on next page).
- LED indicators for ATS position and source availability
- Plant exerciser clock (configured for 1, 7, 14 or 28 day run selections)
- Built-in time delays with count-down display
- Pushbutton to bypass time delay transfer/retransfer
- Transfer/commit/no commit selection
- In-phase monitor
- Event logging (last 16 events)
- A test is standard (fast test/load/no load) to simulate source 1 failure – automatically bypassed should source 2 fail.

MX250 MICROPROCESSOR BASED ATS CONTROLLER

PERFORMANCE FEATURES

- UL, CSA and IEC listed
- Ringing wave immunity per IEEE 472 (ANSI C37.90A)
- Conducted and Radiated Emissions per EN55022 Class B (CISPR11) (Exceeds EN55011 & MILSTD 461 Class 3)
- ESD immunity test per EN61000-4-2 Class B (Level 4)
- Radiated RF, electromagnetic field immunity test per EN61000-4-3 (ENV50140) 10v/m
- Electrical fast transient/burst immunity test per EN61000-4-4
- Surge immunity test per EN61000-4-5 IEEE C62.41
- Conducted immunity test per EN61000-4-6 (ENV50141)
- Voltage dips and interruption immunity EN61000-4-11

USER-FRIENDLY OPERATION

- Multipurpose display: LEDs for continuous monitoring of switch position and source availability; a four line by twenty character LCD display for settings, functions, programming and annunciation
- Through-the-door programming and display
- Simplified keypad entry – menu-driven system is designed for ease of use
- Built-in diagnosis with displays for ease of troubleshooting
- Weather and tamper resistant touchpad

ADDITIONAL FEATURES

- Built-in programmable exerciser uses separate microcontroller with independent battery back-up to serve as clock/calendar – battery failure will not affect switch operation
- User settings are unaffected by power outages
- Separate line voltage components for controller isolation
- Inputs are optoisolated for high electrical immunity to transients and noise
- Built-in electrical operator protection
- Watchdog circuit for microprocessor operation
- Source connection and transfer data logging

CONTROL SETTING RANGES

Control Function		MX250	
		Range	Factory Setting
S1 Line Sensing – Under-voltage	Fail	75-98%	80%
	Restore	85-100%	90%
S1 Line Sensing – Under-frequency	Fail	88-98%	90%
	Restore	90-100%	95%
S2 Line Sensing – Under-voltage	Fail	75-98%	80%
	Restore	85-100%	90%
S2 Line Sensing – Under-frequency	Fail	88-98%	90%
	Restore	90-100%	95%
Time Delay S2 Start	(P1)	0-10 seconds	3 seconds
S2 Stop Delay	(U)	0-60 minutes	5 minutes
Time Delay S2 Stable Timer	(W)	0-5 minutes	1 second
Time Delay S1 Stable Timer	(T)	0-60 minutes	30 minutes
Universal Motor Disconnect*	(UMD)	0-5 minutes	15 seconds
Elevator Transfer Presignal*	(T3/W3)	0-60 seconds	20 seconds
Delay Transition Time Delays	(DT, DW)	0-10 minutes	5 seconds

* Form C Double Throw

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REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
C	S-8604 REVISED SHEET 2	04/05/07	YJS MES

CTS(2/3/4) SERIES WITH MX250 MICROPROCESSOR-BASED CONTROL PANEL
AUTOMATIC TRANSFER SWITCH (ATS)
40-400A

FOR USE ON EMERGENCY OR STANDBY SYSTEMS - RATED FOR TOTAL SYSTEM & MOTOR LOAD

A. LEGEND

DS..... Disconnect Switch
L1..... SOURCE 2 Position Light
L2..... SOURCE 1 Position Light
L3..... SOURCE 1 Available Light
L4..... SOURCE 2 Available Light

Controls Power Supply (CPS)

XE1, XE2..... Control Transformer, SOURCE 2
XN1,XN2..... Control Transformer, SOURCE 1

Power Panel

N1,2,3,(N)..... SOURCE 1 Line-----
E1,2,3,(N)..... SOURCE 2 Line-----
T1,2,3,(N)..... Load Connections
CE SOURCE 2 Transfer Operator
CN SOURCE 1 Transfer Operator
CNE..... Main Transfer Operator (40-200A)
GND..... Ground
NB Neutral Bar (if required)
SCR-E SCR, Source 2
SCR-N SCR, Source 1
SE SOURCE 2 Position Limit Switch
SN SOURCE 1 Position Limit Switch

Interconnect Plugs

J1, J2, J4, J5, J6, J7, J9, Jc

B. OPERATION

When SOURCE 1 line drops below the preset "Fail" values, SOURCE 1 voltage sensing circuit initiates the engine start signal.

When SOURCE 2 line voltage and frequency reach the preset "Restore" values, the MX controller initiates a transfer signal through the SCR-E to operate the main transfer operator. The load is now transferred to SOURCE 2 line. The transfer switch is mechanically locked. SN limit switch awaits the next operation to SOURCE 1.

When SOURCE 1 line voltage reaches the preset "Restore" values, the MX controller initiates a transfer signal through the SCR-N to operate the main transfer operator. The load is now re-transferred back to SOURCE 1 line. The transfer switch is mechanically locked. SE limit switch awaits the next operation to SOURCE 2.

Test Switch

The Test Switch simulates a SOURCE 1 line failure when activated. To test, activate the Test Switch, thus allowing the transfer switch to transfer to the SOURCE 2 position. De-activate the Test Switch. The transfer switch will reset to the SOURCE 1 position. Testing at least once a month is recommended. For hospital Emergency systems, test once a week.

Disconnect Switch

When the Disconnect Switch is placed in the INHIBIT position, the MX control panel is disengaged and transfer cannot take place.

ACCESSORY GROUP PACKAGES:

☐ C. (STDS) GROUP PACKAGE

6, A3, A4, CALIBRATE, CDT DS, DT, DW, E, EL/P, KP, L1, L2, L3, L4, LN, P1, R50, S13, T, U, VI, W AND YEN.

☐ D. (EXES) OPTION PACKAGE

6, A1, A1E, A3, A4, CALIBRATE, CDP DS, DT, DW, E, EL/P, KP, L1, L2, L3, L4, LN, P1, Q2, R16, R50, S13, T, U, VI, W AND YEN.

☐ E. (CONS) OPTION PACKAGE

6, A1, A1E, A3, A4, CALIBRATE, CDP, DS, DT, DW, E, EL/P, KP, L1, L2, L3, L4, LN, P1, Q2, Q3, Q7, R16, R50, S13, T, T3/W3, U, UMD, VI, W AND YEN.

☐ F. (SENS) OPTION PACKAGE

6, A1, A1E, A3, A4, CALIBRATE, CDP, DS, DT, DW, E, EL/P, KP, L1, L2, L3, L4, LN, P1, Q2, Q7, R1-1/R1-3, R16, R50, S12, S13, T, U, VI, W AND YEN.

☒ G. (SPES) OPTION PACKAGE

6, A1, A1E, A3, A4, CALIBRATE, CDP, DS, DT, DW, E, EL/P, KP, L1, L2, L3, L4, LN, P1, Q2, Q3, Q7, R1-1/R1-3, R16, R50, S5, S13, T, T3/W3, U, UMD, VI, W AND YEN.

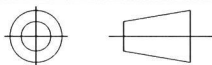
☐ H. (PSGS) OPTION PACKAGE

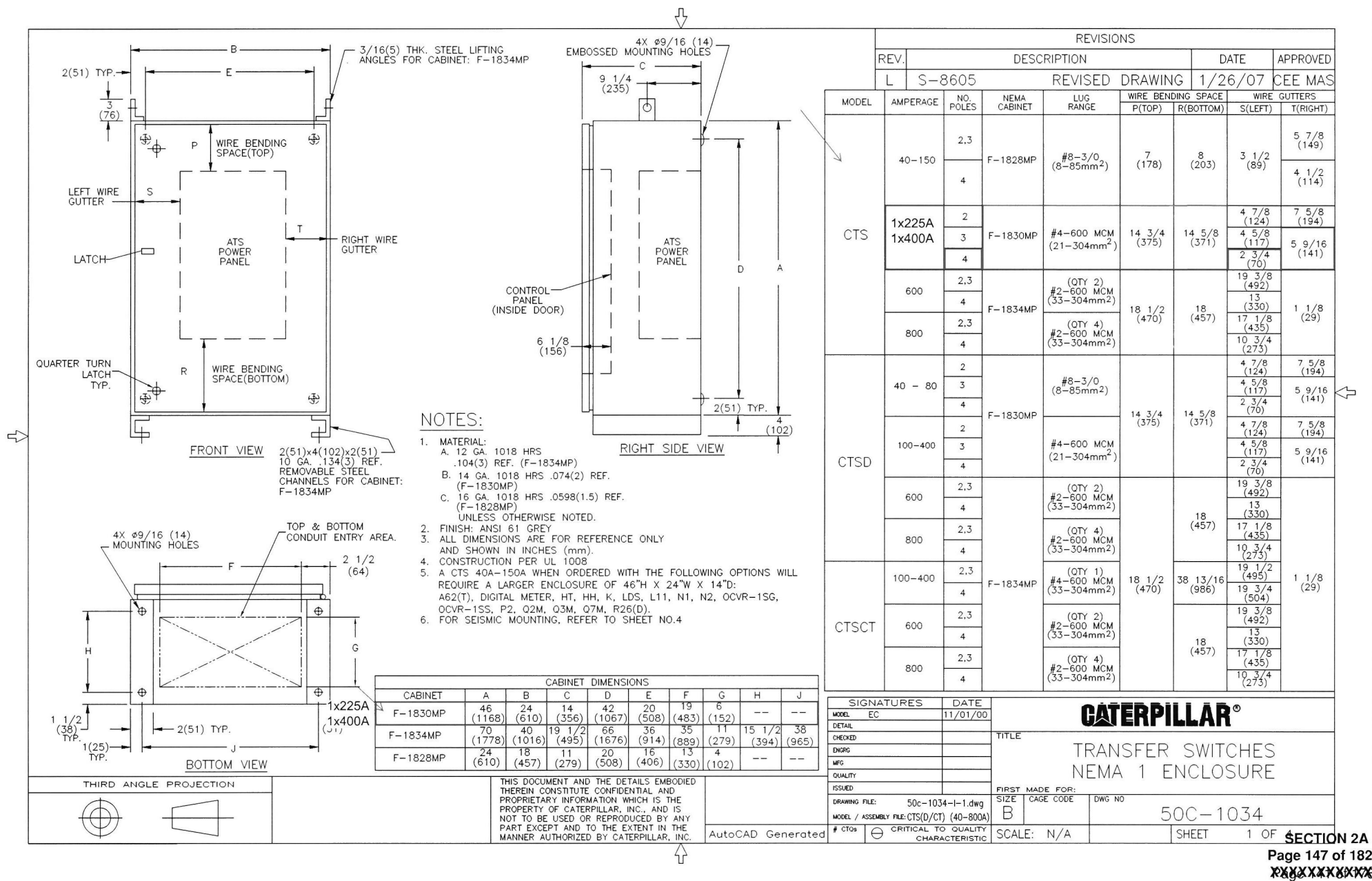
6, A1, A1E, A3, A4, CALIBRATE, CDP, DS, DT, DW, E, EL/P, KP, L1, L2, L3, L4, LN, P1, Q2, Q3, Q7, R1-1/R1-3, R15, R16, R50, S12, S13, T, T3/W3, U, UMD, VI, W AND YEN.

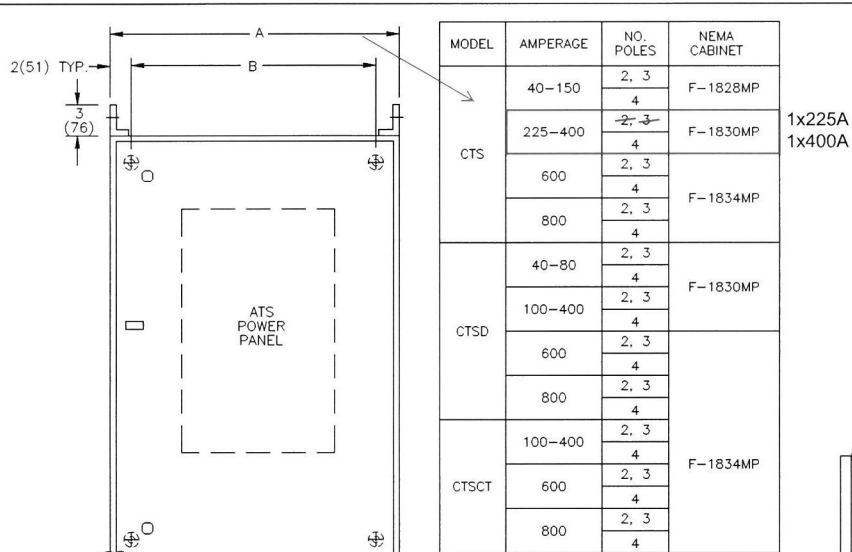
NOTES:

- ⚠ CAUTION: In using a 3 phase, 4 wire delta or open delta power supply (usually 120/240V, sometimes listed as 120/208V) with one leg having a grounded center tap, one line will be 160 to 208V to ground. When such a system is used it is necessary to connect the high leg to N2. DO NOT CONNECT 120V LOAD CIRCUIT TO THE HIGH LEG.
- GROUNDING TERMINAL: A grounding terminal (GND) is provided. When installing open type switches connect this terminal to the metal enclosure or an equivalent earth ground.
- ⚠ WARNING - TO ENSURE AGAINST SHOCK OR ACCIDENT HAZARD, DISCONNECT ALL SOURCES OF SUPPLY BEFORE SERVICING.
- ON SINGLE PHASE UNITS WHERE THE SOURCE 2 IS A UTILITY LINE, CONNECT SOURCE 2 LINE SO THAT MINIMUM VOLTAGE IS MEASURED FROM N1 TO E1.
- ON SINGLE PHASE (2 POLE) UNITS, CENTER POLE IS NOT SUPPLIED. RIGHT-HAND POLE IS NOT SUPPLIED ON 400A UNITS.

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THIRD ANGLE PROJECTION		APPLIED PRACTICES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	MODEL GG	05/01/03		
TOLERANCES ON: 2 PL. DECIMALS ± .020 3 PL. DECIMALS ± .005 ANGLES ± 1° FRACTIONS ± 1/64		DRAWING FILE: 73a-0900-c-1.dwg	CHECKED		TITLE LEGEND, OPERATION, & ACCESSORIES	
FINISH ✓		MODEL / ASSEMBLY FILE: CTS40-400A	ENG'G			
AutoCAD Generated		# CTOs	ISSUED		FIRST MADE FOR: CTS40-400A	
		CRITICAL TO QUALITY CHARACTERISTIC	QUALITY		SIZE CAGE CODE DWS NO	
					73A-0900	
					SCALE: - SHEET 1 OF 2	

CTS SERIES WITH MX250 MICROPROCESSOR-BASED CONTROL PANEL AUTOMATIC TRANSFER SWITCH (ATS) 40-400A		REVISIONS						
REV.	DESCRIPTION	DATE	APPROVED					
C	S-8604	REVISED DWG	04/05/07	YJS MES				
FOR USE ON EMERGENCY OR STANDBY SYSTEMS-RATED FOR TOTAL SYSTEM & MOTOR LOAD								
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>I. ACCESSORIES DEFINITION.</p> <p><input checked="" type="checkbox"/> 6 Test Switch, Momentary.</p> <p><input type="checkbox"/> 6A Test Switch, Maintained/Momentary. Door mount.</p> <p><input type="checkbox"/> 6AP Test Switch Maintained/Momentary Utilizing Keypad.</p> <p><input type="checkbox"/> 6B Test Switch, Maintained-Auto/Momentary-test, Key Operated.</p> <p><input type="checkbox"/> 6C Test Switch, Maintained-Auto/Mantained-test, Key Operated.</p> <p><input checked="" type="checkbox"/> A1 Auxiliary Contact, Operates on Source 1 line failure.</p> <p><input checked="" type="checkbox"/> A1E Auxiliary Contact, Operates on Source 2 line failure.</p> <p><input checked="" type="checkbox"/> A3 Auxiliary Contact Closed when the switch is in Source 2 position.</p> <p><input checked="" type="checkbox"/> A4 Auxiliary Contact Closed when the switch is in Source 1 position.</p> <p><input type="checkbox"/> A62 Sequential Universal Motor load Disconnect Circuit.</p> <p><input type="checkbox"/> B9 Battery charger.</p> <p><input checked="" type="checkbox"/> CALIBRATE Source 1 & Source 2 Calibrate capabilities for voltage a frequency.</p> <p><input checked="" type="checkbox"/> CDP Clock Exerciser Load / No Load, one event: allows the Generator to start and run unloaded or simulate a power failure, start Generator and run under load. Can be configured by end user for a 1, 7, 14, 28, or 365 day cycle. A total of 7 independent exercise periods (up to 10 hours each) can be programmed for each of the daily, weekly, 14-day, and 28-day Exercisers. A total of 12 independent exercise periods (up to 10 hours each) can be programmed for the 365-day Exerciser. When exercise is impending, (*E*) appears in the upper right hand corner of LCD screen. configured via CFG menu and set via SET menu.</p> <p><input type="checkbox"/> CDT Timer Exerciser Load / No Load, one event: allows the Generator to start and run unloaded or simulate a power failure, start Generator and run under load. Can be configured by end user for a 1, 7, 14, or 28 day cycle. Exercise duration can be set between 5 and 60 minutes in 1 minute increments. Factory default is 20 minutes. When exercise is impending, (*E*) appears in the upper right hand corner of LCD screen. configured via CFG menu and set via SET menu.</p> <p><input type="checkbox"/> CTAP Alarm Panel on transfer to Source 2 w/Silence button.</p> <p><input checked="" type="checkbox"/> DS Disconnect Switch, Auto /Inhibit. Inhibits transfer in either direction when in inhibit. Allows automatic operation when in Auto.</p> <p><input checked="" type="checkbox"/> DT Time delay from Neutral switch position to Source 1 position.</p> <p><input checked="" type="checkbox"/> DW Time delay from Neutral switch position to Source 2 position.</p> <p><input checked="" type="checkbox"/> E Engine Start Contact.</p> <p><input type="checkbox"/> EL/P Event Log: Sequentially Numbered Log of 16 events that track date, time, reason and action taken.</p> <p>System Data: Total Life Transfers (N2P) Days Powered Up Total Transfers to S2 Total S1 Failures Total S1 available in hours Total S2 available in hours. (NIP)</p> <p><input type="checkbox"/> F Fan contact operates when generator is running.</p> <p><input type="checkbox"/> HT Heater and Thermostat.</p> <p><input type="checkbox"/> K Frequency Meter, Door mount.</p> <p><input checked="" type="checkbox"/> KP Frequency, LCD-Indication S1 & S2</p> <p><input checked="" type="checkbox"/> L Indicating LED lights. L1 Indicates Switch in Source 2 position. L2 Indicates Switch in Source 1 position. L3 Indicates Source 1 available. L4 Indicates Source 2 available. LN center-off position LCD-indicator.</p> </div> <div style="width: 48%;"> <p><input type="checkbox"/> M1 Single Phase Ampere Meter</p> <p><input type="checkbox"/> M2 Three Phase Ampere Meter</p> <p><input type="checkbox"/> M3 Single Phase Volt Meter</p> <p><input type="checkbox"/> M4 Three Phase Volt Meter</p> <p><input type="checkbox"/> M90 2000 Digital Power Monitor Δ</p> <p><input type="checkbox"/> M91 EPM 6000 Digital Power Meter w/RS485 Δ</p> <p><input type="checkbox"/> N1 Running Time meter, Door Mount.</p> <p><input type="checkbox"/> N2 Operation Counter meter, Door Mount.</p> <p><input checked="" type="checkbox"/> P1 Time Delay Source 2 Start. Adjustable 0 to 10s.</p> <p><input type="checkbox"/> P2 Time Delay Source 2 Start. Adjustable 1/6 to 300s.</p> <p><input checked="" type="checkbox"/> Q2 Peak Shave/Remote Load Test:Input for Peak Shave or Remote Load Test. Includes automatic return to Source 1 if Source 2 fails and Source 1 present.</p> <p><input checked="" type="checkbox"/> Q3 Inhibit Transfer to Source 2 Circuit.</p> <p><input checked="" type="checkbox"/> Q7 Inhibit Transfer to Source 1 Circuit.</p> <p><input checked="" type="checkbox"/> R2E Under voltage sensing of Source 2 for single-phase. (R17 replaces R2E for Utility to Utility switches)</p> <p><input checked="" type="checkbox"/> R1-1/R1-3 Source 1 Over Voltage sensing for single and three phase systems.</p> <p><input type="checkbox"/> R16 Phase Rotation Sensing</p> <p><input type="checkbox"/> R26 Interruptable Power Rate Provisions</p> <p><input type="checkbox"/> R50 In-Phase Monitor. Prevents transfer until two sources are in-phase.</p> <p><input checked="" type="checkbox"/> S5 Auto/Semi Manual selector, Utilizing keypad</p> <p><input type="checkbox"/> S12 Auto/Manual selector, Utilizing keypad</p> <p><input checked="" type="checkbox"/> S13 Transfer Commit or no Commit to transfer upon Engine start.</p> <p><input type="checkbox"/> S14 Test/Auto/Source 1 Selector, Door mount</p> <p><input type="checkbox"/> SW1 Auto/Off/Start Engine control selector Door mount</p> <p><input type="checkbox"/> SW2 Auto/Off Engine control selector Door mount</p> <p><input type="checkbox"/> SW3 Source Priority Selector Switch Door mount</p> <p><input checked="" type="checkbox"/> T Time Delay to SOURCE 1 stable timer</p> <p><input type="checkbox"/> T3/W3 Elevator Pre-Signal Auxiliary Contacts: Open 0-60s prior to transfer to either direction, re-closes after transfer.</p> <p><input type="checkbox"/> U Source 2 Stop Delay Timer.</p> <p><input checked="" type="checkbox"/> UMD Universal Motor Load Disconnect Circuit.</p> <p><input checked="" type="checkbox"/> VI Voltage Imbalance Sensing (Three Phase)</p> <p><input checked="" type="checkbox"/> W Time Delay (S2) Source 2 Stable Timer. To delay transfer to Source 2.</p> <p><input checked="" type="checkbox"/> YEN Bypass T and W Timers utilizing keypad.</p> <p><input type="checkbox"/> ZNET Network Communication Interface Card.</p> </div> </div>								
<p>THIS DOCUMENT AND THE DETAILS EMBODIED THEREIN CONSTITUTE CONFIDENTIAL AND PROPRIETARY INFORMATION WHICH IS THE PROPERTY OF CATERPILLAR, INC., AND IS NOT TO BE USED OR REPRODUCED BY ANY PART EXCEPT AND TO THE EXTENT IN THE MANNER AUTHORIZED BY CATERPILLAR, INC.</p> <p>THIRD ANGLE PROJECTION</p> 		<p>FOR ADDITIONAL INFO REFER TO</p> <p>APPLIED PRACTICES: UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES</p> <p>TOLERANCES ON:</p> <p>2 PL. DECIMALS $\pm .020$</p> <p>3 PL. DECIMALS $\pm .005$</p> <p>ANGLES $\pm 1^\circ$</p> <p>FRACTIONS $\pm 1/64$</p> <p>FINISH \checkmark</p> <p>AutoCAD Generated</p>			<p>SIGNATURES</p> <p>DATE</p> <p>MODEL GG 04/28/03</p> <p>CHECKED</p> <p>ENGRG FS</p> <p>MFG</p> <p>QUALITY</p> <p>ISSUED</p> <p>DRAWING FILE: 73a-0900-c-2.dwg</p> <p>MODEL / ASSEMBLY FILE: CTS40-400A</p> <p># CTOs \ominus CRITICAL TO QUALITY CHARACTERISTIC</p>		<p style="text-align: center;">CATERPILLAR®</p> <p style="text-align: center;">LEGEND, OPERATION, AND ACCESSORIES</p> <p>FIRST MADE FOR: CTS40-400A</p> <p>SIZE B CAGE CODE DWG NO 73A-0900</p> <p>SCALE: NA SHEET 2 OF 2</p>	





1x225A
1x400A

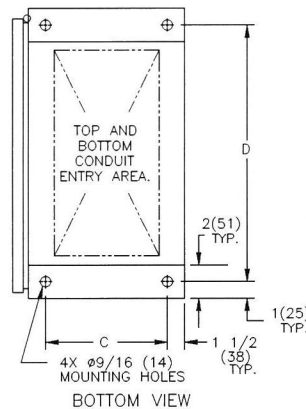
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
L	S-8605 ESTABLISHED DRAWING	1-26-07	CEE MAS

NOTES:

- ALL DIMENSIONS ARE FOR REFERENCE ONLY AND SHOWN IN INCHES (mm).
- SEISMIC DATA OF MOST VULNERABLE ATS CONSTRUCTION WITHIN ITS PLATFORM:

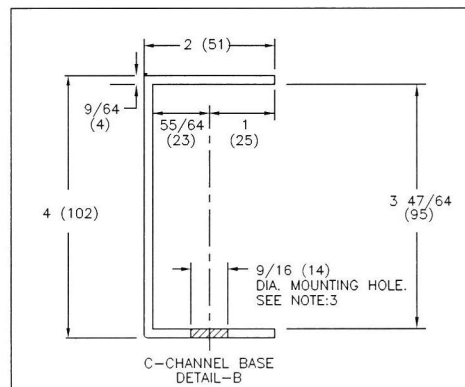
MAXIMUM DEFLECTION AT TOP OF GEAR:		dss=0.69 INCHES (18mm)
		dfb=0.21 INCHES (5mm)
QUALIFIED BY:		TIME HISTORY SHAKE TABLE TEST
		IEEE-693-2005-HIGHx2.5 (64mm)
		IBC-2003-300%G
RESONANCE FREQUENCIES:		fss=10.9Hz
		ffb=19.5Hz
		fv=33.0Hz
MAXIMUM REACTION TO ANY BOLT:		Vsg=945 LBS (430kg) SHEAR
		(DEAD LOAD +/- SEISMIC)
		Vfb=945 LBS (430kg) SHEAR
		Tv=1872 LBS (851kg) UP
		Pv=2613 LBS (1188kg) DOWN

- BOLT ENCLOSURE FROM C-CHANNEL BASE (SEE DETAIL B) USING THE FOLLOWING SEISMIC CERTIFIED MOUNTING HARDWARE PER MOUNTING HOLE:
(HARDWARE PROVIDED BY INSTALLER).
 - 1/2-13 GRADE 5 BOLT TORQUE TO 15 FT-LBS. (95Nm).
 - US STANDARD HIGH STRENGTH ZINC-PLATED FLAT WASHER 5/8 (16) I.D. AND 1-1/2 (38) O.D.
 - 1/2 (13) HELICAL SPRING LOCK WASHER.

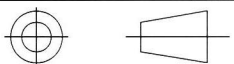


1x225A
1x400A

CABINET DIMENSIONS				
CABINET	A	B	C	D
F-1830MP	24 (610)	20 (508)	--	--
F-1834MP	40 (1016)	36 (914)	15 1/2 (394)	38 (965)
F-1828MP	18 (457)	16 (406)	--	--



THIRD ANGLE PROJECTION



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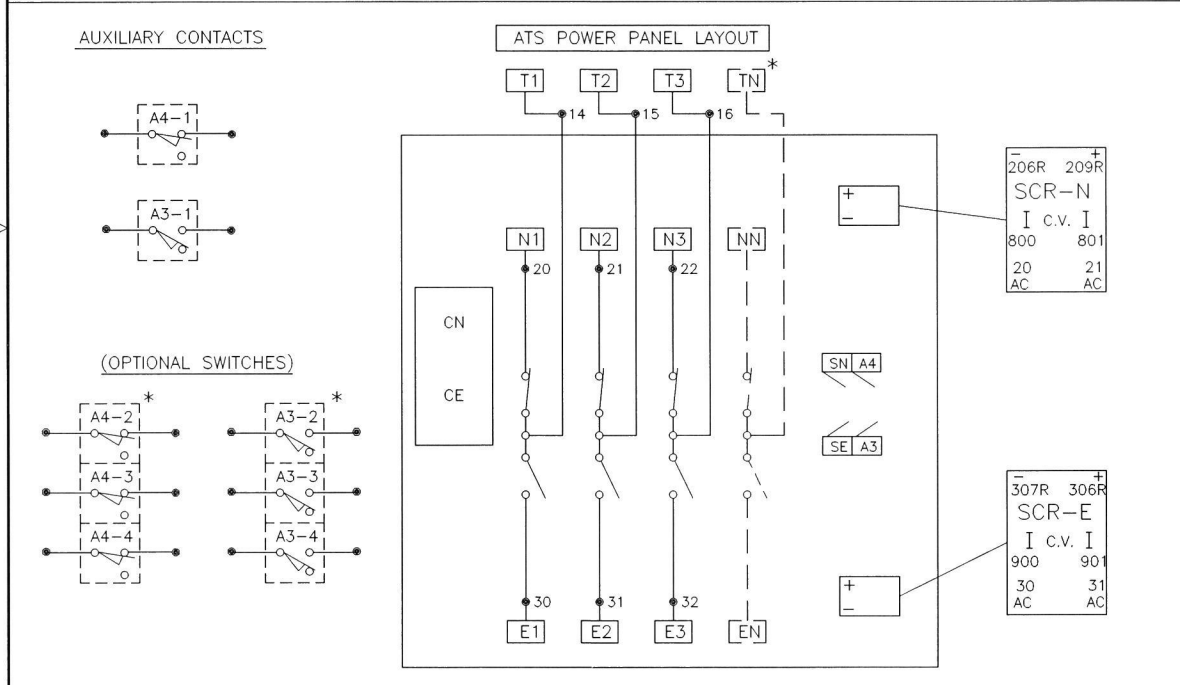
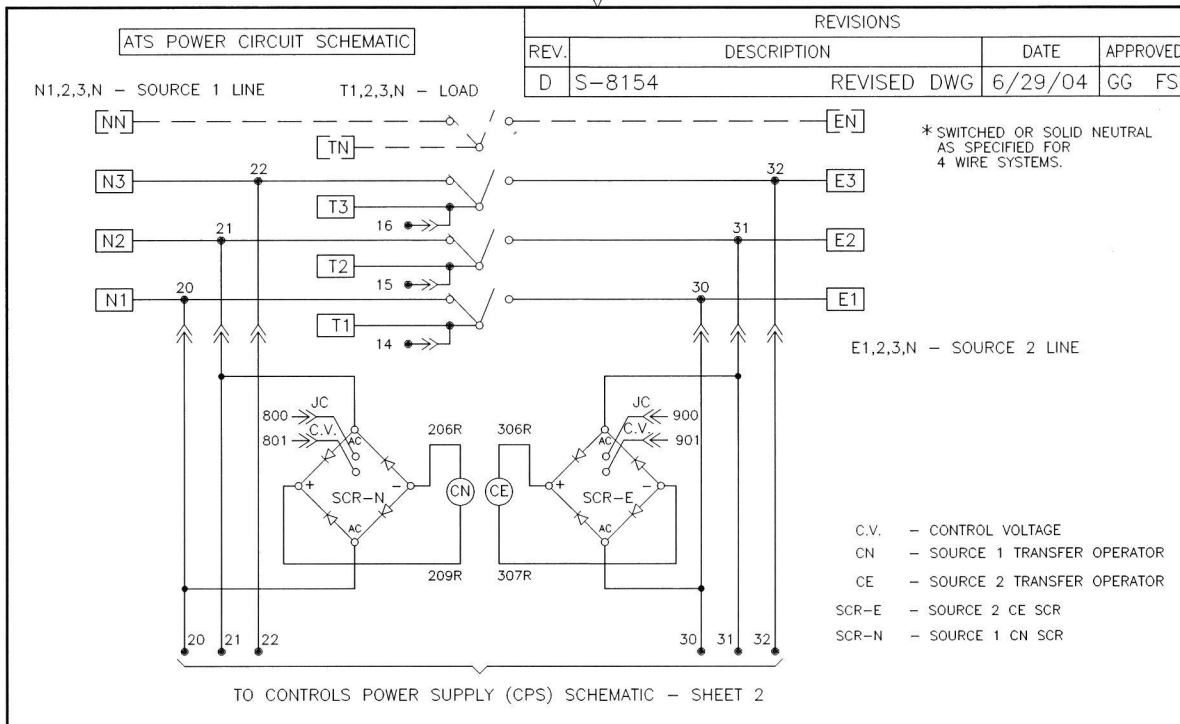
AutoCAD Generated

SIGNATURES	DATE
MODEL EC	11/01/00
DETAIL	
CHECKED	
ENGRG	
MFG	
QUALITY	
ISSUED	
DRAWING FILE:	50C-1034-I-4.dwg
MODEL / ASSEMBLY FILE:	CTS(D/CT) (40-800A)
# CTS	⊖ CRITICAL TO QUALITY CHARACTERISTIC

CATERPILLAR®

TITLE
NEMA 1
ENCLOSURE SEISMIC MTG. DETAIL

FIRST MADE FOR:		DWG NO
SIZE B	CAGE CODE	50C-1034
SCALE: N/A	SHEET 4 OF	SECTION 2A



NOTES

ATS SHOWN IN SOURCE 1 POSITION WITH NO POWER AVAILABLE.

LEGEND

- WIRE CONNECTION
- WIRE ON TERMINAL BLOCK
- ➔ WIRE IN INTERCONNECT PLUG
- * OPTIONAL

REFERENCE

LEGEND, OPERATION, AND ACCESSORIES:
73A-0900
FOR PRODUCTION ONLY:
CPS AND PLUGS - SEE SHT 2
MX250 CONTROLLER - 71A-0500

LIMIT SWITCH SCHEMATIC

SE - SOURCE 2 LIMIT SWITCH
SN - SOURCE 1 LIMIT SWITCH
DS - DISCONNECT SWITCH ON MX250

TO MX SERIES

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THIRD ANGLE PROJECTION

FOR ADDITIONAL INFO REFER TO		SIGNATURES	DATE
APPLIED PRACTICES	MODEL	GG	04/07/03
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DETAIL		
TOLERANCES ON:	CHECKED		
2 PL. DECIMALS ± .020	ENGRS	FS	
3 PL. DECIMALS ± .005	MFG		
ANGLES ± 1°	QUALITY		
FRACTIONS ± 1/64	ISSUED		
FINISH	DRAWING FILE:	71A-2000-d-1.dwg	
✓	MODEL / ASSEMBLY FILE:	CTS(2/3/4)(225-400A)	
AutoCAD Generated	# CTOs	⊖ CRITICAL TO QUALITY CHARACTERISTIC	

CATERPILLAR®

ATS POWER CIRCUIT & LAYOUT

225A & 400A

FIRST MADE FOR: CTS(2/3/4)(225-400A)

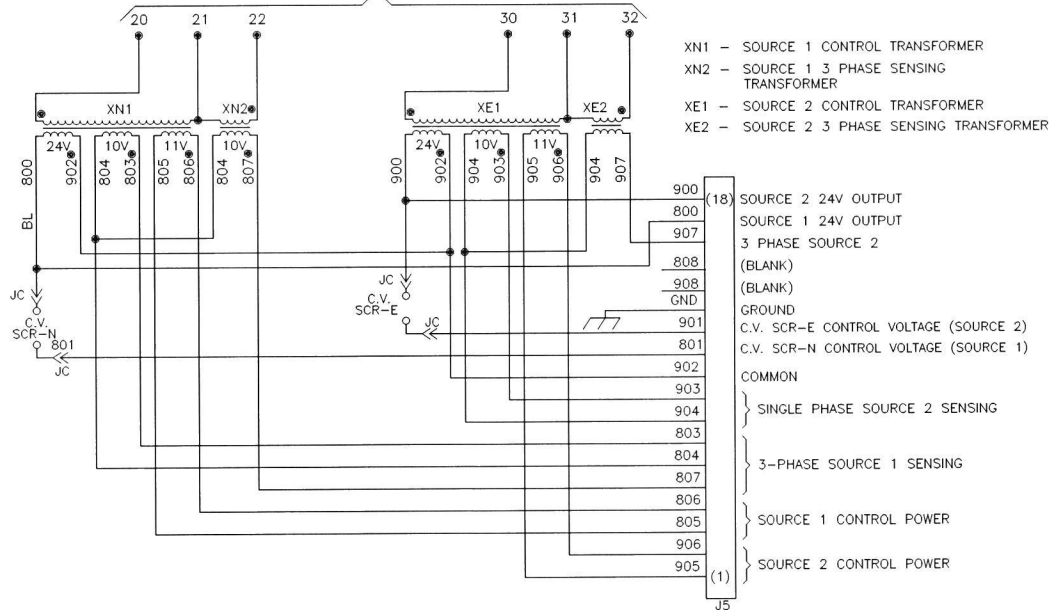
SIZE	CAGE CODE	DWG NO
B		71A-2000

SCALE: N/A SHEET 1 OF 2

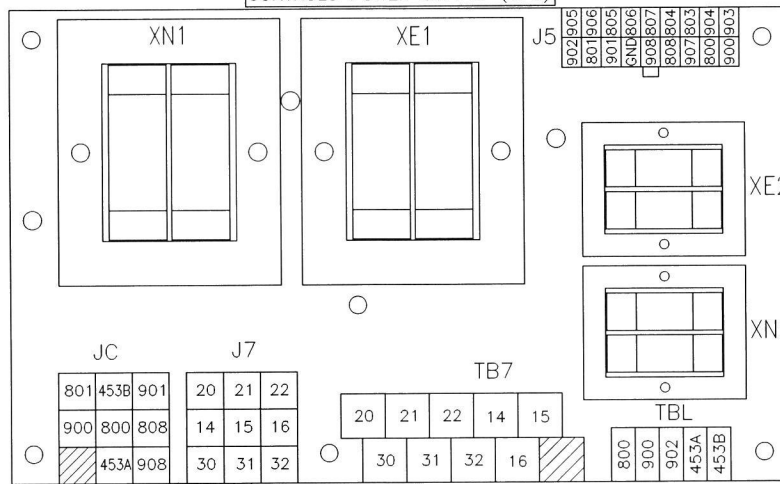
CONTROLS POWER SUPPLY (CPS) SCHEMATIC

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
D	S-8154	REVISED DWG 11/22/04	GG FS

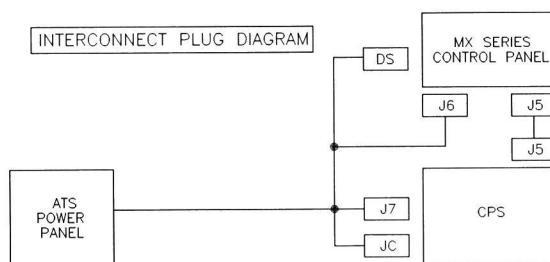
TO POWER CIRCUIT SCHEMATIC - SHEET 1



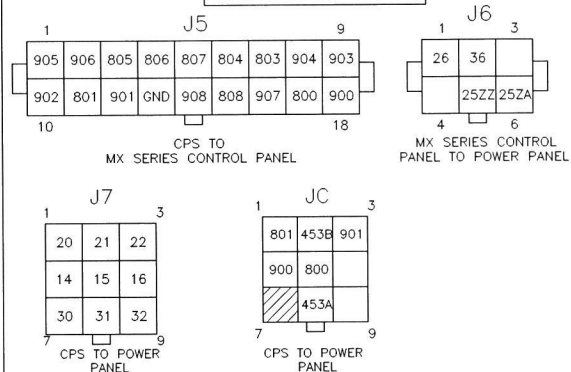
CONTROLS POWER SUPPLY (CPS)



INTERCONNECT PLUG DIAGRAM



INTERCONNECT PLUGS



LEGEND

—●— WIRE CONNECTION

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THIRD ANGLE PROJECTION



FOR ADDITIONAL INFO REFER TO

APPLIED PRACTICES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

TOLERANCES ARE:

2 PL DECIMALS ± .020

3 PL DECIMALS ± .005

ANGLES ± 1°

FRACTIONS ± 1/64

FINISH

AutoCAD Generated

SIGNATURES

MODEL GG

CHECKED

ENGR FS

MFG

QUALITY

ISSUED

DRAWING FILE: 71a-2000-d-2.dwg

MODEL / ASSEMBLY FILE: CTS(2, 3, 4)(225-400A)

CTS

DATE

04/08/03

TITLE

CONTROLS POWER SUPPLY(CPS) INTERCONNECT PLUGS

FIRST MADE FOR: CTS(2, 3, 4)(225-400A)

SIZE CAGE CODE

DWG NO

71A-2000

SCALE: N/A

SHEET 2 OF 2

SECTION 2A

Page 150 of 182

XXXXXXXXXX



REVISIONS	
REV.	DESCRIPTION
C	S-8079
REVISED DWG 3/17/04 AMG FS	

CONNECTION DIAGRAM	SCHEMATIC

LEGEND & OPERATION	TO CONFIGURE TIMERS
<p>A1 - Auxiliary Contact, Operates on Source 1 Line Failure.</p> <p>A1E - Auxiliary Contact, Operates on Source 2 Line Failure.</p> <p>Q2 - Remote Peak Shave or Area Protection Circuit. Energize Q2 input to simulate a Source 1 line failure causing the Generator to start and transfer the load to Source 2. Should Source 2 fail during this operation, the transfer switch will retransfer back to Source 1.</p> <p>Q3 - Remote Inhibit Transfer to Source 2 Circuit. Voltage applied to Q3 input will allow transfer to Source 2, conversely, no input on Q3 will result in no transfer to Source 2.</p> <p>* To enable Q3 option engage Q3 jumper.</p> <p>Q7 - Remote Inhibit Transfer to Source 1 Circuit. Energize Q7 input to prevent transfer to Source 1.</p> <p>S5P - In "AUTO", retransfer to Source 1 is Automatic after T timer times out. T time delay is bypassed if Source 2 fails. In "MANUAL", retransfer to Source 1 is upon depression of YN or if Source 2 fails.</p> <p>Connections & Instructions:</p> <p>1 - Add wire jumper between J2 pin 3 and J4 pin 14.</p> <p>2 - Programming: Enable (S5) Auto/Manual option.</p> <p>T3/W3 - Transfer pre-signal time delay.</p> <p>- Normally open Auxiliary contact for elevator pre-signal.</p> <p>- Closes 0-60s prior to transfer in either direction and reopens after transfer.</p> <p>- Timers are adjustable, 0-60s in 1 second increments, factory default is 5s.</p> <p>- Timers are bypassed when transferring from dead source.</p> <p>UMD - Universal Motor Load Disconnect Circuit.</p> <p>- Normally closed Auxiliary contact for Motor Disconnect loads.</p> <p>- Opens 0-60s prior to transfer, after transfer or both in either direction then recloses after transfer.</p> <p>- Timers adjustable 0-60s in 1 second increments, factory default is 5s.</p> <p>- Timers are NOT bypassed when transferring from dead source.</p>	<p>1. Press MORE then CFG.</p> <p>2. Press MORE to scroll to "CONFIG LOAD DISCONNECT T/D" screen.</p> <p>3. The third line of the "CONFIG LOAD DISCONNECT T/D" screen will show either PRE, POST, BOTH, or OFF.</p> <p>4. If the third line shows the desired selection, press MORE repeatedly to BACK. Press ESC then proceed to the SET Menu to set the timers.</p> <p>5. If the third line is not showing the desired selection, press SEL.</p> <p>6. Enter Access code located on white label on the back of the controller.</p> <p>7. Press UP or DOWN to select PRE, POST, BOTH or OFF as desired.</p> <p>8. Press SAVE.</p> <p>9. Press MORE repeatedly to BACK.</p> <p>10. Press ESC to S1 OK screen.</p> <p>TO SET TIMERS:</p> <p>FROM S1 OK SCREEN</p> <p>1. Press MORE.</p> <p>2. Press SET to SET USER SETUP menu.</p> <p>3. Press MORE to scroll to SET "LOAD DISCONNECT TD" or "LOAD PRESIGNAL TD" then press SEL.</p> <p>4. Enter Access code located on in white label on the inside cover, then press.</p> <p>5. Cursor is indicated as a line under character to be changed. Change values with up and down keys. Press SAVE after each entry to move to the next value to be changed.</p> <p>6. When complete, press MORE to scroll to BACK.</p> <p>7. Press ESC to the S1 OK screen.</p> <p>8. During operation, ATA (Alternate Timer Active), indicates that there is another timer that is active or about to be active during or after the present timing cycle.</p> <p>9. To display the status of that timer, press MORE.</p>

NOTES
1. MOUNT MODULES ON DIN RAIL ON MX250 CONTROL PANEL TOP TO BOTTOM, AS SHOWN.
2. PLACE IDENTIFICATION LABEL ON INPUT MODULE AND FILL IN OPTION CODE AS REQUIRED.
* To enable Q3 option, engage Q3 jumper.

FOR ADDITIONAL INFO REFER TO	SIGNATURES	DATE
APPLIED PRACTICES	MODEL GG	3/20/03
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DETAIL	
TOLERANCES ON:	CHECKED	
2 PL. DECIMALS ± .020	ENGRG FS	
3 PL. DECIMALS ± .005	MFG	
ANGLES ± 1°	QUALITY	
FRACTIONS ± 1/64	ISSUED	
FINISH	DRAWING FILE: 71r-2083-c-1.dwg	FIRST MADE FOR: SIZE B CAGE CODE
AutoCAD Generated	MODEL / ASSEMBLY FILE:	DWG NO 71R-2083
	# CTOs	SCALE: NA
	CRITICAL TO QUALITY CHARACTERISTIC	SHEET 1

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THIRD ANGLE PROJECTION

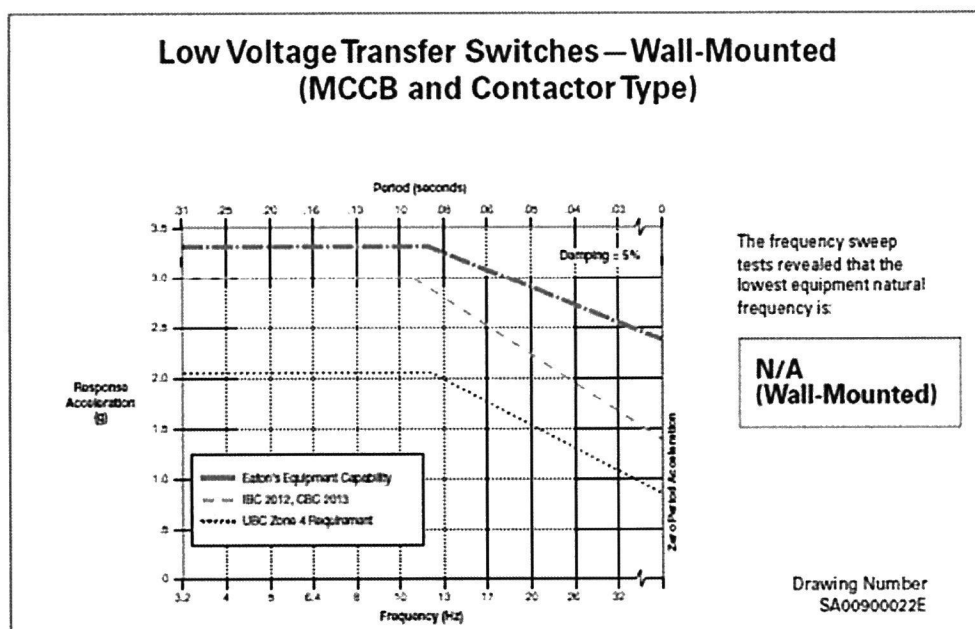
CATERPILLAR®
(SPES)
OPTION PACKAGE

SECTION 2A
Page 151 of 182

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Wall Mounted ATS Test Certificate of Seismic Withstand Capability

Cat® ATS equipment identified below was tested for both seismic withstand capability and in accordance with the combined requirements specified in the International Building Code, and the Uniform Building Code. As required by the codes, the equipment demonstrated its ability to function after the seismic tests. The seismic capability of the equipment exceeds the worst-case required levels, as illustrated in the figure below.



William V. Joerger, S.E.
ISAT

WV Joerger
3RD PARTY TEST ENGINEER IN CHARGE

TESTED BY
Wyle Laboratories
January, 2013-70461R12

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www.Cat-ElectricPower.com

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XE0091-02 (10/15)

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Coordinated Breaker Model Types (Cont.)

WITHSTAND RATING:
35KAIC ANY / 50KAIC SPECIFIC

GE ZENITH MODEL FAMILY	AMP	UL SHORT-TIME RATING (STR) & TIME (SEC-MAX)	TIME BASED WCR RATING (A) & TIME (SEC-MAX) <small>NOTE 1</small>	MAXIMUM VOLTAGE	MAXIMUM COORDINATED BREAKER RATING (A)	BREAKER MFR	MAX BREAKER AMPERAGE	BREAKER TYPE	CURRENT LIMITING FUSE RATING (A)	MAX FUSE SIZE
ZTX (300-400A)	40	-	35,000	240V	65,000	Schneider	600A	LJ, LL, LR	200,000 (Class J)	600A
ZTG (OT) (400A)	80		0.050 Sec			General Electric	150A	SEL, SEP, PE_N, PE_H, PE_L	100,000 (Class RK5, RK1)	
	100						250A	SFL, SFP, PE_N, PE_H, PE_L		
	150						400A	SGL, SGP		
	200						600A	SGL, SGP, FGL, FGP		
ZTG (DT) (40-400A)	225									
	260									
	300									
	400									
ZTS (OT) (225- 400A)				480V	50,000	Eaton	250A	HJD, JDC, JGC, JGH, JGU, JGX		
							400A	CHLD4, CLD, HLD4, CLDC, LDC, KDC, HKD, CHMDL4, CMDL4		
							600A	CHLD6, HDL6, CHMDL6, CMDL6, CLDC, CLD6, LDC6, CLDC6		
							800A	CHMDL8, HMDL8, MDL8, CMDL8		
ZTS (DT, CT) (40-400A)										
ZBTS (OT, DT) (100-400A)										
ZTE (OT) (225-400A)						ITE/ Siemens	250A	CFD6, HFD6, HFXD6, HHFD6, HHFXD6		
							400A	CJD6		
							600A	CLD6, HHLD6, HHLXD6, HLD6, HLXD6		
							800A	CMD6, MD6, HMD6, HMXD6, MXD6		
ZTE (DT, CT) (40-400A)						General Electric	150A	SEL, SEP, PE_N, PE_H, PE_L		
							250A	SFL, SFP, PE_N, PE_H, PE_L		
							400A	SGL, SGP		
							600A	SGL, SGP, FGL, FGP, PG_N, PG_H, PG_L, PG_P		
ZBTE (OT, DT) (100-400A)						Schneider	150A	HJ, HL, HR		
							250A	JJ, JL, JR		
							600A	LJ, LL, LR		
							800A	MJ		
					100,000	General Electric	600A	PG_H, PG_L, PG_P		

600V rating is shown on next page
See page 17 for note details

Each ATS has Rating Label per UL 1008 Marking Requirements as Shown in Fig 1.

600-800 AMPS TRANSFER SWITCH EQUIPMENT TYPE A(PC)

FOR USE ON EMERGENCY OR STAND-BY SYSTEMS RATED FOR TOTAL SYSTEM OR MOTOR LOADS

Suitable for control of motors, electric discharge lamps, tungsten filament lamps and electric heating equipment where the sum of motor full-load ampere ratings and the ampere rating of other loads do not exceed the ampere rating of the switch and the tungsten load does not exceed 30 percent of switch rating.
Rated Frequency : 50/60 Hz
IEC Utilization Category : 32A, 32B

SHORT-CIRCUIT RATING

When protected by a circuit breaker, this Transfer Switch is suitable for use in a circuit capable of delivering the Short-Circuit current for the maximum time duration and voltage marked below. The circuit breaker must include an instantaneous trip response and shall not include a short-time response. The maximum clearing time of the instantaneous trip response must be equal to or less than the time duration shown for the marked short-circuit current.

Switch Amperes	Short-Circuit Current (RMS Symmetrical Amperes x 1000)	Voltage (VOLTS AC, Maximum)	Time Duration (Sec. Maximum)	Agency
600-800A	50	480	0.050	UL / IEC / CSA
600-800A	42	600	0.050	CSA

SHORT-TIME CURRENT RATING

This Transfer Switch does not include Short-Time Current Ratings

SHORT-CIRCUIT RATING WHEN PROTECTED BY FUSE

When protected by a fuse of the specific fuse class and maximum amperage rating as marked below, this transfer switch is suitable for use in circuits capable of delivering the Short-circuit current at the maximum voltage marked.

Switch Amperes	Short-Circuit Current (RMS Symmetrical Amperes x 1000)	Voltage (VOLTS AC, Maximum)	Fuse Class	Rating Amperes	Agency
600A	200	480	L, J, RK5, RK1	750A Max.	UL / IEC / CSA
600A	150	600	L, J, RK5, RK1	750A Max.	CSA
800A	200	480	L	1200A Max.	UL/IEC/CSA

SHORT-CIRCUIT RATINGS WHEN USING SPECIFIC CIRCUIT BREAKERS

When protected by a circuit breaker of specific manufacturer, type, and ampere rating as marked below, this Transfer Switch is suitable for use in a circuit capable of delivering the Short-Circuit current at the maximum voltage marked below.

	UL/IEC/CSA 480V. max. Short-Circuit Current (RMS SYMM AMPs X 1000)	CSA 600V. max. Short-Circuit Current (RMS SYMM AMPs X 1000)
With Specific manufacturing molded case circuit breakers (MCCB) per table A below	65	
With Specific manufacturing molded case circuit breakers (MCCB) per table B below		50

TABLE A

Manufacturer	Max. Amp	Type
Eaton	600A, 800A	HLD, CHLD, LDC, CLDC HMDL, HMDLB, CHMDL, NB TRI PAC
ITE/Siemens	600A, 800A, 1200A, 1600A	CLD6, SHLD6, SCLD6, HLD6, HLXD6, HHLD6, HHLXD6 CMD6, HMXD6, HMD6, SCMD6, SHMD6, SCND6, SHND6, HND6, HNXD6, CND6 HRD6, HRXD6
General Electric	600A, 1200A	SGH, SGL, SGP SKL, SKP, SKT, SKS
Schneider	600A, 1200A, 1600A	LJ, LL, LR PJ MASTERPACT NW

TABLE B

Eaton	600A, 800A	LDC, CLDC NB TRI PAC, DSL206
Schneider	600A, 800A, 1200A	LI, LXI NC, NE, NX PK
ITE/Siemens	600A, 800A, 1200A	CLD6, HHLD6, HHLXD6, SCLD6, SHLD6 CMD6, HMD6, SCMD6, SCND6, SHMD6, SHND6 CND6, SCND6
General Electric	600A, 800A, 1200A	TB6, SGL6, SGP6 TB8, THP, THC, SKP8 SKP

Fig 1 (Label shown for reference only)

GE
4200 Wildwood Parkway
Atlanta, GA 30339
www.geindustrial.com

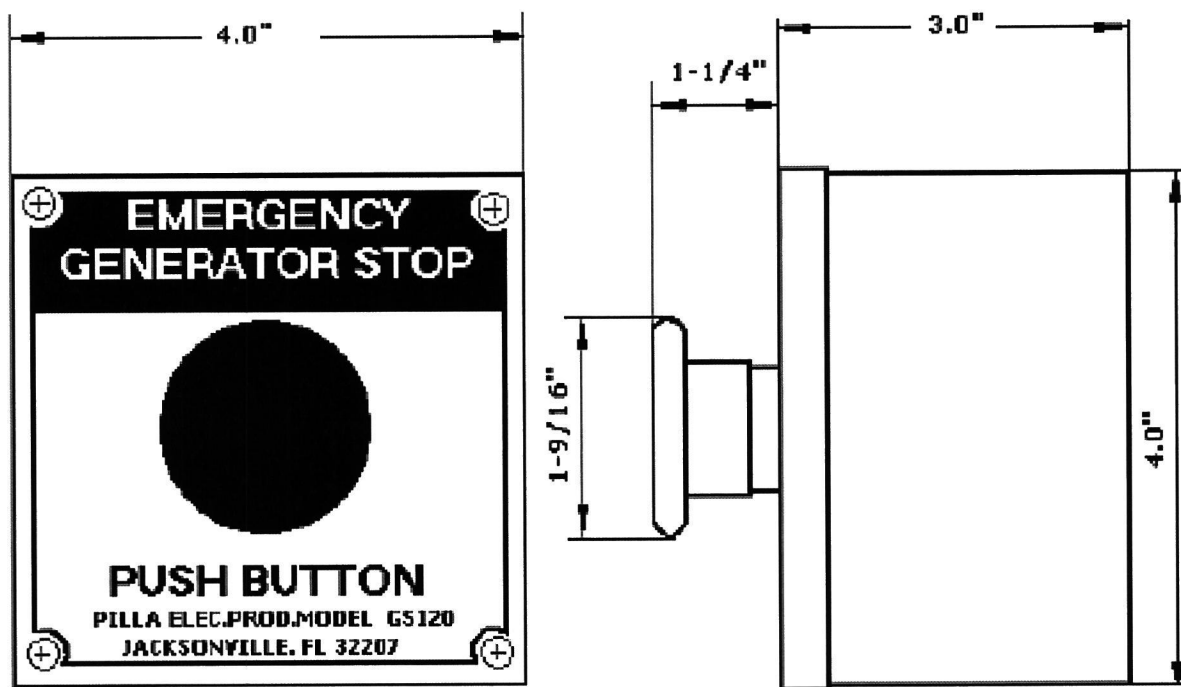
*Registered trademark of the General Electric Company.
The GE brand, logo, and lumination are trademarks of the General Electric Company. © 2017 General Electric Company.
Information provided is subject to change without notice. All values are design or typical values when measured under laboratory conditions.

TB-1102, Rev. 02/2018

V

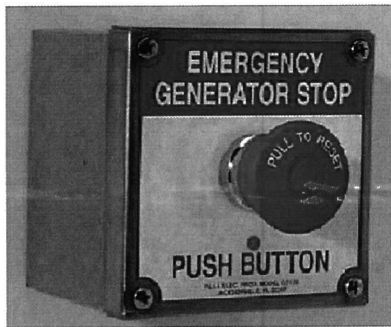
REMOTE E-STOP

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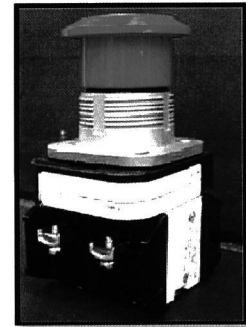
PILLA MODEL GS120N1 (Generator Stop) PUSH BUTTON STATION

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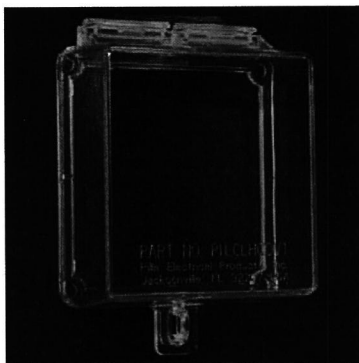
GS120

EMERGENCY GENERATOR STOP OPERATOR STATION PUSH BUTTON



For all industrial, institutional and marine generator set applications including those under N.E.P.A. requirements 99 & 110. Full range of options available.

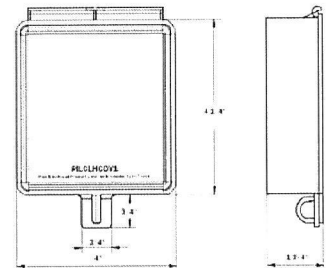
SERIES GS120 EMERGENCY GENERATOR STOP Push Button Station
Maintained (Pull to Reset) 40mm mushroom operator is standard



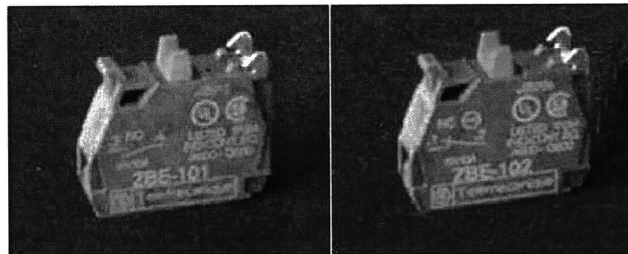
PILCLHCOV1

One clear Hinged cover fits all one device/push button model series and one-two device/Power Control series, provision for padlock/seal. Can be adapted for use with , and is same outside dimension as 4X4 wall box.

CLOSE WINDOW



PILCLHCOV1
CLEAR HINGED COVER FITS ALL PUSH BUTTON STATIONS AND FOR CONSOLE PANEL APPLICATIONS



PILNOCB

PILNCCB

Rated operational characteristics Conforming to IEC/EN 60947-5-1	AC supply : Utilization category AC-15	Standard blocks (single or double) with screw clamp terminals: A600 Ue =600 Vac and Ie = 1.2 a or Ue = 240 Vac and Ie= 3 A or Ue = 120 Vac and Ie =6 A Continuous Thermal Current : 10 A
	DC supply : Utilization category DC-13	Standard single or double blocks with screw clamp terminals: Q600: Ue = 600Vac and Ie = 1.2 a or Ue = 250 Vdc and Ie = 0.27 A or Ue = 125 Vdc and Ie = 0.55 A Joystick XD4-PA: R300; Ue 125 Vdc and Ie = 0.22 A or Ue = 250 Vdc and Ie = 0.1 A

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ZBE101 - PILNOCB

single contact block for head Ø22 1NO screw clamp terminal



Main

Range of product	Harmony XB4 Harmony XB5
Product or component type	Contact block
Device short name	ZBE
Sale per indivisible quantity	5
IP degree of protection	IP20 conforming to IEC 60529
Contacts type and composition	1 NO
Contacts operation	Slow-break
Contact block type	Single
Contacts usage	Standard contacts
Connections - terminals	Screw clamp terminals : $\geq 1 \times 0.22 \text{ mm}^2$ without cable end conforming to EN 60947-1 Screw clamp terminals : $\leq 2 \times 1.5 \text{ mm}^2$ with cable end conforming to EN 60947-1

Complementary

Terminals description ISO n°1	(13-14)NO
Product weight	0.011 kg
Positive opening	Without positive opening
Operating travel	4.3 mm (total travel) 2.6 mm (NO changing electrical state)
Operating force	2.3 N (NO changing electrical state)
Operating torque	0.05 N.m (NO changing electrical state)
Mechanical durability	5000000 cycles
Tightening torque	0.8...1.2 N.m conforming to EN 60947-1
Shape of screw head	Slotted head compatible with flat Ø 5.5 mm screwdriver Slotted head compatible with flat Ø 4 mm screwdriver Cross head compatible with pozidriv No 1 screwdriver Cross head compatible with Philips no 1 screwdriver
Contacts material	Silver alloy (Ag/Ni)
Short circuit protection	10 A cartridge fuse type gG conforming to EN/IEC 60947-5-1
[Ith] conventional free air thermal current	10 A conforming to EN/IEC 60947-5-1
[Ui] rated insulation voltage	600 V (degree of pollution: 3) conforming to EN 60947-1
[Uimp] rated impulse withstand voltage	6 kV conforming to EN 60947-1
[Ie] rated operational current	1.2 A at 600 V, AC-15, A600 conforming to EN/IEC 60947-5-1 0.55 A at 125 V, DC-13, Q600 conforming to EN/IEC 60947-5-1 0.27 A at 250 V, DC-13, Q600 conforming to EN/IEC 60947-5-1 0.1 A at 600 V, DC-13, Q600 conforming to EN/IEC 60947-5-1 6 A at 120 V, AC-15, A600 conforming to EN/IEC 60947-5-1 3 A at 240 V, AC-15, A600 conforming to EN/IEC 60947-5-1
Electrical durability	1000000 cycles, DC-13, 0.5 A at 24 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, DC-13, 0.2 A at 110 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, AC-15, 4 A at 24 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, AC-15, 3 A at 120 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, AC-15, 2 A at 230 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C

The information provided in this documentation contains general descriptions and/or technical characteristics of the products of the Schneider Electric group. It is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the responsibility of the user to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

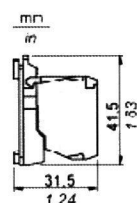
Electrical reliability IEC 60947-5-4	$\Lambda < 10\exp(-8)$ at 17 V, 5 mA in clean environment conforming to EN/IEC 60947-5-4 $\Lambda < 10\exp(-7)$ at 5 V, 1 mA in clean environment conforming to EN/IEC 60947-5-4
Mounting of block	Front mounting
Additional information	Mounting on pushbutton collar
Electrical composition code	C13 (quantity <= 1) M4 (quantity <= 2) C10 (quantity <= 2) MF2 (quantity <= 2) MF1 (quantity <= 2) SF2 (quantity <= 2) SF1 (quantity <= 3) M9 (quantity <= 2) M8 (quantity <= 4) M7 (quantity <= 6) M6 (quantity <= 2) M5 (quantity <= 2) M3 (quantity <= 4) M2 (quantity <= 4) M1 (quantity <= 6) C12 (quantity <= 6) C9 (quantity <= 3) C8 (quantity <= 2) C7 (quantity <= 4) C6 (quantity <= 3) C5 (quantity <= 5) C4 (quantity <= 4) C3 (quantity <= 6) C2 (quantity <= 7) C1 (quantity <= 9)

Environment

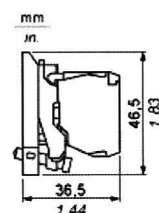
Protective treatment	TH
Ambient air temperature for storage	-40...70 °C
Ambient air temperature for operation	-25...70 °C
Standards	EN/IEC 60947-1 EN/IEC 60947-5-1 EN/IEC 60947-5-4 JIS C 4520 UL 508 CSA C22.2 No 14
Product certifications	BV CCC CSA DNV GL GOST LROS (Lloyds register of shipping) RINA UL
Vibration resistance	5 gn (f = 2...500 Hz) conforming to IEC 60068-2-6
Shock resistance	50 gn (duration = 11 ms) for half sine wave acceleration conforming to IEC 60068-2-27 30 gn (duration = 18 ms) for half sine wave acceleration conforming to IEC 60068-2-27

Dimensions

with ZB5AZ009 Fixing Collar

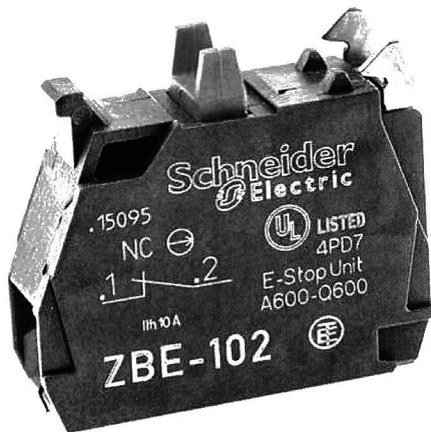


with ZB4BZ009 Fixing Collar



ZBE102 - PILNCCB

single contact block for head Ø22 1NC screw
clamp terminal



Main

Range of product	Harmony XB4 Harmony XB5
Product or component type	Contact block
Device short name	ZBE
Sale per indivisible quantity	5
IP degree of protection	IP20 conforming to IEC 60529
Contacts type and composition	1 NC
Contacts operation	Slow-break
Contact block type	Single
Contacts usage	Standard contacts
Connections - terminals	Screw clamp terminals : $\geq 1 \times 0.22 \text{ mm}^2$ without cable end conforming to EN 60947-1 Screw clamp terminals : $\leq 2 \times 1.5 \text{ mm}^2$ with cable end conforming to EN 60947-1

Complementary

Terminals description ISO n°1	(11-12)NC
Product weight	0.011 kg
Positive opening	With positive opening conforming to EN/IEC 60947-5-1 appendix K
Operating travel	4.3 mm (total travel) 1.5 mm (NC changing electrical state)
Operating force	2 N (NC changing electrical state)
Mechanical durability	5000000 cycles
Tightening torque	0.8...1.2 N.m conforming to EN 60947-1
Shape of screw head	Slotted head compatible with flat Ø 5.5 mm screwdriver Slotted head compatible with flat Ø 4 mm screwdriver Cross head compatible with pozidriv No 1 screwdriver Cross head compatible with Philips no 1 screwdriver
Contacts material	Silver alloy (Ag/Ni)
Short circuit protection	10 A cartridge fuse type gG conforming to EN/IEC 60947-5-1
[Ith] conventional free air thermal current	10 A conforming to EN/IEC 60947-5-1
[Ui] rated insulation voltage	600 V (degree of pollution: 3) conforming to EN 60947-1
[Uimp] rated impulse withstand voltage	6 kV conforming to EN 60947-1
[Ie] rated operational current	1.2 A at 600 V, AC-15, A600 conforming to EN/IEC 60947-5-1 0.55 A at 125 V, DC-13, Q600 conforming to EN/IEC 60947-5-1 0.27 A at 250 V, DC-13, Q600 conforming to EN/IEC 60947-5-1 0.1 A at 600 V, DC-13, Q600 conforming to EN/IEC 60947-5-1 6 A at 120 V, AC-15, A600 conforming to EN/IEC 60947-5-1 3 A at 240 V, AC-15, A600 conforming to EN/IEC 60947-5-1
Electrical durability	1000000 cycles, DC-13, 0.5 A at 24 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, DC-13, 0.2 A at 110 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, AC-15, 4 A at 24 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, AC-15, 3 A at 120 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C 1000000 cycles, AC-15, 2 A at 230 V, operating rate: 3600 cyc/h, load factor: 0.5 conforming to EN/IEC 60947-5-1 appendix C
Electrical reliability IEC 60947-5-4	$\Lambda < 10 \exp(-8)$ at 17 V, 5 mA in clean environment conforming to EN/IEC 60947-5-4 $\Lambda < 10 \exp(-7)$ at 5 V, 1 mA in clean environment conforming to EN/IEC 60947-5-4

This information provided in this documentation contains general descriptions and/or technical characteristics of the products of the Schneider Electric group. It is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the responsibility of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

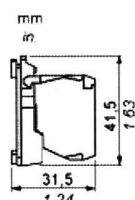
Mounting of block	Front mounting
Additional information	Mounting on pushbutton collar
Electrical composition code	C13 (quantity <= 1) M4 (quantity <= 2) C10 (quantity <= 2) MF2 (quantity <= 2) MF1 (quantity <= 2) SF2 (quantity <= 2) SF1 (quantity <= 3) M9 (quantity <= 2) M8 (quantity <= 4) M7 (quantity <= 6) M6 (quantity <= 2) M5 (quantity <= 2) M3 (quantity <= 4) M2 (quantity <= 4) M1 (quantity <= 6) C12 (quantity <= 6) C9 (quantity <= 3) C8 (quantity <= 2) C7 (quantity <= 4) C6 (quantity <= 3) C5 (quantity <= 5) C4 (quantity <= 4) C3 (quantity <= 6) C2 (quantity <= 7) C1 (quantity <= 9)

Environment

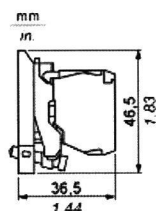
Protective treatment	TH
Ambient air temperature for storage	-40...70 °C
Ambient air temperature for operation	-25...70 °C
Standards	EN/IEC 60947-1 EN/IEC 60947-5-1 EN/IEC 60947-5-4 JIS C 4520 UL 508 CSA C22.2 No 14
Product certifications	BV CCC CSA DNV GL GOST LROS (Lloyds register of shipping) RINA UL
Vibration resistance	5 gn (f = 2...500 Hz) conforming to IEC 60068-2-6
Shock resistance	50 gn (duration = 11 ms) for half sine wave acceleration conforming to IEC 60068-2-27 30 gn (duration = 18 ms) for half sine wave acceleration conforming to IEC 60068-2-27

Dimensions

with ZB5AZ009 Fixing Collar



with ZB4BZ009 Fixing Collar



VI

DOCUMENTATION

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Effective with sales to the first user on or after August 1, 2016

CATERPILLAR LIMITED WARRANTY

Industrial, Petroleum, Locomotive, and Agriculture Engine Products and Electric Power Generation Products

Worldwide

Caterpillar Inc. or any of its subsidiaries ("Caterpillar") warrants new and remanufactured engines and new and rebuild electric power generation products sold by it (including any products of other manufacturers packaged and sold by Caterpillar), to be free from defects in material and workmanship.

This warranty does not apply engines sold for use in on-highway vehicle or marine applications; engines in machines manufactured by or for Caterpillar; C175, 3500 and 3600 series engines used in locomotive applications; 3000 Family engines, C0.5 through C4.4 and ACERT™ (C6.6, C7, C7.1, C9, C9.3, C11, C13, C15, C18, C27, and C32) engines used in industrial, mobile agriculture and locomotive applications; or Cat® batteries; or Electric Power Generation Products manufactured or assembled in India. These products are covered by other Caterpillar warranties.

This warranty is subject to the following:

Warranty Period

- For industrial engines, engines in a petroleum applications or Petroleum Power Systems (excluding petroleum fire pump application), or engines in a Locomotive application, or Uninterruptible Power Supply (UPS) systems, the warranty period is 12 months after date of delivery to the first user.
- For engines used in petroleum fire pump and mobile agriculture applications the warranty period is 24 months after date of delivery to the first user.
- For controls only (EPIC), configurable and custom switchgear products, and automatic transfer switch products, the warranty period is 24 months after date of delivery to the first user.
- For new CG132, CG170 and CG260 series power generation products the warranty period is 24 months/16,000 hours, whichever comes first, after date of delivery to first user.
- For electric power generation products other than CG132, CG170 and CG260 series in prime or continuous applications the warranty period is 12 months. For standby applications the warranty period is 24 months/1000 hours. For emergency standby applications the warranty period is 24 months/400 hours. All terms begin after date of delivery to the first user.
- For Caterpillar rebuild electric power generation products the warranty period is 12 months, but not to exceed 24 months from shipment of rebuilt electric power generation product from Caterpillar.
- For all other applications the warranty period is 12 months after date of delivery to the first user.

Caterpillar Responsibilities

If a defect in material or workmanship is found during the warranty period, Caterpillar will, during normal working hours and at a place of business of a Cat dealer or other source approved by Caterpillar:

- Provide (at Caterpillar's choice) new, Remanufactured, or Caterpillar approved repaired parts or assembled components needed to correct the defect.

Note: New, remanufactured, or Caterpillar approved repaired parts or assembled components provided under the terms of this warranty are warranted for the remainder of the warranty period applicable to the product in which installed as if such parts were original components of that product. Items replaced under this warranty become the property of Caterpillar.

- Replace lubricating oil, filters, coolant, and other service items made unusable by the defect.
- Provide reasonable and customary labor needed to correct the defect, including labor to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems, if required.

For new 3114, 3116, and 3126 engines and, new and Caterpillar rebuild electric power generation products (which includes the following: any new products of other manufacturers packaged and sold by Caterpillar)

- Provide travel labor, up to four hours round trip, if in the opinion of Caterpillar, the product cannot reasonably be transported to a place of business of a Cat dealer or other source approved by Caterpillar (travel labor in excess of four hours round trip, and any meals, mileage, lodging, etc. is the user's responsibility).

For all other products:

- Provide reasonable travel expenses for authorized mechanics, including meals, mileage, and lodging, when Caterpillar chooses to make the repair on-site.

User Responsibilities

The user is responsible for:

- Providing proof of the delivery date to the first user.
- Labor costs, except as stated under "Caterpillar Responsibilities," including costs beyond those required to disconnect the product from and reconnect the product to its attached equipment, mounting, and support systems.

- Travel or transporting costs, except as stated under "Caterpillar Responsibilities."
- Premium or overtime labor costs.
- Parts shipping charges in excess of those that are usual and customary.
- Local taxes, if applicable.
- Costs to investigate complaints, unless the problem is caused by a defect in Caterpillar material or workmanship.
- Giving timely notice of a warrantable failure and promptly making the product available for repair.
- Performance of the required maintenance (including use of proper fuel, oil, lubricants, and coolant) and items replaced due to normal wear and tear.
- Allowing Caterpillar access to all electronically stored data.

Limitations

Caterpillar is not responsible for:

- Failures resulting from any use or installation that Caterpillar judges improper.
- Failures resulting from attachments, accessory items, and parts not sold or approved by Caterpillar.
- Failures resulting from abuse, neglect, and/or improper repair.
- Failures resulting from user's delay in making the product available after being notified of a potential product problem.
- Failures resulting from unauthorized repairs or adjustments, and unauthorized fuel setting changes.
- Damage to parts, fixtures, housings, attachments, and accessory items that are not part of the engine, Cat Selective Catalytic Reduction System or electric power generation product (including any products of other manufacturers packaged and sold by Caterpillar).
- Repair of components sold by Caterpillar that is warranted directly to the user by their respective manufacturer. Depending on type of application, certain exclusions may apply. Consult your Cat dealer for more information.

(Continued on reverse side...)

This warranty covers every major component of the products. Claims under this warranty should be submitted to a place of business of a Cat dealer or other source approved by Caterpillar. For further information concerning either the location to submit claims or Caterpillar as the issuer of this warranty, write Caterpillar Inc., 100 N. E. Adams St., Peoria, IL USA 61629.

Caterpillar's obligations under this Limited Warranty are subject to, and shall not apply in contravention of, the laws, rules, regulations, directives, ordinances, orders, or statutes of the United States, or of any other applicable jurisdiction, without recourse or liability with respect to Caterpillar.

A) For products operating outside of Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

NEITHER THE FOREGOING EXPRESS WARRANTY NOR ANY OTHER WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED, IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, EXCEPT CATERPILLAR EMISSION-RELATED COMPONENTS WARRANTIES FOR NEW ENGINES, WHERE APPLICABLE. REMEDIES UNDER THIS WARRANTY ARE LIMITED TO THE PROVISION OF MATERIAL AND SERVICES, AS SPECIFIED HEREIN.

CATERPILLAR IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

For personal or family use engines or electric power generation products, operating in the USA, its territories and possessions, some states do not allow limitations on how long an implied warranty may last nor allow the exclusion or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary by jurisdiction. To find the location of the nearest Cat dealer or other authorized repair facility, call (800) 447-4986. If you have questions concerning this warranty or its applications, call or write:

In USA and Canada: Caterpillar Inc., Engine Division, P. O. Box 610, Mossville, IL 61552-0610, Attention: Customer Service Manager, Telephone (800) 447-4986. Outside the USA and Canada: Contact your Cat dealer.

B) For products operating in Australia, Fiji, Nauru, New Caledonia, New Zealand, Papua New Guinea, the Solomon Islands and Tahiti, the following is applicable:

THIS WARRANTY IS IN ADDITION TO WARRANTIES AND CONDITIONS IMPLIED BY STATUTE AND OTHER STATUTORY RIGHTS AND OBLIGATIONS THAT BY ANY APPLICABLE LAW CANNOT BE EXCLUDED, RESTRICTED OR MODIFIED ("MANDATORY RIGHTS"). ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED (BY STATUTE OR OTHERWISE), ARE EXCLUDED. WITHOUT LIMITING THE FOREGOING PROVISIONS OF THIS PARAGRAPH, WHERE A PRODUCT IS SUPPLIED FOR BUSINESS PURPOSES, THE CONSUMER GUARANTEES UNDER THE CONSUMER GUARANTEES ACT 1993 (NZ) WILL NOT APPLY.

NEITHER THIS WARRANTY NOR ANY OTHER CONDITION OR WARRANTY BY CATERPILLAR, EXPRESS OR IMPLIED (SUBJECT ONLY TO THE MANDATORY RIGHTS), IS APPLICABLE TO ANY ITEM CATERPILLAR SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY ITS MANUFACTURER.

IF THE MANDATORY RIGHTS MAKE CATERPILLAR LIABLE IN CONNECTION WITH SERVICES OR GOODS, THEN TO THE EXTENT PERMITTED UNDER THE MANDATORY RIGHTS, THAT LIABILITY SHALL BE LIMITED AT CATERPILLAR'S OPTION TO (a) IN THE CASE OF SERVICES, THE SUPPLY OF THE SERVICES AGAIN OR THE PAYMENT OF THE COST OF HAVING THE SERVICES SUPPLIED AGAIN AND (b) IN THE CASE OF GOODS, THE REPAIR OR REPLACEMENT OF THE GOODS, THE SUPPLY OF EQUIVALENT GOODS, THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT GOODS.

CATERPILLAR EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES IN RESPECT OF THE MANUFACTURE OR SUPPLY OF GOODS OR THE PROVISION OF SERVICES RELATING TO THE GOODS.

CATERPILLAR IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNLESS IMPOSED UNDER MANDATORY RIGHTS.

IF OTHERWISE APPLICABLE, THE VIENNA CONVENTION ON CONTRACTS FOR THE INTERNATIONAL SALE OF GOODS IS EXCLUDED IN ITS ENTIRETY.

C) For products supplied in Australia:

IF THE PRODUCTS TO WHICH THIS WARRANTY APPLIES ARE:

I. PRODUCTS OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION; OR

II. PRODUCTS THAT COST AUD 40,000 OR LESS,

WHERE THOSE PRODUCTS WERE NOT ACQUIRED FOR THE PURPOSE OF RE-SUPPLY OR FOR THE PURPOSE OF USING THEM UP OR TRANSFORMING THEM IN THE COURSE OF PRODUCTION OR MANUFACTURE OR IN THE COURSE OF REPAIRING OTHER GOODS OR FIXTURES, THEN THIS SECTION C APPLIES.

THE FOLLOWING MANDATORY TEXT IS INCLUDED PURSUANT TO THE AUSTRALIAN CONSUMER LAW AND INCLUDES REFERENCES TO RIGHTS THE USER MAY HAVE AGAINST THE DIRECT SUPPLIER OF THE PRODUCTS: OUR GOODS COME WITH GUARANTEES THAT CANNOT BE EXCLUDED UNDER THE AUSTRALIAN CONSUMER LAW. YOU ARE ENTITLED TO A REPLACEMENT OR REFUND FOR A MAJOR FAILURE AND COMPENSATION FOR ANY OTHER REASONABLY FORESEEABLE LOSS OR DAMAGE. YOU ARE ALSO ENTITLED TO HAVE THE GOODS REPAIRED OR REPLACED IF THE GOODS FAIL TO BE OF ACCEPTABLE QUALITY AND THE FAILURE DOES NOT AMOUNT TO A MAJOR FAILURE. THE INCLUSION OF THIS TEXT DOES NOT CONSTITUTE ANY REPRESENTATION OR ACCEPTANCE BY CATERPILLAR OF LIABILITY TO THE USER OR ANY OTHER PERSON IN ADDITION TO THAT WHICH CATERPILLAR MAY HAVE UNDER THE AUSTRALIAN CONSUMER LAW.

TO THE EXTENT THE PRODUCTS FALL WITHIN THIS SECTION C BUT ARE NOT OF A KIND ORDINARILY ACQUIRED FOR PERSONAL, DOMESTIC OR HOUSEHOLD USE OR CONSUMPTION, CATERPILLAR LIMITS ITS LIABILITY TO THE EXTENT IT IS PERMITTED TO DO SO UNDER THE AUSTRALIAN CONSUMER LAW TO, AT ITS OPTION, THE REPAIR OR REPLACEMENT OF THE PRODUCTS, THE SUPPLY OF EQUIVALENT PRODUCTS, OR THE PAYMENT OF THE COST OF SUCH REPAIR OR REPLACEMENT OR THE ACQUISITION OF EQUIVALENT PRODUCTS.

THE WARRANTY SET OUT IN THIS DOCUMENT IS GIVEN BY CATERPILLAR INC. OR ANY OF ITS SUBSIDIARIES, 100 N. E. ADAMS ST, PEORIA, IL USA 61629, TELEPHONE 1 309 675 1000, THE USER IS RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH MAKING A CLAIM UNDER THE WARRANTY SET OUT IN THIS DOCUMENT, EXCEPT AS EXPRESSLY STATED OTHERWISE IN THIS DOCUMENT, AND THE USER IS REFERRED TO THE BALANCE OF THE DOCUMENT TERMS CONCERNING CLAIM PROCEDURES, CATERPILLAR RESPONSIBILITIES AND USER RESPONSIBILITIES.

TO THE EXTENT PERMISSIBLE BY LAW, THE TERMS SET OUT IN THE REMAINDER OF THIS WARRANTY DOCUMENT (INCLUDING SECTION B) CONTINUE TO APPLY TO PRODUCTS TO WHICH THIS SECTION C APPLIES.

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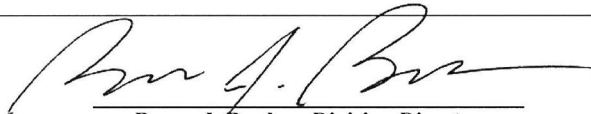


UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2019 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION
AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: Caterpillar Inc.
(U.S. Manufacturer or Importer)
Certificate Number: KCPXL15.2NZS-008

Effective Date:
07/24/2018
Expiration Date:
12/31/2019


Byron J. Bunker, Division Director
Compliance Division

Issue Date:
07/24/2018
Revision Date:
N/A

Model Year: 2019
Manufacturer Type: Original Engine Manufacturer
Engine Family: KCPXL15.2NZS

Mobile/Stationary Indicator: Stationary
Emissions Power Category: 560<kW<=2237
Fuel Type: Diesel
After Treatment Devices: No After Treatment Devices Installed
Non-after Treatment Devices: Electronic Control, Engine Design Modification

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 60.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

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THE VMC GROUP

The Power of Together™

CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS



Certification No.

VMA-50365-01 C (REVISION 03)

Expiration Date: 05/31/2019

Certification Parameters:

The nonstructural products (mechanical and/or electrical components) listed on this certificate are CERTIFIED¹ FOR SEISMIC APPLICATIONS in accordance with the following building code² releases.

IBC 2006, IBC 2009, IBC 2012, IBC 2015

The following model designations, options, and accessories are included in this certification. Reference report number **VMA-47967-01** and **VMA-48473-01** as issued by The VMC Group for a complete list of certified models, included accessories/options, and certified installation methods.

Cat® Diesel Engine Generator Set

The above referenced equipment is **APPROVED** for seismic application when properly installed³, used as intended, and contains a Seismic Certification Label referencing this Certificate of Compliance⁴. As limited by the tabulated values, below grade, grade, and roof-level installations, installations in essential facilities, for life safety applications, and/or of equipment containing hazardous contents are permitted and included in this certification with an Equipment Importance Factor assigned as $I_p=1.5$. The equipment is qualified by successful seismic shake table testing at the nationally recognized University of California Berkeley Pacific Earthquake Engineering Research Center and the Construction Engineering Research laboratory in Champaign, IL, under the review of the ISO Accredited Product Certification Agency, The VMC Group.

Certified Seismic Design Levels

Certified IBC	Importance $I_p \leq 1.5$ Soil Classes A-E Risk Categories I-IV Design Categories A-F	$S_{DS} \leq 2.260 \text{ g}^8$	$S_{DS} \leq .753 \text{ g}^8$
		$z/h = 0.0$	$z/h \leq 1.0$
		Horizontal Design ⁵	$\frac{F_p}{W_p} = 0.4 S_{DS} I_p \frac{a_p}{R_p} \left(1 + 2 \frac{z}{h}\right) \leq 1.695 \text{ g}$
Test Datum AC156	ISO 17025 Laboratory Pre/Post-Shake Functionality Tri-axial, 5% Damping SRS	$A_{FLEX-H} \leq 2.260 \text{ g}$	$A_{FLEX-V} \leq 1.507 \text{ g}$
		$A_{RIG-H} \leq 0.904 \text{ g}$	$A_{RIG-V} \leq 0.603 \text{ g}$
		$ZPA_H \leq 0.814 \text{ g}$	$ZPA_V \leq 0.542 \text{ g}$

Certified Seismic Installation Methods

Rigid mounting from unit base to rigid structure	External isolation mounting from unit base to rigid structure
--	---

SECTION 2A

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THE VMC GROUP
The Power of Together™

CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Certified Product Table:

Series	Model	Max Rating [kW]	EPA Rating	Enclosure Options						Fuel Tank Capacities [gal]	S _{DS}	
				Steel			Aluminum				z/h = 0.0	z/h = 1.0
				WP Std.	SA1 Std.	SA2 Std.	WP Std.	SA1 Std.	SA2 Std.			
C4.4 LC	D40 / D50 / D60	60	Tier 3	●	●	●				140 – 258	2.49	0.83
C4.4	D40 / D50 / D60 / D80 / D100	100	Tier 3	●	●	●			●	156 – 412	2.49	0.83
C7.1	D125 / D150 / D175 / D200	200	Tier 3	●	●	●			●	376 – 784	2.49	0.83
C9	C9	300	Tier 3	●	●	●			●	150 – 1100	2.26	0.75
C13	C13	400	Tier 3	●	●	●		●		300 - 2100	2.26	0.75
C15	C15	550	Tier 2/3	●	●	●		●		300 - 2100	2.26	0.75
C18	C18	600	Tier 2/4	●				●		300 - 2100	2.26	0.75

This certification **includes** the open generator set and the enclosed generator set when installed with or without the sub-base tank. This certification also included the sub-base tank as a stand-alone accessory. The generator set and included options shall be a catalogue design and factory supplied. The product must be installed and attached directly to a housekeeping pad using the anchoring system provided by the equipment manufacturer and in accordance with the seismic installation details provided or approved by the project or building Structural Engineer of Record. This certification **excludes** all non-factory supplied accessories, including but not limited to mufflers, isolation/restraint devices, remote control panels, remote radiators, pumps and other electrical/mechanical components.



VMA-50365-01C (Revision 3)
Issue Date: May 9, 2016
Revision Date: November 28, 2016
Expiration Date: May 31, 2019

SECTION 2A

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THE VMC GROUP
The Power of Together™

CATERPILLAR®

CERTIFICATE OF COMPLIANCE SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Notes and Comments:

1. All equipment listed herein successfully passed the seismic acceptance criteria for shake testing non-structural components and systems as set forth in the ICC AC-156. The Test Response Spectrum (TRS) enveloped the Required Response Spectrum (RRS) for all units tested. The units cited in this certification were representative sample(s) of a contingent of models and all remained captive and structurally sound after the seismic shake simulation. The units also remained functionally operational after the simulation testing as functional testing was completed by the equipment manufacturer before and after the seismic simulations. Although a seismic qualified unit inherently contains some wind resisting capacity, that capacity is undetermined and is excluded from this certification. Snow/Ice loads have been neglected and thus limit the unit to be installed both indoors (covered by an independent protective structure) and out of doors (exposed to accumulating snow/ice) for ground snow loads no greater than 30 psf for all applications.
2. The following building codes are addressed under this certification:

IBC 2015 – referencing ASCE7-10 and ICC AC-156
IBC 2012 – referencing ASCE7-10 and ICC AC-156
IBC 2009 – referencing ASCE7-05 and ICC AC-156
IBC 2006 – referencing ASCE7-05 and ICC AC-156
3. Refer to the manufacturer supplied installation drawings for mounting provisions. The Structural Engineer or Design Engineer of Record is responsible for detailing the equipment anchorage requirements for the given installation. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, wall design, and attachment to non-building structures must be outlined and approved by the Engineer of Record for the project or building. Structural walls, structural floors, and housekeeping pads must also be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads. The installing contractor is responsible for observing the installation details provided or approved by the project or building Structural Engineer of Record for the seismic installation and proper installation of all anchors and mounting hardware.
4. For this certificate and certification to remain valid, this certificate must correspond to the "Seismic Certification Label" found affixed to the unit by the factory. The label ensures the manufacturer built the unit in conformance to the IBC seismic design criteria set forth by the Certified Seismic Qualification Agency, The VMC Group, and meets the seismic design levels claimed by this certificate.
5. Mechanical, Electrical, and Plumbing connections to the equipment must be flexibly attached as to not transfer load through the connection. The structural integrity of any conduit, cable trays, piping, ductwork and/or flexible connections is the responsibility of others. This certification does not guarantee the equipment will remain compliant to UL or NEMA standards after a seismic event.
6. This certificate applies to units manufactured at 284 Mawsons Way, Newberry, SC 29360.
7. This project follows The VMC Group's ISO-17065 Scheme for Product Certification of Nonstructural Components.
8. The qualified seismic design level stated is the lowest for all series this certificate covers, for more detailed ranges of qualified seismic design levels, see the certified product tables.

John P. Giuliano, PE
President, The VMC Group

VMA-50365-01C (Revision 3)
Issue Date: May 9, 2016
Revision Date: December 2, 2016
Expiration Date: May 31, 2019



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UL PRODUCT CATEGORY

Engine Generators

See General Information for Engine Generators

CATERPILLAR INC
560 REHOBOTH RD
GRIFFIN, GA 30224-7618 USA

AU3508

Stationary engine generator assemblies, "C15 Series", Model(s) GS533

Stationary engine generator assemblies, "C27 Series", Model(s) GS534, GS603

Stationary engine generator assemblies, "C32 Series", Model(s) GS277, GS471, GS471 LS

Stationary engine generator assemblies, Model(s) 3500 Global Series, 3508, 3508B, 3512, 3512B, 3512B HD, 3512C, 3516, 3516B, 3516B HD, 3516C, 3516C-HD, 3516E, C15, C175-16, C18, C9

Stationary engine generator assemblies, 3 phase, Model(s) C13 (350-400kW), C15 (350-550kW), C18 (500 KW, Aftertreatment), C18 (500-750 kW), D125, D150, D175, D200

Stationary engine generator assemblies, 3 phase, Model(s) DG, followed by 30, 40, 50, 60, 80, 100, 125 or 150, may be followed by -2 or -4.

Stationary engine generator assemblies, 3 phase, Model(s) G3412 (500KW standby), G3500 (750-1500kW standby)

Stationary engine generator assemblies, 3 phase and single phase, "Verizon Series", Model(s) D40, D50

Stationary engine generator assemblies, 3 phase and single phase, Model(s) D, followed by 40, 50 or 60, maybe followed by -, maybe followed by a number designated x, maybe followed by letter designated XX.

Stationary engine generator assemblies, 3 phase and single phase, Model(s) D100, D80

Stationary engine generator assemblies, single phase, Model(s) DG, followed by 30, 40, 50, 60, 80 or 100, may be followed by -2 or -4.

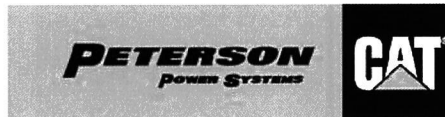
Last Updated on 2018-09-03

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products

bearing the UL Mark should be considered to be Certified and covered under UL's Follow-Up Service. Always look for the Mark on the product.

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TESTING

I. TESTING THE GENERATOR SET WILL INCLUDE THE FOLLOWING:

- Check all fluid levels
- Check antifreeze protection level
- Check for proper installation
- Check battery cables
- Check hoses and belts
- Check load cable connections
- Check for proper operation of coolant and oil heaters
- Check for proper operation of battery charger
- Check for adjustment of vibration isolators (if applicable)
- Check for loose bolts and clamps
- Check cable connections on additional equipment (if applicable)
- Check settings on additional equipment (if applicable)

II. START AND RUN GENERATOR. PERFORM THE FOLLOWING:

- Check oil pressure and water temperature
- Check for leaks
- Set AC voltage and frequency
- Check for loose items and unusual noise
- Check safety shutdown circuits
- Close circuit breaker to transfer switch if applicable
- Check phase rotation and voltage at transfer switch if applicable

III. LOAD TEST, AFTER GENERATOR SET CONTROLS ARE PLACED IN THE "AUTO" POSITION:

- Disconnect normal power source
- Check for proper start up and transfer of standby power system
- Load test per spec requirements
- Simulate power failure including operation of transfer switch (if applicable), automatic starting cycle and automatic shutdown and return to normal
- Record all gauge and meter readings on generator set per spec requirements
- Reconnect normal power and check proper operation of transfer switch retransfer (if applicable) and cool down sequence
- Make necessary adjustments to transfer switch timers if needed



TRAINING

Training includes demonstration of proper operation and maintenance of the Caterpillar generator set as outline in the narrative below:

I. PRODUCT OVERVIEW

- Description of the Caterpillar standby generator set
- Description of any additional equipment applicable to the project
- Description of proper maintenance procedures

II. WALK AROUND INSPECTIONS

- Identify generator components
- Identify maintenance points
- Identify additional equipment components

III. START UP TEST

- Discuss proper operation of generator set (Unit Off)
- Start and run generator
- Observe readings on all gauges and meters

IV. TRANSFER TEST (IF ALLOWED)

- Place generator control panel in "Auto"
- Close generator main breaker
- Disconnect normal power to transfer switch (If Applicable)
- Observe automatic operations of generator start and transfer
- Reconnect normal power and observe retransfer of power to the normal source

V. QUESTIONS AND ANSWERS

- Discussion with essential personnel



GENERATOR SET (RETAIL DIESEL) PRE-START-UP CHECKLIST
CUSTOMER TO RETURN PRIOR TO SCHEDULING PETERSON START-UP.

This form must be completed by the electrical contractor; customer and returned to the project manager listed below prior to start-up and testing by any representative of Peterson Power Systems. If any items on this checklist are found to be incomplete and/or incorrectly performed, additional charges will be assessed for any and all charges incurred in the correction and completion of this checklist (including travel time to site).

Return to:
Peterson Power Systems
Attn: Scott Posey
E-mail: SMPosey@petersonpower.com
Fax #: 503-280-1552

Customer Contact Information:

Project Name:	Press Block Half	Site Contact:
Contractor:		Site Phone:
Project Mgr:		Site Address
Phone No:		
*Requested Date of Startup:		

	YES	NO	N/A	DESCRIPTION
1.	()	()	()	Power conductors connected between generator set & ATS
2.	()	()	()	Normal power available at line side of ATS.
3.	()	()	()	Building load connected to load side of ATS.
4.	()	()	()	Control wiring in separate conduit ran to ATS. **
5.	()	()	()	AC Accessories Circuit ran to Generator connection; breaker box. **
6.	()	()	()	Remote Communications and DC power conductors run to annunciator. **
7.	()	()	()	Fuel tank filled (DO NOT FILL TANK IF PRESSURE TEST IS REQUIRED).
8.	()	()	()	Exhaust system installed (May include insulation & additional piping if required)
9.	()	()	()	Fuel day tank pump circuit installed and connected.
10.	()	()	()	Fuel supply & return lines connected to engine (hose or black pipe).
11.	()	()	()	Generator set anchored securely to pad.
12.	()	()	()	Radiator air ductwork installed and operational (if applicable).
13.	()	()	()	Generator set is free of all construction debris and encumbrances.
14.	()	()	()	Battery installed, filled, and secured to rack. (If needs to be filled check here____)
15.	()	()	()	Witnesses required (inspectors, fire marshal, etc.) have been notified.
16.	()	()	()	Breaker trip units are adjusted per the electrical selective coordination study.
17.	()	()	()	All wires are clearly identified with labels on both ends.

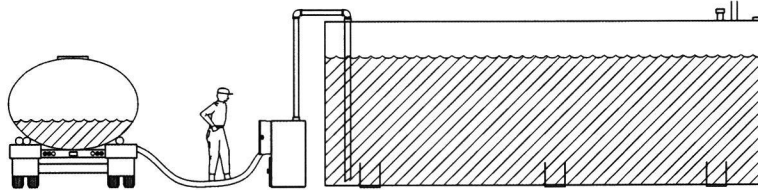
* Date and time of start-up is NOT guaranteed until confirmation by the project manager listed above.

**CUSTOMER INTERCONNECT WIRING: Power conductor and communication cable requirements and additional information are shown on the Peterson Power Systems provided interconnect drawing.

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What is it used for?

Generally used with aboveground storage tanks, although some underground uses as well.



What is it?

An easy means of filling above ground storage tanks from delivery trucks.

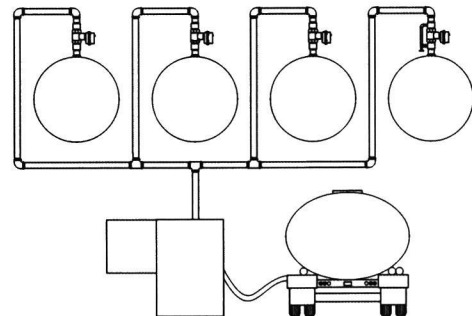
From pumpers...

From gravity trucks...

With manual shutoff

With automatic shutoff

One Tank or Multiple Tanks



What kinds of products can I deliver with this system?

Petroleum products and automotive products

- Fuel Oils
- Jet Fuel
- Gasoline
- Lube Oils
- Transmission Fluid
- Hydraulic Oils
- Brake Fluid
- Antifreeze
- Contact Simplex for other products

Why do I need this Simplex system?

- Easy fill of aboveground storage tanks
- Eliminates ladders, top fill
- Allows use of gravity truck with tall aboveground storage tanks
- Controls and prevents spills
- Provides fill shutoff
- Allows multiple tank filling
- Factory standard, packaged
- Highly engineered
- Economical

CODES:

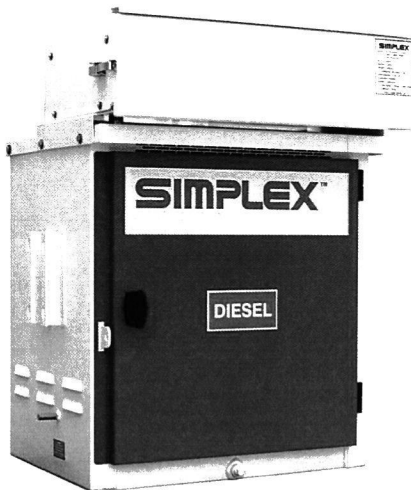
FP and FFP: EQ 481

AFP, SP, CAFPP, and MSP: EQ 706

Non-Explosion Proof Controller:
UL 508A

Spill Containment: UL 6M86, United
States and Canada

Automatic FuelPort



Compact Automatic FuelPort



Level Transmitter

Description

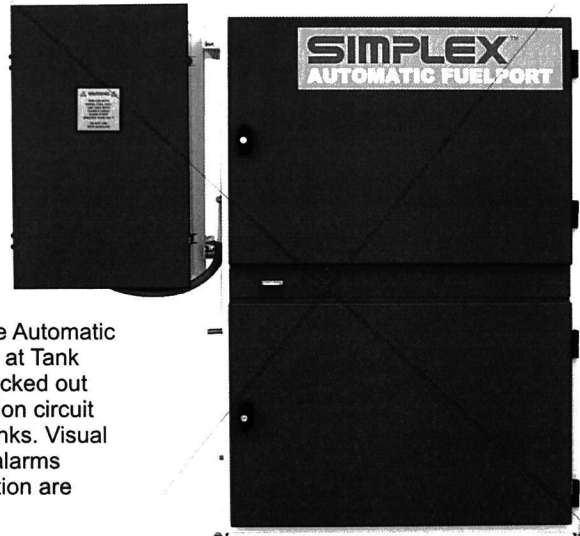
The Simplex Automatic FuelPort is a factory packaged system for control of filling operations of aboveground tanks that are filled from pumper trucks. The Automatic FuelPort provides a ready means of ground level connection of the fill hose, and captures spills that may occur at the fill point during filling operations. The Automatic FuelPort alerts the operator at Tank Full with filling operations locked out at High Level. A leak detection circuit prevents filling of leaking tanks. Visual and audible level and leak alarms and continuous level indication are provided.

The Simplex Automatic Fuel-Port is available for use with fuel oil (Class-II liquids) or gasoline (Class-I liquids).

Single or multiple tank controllers are available. Multiple tank controllers allow operator selection of the tank to be filled with automatic lockout of all other tanks. (refer to page 8 and 9)

How It Works:

1. Delivery truck arrives and driver proceeds to Automatic FuelPort to make fuel delivery.
2. Connect ground cable
3. Unlock fill box and control box
4. Turn on controller
5. Read fuel level in tank on level indicator gauge
6. Connect delivery hose to hose coupling
7. Open valve on truck
8. Start delivery pump on truck
9. Press Valve Open pushbutton on controller
10. Automatic FuelPort valve opens
11. Fuel is delivered to tank
12. At Tank Full level, audible and visual alarm activates and alerts driver
13. Driver may stop delivery by pressing the Valve Close pushbutton and proceed to step #16
14. Driver tops off to Tank Full



15. At High Level, audible and visual alarm activates and Automatic FuelPort valve closes (valve may not be reopened)
16. Stop fill pump
17. Drain delivery hose
18. Close truck valve
19. Disconnect delivery hose from Automatic FuelPort
20. Turn controller off
21. Close and lock Automatic FuelPort doors
22. Proceed to next delivery, where, hopefully, the owner has had the foresight to install a Simplex Automatic FuelPort

Includes:

- Freestanding, pad or tank mountable, weatherproof and lockable enclosure
- Quick disconnect hose coupling with dust plug
- Check valve
- Electrically operated shutoff valve
- Automatic controller, described below
- Hand pump for spill containment, with shutoff and check valve
- Ground stud

Controller

Includes:

- Level transmitter for installation in 2" tank fitting minimum
- Digital level indicator scaled in percent level (diesel version only)
- Tank Full visual alarm
- High Level visual alarm
- Tank leak alarm
- Audible alarm horn activated by alarms above
- Power available indicator
- Control power On-Off switch
- Valve Open/Close push-buttons
- Type 3R enclosure (fuel oil version)
- Explosion proof enclosure (gasoline version)

Specifications:

Fitting size: 2", 3" or 4"

Spill containment:

Automatic FuelPort - 20 gallons

Compact Automatic FuelPort - 7 gallons

Hand pump capacity: 1 gpm

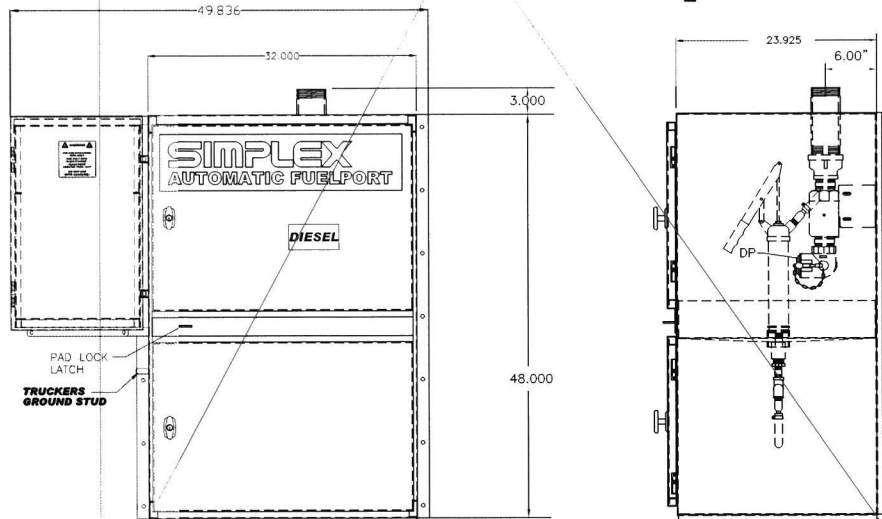
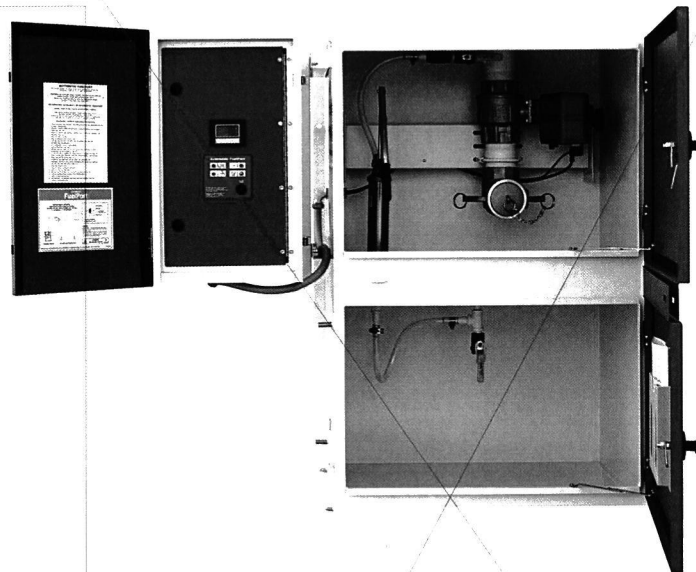
Paint: white

Net Weight: 313 lbs. (Oil), 363 lbs.

(Gas)

Control power: 115-1-60v

Level transmitter fitting: 2" min.



Automatic FuelPort Order Checklist

- ☐ If gasoline use, is vapor recovery required?
- ☐ How many tanks to fill?
- ☐ Tank leak sensing required?
- ☐ Size fill fittings: 2", 3" or 4"?
- ☐ Accurate tank dimensions required, 2" or 4" fitting required for transmitter (specify)
- ☐ Specify options

Tank Filling Systems

for Petroleum Products • Page 16

SIMPLEX®

ORDER FORM

To receive a quote, fax this completed form to Simplex (217-483-1616) or visit the Simplex web site at www.simplexdirect.com and place your request via e-mail.

Customer: _____ Project: _____

PO#: _____ WO#: _____ Date: _____

PRODUCT USED:

- ☐ Diesel
☐ Gas
☐ Vapor Rec.
☐ Other _____

TANK CONSTRUCTION:

- ☐ AST
☐ UST
☐ Single Wall
☐ Double Wall
☐ Vaulted
☐ Basetank
- ☐ Rectangular
 L _____ W _____ H _____
☐ Horizontal Cylinder
 D _____ L _____
☐ Vertical Cylinder
 D _____ H _____
☐ Capacity
 (actual gal.) _____

NO. OF TANKS:

- ☐ 1
☐ 2
☐ 3
☐ Other _____

VOLTAGE:

- ☐ 120v, 1ph.¹
☐ 240v, 1ph.²
☐ 208v, 3ph.
☐ 230v, 3ph.
☐ 460v, 3ph.

Voltage Notes: ¹Not Available with SmartPump, ²Not Available with 5HP gasoline SmartPump

COMMENTS: _____

TANK SPECIFICATIONS:

H - Tank Inside Height/Diameter.....

D - Double Wall Tank Interstitial Space

R - Fitting Riser

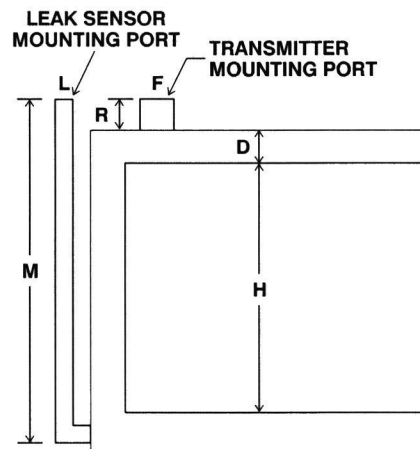
F - Transmitter Mounting Port Style and Size:

- a) ☐ Female ☐ Male
 b) ☐ 2" NPT ☐ 4" NPT ☐ Other _____

L - Leak Sensor Mounting Port Style and Size:

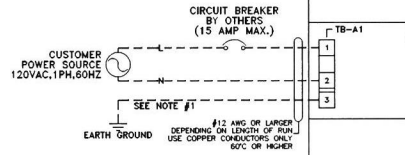
- a) ☐ Female ☐ Male
 b) ☐ 2" NPT ☐ Other _____

M - Leak Sensor Well Depth.....



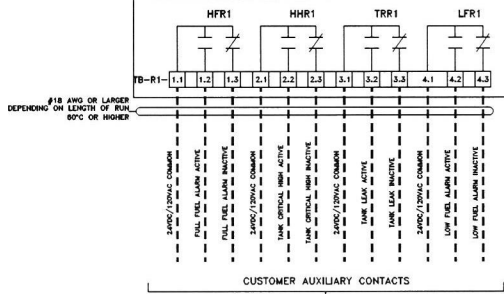
CUSTOMER FIELD CONNECTION WIRING DIAGRAM DETAIL

SIMPLEX CONTROL PANEL

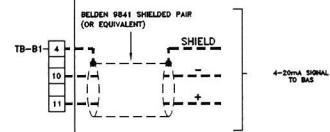
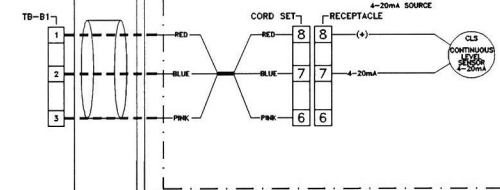
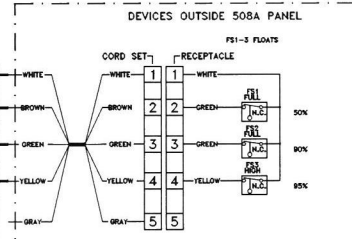


TANK
FLOAT SWITCHES
& LEAK SENSOR
CONNECTIONS

TANK
LEVEL TRANSDUCER
CONNECTIONS



CONTACTS RATED
10A @ 125/250VAC
1A @ 50VDC
PROVIDE EXTERNAL CIRCUIT PROTECTION AS REQUIRED

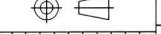


- NOTES:
1. UNIT MUST BE GROUNDED FOR OPERATORS SAFETY.
 2. DASHED LINES - - - INDICATE WIRING NOT SUPPLIED BY SIMPLEX.

SIMPLEX INC.
5300 BREND MCKIN ROAD
SPRINGFIELD, ILLINOIS 62711-4528

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THIRD ANGLE PROJECTION



REV.	DATE	DESCRIPTION
A	02/06/2017	000001 Submitt

TOLERANCES
X.XXX ± 0.005"
X.XX ± 0.010"
X.X ± 0.020"
FRACTIONAL ± 1/32"
ANGLES ± 1°
SURFACES 125/

APPROVED BY: LT
DRAWN BY: LT
SCALE: 1:2.4481
SHEET SIZE: ANSI B
JOB NUMBER: 095582-1-1

DESCRIPTION
FIELD CONNECTION
CAFFC

Approved 02/06/2017

DRAWING NUMBER
ACD-00028417

SHEET NUMBER
1/1

REVISION
A



Wheatland ASTM A 53 Schedule 40 and Schedule 80 Pipe

Wheatland Steel Pipe is made by specialists who understand that it's the small details that make the difference between average products and superior products. At the Wheatland Plant, most department heads and foremen have been employed in some phase of pipe manufacturing for 25 or more years.

This kind of specialization, experience and knowledge pays off...in workable, threadable, uniform pipe. Delivered clean. Delivered promptly.

Wheatland specializes in manufacturing welded steel pipe in 1/2 through 4 nominal sizes. Available inventory in 1/8 to 12 pipe sizes produced to various ASTM standards is maintained to meet your pipe requirements.

Care, pride and personal concern are bonus features that go into every inch of Wheatland Pipe. Don't settle for less.

Make sure it's quality. Make sure it's Wheatland.

Standard Pipe Schedule 40 ASTM A 53 Grades A and B

NPS Designator	DN Designator	Outside Diameter		Inside Diameter		Wall Thickness		Nominal Weight (Mass) per unit Length			
		(Inches)	(mm)	(Inches)	(mm)	(Inches)	(mm)	Plain End (lb/ft)	Plain End (kg/m)	Threads & Couplings (lb/ft)	Threads & Couplings (kg/m)
1/8	6	0.405	10.3	0.269	6.8	0.068	1.73	0.24	0.37	0.25	0.37
1/4	8	0.540	13.7	0.364	9.2	0.088	2.24	0.43	0.63	0.43	0.63
3/8	10	0.675	17.1	0.493	12.5	0.091	2.31	0.57	0.84	0.57	0.84
1/2	15	0.840	21.3	0.622	15.8	0.109	2.77	0.85	1.27	0.86	1.27
3/4	20	1.050	26.7	0.824	20.9	0.113	2.87	1.13	1.69	1.14	1.69
1	25	1.315	33.4	1.049	26.6	0.133	3.38	1.68	2.50	1.69	2.50
1-1/4	32	1.660	42.2	1.380	35.1	0.140	3.56	2.27	3.39	2.28	3.40
1-1/2	40	1.900	48.3	1.610	40.9	0.145	3.68	2.72	4.05	2.74	4.04
2	50	2.375	60.3	2.067	52.5	0.154	3.91	3.66	5.44	3.68	5.46
2-1/2	65	2.875	73.0	2.469	62.7	0.203	5.16	5.80	8.63	5.85	8.67
3	80	3.500	88.9	3.068	77.9	0.216	5.49	7.58	11.29	7.68	11.35
3-1/2	90	4.000	101.6	3.548	90.1	0.226	5.74	9.12	13.57	9.27	13.71
4	100	4.500	114.3	4.026	102.3	0.237	6.02	10.80	16.07	10.92	16.23
5	125	5.563	141.3	5.047	158.2	0.258	6.55	14.63	21.77	14.90	22.07
6	150	6.625	168.3	6.065	154.1	0.280	7.11	18.99	28.26	19.34	28.58
8	200	8.625	219.1	7.981	202.7	0.322	8.18	28.58	42.55	29.35	43.73
10	250	10.750	273.0	10.020	254.5	0.365	9.27	40.52	60.29	41.49	63.36
Standard Pipe											
12'	300	12.750	323.8	12.000	304.8	0.375	9.52	49.61	73.78	51.28	76.21

Note: NPS 12 dimensions are for standard wall pipe, not schedule 40.

Product Type and Specification:

Standard welded pipe is produced in 1/2 to 6 trade sizes. Wheatland pipe is produced to ASTM A 53 Grades A and B, A 501, and A 589 Type II, API 5L and Federal Specification WW-P404. All pipe threads conform to ANSI B1.20.1. Merchant couplings comply with ASTM A 865.

Specifications and descriptions are accurate as known at time of publication and subject to change without notice.

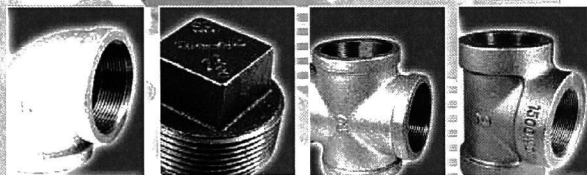
Wheatland ASTM A 53 Grades A & B Schedule 40 Pipe

STANDARD PACKING LISTS & PRODUCT SPECIFICATIONS

MALLEABLE IRON PIPE FITTINGS
GALVANIZED & BLACK
CLASS 150 lbs. & 300 lbs.

SFA
S.A. BRAND

SIAM FITTINGS CO., LTD.



QUALITY SYSTEM ISO 9001:2000

EN ISO 9001:2000; BS EN ISO 9001:2000; ANSI/ASQ Q9001:2000



Accredited by
Raad voor
Accreditatie

PACKING LISTS and SPECIFICATION STANDARD

STANDARD SPECIFICATIONS MALLEABLE IRON PIPE FITTINGS

CLASS	150 lbs.	300 lbs.
MATERIALS DIMENSIONS	ASTM A 197/ A 197 M, EQUIVALENT TO EN 1562 ASME B 16.3, ASME B 16.14, DIN EN 10242, EQUIVALENT TO BS 143 & 1256 : 2000	ASTM A 197/ A 197 M ASME B 16.3, ASME B 16.14
FLANGES DIMENSION	NA	NA
UNION DIMENSIONS	ASME B16.39, DIN EN 10242	ASME B16.39
THREADS	ANSI / ASME B 1.20.1, BS 21, DIN 2999, ISO 7-1	ANSI / ASME B 1.20.1
TENSILE STRENGTH	Min. 40,000 psi (28.4 kgf/mm. ²)	Min. 40,000 psi (28.4 kgf/mm. ²)
ELONGATION	Min. 5%	Min. 5%
ZINC COATING	ASTM A 153/A, 153M	ASTM A 153/A, 153M
WORKING PRESSURE	Class 150 psi. at 350°F	Class 300 psi. at 550°F

QUALITY SYSTEM ISO 9001:2000

SA QUALITY POLICY

- S** = Satisfy Customers.
I = Improvement Continually.
A = At acceptable price and cost.
M = Management Leadership.

All product and services provided by Siam Fittings Co., Ltd. Shall conform to the standard requirements and by our customers. Each employee is responsible for his or her input to the procurement, production, support, delivery service, corporate with supplier of management provided.

We are committed to continually improving all products and services and to maintain Siam Fittings as Quality Leader in our field, by Involvement of people, Leadership, Process approach, System approach to management and making decision base on fact.

Contain-It™

Secondary Containment Piping System

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Certified QMS ISO 9001: 2000
Certified EMS ISO 14001: 1996



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Easy and Reliable Secondary Containment Piping System

- **Split Pipe and Fittings**
- **Solid Pipe**

Not for Use with Compressed Air or Gases

George Fischer, Inc. DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above or below ground locations. The use of George Fischer, Inc. products in compressed air or gas systems automatically voids George Fischer, Inc. warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. George Fischer, Inc. will not accept responsibility for damage or impairment from its products, or other consequential or incidental damages caused by misapplication, incorrect assembly, and/or exposure to harmful substances or conditions.

Threaded fittings are not recommended for pressure applications.

For more information about any of our product lines, please call (800) 854-4090.

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+GF+ Contain-It Offers:

- **Split pipe and fittings**
- **Fits over virtually any carrier system**
- **Lightweight, easy to install**
- **Clear construction**
- **Interlocking construction**
- **Engineered bonding media channels and flanges**
- **Pre-drilled bonding media injection ports**
- **Quick and easy fitting clips**
- **Predetermined fitting clip locators**

Applications

Chemical Process Industry

The retrofit capability and chemical resistance of +GF+ Contain-It make this an ideal choice for containment piping of chemical process lines.

When you combine the advantages of +GF+ Contain-It with George Fischer's complete line of thermoplastic piping systems, you'll see that you can use "one source" for all your process and waste piping needs.

Environmental Protection Requirements

Federal, state and local regulations have been created to protect our environment from industrial pollution. Many of these regulations provide criminal penalties for owners, managers, and employees for environmental damage caused by chemical spills and leaks. For example, the Clean Water Act allows fines of \$25,000 to \$50,000 per day of violation and prison terms of one to three years.

Industry has been assessed clean-up expenditures which far exceed the costs to install protective measures. When penalties and fines are added to the costs of cleaning up spills and leaks, it becomes obvious that industry has a legal and financial responsibility for protecting our environment. George Fischer's Secondary Containment System provides the necessary environmental protection at a fraction of potential clean-up costs. The system includes many features which yield benefits to the owner, engineer and installer.

Split Pipe and Fittings

With pipe split along its length, the +GF+ Contain-It piping system can be installed over virtually any tested carrier system. The carrier system can be tested without interference from the containment piping. Any leaks found during testing can be easily repaired. Leak detection cable can be installed as the split components are assembled, eliminating the need for time consuming cable pulling or the inclusion of lines to pull the cable. Containment piping can be retrofitted over plastic and metallic systems above and below ground, protecting employees, equipment and the environment. Split Pipe and Fittings are available in 4" and 6".

Solid Pipe

Solid pipe may be combined with split fittings in installations which do not require retrofit capability or where it is preferred to pull a leak detection cable. Solid Pipe is available in 4" and 6".

Flexible Adapter

Flexible adapters allow connection to metal or chemical resistant plastic carrier systems other than PVC.

Centralizer

Centralizers center and support the carrier pipe. They are available for IPS and metric, for one or more carrier pipes.



Split Pipe and Fittings

Solid Pipe

Flexible Adapter

Centralizer

Clear Polyvinyl Chloride Construction

The clear construction allows for total inspection of the annular space which, in above ground installations, may eliminate the need for expensive leak detection systems. Polyvinyl Chloride's chemical resistance, high tensile strength and good impact resistance provides a material that is suitable for a broad range of applications. +GF+ Contain-It PVC secondary containment system is suitable for the intermittent and short term exposure found in containment piping.

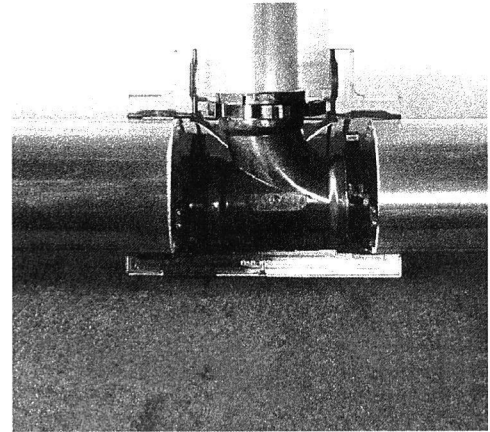
Few Tools Needed

+GF+ Contain-It requires fewer and less expensive tools than other containment piping systems. With +GF+ Contain-It, there is no fusion welding, eliminating the need for those tools which simplifies the installation procedures. Except for the common pipe preparation tools, all you'll need for +GF+ Contain-It are the following.

- *Fitting Clips and Hammer* — we provide the clips to hold the fittings in place prior to bonding. The hammer is used to drive the clips into place.
- *Pipe Clamp* — helps you snap the split pipe together.
- *Drill and Counterbore Drill Bit* — to drill injection ports when needed.
- *Injection Gun* — to inject bonding adhesive into the fittings.

Injection Bonding System

The Injection Bonding System provides a controlled application of the bonding media, eliminating the mess usually associated with brush applied resins and solvent cements. Furthermore, fusion welding is eliminated allowing installation using less expensive tools. The bonding media is injected into the length of the split pipe to provide a pressure rated leak free seal.



Pressure Rated

The +GF+ Contain-It system can be air pressure tested or, if preferred, a hydrostatic test may be specified.

Dim.	with Air	with Water with flex. Term. Fitting with Female Adapter	with rigid Term. Fitting
4"	5 psi (0.3 bar)	5 psi (0.3 bar)	32 psi (2.2 bar)
6"	5 psi (0.3 bar)	5 psi (0.3 bar)	32 psi (2.2 bar)

Installation Instructions

Equipment Needed For Assembly

- Fine tooth saw and miter box or chop saw with fine tooth blade
- Tubing cutter with wheel designed for plastic pipe (solid pipe only)
- File or pocket knife for deburring
- Pipe clamp (for split pipe assembly)
- Hammer
- Electric or battery operated hand drill
- Counterbore drill bits
- Crossover hole drill bits
- Pneumatic adhesive injection gun (air supply not to exceed 73 psi inbound air pressure) with air regulator gauge and hose assembly (0-100 psi gauge range) or manual adhesive injection gun
- Flash light and mirror
- Hot box for cartridges and heat blanket wrap/hot air heater for split pipe (for low temperature applications)

Solid Pipe Preparation

1. Determine pipe length via typical on site measurements.
2. Cut pipe. **Square cuts are important.** Solid pipe may be cut with a tubing cutter designed for cutting plastic pipe.
3. Deburr pipe ends using a knife blade or file.
4. Wipe pipe end with a clean, dry cloth.
5. Prior to installing solid pipe, install centralizers on primary pipe (see page 9.18).

Solid Pipe Installation

The exclusive use of solid Contain-It pipe may result in difficulty when joining the primary piping. Therefore, the installer should determine the ease with which the primary pipe fittings may be assembled within the Contain-It system. Pipe fittings must have enough room for the joining method.

There are two methods by which the primary pipe fittings will be accessible enough for proper installation. Both methods are illustrated on page 9.7.

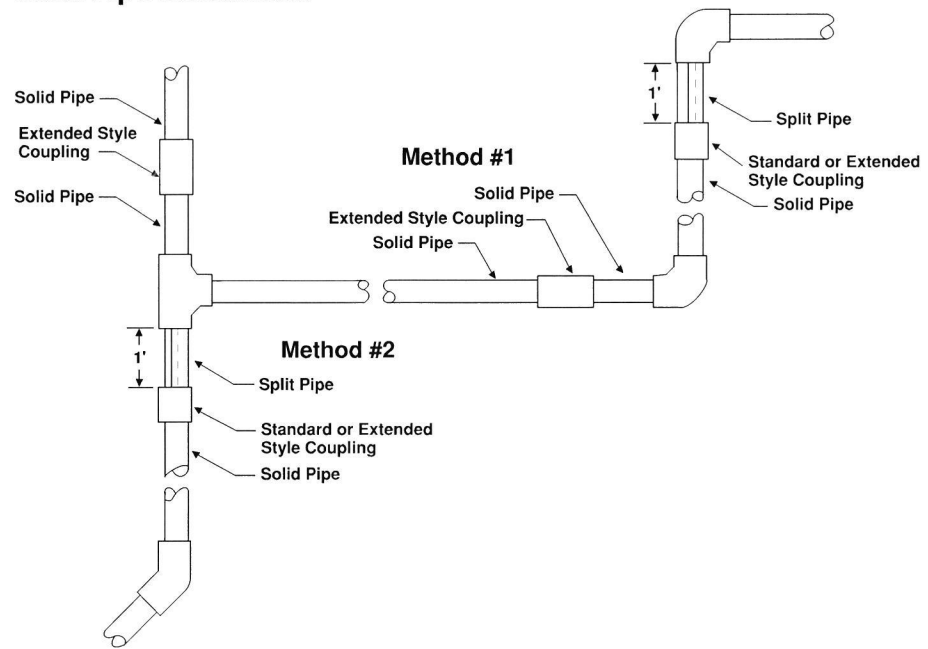
Method #1:

Utilizes solid pipe and at least one extended style coupling along a pipe run.

Method #2:

Utilizes split pipe with either a standard or extended style coupling along a pipe run.

Solid Pipe Installation

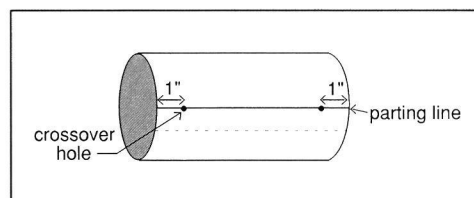


Split Pipe Preparation

1. Determine pipe length via typical on site measurements.
2. Cut pipe. **Square cuts are important.** Split pipe requires the use of a saw and miter box or a chop saw with a fine tooth blade.
3. Deburr pipe ends using a knife blade or file.
4. When using split pipe, a parting seam can be seen (and felt) where the pipe separates. **When cutting any split pipe for preparation/installation in the field, a crossover hole has to be drilled into this seam, on the cut end, and located within the bonding channel of the fitting.**

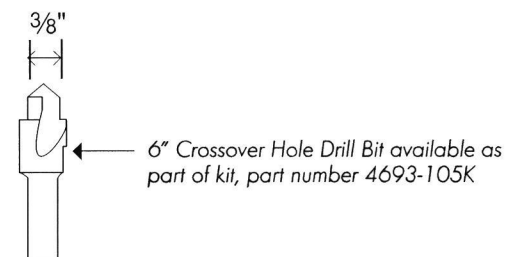
These locations are:

- **For most fittings** — the crossover hole must be drilled 1" from each end of the pipe length.



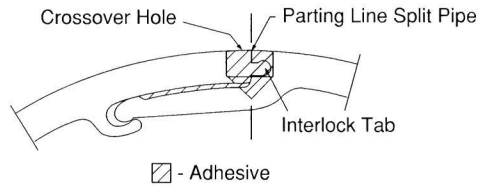
- **For extended style couplings** — based upon varying pipe insertions, the location of the crossover hole is to be determined so that it is located within the bonding channel of the fitting.

Note: The crossover hole drill bit for 6" split pipe is identified by a flat surface ground on one side of the bit as shown below.



5. The failure to properly drill crossover holes when using split pipe will result in leaks during a pressure test. If you are not completely sure of this procedure, **STOP IMMEDIATELY** and contact George Fischer Technical Service Department at (800) 854-4090.

6. Inspect the crossover hole for complete removal of the interlocking tab and any obstructions that may affect adhesive flow.



7. Prior to assembling split pipe, install centralizers on primary pipe (refer to page 16 of Contain-It Technical Manual).
8. Snap split pipe together for its full length using the pipe clamp (see below for more information) to insure full interlock of the tongue and groove seam.
9. Wipe pipe end with a clean, dry cloth.

Pipe Clamp Usage Instructions

Normally Contain-It split pipe can be hand assembled by pressing the halves together. However, in some cases, additional force may be required to fully engage the Contain-It split pipe seam. The Contain-It pipe clamp provides the additional force for assembling split four inch and six inch pipe.

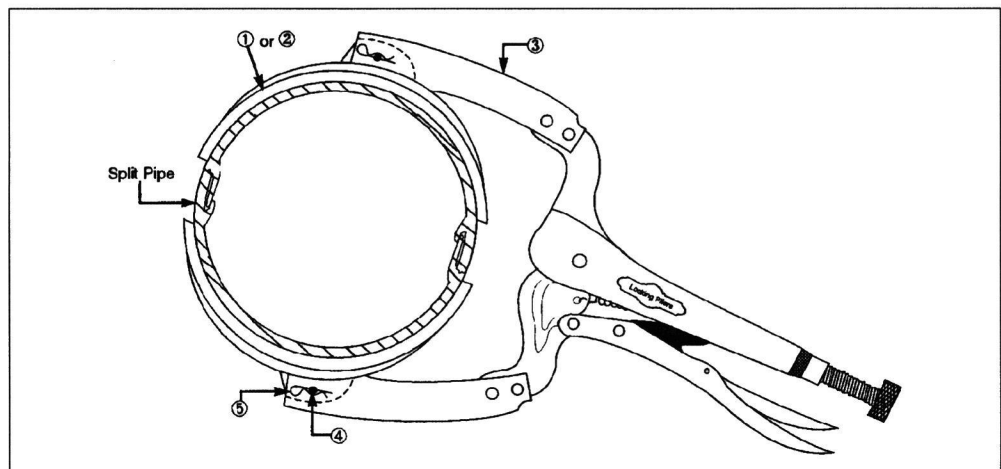
Assembling Clamp Halves

Four inch and six inch clamp halves are furnished and are readily inter-changeable by following this procedure:

1. Remove both hair pin cotters (5) from the clevis pins.
2. Remove the clevis pins (4).
3. Remove clamp halves (1 or 2) from the locking pliers.
4. Insert appropriate clamp halves with clevis pin hole facing forward in the locking pliers arm as shown in the drawing. The clevis pin hole (5) should be positioned forward on the clamp half, so that the tab does not extend past the pliers (3).
5. Replace clevis pins and hair pin cotters.
6. To adjust the pipe clamp, open the locking pliers and **position pipe all the way back in the clamp jaws** with pipe seams centered in the jaw openings. Close the locking pliers and adjust screw until clamp fits firmly on the pipe. Open locking pliers and tighten adjusting screw one to one and one half turns. This adjustment should provide sufficient force to press the pipe halves together.

Using the Pipe Clamp

The pipe clamp is now ready for use. Position the pipe clamp, as shown in the drawing, with the pipe seams centered in the jaw openings. Close the locking pliers to exert force suitable to fully engage the split pipe seam. Repeat this operation along the pipe barrel until total engagement is achieved.



Split Fitting Assembly

1. Assemble fitting halves over pipe with the inter-locking fitting surfaces accurately aligned.
2. Install fitting clips on all locators and tap them into place.
 - **For most fittings** — make sure that the pipe is bottomed out in the socket.
 - **For extended style couplings** — make sure each pipe is inserted beyond the minimum depth mark on the fitting. A maximum space of $5\frac{1}{2}$ " may exist between pipe ends.

Note: If split pipe is used with the extended style coupling, it is important that the crossover holes do not align with the bonding channel of the fitting.

9

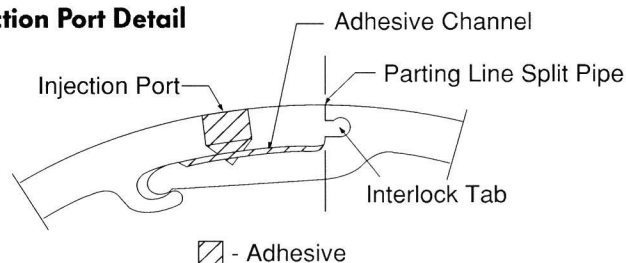
Preparation For Injection

If split pipe is being used, check to see if the predrilled injection ports on the pipe are located close to each fitting. If not, drill new injection ports within 2" of each fitting along the middle of the adhesive channel of the split pipe.

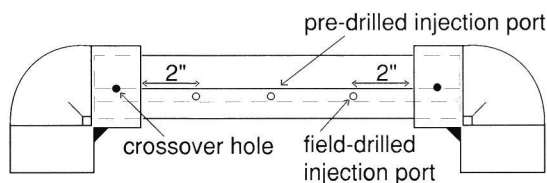
Note: The additional injection ports will allow proper adhesive flow through the crossover holes. The proper drill bits for this operation are:

4" dia. — Part No. 4693-104
 6" dia. — available as part of kit, Part No. 4693-105K

Injection Port Detail



Injection Hole Location



Instructions For Pneumatic Injection Gun

Caution: Read Before Using Product

- ALWAYS WEAR SAFETY GLASSES WHEN OPERATING DISPENSER.
- READ INSTRUCTIONS ON CARTRIDGE DISPENSER.
- ALWAYS AIM DISPENSER AT PARTS, NEVER AT PEOPLE.
- DO NOT EXCEED 73 PSI INBOUND AIR PRESSURE.

Instructions For Use

1. Connect air supply to injection gun. Set the regulator to 30 psi.
2. Load cartridge into the injection gun by grasping the large tube and inserting the small tube into the injection gun until it snaps in place. The tab between the tubes and the cartridge nut will slide into the grooved metal plate of the injection gun.
3. Remove the nut from the end of the cartridge. This will also remove the plug. Separate the plug from the nut and set the nut aside.
4. Assemble the mixing tip and the nut and attach to the end of the cartridge.
5. Dispense a tablespoon of the adhesive by pressing the trigger and observe that both components of the adhesive are flowing easily and the color and consistency is white and smooth. Release the trigger and press the red button at the back of the handle to stop the flow (the red button releases pressure on the pistons that push out the adhesives).
6. Check proper gun operation and adhesive flow by pressing the trigger. The adhesive should flow easily and the color and consistency should be white and smooth. Release the trigger and press the red button behind the handle to stop the flow. During injection, if adhesive is flowing into the Contain-It secondary pipe or

out of the seams of the Contain-It tongue and groove system, back off the pressure about 5 psi at a time until the situation improves.

7. When finished or when the cartridge is empty, press the red button on the back of the injection gun handle. This will retract the pistons.
8. To remove the cartridge, press the black button on the bottom of the cartridge housing. Grasp the large tube and remove the cartridge from the injection gun.
9. Store partial cartridges with a used tip in place. When reusing a cartridge, the mixing tip must be replaced.

Instructions For Manual Injection Gun

Caution: Read Before Using Product

- ALWAYS WEAR SAFETY GLASSES WHEN OPERATING DISPENSER.
- READ INSTRUCTIONS ON CARTRIDGE DISPENSER.
- ALWAYS AIM DISPENSER AT PARTS, NEVER AT PEOPLE.

Instructions For Use

1. Push the rear lever forward and pull back on the plunger located at the back end of the gun as far as it will allow.
2. Load cartridge into the injection gun by grasping the large tube and inserting the small tube into the injection gun until it snaps in place. The tab between the tubes and the cartridge nut will slide into the grooved metal plate of the injection gun. At this time it is necessary to select the ratio by turning the indicator, located on the side of the gun, to 10:1.
3. Remove the nut from the end of the cartridge. This will also remove the plug. Separate the plug from the nut and set the nut aside.
4. Assemble the mixing tip and the nut and attach to the end of the cartridge.

Note: If work is being done at temperatures below 50°F (10°C), the adhesive should be brought up to 73°F (23°C) to insure the best possible flow viscosity and to promote the chemical reaction necessary for bond strength. It may be necessary to use a hot box to achieve and maintain the 73°F (23°C) temperature.

5. Adhesive flow will begin after pumping the gun trigger several times. Dispense a tablespoon of the adhesive. The adhesive should flow easily and the color and consistency should be white and smooth. Push the rear lever to stop adhesive run-on.
6. When finished, push the rear lever, pull back on the plunger and remove the adhesive cartridge.
7. Store partial cartridges with a used tip in place. When reusing a cartridge, the mixing tip must be replaced.

Cold Weather Instructions

Use of Two Part Adhesive

It is very important that prior to use, the adhesive be brought up or cooled down to 73°F (23°C). At this temperature, the adhesive has its best flow viscosity and the cure cycle is promoted. Above 80°F (27°C) the flow viscosity turns thin. You may have to reduce the pressure of the injection gun to adjust for the easier flow or better keep it in an air-conditioned room until use.

To cure at low temperatures, a heat blanket is available from Bylin Heating Systems of El Dorado Hills, CA. For information call (916) 933-6666 and refer to BHS Part No. HTB-6505). The following table provides guidelines for ambient temperature conditions versus cure times.

Cure Time with Adhesive at 73°F (23°C)

Ambient Temperature	Cure Time (approx.)*
73°F (23°C) (Plus)	6 hours
30°F (0°C)	18 hours
Below 30°F (0°C)	Elevate joint and split pipe temperature above 30°F via heat blankets or hot air heater.

***Note:** Before pressure testing, check the adhesive at the last of the injection ports to be injected in order to insure that the adhesive has cured. If the adhesive is soft, lengthen the cure time until it hardens.

Injection of Split Pipe

1. **Always inject split pipe first.** Insert the mixing tip into the injection port closest to the fitting. The adhesive should flow easily through the adhesive channel. When the adhesive fills the crossover hole, close the valve.
2. Repeat Step #1 for the other side of the split pipe.
3. Repeat Step #1 for both sides of the other end of the pipe.
4. Move along the pipe to the next injection port and inject adhesive until it fills the bonding channel one-half the distance to the next injection port.
5. Repeat Step #4 until the channels on both sides of the pipe are completely filled with adhesive.

Injection of Split Fittings

1. Insert the mixing tip into a pre-drilled injection port around the fitting socket and open the valve handle. Allow the adhesive to flow until it reaches one-half the distance to the next injection port before closing the valve. Continue until the bonding channel is completely filled with adhesive.
2. All split fittings except the standard couplings have additional injection ports in the flange area. After completely filling the bonding channels along the fittings sockets, insert the mixing tip into the injection port in the flange area and completely fill the flange area with adhesive.

Containment of Flanged Systems

Research and Development has determined which size primary flanged systems will fit inside Contain-It. The chart below will be very helpful when recommending our system for this application. Custom centralizers will be necessary. Call for availability and price.

Contain-It Size	Primary Pipe Nominal Diameter	Flange OD
4"	1/2	3.520
6"	3/4	3.900
	1	4.270
	1 1/4	4.656
	1 1/2	5.032

Installation of One Piece Fittings

One piece Contain-It PVC fittings are not designed for injection. To install, simply apply a bead of adhesive to the pipe end and approximately 1" inside the fittings socket and join by inserting the pipe.

Installation of Drainage Patterns*

***Note:** For installation of 4" Fuseal, please contact George Fischer Sloane.

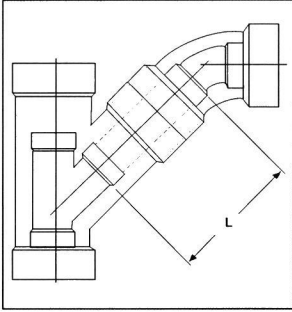
Injection molded drainage patterns which are available for Contain-It and primary drainage systems minimize the need for fabricated fittings. This off-the-shelf capability improves availability and speeds construction. In addition, flow characteristics are improved with injection molded primary drainage fittings.

However, due to differences in laying lengths, only certain primary fittings will fit inside similar Contain-It configurations. The chart below indicates which George Fischer drainage patterns fit inside split Contain-It fittings.

The Long Turn Tee Wyes listed are the only ones that will fit inside Contain-It fittings. If other Long Turn Tee Wyes or combinations are required, they must be assembled from Wyes and 1/8 Bends. The following diagram and chart give guidance on the assembly of primary and Contain-It drainage combinations. The Contain-It pipe that is twice the socket depth of the fittings. The primary Wye and 1/8 Bend require a longer section of pipe. The chart lists the primary pipe lengths required for various configurations.

Combination Contain-It Wye and 1/8 bends

George Fischer Drainage Patterns	Contain-It
1 1/2" and 2" Straight and Reducing Sanitary Tees	4" Tee (4601-040)
1 1/2" Long Turn Tee Wye	
1 1/2" and 2" Wye	4" Wye (4683-040)
1 1/2", 2" and 3" Straight and Reducing Sanitary Tees	6" Tee (4601-060)
1 1/2" and 2" Long Turn Tee Wye	
1 1/2", 2" and 3" Straight and Reducing Wyes	6" Wye (4683-060)



Contain-It is assembled socket to socket with a short piece of pipe. The primary is joined with a short piece of pipe, defined as "L" in the chart.

Combination Contain-It Wye and 1/8 bends

George Fischer Drainage Patterns	"L" Primary Pipe Length	Contain-It Combination
1/8 Bend combined with:		
2" Wye	6"	4" Wye + 1/8 Bend (socket to socket)
2" x 2" x 1 1/2" Wye	6 3/4"	(4683-040 + 4617-040)
1 1/2" Wye	7 1/2"	4" length of 4" pipe
1/8 Bend combined with:		
3" Wye	9"	
3" x 3" x 2" Wye	10 1/4"	6" Wye + 1/8 Bend (socket to socket)
2" Wye	10 1/2"	(4683-060 + 4617-060)
2" x 2" x 1 1/2" Wye	11 3/4"	5 1/2" length of 6" pipe
1 1/2" Wye	12 1/4"	

Installation Time Estimate

To provide a guide for estimating Contain-it installations, the following assembly and adhesive injection times are provided.

Assembly and Injection Time Per Fitting

Part	Number	Time
4" Contain-It Tee	4601-040	3 minutes
4" Contain-It Coupling	4629-040	2 minutes
6" Contain-It Tee	4601-060	4 1/2 minutes
6" Contain-It Coupling	4629-060	2 1/2 minutes

The following two charts (shown at right) show the time required to inject adhesive into split pipe and fittings (at 60 psi inject pressure with the Pneumatic Gun).

4" Split Pipe and Fittings

Part	Time
4" Split Pipe	44 seconds per linear foot
4" Split Fitting	30 seconds per socket
4" Split Tee (3 sockets)	1 1/2 minutes

6" Split Pipe and Fittings

Part	Time
6" Split Pipe	1 minute per linear foot
6" Split Fitting	80 seconds per socket
6" Split Tee (3 sockets)	4 minutes

Adhesive Requirements

Contain-It Cartridge	Fittings/Pipe	# of Sockets/Tube
1 cartridge	4" fittings	14
1 cartridge	6" fittings	10
1 cartridge	4" pipe	20 ft. length, both sides
1 cartridge	6" pipe	10 ft. length, both sides

Adhesive Requirements Calculation

This table is designed to assist in the accurate determination of the number of adhesive cartridges required for a specific project.

Fittings

Quantity of 4" Tees and Wyes _____ x 3 = _____

Quantity of 4" Fittings _____ x 2 = _____

(other than tees and wyes)

_____ /14 = _____

Quantity of 6" Tees and Wyes _____ x 3 = _____

Quantity of 6" Fittings _____ x 2 = _____

(other than tees and wyes)

_____ /10 = (+) _____

Split Pipe

_____ Feet 4" Split Pipe/20 = (+) _____

(1 cartridge will fill 20 ft., both sides)

_____ Feet 6" Split Pipe/10 = (+) _____

(1 cartridge will fill 10 ft., both sides)

.

TOTAL CARTRIDGES _____

Thermal Expansion Data

The change in length of PVC Contain-It pipe with variation should always be considered when installing pipe lines, and provisions should be made to

compensate for this change in length. The following table has been prepared to assist you in determining this expansion.

Example:

Highest temp. expected - 120°F

Lowest temp. expected - 50°F

Total Change (ΔT) - 70°F

Length of run - 40 feet

From 70°F row, read 1.01 inches length change (ΔL)

Note: Table is based on:
 $\Delta L = 12eL(\Delta T)$

Where:

e = Coefficient of
Thermal Expansion
 3.0×10^{-5} in./in. °F

L = Length of Run

ΔT = Temperature Change

Thermal Expansion ΔL (in.) – PVC

ΔT (°F)	Length of Run (ft.)									
	10'	20'	30'	40'	50'	60'	70'	80'	90'	100'
30	.11"	.22"	.32"	.43"	.54"	.65"	.76"	.86"	.97"	1.08"
40	.14"	.29"	.43"	.58"	.72"	.86"	1.01"	1.15"	1.30"	1.44"
50	.18"	.36"	.54"	.72"	.90"	1.08"	1.26"	1.40"	1.62"	1.80"
60	.22"	.43"	.65"	.86"	1.08"	1.30"	1.51"	1.73"	1.94"	2.16"
70	.25"	.50"	.76"	1.01"	1.26"	1.51"	1.76"	2.02"	2.27"	2.52"
80	.29"	.58"	.86"	1.15"	1.44"	1.73"	2.02"	2.30"	2.59"	2.88"
90	.32"	.65"	.97"	1.30"	1.62"	1.94"	2.27"	2.59"	2.92"	3.24"
100	.36"	.72"	1.03"	1.44"	1.80"	2.16"	2.52"	2.88"	3.24"	3.60"

Depending on the piping material used in the primary and secondary and their material properties (modules of elasticity, coefficient of expansion and allowable stress), many different expansion situations may be encountered. Other considerations should be: installation temperature versus primary operating temperatures versus secondary operating temperatures. There are several methods available for expansion and contraction compensation:

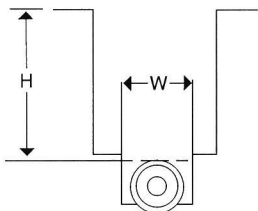
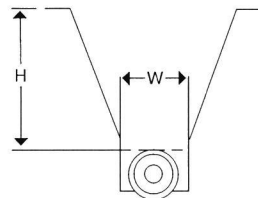
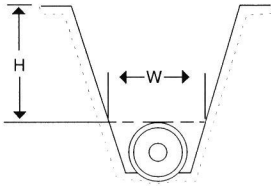
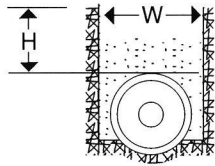
1. Expansion joints can be used in the secondary piping, allowing it to float with the primary system, creating a stress-free system.
2. Stress transfer disks may be placed between the primary and secondary piping, transferring thermally induced stresses incrementally.
3. Larger elbows in the secondary piping at changes in direction can be used to provide extra internal room.

In order to avoid excessive piping expansion that causes interference between the process and the containment piping, piping leg lengths shall be limited to size 4" / 2" - 50 feet, and size 6" / 4" - 45 feet liner and outer pipe temperatures @ 125°F. Anything over these lengths will require expansion or absorption devices.

Caution:

Expansion and contraction of the carrier or Contain-It piping can cause a failure of the containment protection system. It is important to adequately compensate for thermally induced expansion and contraction by the use of properly located offsets and/or expansion joints. The annular space must be considered in determining if adequate clearance exists for any carrier movement.

Trench Widths for PVC



W = Trench width at top of pipe

Note 1: Figures are calculated from minimum soil resistance values ($E' = 200$ psi for uncompacted sandy clay loam) and compacted soil ($E' = 700$ for side-fill soil that is compacted to 90% or more of Proctor Density for distance of two pipe diameters on each side of the pipe). If Wc' is less than Wc at a given trench depth and width, then soil compaction will be necessary.

Note 2: These are soil loads only and do not include live loads.

Soil Load

Underground pipes are subjected to external loads caused by the weight of the backfill material and by loads applied at the surface of the fill. These can range from static to dynamic loads.

Static loads comprise the weight of the soil above the top of the pipe and any additional material that might be stacked above ground. An important point is that the load on a flexible pipe will be less than on a rigid pipe buried in the same manner. That is because the

flexible conduit transfers part of the load to the surrounding soil and not the reverse. Soil loads are minimal with narrow trenches until a pipe depth of 10 feet is attained.

Dynamic loads are loads due to moving vehicles such as trucks, trains and other heavy equipment. For shallow burial conditions, live loads should be considered and added to static loads, but at depths greater than 10 feet, live loads have very little effect.

Live Loads for Buried Pipe, lb./ft.

Pipe Size	H 20 Wheel Loads for Various Depths of Pipe (lb./ft.)				
	2 ft.	4ft.	6ft.	8ft.	10ft.
4"	574	154	72	42	27
6"	837	224	106	61	40

Note: H 20 wheel load is 16,000 lb./wheel

Soil Load and Pipe Resistance for Thermoplastic Pipe – PVC Contain-It

Nom. Size	Wc' = Load Resistance of Pipe (lb./ft.)				H (ft.)	Wc = Soil Loads at Various Trench Widths at Top of Pipe (lb./ft.)			
	Solid Pipe		Split Pipe			2 ft.	3 ft.	4 ft.	5 ft.
	E' = 200	E' = 700	E' = 200	E' = 700					
4	426	975	352	901	10	252	297	324	360
					20	328	432	540	551
					30	342	493	603	743
					40	—	506	639	754
6	584	1392	514	1323	10	371	437	477	530
					20	484	636	742	812
					30	503	725	888	1093
					40	—	745	941	1110

Support Spacing

When Contain-It piping is installed above ground, it must be properly supported to avoid unnecessary stresses and excessive sagging. On horizontal runs, hangers or supports should be used at approximately the spacing given.

Note: additional support is required as temperature increases.

The following tables were calculated for 4" and 6" Contain-It with thermoplastic pipe (PVC, CPVC, PP) as the carrier, full of 1.0 specific gravity liquid.

4" Contain-It Support Spacing (ft.)

Temp °F (°C)	PVC, CPVC, PP Carrier Pipe Sizes (inch)					
	1/2	3/4	1	1 1/4	1 1/2	2
60 (15)	10.0	9.8	9.5	9.1	8.8	8.3
100 (36)	9.5	9.3	9.0	8.6	8.4	7.9
140 (57)	9.1	8.9	8.6	8.2	8.0	7.5

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

6" Contain-It Support Spacing (ft.)

Temp °F (°C)	PVC, CPVC, PP Carrier Pipe Sizes (inch)							
	1/2	3/4	1	1 1/4	1 1/2	2	3	4
60 (15)	12.7	12.6	12.4	12.0	11.8	11.3	10.3	9.4
100 (36)	12.1	11.9	11.7	11.4	11.2	10.8	9.7	9.0
140 (57)	11.5	11.4	11.2	10.9	10.7	10.2	9.3	8.5

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

Steel, Fiberglass Support Spacing (ft.)

If the carrier piping is stiffer than thermoplastic piping (steel, fiberglass, etc.), use the following table for hanger support spacing. Place centralizers only at pipe supports. No centralizers are required between pipe supports.

Support Spacing (ft.)

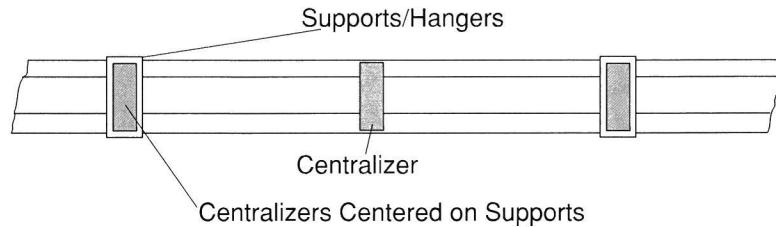
Temp °F (°C)	Contain-It Size (inch)	
	4"	6"
60 (15)	10.6	13.1
100 (36)	10.0	12.4
140 (57)	9.5	11.8

Centralizer Spacing

When thermoplastic piping is used as the carrier system, proper centralizer spacing is necessary to prevent over stressing or excessive sagging. To properly transfer the carrier load to the supports, centralizers should be centered on and, if required, positioned between the supports or hangers.

In the case of elbows and tees, one centralizer is required at the elbow or tee and the next one is spaced in either direction according to the tables.

The following tables are for centralizer spacing when thermoplastic pipe is the carrier pipe.



Maximum Centralizer Spacing (ft.) for Buried Pipe

Temp °F (°C)	Carrier Pipe Sizes (inch)							
	1/2	3/4	1	1 1/4	1 1/2	2	3	4
Schedule 40 PVC								
60 (15)	4 1/4	4 1/2	5	5 1/2	5 3/4	6 1/4	7 1/2	8 1/4
100 (36)	4	4 1/4	4 3/4	5 1/4	5 1/2	6	7	7 3/4
140 (57)	3 3/4	4	4 1/2	5	5 1/4	5 3/4	6 3/4	7 1/2
Schedule 80 PVC & CPVC								
60 (15)	4 1/2	4 3/4	5 1/4	5 3/4	6	6 1/2	8	8 3/4
100 (36)	4	4 1/2	5	5 1/2	5 3/4	6 1/4	7 1/2	8 1/4
140 (57)	3 3/4	4 1/4	4 3/4	5 1/4	5 1/4	6	7	8
Schedule 40 PPFR — Fuseal								
60 (15)	—	—	—	—	4 3/4	5 1/4	6 1/4	6 3/4
100 (36)	—	—	—	—	4 3/4	5	6	6 3/4
140 (57)	—	—	—	—	4 1/2	5	6	6 1/2
Schedule 80 PP								
60 (15)	3	3	3 1/2	—	4	4 1/4	5 1/4	5 1/4
100 (36)	2 1/2	3	3	—	3 1/2	4	4 3/4	5 1/4
140 (57)	2 1/4	2 1/2	2 3/4	—	3 1/4	3 1/2	4 1/4	4 1/2

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

For centralizer spacing for steel or fiberglass pipe, see table on page 15. Use the same spacing for buried steel or fiberglass pipe.

Testing

Final inspection should be accomplished via low pressure air or hydrostatic test as defined in the chart below. This chart gives the pressures allowed.

Fitting	Hydrostatic psi (bar)	Air psi (bar)
4" (with rigid Term. Fit.)	32 (2.2)	5 (0.3)
6" (with rigid Term. Fit.)	32 (2.2)	5 (0.3)
Female Adapters	5 (0.3)	5 (0.3)
Flexible Adapters	5 (0.3)	5 (0.3)

Note: When flexible adapters or female adapters are included, the entire system is rated at 5 psi (0.3 bar), otherwise 32 psi (2.2 bar).

Repair

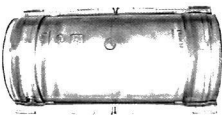
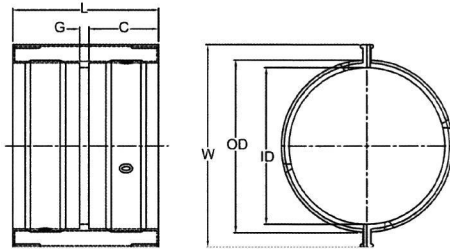
In the event that an adhesive void is discovered, it can be repaired by drilling into the void with the proper size Counterbore Drill Bit and injecting more adhesive. However, if leaks are discovered where no void is visible, the fitting and/or pipe must be removed and replaced.

Contain-It Fittings

Containment Coupling - Standard, Split (S x S)



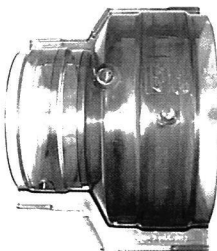
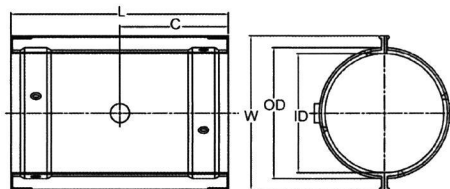
Size [inch]	code	Pack Qty	C [inch]	G [inch]	L [inch]	W [inch]	O.D. [inch]	I.D. [inch]	
3	4629-030	5	2.00	0.38	4.38	5.04	3.96	3.55	
4	4629-040	5	2.00	0.38	4.38	5.81	4.69	3.88	
6	4629-060	5	2.75	0.38	5.81	8.19	6.88	5.97	



Containment Coupling - Extended, Split (S x S)

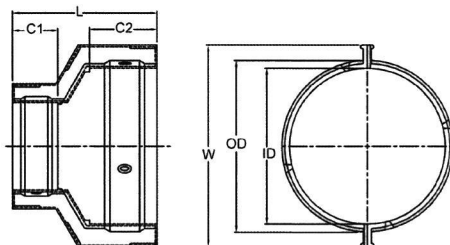
Maximum Gap: 5.50"

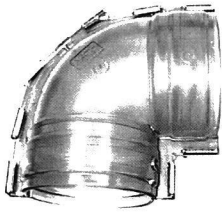
Size [inch]	code	Pack Qty	C [inch]	L [inch]	W [inch]	O.D. [inch]	I.D. [inch]	
3	4629-030E	5	4.50	9.00	5.04	3.96	3.55	
4	4629-040E	5	5.00	10.00	5.81	4.69	3.88	
6	4629-060E	5	5.75	11.50	8.19	6.88	5.97	



Containment Coupling - Reducing, Split (S x S)

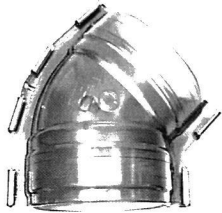
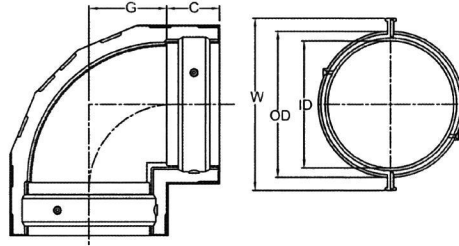
Size [inch]	code	Pack Qty	C1 [inch]	C2 [inch]	L [inch]	W [inch]	O.D. [inch]	I.D. [inch]	
6 x 4	4629-532	5	2.00	2.75	5.81	8.19	6.88	5.97	





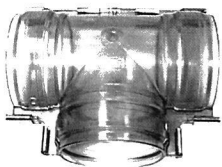
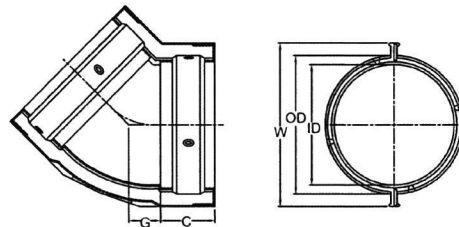
Containment 90° ELL, Split (SxS)

Size [inch]	code	Pack Qty	C [inch]	G [inch]	W [inch]	O.D. [inch]	I.D. [inch]	
3	4606-030	5	2.00	2.44	5.81	4.69	3.88	
4	4606-040	5	2.00	2.44	5.81	4.69	3.88	
6	4606-060	5	2.75	3.38	8.19	6.88	5.97	



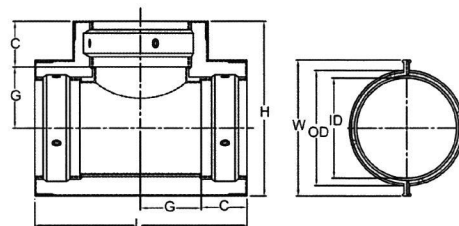
Containment 45° ELL, Split (S x S)

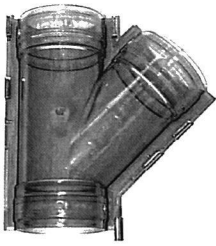
Size [inch]	code	Pack Qty	C [inch]	G [inch]	W [inch]	O.D. [inch]	I.D. [inch]	
3	4617-030	5	2.00	2.00	5.04	3.96	3.55	
4	4617-040	5	2.00	1.00	5.81	4.69	3.88	
6	4617-060	5	2.75	1.75	8.19	6.88	5.97	



Containment Tee, Split (S x S x S)

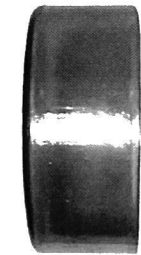
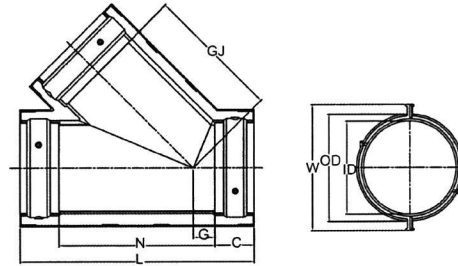
Size [inch]	code	C [inch]	G [inch]	H [inch]	L [inch]	W [inch]	O.D. [inch]	I.D. [inch]	Pack Qty	
4	4601-040	2	2	7.19	9	6	5	4	5	
6	4601-060	3	3	10.25	12	8	7	6	5	





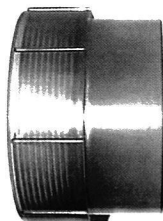
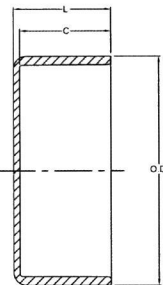
Containment 45° Wye, Split (S x S x S)

Size [inch]	code	Pack Qty	C [inch]	G [inch]	GJ [inch]	L [inch]	N [inch]	W [inch]	O.D. [inch]	I.D. [inch]	
4	4683-040	5	2.00	0.75	5.88	11.00	7.13	5.81	4.69	3.88	
6	4683-060	5	2.75	1.81	7.75	15.19	9.75	8.19	6.88	5.97	



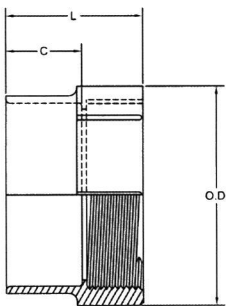
Containment Cap, One Piece (S)

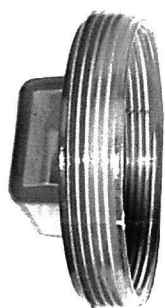
Size [inch]	code	Pack Qty	C [inch]	L [inch]	O.D. [inch]	
4	4647-040	5	1.75	1.94	4.50	
6	4647-060	5	2.75	3.19	6.75	



Containment Female Adapter, One Piece (S x FPT)

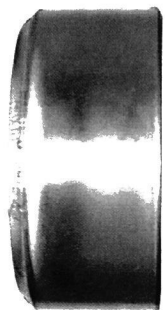
Size [inch]	code	Pack Qty	C [inch]	L [inch]	O.D. [inch]	
4	4635-040	5	1.75	3.18	5.00	
6	4635-060	5	3.00	5.00	6.75	





Plug, One Piece (MPT)

Size [inch]	code	Pack Qty	
4	4650-040	5	
6	4650-060	5	



Adapter Sleeve, One Piece (IPS Spg x S)

Size [inch]	code	Pack Qty	
3 x 3	4687-030	10	
4 x 4	4687-040	10	
6 x 6	4687-060	10	



Containment PPFR Floor Drain, One Piece (IPS Spg x MPT)

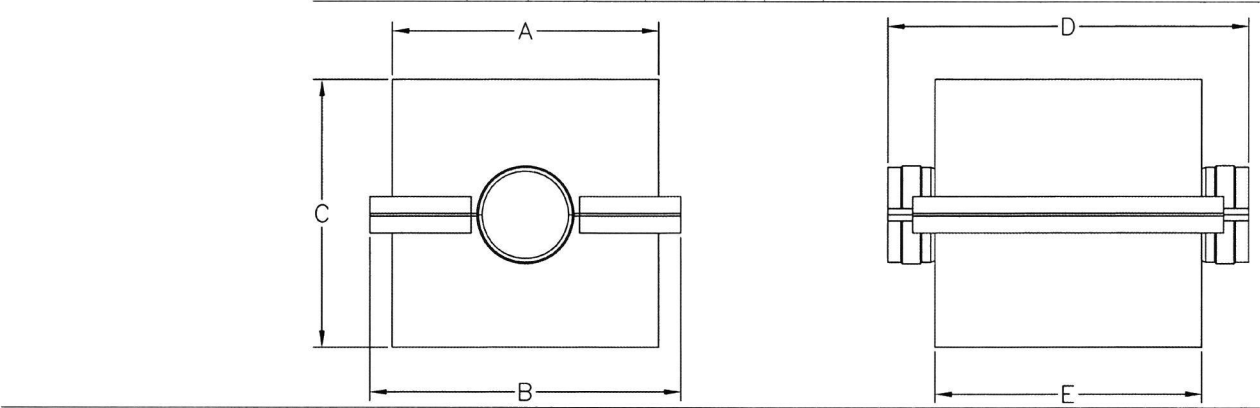
For use with Fuseal primary piping only.
Must use 4635-060 for Contain-It transition.

Size [inch]	code	
3 x 6	46104-530 *	
4 x 6	46104-532 *	

Contain-It Flange Box

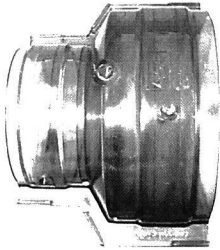
Flange Box

code	Size [inch]	A [inch]	B [inch]	C [inch]	D [inch]	E [inch]	
150 991 100 *	3	10	12	10	14.3	10	
150 991 101 *	4	12	14	12	16.3	12	
150 991 102 *	6	12	14	12	17.8	12	

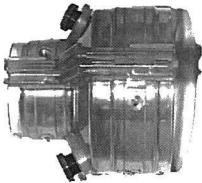
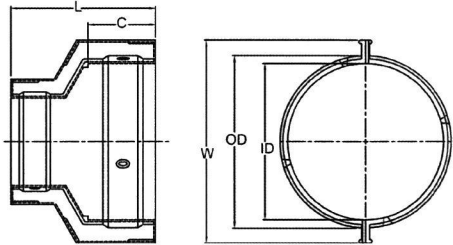


Contain-It Terminations

Termination Fitting - Rigid PVC, Split (S to IPS)

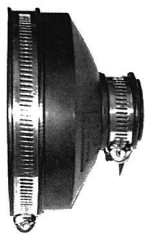
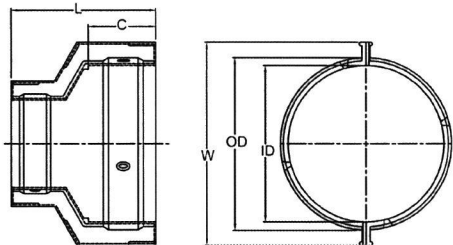


Size [inch]	code	C [inch]	L [inch]	W [inch]	O.D. [inch]	I.D. [inch]
4 x 1/2	4628-415 *	2.00	4.44	5.81	4.69	3.88
4 x 3/4	4628-416 *	2.00	4.44	5.81	4.69	3.88
4 x 1	4628-417 *	2.00	4.44	5.81	4.69	3.88
4 x 1 1/4	4628-418	2.00	4.44	5.81	4.69	3.88
4 x 1 1/2	4628-419	2.00	4.44	5.81	4.69	3.88
4 x 2	4628-420	2.00	4.44	5.81	4.69	3.88
6 x 2 1/2	4628-529 *	2.75	5.81	8.19	6.88	5.97
6 x 3	4628-530	2.75	5.81	8.19	6.88	5.97
6 x 4	4628-532	2.75	5.81	8.19	6.88	5.97



Test Termination Fitting - Rigid PVC, Split (S to IPS)

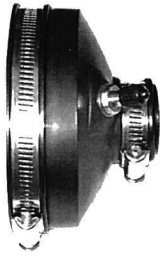
Size [inch]	code	C [inch]	L [inch]	W [inch]	O.D. [inch]	I.D. [inch]
4 x 2	4628-420T	2.00	4.44	5.81	4.69	3.88
6 x 4	4628-532T	2.75	5.81	8.19	6.88	5.97



Termination Fitting - Flexible Alcryn, One Piece

Contain-It to IPS/Metric

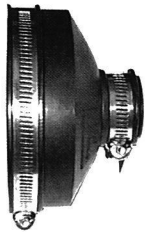
Size [inch]	Size	code
3 x 2	63	4628-338A
4 x 1/2	20	4628-415A
4 x 3/4	25	4628-416A
4 x 1	32	4628-417A
4 x 1 1/4	40	4628-418A
4 x 1 1/2	50	4628-419A
4 x 2	63	4628-420A
6 x 2 1/2	75	4628-529A
6 x 3	90	4628-530A
6 x 4	110	4628-532A



Test Termination Fitting - Flexible Alcryn, One Piece

Contain-It to IPS/Metric

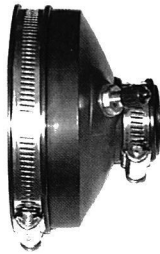
Size [inch]	Size	code	
3 x 2	63	4628-338AT	
4 x ½	20	4628-415AT	
4 x ¾	25	4628-416AT	
4 x 1	32	4628-417AT	
4 x 1 ¼	40	4628-418AT	
4 x 1 ½	50	4628-419AT	
4 x 2	63	4628-420AT	
6 x 2 ½	75	4628-529AT	
6 x 3	90	4628-530AT	
6 x 4	110	4628-532AT	



Termination Fitting - Flexible Alcryn, One Piece

Contain-It to Copper Tube Size

Size [inch]	code	
4 x ½	4628-415AC	
4 x ¾	4628-416AC	
4 x 1	4628-417AC	
4 x 1 ¼	4628-418AC	
4 x 1 ½	4628-419AC	
4 x 2	4628-420AC	
6 x 2	4628-528AC	
6 x 2 ½	4628-529AC	
6 x 3	4628-530AC	
6 x 4	4628-532AC	



Test Termination Fitting - Flexible Alcryn, One Piece

Contain-It to Copper Tube Size

Size [inch]	code	
4 x ½	4628-415ATC	
4 x ¾	4628-416ATC	
4 x 1	4628-417ATC	
4 x 1 ¼	4628-418ATC	
4 x 1 ½	4628-419ATC	
4 x 2	4628-420ATC	
6 x 2	4628-528ATC	
6 x 2 ½	4628-529ATC	
6 x 3	4628-530ATC	
6 x 4	4628-532ATC	

Contain-It Centralizers

Centralizer (Contain-It x IPS)



Size [inch]	d [inch]	code	Pack Qty
3 x 2		4686-338 *	25
4 x ½		4686-415 *	25
4 x ¾		4686-416 *	25
4 x 1		4686-417 *	25
4 x 1 ¼		4686-418 *	25
4 x 1 ½		4686-419 *	25
4 x 2		4686-420 *	25
6 x 2 ½		4686-529 *	25
6 x 3		4686-530 *	25
6 x 4		4686-532 *	25
6 x ½	Twin	4686-811 *	5
6 x ¾	Twin	4686-813 *	5
6 x 1	Twin	4686-815 *	5

Centralizer (Contain-It x Copper Tube Size)



Size [inch]	code	Pack Qty
4 x ½	4686-415C *	10
4 x ¾	4686-416C *	10
4 x 1	4686-417C *	10
4 x 1 ¼	4686-418C *	10
4 x 1 ½	4686-419C *	10
4 x 2	4686-420C *	10
6 x 2	4686-528C *	10
6 x 2 ½	4686-529C *	10
6 x 3	4686-530C *	10
6 x 4	4686-532C *	10

Centralizer (Contain-It x Metric)



Size [inch]	d [inch]	code	Pack Qty
4 x 20		4686-712 *	25
4 x 25		4686-713 *	25
4 x 32		4686-714 *	25
4 x 40		4686-715 *	25
4 x 50		4686-716 *	25
4 x 63		4686-717 *	25
6 x 75		4686-719 *	25
6 x 90		4686-720 *	25
6 x 110		4686-721 *	25
6 x 20	Twin	4686-812 *	5
6 x 25	Twin	4686-814 *	5
6 x 32	Twin	4686-816 *	5



Injection Bonding Made Easier!

No pressurized air

Easy, convenient operation

Less expensive

The Manual Injection Gun

for Contain-It™ Injection System

Contain-It™

Manual Injection Bonding System



Contain-It™ products and accessories.

The technical data given in this publication are for informational purposes only. They imply no warranty of any kind. Please consult our General Conditions of Supply.

The Manual Injection Gun offers three advantages that make it an ideal Contain-It™ Injection Bonding System.

The Injection Bonding System provides a controlled application of the bonding media, eliminating the mess usually associated with brush applied resins and solvent cements. The bonding media is injected into the interlocking groove found on split pipe and interlocking channel found on split fittings to provide a leak free seal.

No pressurized air

The manual model does not rely on pressurized air. Thus, it can be used anywhere, without wait or worry.

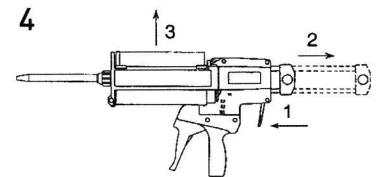
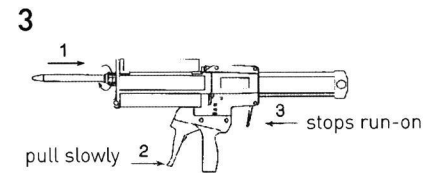
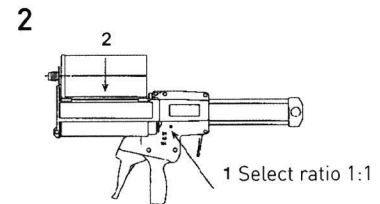
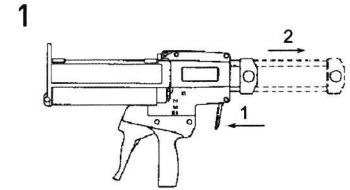
Easy, convenient operation

Because it can be used anywhere, the manual model offers more convenience to the operator.

Less expensive

The manual model is less expensive than the pneumatic model.

Instructions



Manual Injection Gun

For injecting bonding adhesive into the containment fittings.

Part Number	Std. Packs
4694-200	1

for pricing, terms and conditions see GF Piping Systems price lists

GF Piping Systems

7777 Sloane Drive, Little Rock, AR 72206

Tel. (501) 490-7777, Toll Free (800) 423-2686

Fax (877) 243-2689

sloane@ps.georgfischer.com

www.gfpiping.com

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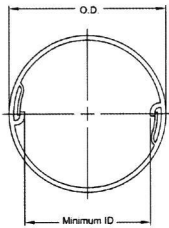
GEORG FISCHER
PIPING SYSTEMS

SECTION 2C

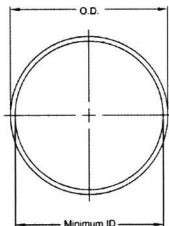
Page 33 of 36

Contain-It Pipe

Split Pipe



Size [inch]	lengths [ft]	code	Lift Qty [ft]	Minimum Order Qty [ft]	O.D. [inch]	Minimum I.D. [inch]	
3	10	37L015030 *	480	80	3.548	2.743	
4	10	37L015040 *	360	60	4.215	3.525	
6	10	37L015060 *	120	20	6.275	5.375	



Solid Pipe

Size [inch]	lengths [ft]	code	Lift Qty [ft]	Minimum Order Qty [ft]	O.D. [inch]	Minimum I.D. [inch]	
3	20	37L026030 *	700	120	3.548	3.248	
4	20	37L026040 *	520	80	4.215	3.882	
6	20	37L026060 *	340	40	6.275	5.782	

Support Spacing

When Contain-It piping is installed above ground, it must be properly supported to avoid unnecessary stresses and excessive sagging. On horizontal runs, hangers or supports should be used at approximately the spacing given.

Note: additional support is required as temperature increases.

The following tables were calculated for 4" and 6" Contain-It with thermoplastic pipe (PVC, CPVC, PP) as the carrier, full of 1.0 specific gravity liquid.

4" Contain-It Support Spacing (ft.)

Temp °F (°C)	PVC, CPVC, PP Carrier Pipe Sizes (inch)					
	1/2	3/4	1	1 1/4	1 1/2	2
60 (15)	10.0	9.8	9.5	9.1	8.8	8.3
100 (36)	9.5	9.3	9.0	8.6	8.4	7.9
140 (57)	9.1	8.9	8.6	8.2	8.0	7.5

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

6" Contain-It Support Spacing (ft.)

Temp °F (°C)	PVC, CPVC, PP Carrier Pipe Sizes (inch)							
	1/2	3/4	1	1 1/4	1 1/2	2	3	4
60 (15)	12.7	12.6	12.4	12.0	11.8	11.3	10.3	9.4
100 (36)	12.1	11.9	11.7	11.4	11.2	10.8	9.7	9.0
140 (57)	11.5	11.4	11.2	10.9	10.7	10.2	9.3	8.5

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

Steel, Fiberglass Support Spacing (ft.)

If the carrier piping is stiffer than thermoplastic piping (steel, fiberglass, etc.), use the following table for hanger support spacing. Place centralizers only at pipe supports. No centralizers are required between pipe supports.

Support Spacing (ft.)

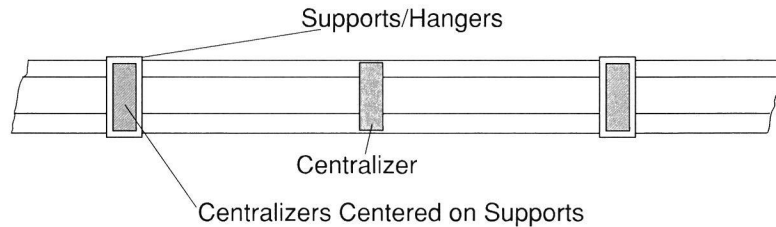
Temp °F (°C)	Contain-It Size (inch)	
	4"	6"
60 (15)	10.6	13.1
100 (36)	10.0	12.4
140 (57)	9.5	11.8

Centralizer Spacing

When thermoplastic piping is used as the carrier system, proper centralizer spacing is necessary to prevent over stressing or excessive sagging. To properly transfer the carrier load to the supports, centralizers should be centered on and, if required, positioned between the supports or hangers.

In the case of elbows and tees, one centralizer is required at the elbow or tee and the next one is spaced in either direction according to the tables.

The following tables are for centralizer spacing when thermoplastic pipe is the carrier pipe.



Maximum Centralizer Spacing (ft.) for Buried Pipe

Temp °F (°C)	Carrier Pipe Sizes (inch)							
	1/2	3/4	1	1 1/4	1 1/2	2	3	4
Schedule 40 PVC								
60 (15)	4 1/4	4 1/2	5	5 1/2	5 3/4	6 1/4	7 1/2	8 1/4
100 (36)	4	4 1/4	4 3/4	5 1/4	5 1/2	6	7	7 3/4
140 (57)	3 3/4	4	4 1/2	5	5 1/4	5 3/4	6 3/4	7 1/2
Schedule 80 PVC & CPVC								
60 (15)	4 1/2	4 3/4	5 1/4	5 3/4	6	6 1/2	8	8 3/4
100 (36)	4	4 1/2	5	5 1/2	5 3/4	6 1/4	7 1/2	8 1/4
140 (57)	3 3/4	4 1/4	4 3/4	5 1/4	5 1/4	6	7	8
Schedule 40 PPFR — Fuseal								
60 (15)	—	—	—	—	4 3/4	5 1/4	6 1/4	6 3/4
100 (36)	—	—	—	—	4 3/4	5	6	6 3/4
140 (57)	—	—	—	—	4 1/2	5	6	6 1/2
Schedule 80 PP								
60 (15)	3	3	3 1/2	—	4	4 1/4	5 1/4	5 1/4
100 (36)	2 1/2	3	3	—	3 1/2	4	4 3/4	5 1/4
140 (57)	2 1/4	2 1/2	2 3/4	—	3 1/4	3 1/2	4 1/4	4 1/2

Note: Table based on .100 in. deflection of a uniformly loaded, continuous beam.

For centralizer spacing for steel or fiberglass pipe, see table on page 15. Use the same spacing for buried steel or fiberglass pipe.

22 05 53

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

SUBMITTAL NO. 22 0553 -

THIS DOCUMENT HAS BEEN REVIEWED FOR GENERAL
CONFORMANCE WITH CONTRACT DOCUMENTS. THIS
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SUPPLIER OF RESPONSIBILITY FOR ADHERENCE TO
CONTRACT DOCUMENTS

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- ☐ APPROVED AS NOTED
- ☐ FOR RECORD ONLY
- ☐ REJECTED
- ☐ REVISE AND RE-SUBMIT
- ☐ VOID

By Levi Aldrich Date: 1/2/2019

lewis

GBD

This product is solely the responsibility of the
Design-Build Contractor and not within the
scope of review by GBD Architects.

GBD Architects Incorporated
1120 NW Couch St., Suite 300 Portland, OR 97209

2.1 EQUIPMENT LABELS

Search Technical Data Sheets



Technical Data Sheet

BRADY B-1 ENGRAVED TAGS AND SIGNS

TDS No. B-1
Effective Date: 29-Jan-2001

Description:

Brady B-1 engraved tags and signs are a rigid laminate in which colored top and bottom layers of the material are thermoset with a contrasting color core.

Details:



✓ Note: 1/2" Letters on Black Background

Use:

Brady B-1 engraved tags and signs are designed for both indoor and outdoor use.

Material Construction:

Blended plastic extruded sheet

Special Properties:

The engraving material is fire and abrasion resistant.

Standard Material Colors:

Yellow/black, blue/white, green/white, red/white, white/black, green/black, orange/black, yellow/magenta

✓ Thickness (ASTM D 1593):

Total: 0.062 in. (1.6 mm)

Tensile Strength (ASTM D 638):

6500 psi (46 MPa)

Flexural Properties (ASTM D 790):

Yield: 16,000 psi (112 MPa)

Modulus: 39,000 psi (273 MPa)

Weight (ASTM D 790):

0.38 lb/ft.² (1.9 kg/m²)

Abrasion Resistance (Method 5306 of U.S. Federal Test Method Std. No. 191A):

CS-10 wheels, 500 g wts.

Screen printed header withstands up to 400 cycles

H-22 wheels, 1000 g wts.

Substrate withstands up to 8000 cycles

Gloss (ASTM D 523):

90 Gardner Units

✓Service Temperature:

-40°F to 193°F (-40°C to 90°C)

Flammability (ASTM D 635):

Burn Rate: 0.83 in./min. (2.1 cm/min.)

Average Outdoor Durability:

5-8 years (Average expected outdoor life of product will depend on user definition of failure and climatic conditions.)

Chemical Resistance:

REAGENT	7 DAY IMMERSION	DIP TEST	RUB TEST
30% Sulfuric Acid	NE	NE	NE
10% Sulfuric Acid	NE	NE	NE
30% HCl	NE	NE	NE
10% HCl	NE	NE	NE
50% NaOH	NE	NE	NE
10% NaOH	NE	NE	NE
Methyl Ethyl Ketone	F	F	NE
Acetone	F	F	NE
1,1,1-Trichloroethane	F	F	NE
Methanol	F	NE	NE
IPA (Isopropanol)	F	NE	NE
ASTM #3 Oil	NE	NE	NE
SAE 20 Oil	NE	NE	NE
Alconox®	NE	NE	NE
Toluene	F	F	NE
Mineral Spirits	NE	NE	NE
Glacial Acetic Acid	F	F	NE
5% Acetic Acid	NE	NE	NE
Diesel Fuel	NE	NE	NE
Heptane	NE	NE	NE
Cellosolve Acetate	F	F	NE
Conc. Ammonia	NE	NE	NE
10% Ammonia	NE	NE	NE
Turpentine	NE	NE	NE
Kerosene	NE	NE	NE
Water	NE	NE	NE
Gasoline	F	NE	NE

NE = No Effect

NT = Not Tested

F = Failed (affected Sample)

7 Day Immersion: Immersed in reagent for 7 days.

Dip Test: Five 10 minute dips in reagent with 30 minute recovery.

Rub Test: Rubbed sample for 1 minute with swab soaked in reagent.

Shelf Life:

Unlimited when stored at 70°F (21°C) and 40% to 50% R.H.

Trademarks:

Alconox® is a registered trademark of Alconox Co.

Signmark® is a registered trademark of Brady Worldwide, Inc.

ASTM: American Society for Testing and Materials (U.S.A.)

SAE: Society of Automotive Engineers (U.S.A.)

All S.I. Units (metric) are mathematically derived from the U.S. Conventional Units.

Note: All values shown are averages and should not be used for specification purposes.

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WARRANTY

Brady products are sold with the understanding that the buyers will test them in actual use and determine for themselves their adaptability to their intended uses. Brady warrants to the buyers that its products are free from defects in material and workmanship, but limits its obligation under this warranty to replacement of the product shown to Brady's satisfaction to have been defective at the time Brady sold it. This warranty does not extend to any persons obtaining the product from the buyers. This warranty is in lieu of any other warranty, express or implied, including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability on Brady's part. Under no circumstances will Brady be liable for any loss, damage, expense, or consequential damages of any kind arising in connection with the use, or inability to use, Brady's products.

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2.2 WARNING SIGNS AND LABELS

Search Technical Data Sheets



Technical Data Sheet

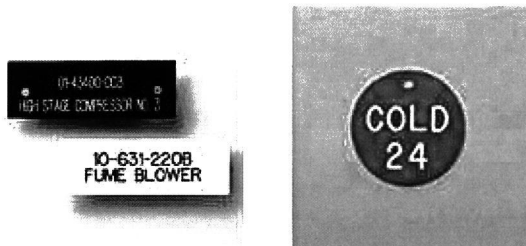
BRADY B-1 ENGRAVED TAGS AND SIGNS

TDS No. B-1
Effective Date: 29-Jan-2001

Description:

Brady B-1 engraved tags and signs are a rigid laminate in which colored top and bottom layers of the material are thermoset with a contrasting color core.

Details:



✓ Note: 1/2" Letters on Yellow Background

Use:

Brady B-1 engraved tags and signs are designed for both indoor and outdoor use.

Material Construction:

Blended plastic extruded sheet

Special Properties:

The engraving material is fire and abrasion resistant.

Standard Material Colors:

✓ Yellow/black, blue/white, green/white, red/white, white/black, green/black, orange/black, yellow/magenta

✓ Thickness (ASTM D 1593):

Total: 0.062 in. (1.6 mm)

Tensile Strength (ASTM D 638):

6500 psi (46 MPa)

Flexural Properties (ASTM D 790):

Yield: 16,000 psi (112 MPa)

Modulus: 39,000 psi (273 MPa)

Weight (ASTM D 790):

0.38 lb/ft.² (1.9 kg/m²)

Abrasion Resistance (Method 5306 of U.S. Federal Test Method Std. No. 191A):

CS-10 wheels, 500 g wts.

Screen printed header withstands up to 400 cycles

H-22 wheels, 1000 g wts.

Substrate withstands up to 8000 cycles

Gloss (ASTM D 523):

90 Gardner Units

✓ **Service Temperature:**

-40°F to 193°F (-40°C to 90°C)

Flammability (ASTM D 635):

Burn Rate: 0.83 in./min. (2.1 cm/min.)

Average Outdoor Durability:

5-8 years (Average expected outdoor life of product will depend on user definition of failure and climatic conditions.)

Chemical Resistance:

REAGENT	7 DAY IMMERSION	DIP TEST	RUB TEST
30% Sulfuric Acid	NE	NE	NE
10% Sulfuric Acid	NE	NE	NE
30% HCl	NE	NE	NE
10% HCl	NE	NE	NE
50% NaOH	NE	NE	NE
10% NaOH	NE	NE	NE
Methyl Ethyl Ketone	F	F	NE
Acetone	F	F	NE
1,1,1-Trichloroethane	F	F	NE
Methanol	F	NE	NE
IPA (Isopropanol)	F	NE	NE
ASTM #3 Oil	NE	NE	NE
SAE 20 Oil	NE	NE	NE
Alconox®	NE	NE	NE
Toluene	F	F	NE
Mineral Spirits	NE	NE	NE
Glacial Acetic Acid	F	F	NE
5% Acetic Acid	NE	NE	NE
Diesel Fuel	NE	NE	NE
Heptane	NE	NE	NE
Cellosolve Acetate	F	F	NE
Conc. Ammonia	NE	NE	NE
10% Ammonia	NE	NE	NE
Turpentine	NE	NE	NE
Kerosene	NE	NE	NE
Water	NE	NE	NE
Gasoline	F	NE	NE

NE = No Effect

NT = Not Tested

F = Failed (affected Sample)

7 Day Immersion: Immersed in reagent for 7 days.

Dip Test: Five 10 minute dips in reagent with 30 minute recovery.

Rub Test: Rubbed sample for 1 minute with swab soaked in reagent.

Shelf Life:

Unlimited when stored at 70°F (21°C) and 40% to 50% R.H.

Trademarks:

Alconox® is a registered trademark of Alconox Co.

Signmark® is a registered trademark of Brady Worldwide, Inc.

ASTM: American Society for Testing and Materials (U.S.A.)

SAE: Society of Automotive Engineers (U.S.A.)

All S.I. Units (metric) are mathematically derived from the U.S. Conventional Units.

Note: All values shown are averages and should not be used for specification purposes.

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2.3 PIPE LABELS

provide pipe label, letter color and background color per spec 3.2.B. provide flow direction arrows. Provide letter size to match pipe size and ANSI standard.

Self-Sticking Vinyl Pipemarkers Section No.

Markers meet the requirements of the ASME (ANSI) A13.1 Standard for the identification of piping system contents when used with Directional Flow Arrow Tape (sold separately pg. 110)

Durable B-946 material ideal for indoor and outdoor environments

Markers supplied on a coated backing material that makes handling and installation easy

Marker ends should be banded with Brady Directional Flow Arrow Tape (sold separately on page 110) to indicate pipe content flow direction

Available in four styles

Choose from more than 200 stock legends or customize your own

Outside Diameter	Letter Height	Style Description	Order Style
8" or greater	2 1/2"	Style 1HV: One 4" x 24" marker per card	1HV
2 1/2" to 7 7/8"	1 1/4"	Style 1: One 2 1/4" x 14" marker per card	1
3/4" to 2 3/8"	3/4"	Style 4: Four 1 1/8" x 7" markers per card	4
Less than 3/4"	1/2"	Style 3C: Three 2 1/4" x 2 3/4" markers per card plus 8 strips of Arrow Tape	3C



*When ordering, please indicate the catalog number for your desired legend followed by the Order Style (1HV, 1,4 or 3C).

Legend	Background Color	Catalog No.	Legend	Background Color	Catalog No.	Legend	Background Color	Catalog No.
ACETONE	Yellow	7000 -*	CHLORINE GAS	Yellow	7049 -*	DOMESTIC HOT		
ACETYLENE GAS	Yellow	7001 -*	CHLORINE SOLUTION	Yellow	7050 -*	WATER SUPPLY	Yellow	7089 -*
ACID	Yellow	7002 -*	CIRCULATING WATER	Green	7051 -*	DRAIN	Green	7090 -*
ACID VENT	Yellow	7003 -*	CIRCULATING WATER	Yellow	7052 -*	DRAIN	Yellow	7091 -*
ACID WASTE	Yellow	7004 -*	CITY GAS	Yellow	7053 -*	DRAIN WATER	Green	7092 -*
AIR	Yellow	7005 -*	CITY WATER	Green	7054 -*	DRINKING WATER	Green	7093 -*
AIR	Blue	7006 -*	COLD WATER	Green	7055 -*	DUAL TEMPERATURE	Yellow	7094 -*
AIR	Green	7007 -*	COLD WATER RETURN	Green	7056 -*	EFFLUENT	Yellow	7095 -*
AIR RETURN	Blue	7008 -*	COLD WATER SUPPLY	Green	7057 -*	ELECTRIC TRACED	Yellow	7096 -*
AIR RETURN	White	7009 -*	COMPRESSED AIR	Yellow	7058 -*	ELECTRIC TRACED	Orange	7097 -*
AIR SUPPLY	Blue	7010 -*	COMPRESSED AIR	Green	7059 -*	EXHAUST	Yellow	7098 -*
AIR SUPPLY	White	7011 -*	COMPRESSED AIR	Blue	7060 -*	EXHAUST	Green	7099 -*
ALCOHOL	Yellow	7012 -*	CONDENSATE	Yellow	7061 -*	EXHAUST AIR	Blue	7100 -*
ALUM	Yellow	7013 -*	CONDENSATE DRAIN	Yellow	7062 -*	EXHAUST AIR	White	7101 -*
AMMONIA	Yellow	7014 -*	CONDENSATE DRAIN	Green	7063 -*	EXHAUST INTAKE	Blue	7102 -*
ARGON	Green	7015 -*	CONDENSATE			FEED	Yellow	7103 -*
ARGON	Blue	7016 -*	PUMP DISCHARGE	Yellow	7064 -*	FEED	Green	7104 -*
ASBESTOS FREE	Blue	7017 -*	CONDENSATE RETURN	Yellow	7065 -*	FILTERED WATER	Green	7105 -*
ASBESTOS FREE			CONDENSATE SUPPLY	Yellow	7066 -*	FILTRATE	Yellow	7106 -*
INSULATION	Blue	7018 -*	CONDENSER WATER	Green	7067 -*	FIRE AUTO		
ASBESTOS			CONDENSER			SPRINKLERS	Red	7107 -*
INSULATION	Yellow	7019 -*	WATER RETURN	Green	7068 -*	FIRE DRY STANDPIPE	Red	7108 -*
BACKWASH	Green	7020 -*	CONDENSER			FIRE MAIN	Red	7109 -*
BLANK	Blue	7021 -*	WATER SUPPLY	Green	7069 -*	FIRE PROTECTION		
BLANK	Green	7022 -*	COOLING WATER	Green	7070 -*	WATER	Red	7110 -*
BLANK	Orange	7023 -*	COOLING WATER			FLOOR DRAIN	Green	7111 -*
BLANK	Red	7024 -*	RETURN	Green	7071 -*	FREON	Green	7112 -*
BLANK	Yellow	7025 -*	COOLING WATER			FRESH WATER	Green	7113 -*
BLANK	White	7026 -*	SUPPLY	Green	7072 -*	FUEL GAS	Yellow	7114 -*
BLOW OFF WATER	Yellow	7027 -*	DEIONIZED WATER	Green	7073 -*	FUEL OIL	Yellow	7115 -*
BLOWDOWN	Yellow	7028 -*	DEIONIZED WATER			FUEL OIL RETURN	Yellow	7116 -*
BLOWER AIR	Green	7029 -*	RETURN	Green	7074 -*	FUEL OIL SUPPLY	Yellow	7117 -*
BOILER BLOW DOWN	Yellow	7030 -*	DEIONIZED WATER			FUEL OIL VENT	Yellow	7118 -*
BOILER FEED	Yellow	7031 -*	SUPPLY	Green	7075 -*	GAS	Yellow	7119 -*
BOILER FEED	Green	7032 -*	DIGESTED SLUDGE	Yellow	7076 -*	GASOLINE	Yellow	7120 -*
BOILER FEED WATER	Yellow	7033 -*	DIGESTER GAS	Yellow	7077 -*	GLYCOL	Yellow	7121 -*
BOILER WATER	Green	7034 -*	DIESEL OIL	Yellow	7078 -*	GLYCOL RETURN	Yellow	7122 -*
BREATHING AIR	Green	7035 -*	DISCHARGE	Yellow	7079 -*	GLYCOL SUPPLY	Yellow	7123 -*
BRINE	Green	7036 -*	DISCHARGE	Green	7080 -*	HEATING	Yellow	7124 -*
CARBON DIOXIDE	Yellow	7038 -*	DISTILLED WATER	Green	7081 -*	HEATING RETURN	Yellow	7125 -*
CARBON DIOXIDE	Red	7039 -*	DOMESTIC	Yellow	7082 -*	HEATING STEAM	Yellow	7126 -*
CAUSTIC	Yellow	7040 -*	DOMESTIC	Green	7083 -*	HEATING SUPPLY	Yellow	7127 -*
CAUSTIC SODA	Yellow	7041 -*	DOMESTIC COLD			HEATING WATER	Yellow	7128 -*
CHEMICAL	Yellow	7042 -*	WATER	Green	7084 -*	HEATING WATER		
CHEMICAL FEED	Yellow	7043 -*	DOMESTIC COLD			RETURN	Yellow	7129 -*
CHILLED HOT WATER	Green	7044 -*	WATER RETURN	Green	7085 -*	HEATING WATER		
CHILLED WATER	Green	7045 -*	DOMESTIC COLD			SUPPLY	Yellow	7130 -*
CHILLED WATER			WATER SUPPLY	Green	7086 -*	HELIUM	Green	7132 -*
RETURN	Green	7046 -*	DOMESTIC HOT			HELIUM	Blue	7133 -*
CHILLED WATER			WATER	Yellow	7087 -*	HIGH PRESSURE	Yellow	7134 -*
SUPPLY	Green	7047 -*	DOMESTIC HOT			HIGH PRESSURE AIR	Yellow	7135 -*
CHLORINE	Yellow	7048 -*	WATER RETURN	Yellow	7088 -*			



Self-Sticking Vinyl Pipemarkers

Section No.

Legend	Background Color	Catalog No.	Legend	Background Color	Catalog No.	Legend	Background Color	Catalog No.
HIGH PRESSURE AIR	Green	7136 *	MEDIUM PRESSURE GAS	Yellow	7189 *	SANITARY VENT	Yellow	7252 *
HIGH PRESSURE CONDENSATE	Yellow	7137 *	MEDIUM PRESSURE NATURAL GAS	Yellow	7190 *	SANITARY WASTE	Yellow	7253 *
HIGH PRESSURE GAS	Yellow	7138 *	MEDIUM PRESSURE STEAM	Yellow	7191 *	SEAL WATER	Green	7254 *
HIGH PRESSURE NATURAL GAS	Yellow	7139 *	MILL AIR	Blue	7192 *	SECONDARY	Green	7255 *
HIGH PRESSURE NITROGEN	Yellow	7140 *	MILL WATER	Green	7193 *	SERVICE AIR	Yellow	7256 *
HIGH PRESSURE STEAM	Yellow	7141 *	MIXED GAS	Yellow	7194 *	SERVICE WATER	Green	7257 *
HIGH PRESSURE WATER	Yellow	7142 *	MURIATIC ACID	Yellow	7195 *	SEWAGE	Yellow	7258 *
HIGH TEMPERATURE HOT WATER	Yellow	7143 *	NATURAL GAS	Yellow	7196 *	SEWER	Green	7259 *
HOT	Yellow	7144 *	NITRIC ACID	Yellow	7197 *	SLUDGE	Yellow	7260 *
HOT GAS	Yellow	7145 *	NITROGEN	Green	7198 *	SLURRY	Yellow	7261 *
HOT WATER	Yellow	7146 *	NITROGEN	Blue	7200 *	SODIUM CHLORATE	Yellow	7262 *
HOT WATER RECIRCULATION	Yellow	7147 *	NITROUS OXIDE	Yellow	7202 *	SODIUM HYDROXIDE	Yellow	7263 *
HOT WATER RETURN	Yellow	7148 *	NON-POTABLE WATER	Yellow	7203 *	SODIUM HYPOCHLORITE	Yellow	7264 *
HOT WATER SUPPLY	Yellow	7149 *	OIL	Yellow	7204 *	SOFT WATER	Green	7265 *
HOUSE VACUUM	Green	7150 *	OUTLET	Green	7205 *	SOLVENT	Yellow	7266 *
HVAC RETURN	Yellow	7151 *	OUTSIDE AIR	Blue	7206 *	SPRINKLER	Red	7267 *
HVAC SUPPLY	Yellow	7152 *	OUTSIDE AIR	White	7207 *	SPRINKLER FIRE	Red	7268 *
HYDRAULIC LINE	Yellow	7153 *	OVERFLOW	Yellow	7208 *	SPRINKLER WATER	Red	7269 *
HYDRAULIC RETURN	Yellow	7154 *	OXYGEN	Green	7210 *	STEAM**	Yellow	7270 *
HYDRAULIC SUPPLY	Yellow	7155 *	OXYGEN	Yellow	7209 *	STEAM RETURN	Yellow	7271 *
HYDROCHLORIC ACID	Yellow	7156 *	OXYGEN	Blue	7211 *	STEAM SUPPLY	Yellow	7272 *
HYDROGEN	Yellow	7157 *	PLANT AIR	Yellow	7212 *	STORM DRAIN	Green	7273 *
HYDROGEN PEROXIDE	Yellow	7158 *	PLANT WATER	Green	7213 *	STORM SEWER	Green	7274 *
HYDROGEN SULFIDE	Yellow	7159 *	PLUMBING VENT	Green	7214 *	STORM WATER	Green	7275 *
INDUSTRIAL COLD WATER RETURN	Green	7160 *	POLYMER	Yellow	7215 *	SUCTION	Yellow	7276 *
INDUSTRIAL HOT WATER	Yellow	7161 *	POLYMER	White	7216 *	SULFUR DIOXIDE	Yellow	7277 *
INDUSTRIAL WASTE	Yellow	7162 *	POTABLE	Green	7217 *	SULFUR DIOXIDE LIQUID	Yellow	7278 *
INDUSTRIAL WATER	Green	7163 *	POTABLE WATER	Yellow	7218 *	SULFURIC ACID	Yellow	7279 *
INERT GAS	Green	7164 *	POTABLE WATER	Green	7219 *	SUMP PUMP	Yellow	7280 *
INLET	Yellow	7165 *	PRIMARY	Yellow	7220 *	DISCHARGE	Yellow	7280 *
INSTRUMENT AIR	Yellow	7166 *	PRIMARY	Green	7221 *	SUPPLY	Blue	7281 *
INSTRUMENT AIR	Green	7167 *	PRIMARY SLUDGE	Green	7222 *	SUPPLY	Green	7282 *
INSTRUMENT AIR	Blue	7168 *	PROCESS	Brown	7223 *	SUPPLY	Yellow	7311 *
KEROSENE	Yellow	7169 *	PROCESS WATER	Yellow	7224 *	TEMPERED WATER	Yellow	7283 *
LAB COMPRESSED AIR	Blue	7170 *	PROCESSED WATER	Green	7225 *	TOLUENE	Yellow	7284 *
LAB VACUUM	Yellow	7171 *	PROCESSED WATER	Yellow	7226 *	TOWER WATER	Green	7285 *
LIQUID NITROGEN	Yellow	7172 *	PROPANE GAS	Green	7227 *	TOWER WATER RETURN	Green	7286 *
LOW PRESSURE	Green	7173 *	PUMP	Yellow	7228 *	TOWER WATER SUPPLY	Green	7287 *
LOW PRESSURE AIR	Green	7174 *	RAIN WATER	Yellow	7229 *	TRANSFER	Yellow	7288 *
LOW PRESSURE CONDENSATE	Yellow	7175 *	RAW WATER	Green	7230 *	TREATED WATER	Green	7289 *
LOW PRESSURE GAS	Yellow	7176 *	RAW WATER	Yellow	7231 *	UNSAFE WATER	Yellow	7290 *
LOW PRESSURE NATURAL GAS	Yellow	7177 *	RECIRCULATED	Yellow	7232 *	VACUUM	Yellow	7291 *
LOW PRESSURE NITROGEN	Yellow	7178 *	RECOVERY	Yellow	7233 *	VACUUM	Green	7292 *
LOW PRESSURE STEAM	Yellow	7179 *	REFRIGERANT	Yellow	7234 *	VACUUM	Yellow	7293 *
LOW PRESSURE WATER	Green	7180 *	DISCHARGE	Yellow	7235 *	VALVE	Yellow	7294 *
LUBE OIL	Yellow	7181 *	REFRIGERANT LIQUID	Yellow	7235 *	VAPOR	Yellow	7294 *
MAKE-UP WATER	Green	7182 *	REFRIGERANT	Yellow	7236 *	VENT	Yellow	7295 *
MEDICAL AIR	Yellow	7184 *	SUCTION	Yellow	7237 *	VENT	Green	7296 *
MEDICAL VACUUM	White	7186 *	REFRIGERATED WATER	Green	7238 *	VENT	Blue	7297 *
MEDIUM PRESSURE AIR	Blue	7187 *	REFRIGERATION	Green	7239 *	WASTE	Yellow	7298 *
MEDIUM PRESSURE CONDENSATE	Yellow	7188 *	RELIEF	Yellow	7240 *	WASTE	Green	7299 *
			RELIEF AIR	Blue	7241 *	WASTE ACTIVATED SLUDGE	Yellow	7300 *
			RETURN	Blue	7242 *	WASTE WATER	Green	7301 *
			RETURN	Green	7243 *	WASTE WATER	Yellow	7302 *
			RETURN	Red	7244 *	WATER	Yellow	7303 *
			RETURN	Yellow	7245 *	WATER	Green	7304 *
			RET. ACTIVATED SLUDGE	Yellow	7246 *	WATER	Green	7305 *
			RIVER WATER	Green	7247 *	WELL WATER	Green	7306 *
			ROOF DRAIN	Green	7248 *	WHITE WATER	Yellow	7307 *
			SALT WATER	Green	7249 *	_____ °C	Yellow	7307 *
			SANITARY DRAIN	Green	7250 *	_____ °F	Yellow	7308 *
			SANITARY SEWER	Green	7251 *	_____ LB. STEAM	Yellow	7309 *
			SANITARY SEWER	Yellow	7251 *	_____ PSI	Yellow	7310 *



Press Blocks - Half Block

Electrical Equipment Submittals

Date Submitted 11/16/18

IES Submittal # 10.1

(Sect 26 32 13) Generator - Seismic Testing

GBD

This product is solely the responsibility of the Design-Build Contractor and not within the scope of review by GBD Architects.

GBD Architects Incorporated
1120 NW Couch St., Suite 300 Portland, OR 97209

SUBMITTAL NO. 26 3213 -

THIS DOCUMENT HAS BEEN REVIEWED FOR GENERAL CONFORMANCE WITH CONTRACT DOCUMENTS. THIS REVIEW DOES NOT RELIEVE SUBCONTRACTOR OR SUPPLIER OF RESPONSIBILITY FOR ADHERENCE TO CONTRACT DOCUMENTS

- ☒ APPROVED
- ☐ APPROVED AS NOTED
- ☐ FOR RECORD ONLY
- ☐ REJECTED
- ☐ REVISE AND RE-SUBMIT
- ☐ VOID

By Levi Aldrich

Date: 1/7/2019

lewis

IES Commercial
16135 SW 74th Ave
Tigard, OR 97224

Ph: (503) 648-1900

Project Manager - Matt Saager

IES®

Commercial
SECTION 2E
Page 1 of 5



THE VMC GROUP
The Power of Together™

CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS



Certification No.

VMA-50365-01C (REVISION 03)

Expiration Date: 05/31/2019

Certification Parameters:

The nonstructural products (mechanical and/or electrical components) listed on this certificate are **CERTIFIED¹** FOR SEISMIC APPLICATIONS in accordance with the following building code² releases.

IBC 2006, IBC 2009, IBC 2012, IBC 2015

The following model designations, options, and accessories are included in this certification. Reference report number **VMA-47967-01** and **VMA-48473-01** as issued by The VMC Group for a complete list of certified models, included accessories/options, and certified installation methods.

Cat® Diesel Engine Generator Set

The above referenced equipment is **APPROVED** for seismic application when properly installed³, used as intended, and contains a Seismic Certification Label referencing this Certificate of Compliance⁴. As limited by the tabulated values, below grade, grade, and roof-level installations, installations in essential facilities, for life safety applications, and/or of equipment containing hazardous contents are permitted and included in this certification with an Equipment Importance Factor assigned as $I_p=1.5$. The equipment is qualified by successful seismic shake table testing at the nationally recognized University of California Berkeley Pacific Earthquake Engineering Research Center and the Construction Engineering Research laboratory in Champaign, IL, under the review of the ISO Accredited Product Certification Agency, The VMC Group.

Certified Seismic Design Levels

Certified IBC	Importance $I_p \leq 1.5$ Soil Classes A-E Risk Categories I-IV Design Categories A-F	$S_{DS} \leq 2.260 \text{ g}^8$	$S_{DS} \leq .753 \text{ g}^8$
		$z/h = 0.0$	$z/h \leq 1.0$
		Horizontal Design ⁵	$\frac{F_p}{W_p} = 0.4 S_{DS} I_p \frac{a_p}{R_p} \left(1 + 2 \frac{z}{h}\right) \leq 1.695 \text{ g}$
Test Datum AC156	ISO 17025 Laboratory Pre/Post-Shake Functionality Tri-axial, 5% Damping SRS	$A_{FLEX-H} \leq 2.260 \text{ g}$	$A_{FLEX-V} \leq 1.507 \text{ g}$
		$A_{RIG-H} \leq 0.904 \text{ g}$	$A_{RIG-V} \leq 0.603 \text{ g}$
		$ZPA_H \leq 0.814 \text{ g}$	$ZPA_V \leq 0.542 \text{ g}$

Certified Seismic Installation Methods

Rigid mounting from unit base to rigid structure	External isolation mounting from unit base to rigid structure
--	---



THE VMC GROUP

The Power of Together™

CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Certified Product Table:

Series	Model		Max Rating [kW]	EPA Rating	Enclosure Options						Fuel Tank Capacities [gal]	S _{DS}	
					Steel			Aluminum				z/h = 0.0	z/h = 1.0
					WP Std.	SA1 Std.	SA2 Std.	WP Std.	SA1 Std.	SA2 Std.			
C4.4 LC	D40 / D50 / D60		60	Tier 3	●	●	●				140 – 258	2.49	0.83
C4.4	D40 / D50 / D60 / D80 / D100		100	Tier 3	●	●	●			●	156 – 412	2.49	0.83
C7.1	D125 / D150 / D175 / D200		200	Tier 3	●	●	●			●	376 – 784	2.49	0.83
C9	C9		300	Tier 3	●	●	●			●	150 – 1100	2.26	0.75
C13	C13		400	Tier 3	●	●	●		●		300 - 2100	2.26	0.75
C15	C15		550	Tier 2/3	●	●	●		●		300 - 2100	2.26	0.75
C18	C18		600	Tier 2/4	●				●		300 - 2100	2.26	0.75

This certification **includes** the open generator set and the enclosed generator set when installed with or without the sub-base tank. This certification also included the sub-base tank as a stand-alone accessory. The generator set and included options shall be a catalogue design and factory supplied. The product must be installed and attached directly to a housekeeping pad using the anchoring system provided by the equipment manufacturer and in accordance with the seismic installation details provided or approved by the project or building Structural Engineer of Record. This certification **excludes** all non-factory supplied accessories, including but not limited to mufflers, isolation/restraint devices, remote control panels, remote radiators, pumps and other electrical/mechanical components.



VMA-50365-01C (Revision 3)
 Issue Date: May 9, 2016
 Revision Date: November 28, 2016
Expiration Date: May 31, 2019



THE VMC GROUP

The Power of Together™

CATERPILLAR®

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Notes and Comments:

1. All equipment listed herein successfully passed the seismic acceptance criteria for shake testing non-structural components and systems as set forth in the ICC AC-156. The Test Response Spectrum (TRS) enveloped the Required Response Spectrum (RRS) for all units tested. The units cited in this certification were representative sample(s) of a contingent of models and all remained captive and structurally sound after the seismic shake simulation. The units also remained functionally operational after the simulation testing as functional testing was completed by the equipment manufacturer before and after the seismic simulations. Although a seismic qualified unit inherently contains some wind resisting capacity, that capacity is undetermined and is excluded from this certification. Snow/Ice loads have been neglected and thus limit the unit to be installed both indoors (covered by an independent protective structure) and out of doors (exposed to accumulating snow/ice) for ground snow loads no greater than 30 psf for all applications.
2. The following building codes are addressed under this certification:

IBC 2015 – referencing ASCE7-10 and ICC AC-156
IBC 2012 – referencing ASCE7-10 and ICC AC-156
IBC 2009 – referencing ASCE7-05 and ICC AC-156
IBC 2006 – referencing ASCE7-05 and ICC AC-156
3. Refer to the manufacturer supplied installation drawings for mounting provisions. The Structural Engineer or Design Engineer of Record is responsible for detailing the equipment anchorage requirements for the given installation. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, wall design, and attachment to non-building structures must be outlined and approved by the Engineer of Record for the project or building. Structural walls, structural floors, and housekeeping pads must also be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads. The installing contractor is responsible for observing the installation details provided or approved by the project or building Structural Engineer of Record for the seismic installation and proper installation of all anchors and mounting hardware.
4. For this certificate and certification to remain valid, this certificate must correspond to the "Seismic Certification Label" found affixed to the unit by the factory. The label ensures the manufacturer built the unit in conformance to the IBC seismic design criteria set forth by the Certified Seismic Qualification Agency, The VMC Group, and meets the seismic design levels claimed by this certificate.
5. Mechanical, Electrical, and Plumbing connections to the equipment must be flexibly attached as to not transfer load through the connection. The structural integrity of any conduit, cable trays, piping, ductwork and/or flexible connections is the responsibility of others. This certification does not guarantee the equipment will remain compliant to UL or NEMA standards after a seismic event.
6. This certificate applies to units manufactured at 284 Mawsons Way, Newberry, SC 29360.
7. This project follows The VMC Group's ISO-17065 Scheme for Product Certification of Nonstructural Components.
8. The qualified seismic design level stated is the lowest for all series this certificate covers, for more detailed ranges of qualified seismic design levels, see the certified product tables.

John P. Giuliano, PE
President, The VMC Group

VMA-50365-01C (Revision 3)
Issue Date: May 9, 2016
Revision Date: December 2, 2016
Expiration Date: May 31, 2019



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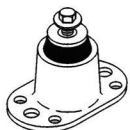
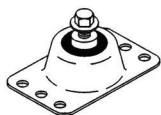


MASON INDUSTRIES, INC.

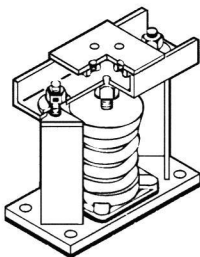
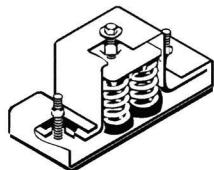
350 Rabro Drive • Hauppauge, NY 11788 • 631/348-0282 • FAX 631/348-0279
2101 W. Crescent Ave., Suite D • Anaheim, CA 92801 • 714/535-2727 • FAX 714/535-5738
Reply to - P.O. Box 410, Smithtown, NY 11787

Representatives in the U.S.A. & throughout the World

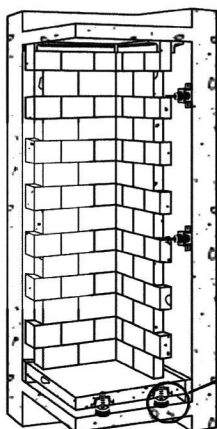
NEOPRENE MOUNTINGS



SPRING MOUNTS



FLOATING FLOORS, CEILINGS & WALLS



SUBMITTAL DATA

PROJECT : PRESS BLOCKS

ARCHITECT :

ENGINEER :

CONTRACTOR:

P.O. NUMBER :

COMMENTS :

SEISMIC BRACING FOR SUSPENDED PIPING SYSTEM

DATE : 1/8/19

M.I. No. : E.O. 32788

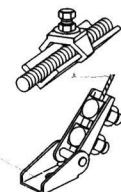
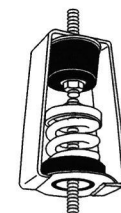
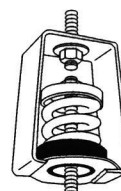


EXPIRES: 12/31/20

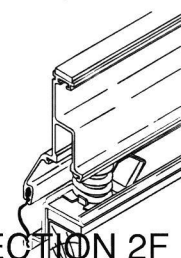
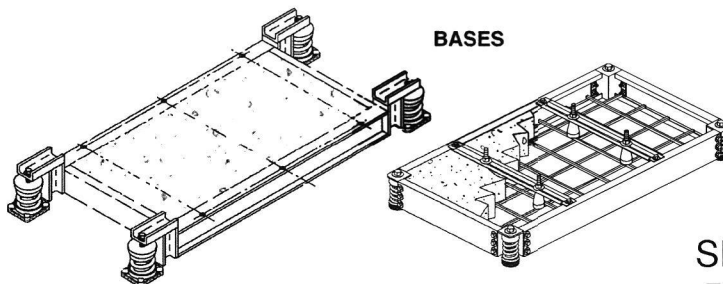
SAFEFLEX CONNECTORS



HANGERS



BASES



SEISMIC SELECTION CALCULATIONS

(SOLID BRACING OF SUSPENDED PIPING)

Horizontal seismic force factor per ASCE 7 - 10, section 13.3.1 :

$$F_{ph} = \left[\frac{0.4 \times a_p \times S_{ds} \times W_p}{\frac{R_p}{I_p}} \times \left(1 + 2 \times \frac{z}{h} \right) \right] \times 0.7 \text{ (ASD)}$$

Except that F_{ph} shall not be less than

$$F_{ph(min.)} = 0.3 \times S_{ds} \times I_p \times 0.7 \text{ (ASD)}$$

and need not be more than :

$$F_{ph(max.)} = 1.6 \times S_{ds} \times I_p \times 0.7 \text{ (ASD)}$$

Where :

W_p = Weight of system

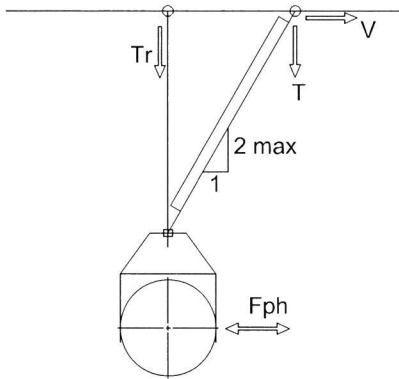
a_p = Component Amplification Factor (ASCE, table 13.6 - 1)

R_p = Component Response Modification Factor (ASCE, table 13.6 - 1)

S_{ds} = Design Spectra Response Acceleration (ASCE7, section 11.4.4)

I_p = Importance Factor (ASCE 7, section 13.1.3)

Vertical Seismic Force : $F_{pv} = (0.2 \times S_{ds} \times W_p) \times 0.7$



Individual Clevis Supported System

Check Seismic brace component : (Clevis)

For worse loading condition, apply F_p along the same line as on brace member :

$$\text{Tension in brace member, } T_c = \frac{F_p}{\cos \theta}$$

If $T_c < T_{allow}$ brace member is Okay. (T_{allow} per page X4 of Mason OPA - 0349)

$$\text{Tension load on struture, } T = T_c \times \cos \theta$$

$$\text{Shear load on structure, } V = T_c \times \sin \theta$$

$$\text{Total load on hanger rod, } T_r = W_p + F_{pv} + T$$

Check Seismic brace component : (Trapeze)

For worse loading condition, apply F_p along the same line as on brace member :

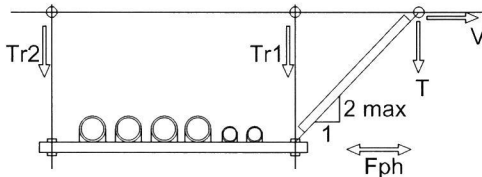
$$\text{Tension in brace member, } T_c = \frac{F_p}{\cos \theta}$$

If $T_c < T_{allow}$ brace member is Okay. (T_{allow} per page X4 of Mason OPA - 0349)

$$\text{Tension load on struture, } T = T_c \times \cos \theta$$

$$\text{Shear load on structure, } V = T_c \times \sin \theta$$

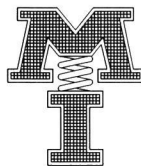
$$\text{Total load on hanger rod, } T_{r1} = \frac{W_p}{2} + F_{pv} + T$$



Trapeze Supported System



EXPIRES: 12/31/20



MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

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FAX 631/348-0279

Info@Mason-Ind.com

2101 W. Crescent Ave., Suite D

Anaheim, CA 92801

714/535-2727

FAX 714/535-5738

Info@MasonAnaheim.com

CERTIFIED FOR

JOB NAME: PRESS BLOCKS

CUSTOMER: MASON OREGON

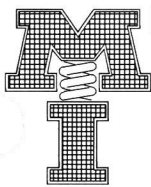
MASON EO: 32788

DATE: 1/8/19

DWN: WL

CHKD: GR

SECTION 2F
WF-32788-C1
Page 2 of 13



MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products
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FAX 631/348-0279 FAX 714/535-5738
Info@Mason-Ind.com Info@MasonAnaheim.com
www.Mason-Ind.com

JOB NAME PRESS BLOCKS

CUSTOMER MASON OREGON

CUSTOMER P.O. _____

MASON M.I. 32788 DWG. NO. WF-SHB

NO. REQ'D. _____ TAG _____

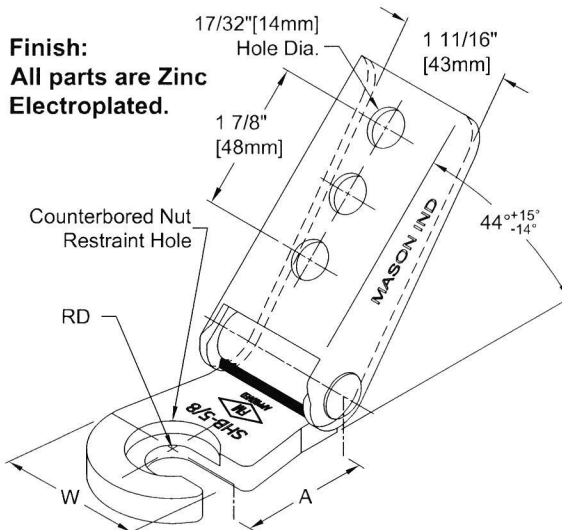
FM Approved

SHB

Seismic Hook
Brace



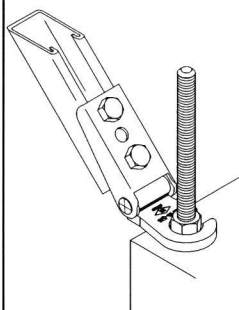
Finish:
All parts are Zinc
Electroplated.



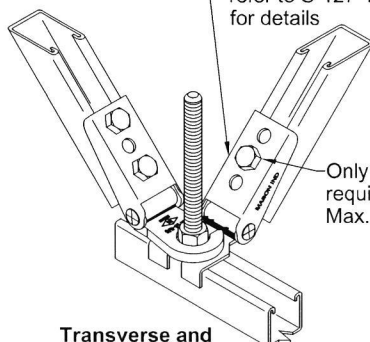
*Strut Attachment Nut must have stamped teeth to achieve these values. Ratings are based on attachment to steel. Ratings may change depending on attachment methods to concrete. Testing was done by FACTORY MUTUAL (FM Approvals).

NOTE: Not to be used as a vertical hanger for equipment, ductwork or piping.
To be used as a seismic restraint only.

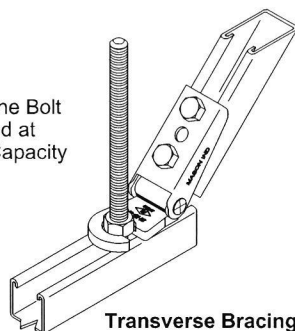
*NOTE: For loads up to 1500 lbs one Strut nut is required, above 1500 lbs two Strut Nuts are required.



Installation may include Mason SFB refer to S-127-1 for details

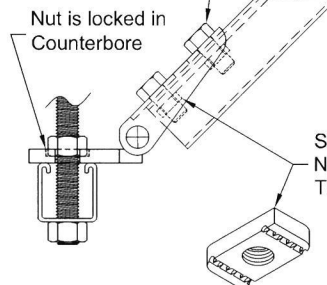


Transverse and Longitudinal Bracing

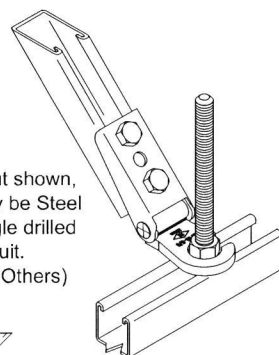


Transverse Bracing

1/2" (13mm) Dia. Bolts 1 or 2 Required per SHB (By Others)
Torque Bolts to 50 ft-lbs (68 Nm). See note below.



Strut shown, may be Steel Angle drilled to suit. (By Others)



Longitudinal Bracing

TYPE SHB DIMENSIONS & RATINGS

Size	(RD) Rod Dia. (in) (mm)		W (in) (mm)		A (in) (mm)		FM Certified Load Ratings*					
							30° - 44°			45° - 59°		
							lbs	kN	kg	lbs	kN	kg
SHB-3/8	3/8	10	2	51	2	51	1420	6.3	644	1000	4.5	454
SHB-1/2	1/2	13	2	51	2	51	1710	7.6	775	1280	5.7	581
SHB-5/8	5/8	16	2 1/8	54	1 15/16	49	1520	6.8	690	1100	4.9	499
SHB-3/4	3/4	19	2 1/4	57	1 7/8	48	1660	7.4	753	1040	4.6	471



Certification Form S-126

10/2013

FORM BY: R.R.
APPR BY: J.T.

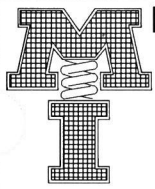
DWN: WL

CHKD: GR

DATE: 1/8/19

DWG. No. WF-SHB

SECTION 2F



MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products
350 Rabro Drive 2101 W. Crescent Ave., Suite D
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FAX 631/348-0279 FAX 714/535-5738
Info@Mason-Ind.com Info@MasonAnaheim.com
www.Mason-Ind.com

JOB NAME PRESS BLOCKS

CUSTOMER MASON OREGON

CUSTOMER P.O. _____

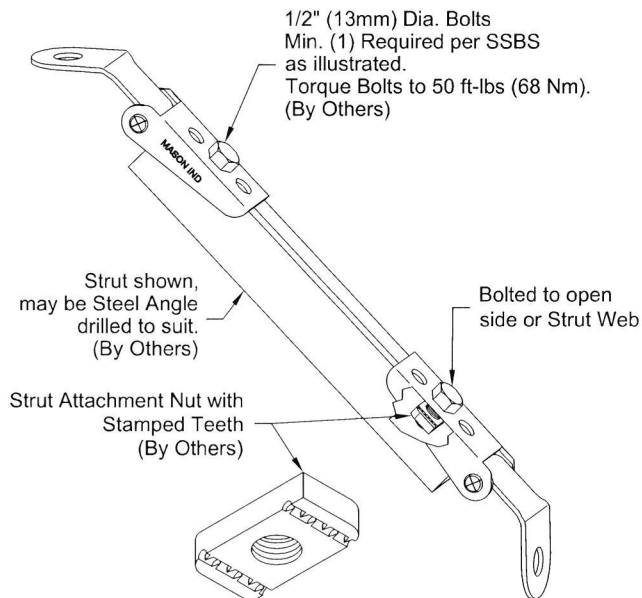
MASON M.I. 32788 DWG. NO. WF-SSBS

NO. REQ'D. _____ TAG _____

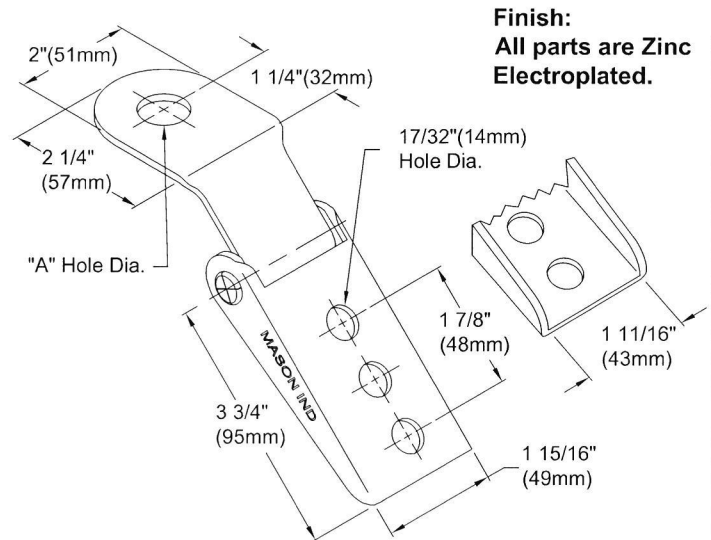
FM Approved

SSBS

Seismic Solid
Brace Strut
Anchor



Solid Brace Anchor (Formed Steel)



*Strut Attachment Nut must have stamped teeth to achieve these values.
Ratings are based on attachment to steel.
Ratings may change depending on attachment methods to concrete.
Testing was done by FACTORY MUTUAL (FM Approvals).
Preferred Installation Angle is 45°
Maximum Variation is ± 15°

NOTE: Not to be used as a vertical hanger for equipment, ductwork or piping.
To be used as a seismic restraint only.

TYPE SSBS DIMENSIONS & RATINGS

Size	A (in) (mm)		Bolt Size (in) (mm)		FM Certified Load Ratings *					
					Installed Angle 30°- 44°			Installed Angle 45°- 59°		
					lbs	kN	kg	lbs	kN	kg
SSBS-12	17/32	13	3/8	10	660	2.9	299	970	4.3	440
SSBS-12	17/32	13	1/2	13	660	2.9	299	970	4.3	440
SSBS-20	25/32	20	5/8	16	660	2.9	299	970	4.3	440
SSBS-20	25/32	20	3/4	19	660	2.9	299	970	4.3	440
SSBS-25	1 1/32	26	7/8	22	660	2.9	299	970	4.3	440
SSBS-25	1 1/32	26	1	25	660	2.9	299	970	4.3	440



QTY	SIZE	TAG

Certification Form S-119

10/2013

FORM BY: R.R.
APPR BY: J.T.

DWN: WL

CHKD: GR

DATE: 1/8/19

DWG. No. WF-SSBS

SECTION 2F

Page 4 of 13



MASON INDUSTRIES, Inc.

Manufacturers of Vibration Control Products

350 Rabro Drive 2101 W. Crescent Ave., Suite D
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FAX 631/348-0279 FAX 714/535-5738
Info@Mason-Ind.com
www.Mason-Ind.com

JOB NAME PRESS BLOCKS

CUSTOMER MASON OREGON

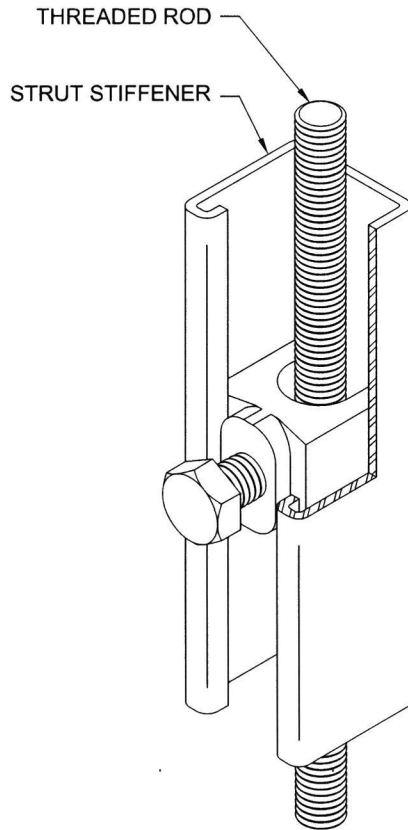
CUSTOMER P.O.

MASON M.I. E.O. 32788

DWG. NO. X5C

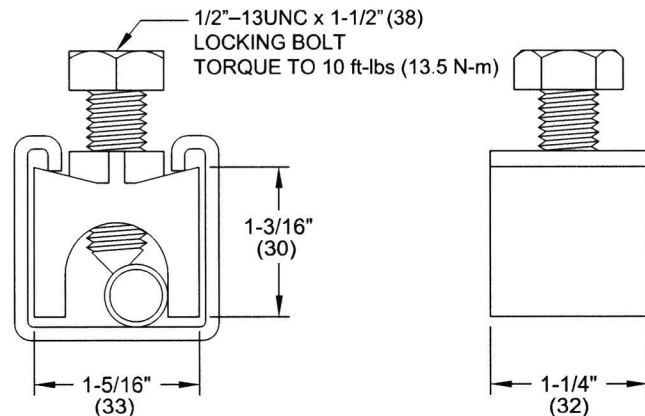
UCC

SEISMIC ROD
CLAMPS FOR
STRUT
CHANNELS



TYPE UCC WITH STEEL STRUT ASSEMBLY RATINGS

Rod Size in (mm)	Maximum Compressive Force lbs (kN)	Strut Stiffener		Maximum UCC Spacing in (mm)
		Minimum Size in (mm)	Max Length in (mm)	
3/8 (10)	425 (1.9)	1 5/8 x 1 5/8 x 12 Gage (41 x 41 x 2.5)	96 (2438)	28 (711)
1/2 (13)	1275 (5.6)	1 5/8 x 1 5/8 x 12 Gage (41 x 41 x 2.5)	96 (2438)	38 (965)
	1200 (5.3)	1 5/8 x 1 5/8 x 12 Gage (41 x 41 x 2.5)	120 (3048)	38 (965)
5/8 (16)	1475 (6.5)	1 5/8 x 1 5/8 x 12 Gage (41 x 41 x 2.5)	96 (2438)	48 (1219)
	1325 (5.9)	1 5/8 x 1 5/8 x 12 Gage (41 x 41 x 2.5)	120 (3048)	48 (1219)
3/4 (19)	2500 (11.1)	1 5/8 x 1 5/8 x 12 Gage (41 x 41 x 2.5)	144 (3658)	57 (1448)



APPROVED

Fixed Equipment Anchorage

Office of Statewide Health Planning and Development



OPA-0349

on
January 16, 2009

Anthony R. Pike
Anthony R. Pike (916) 440-8470



EXPIRES: 12/31/20

Certification Form S-134 04/2014

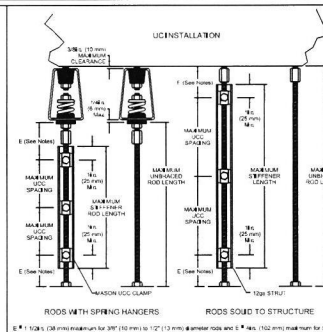
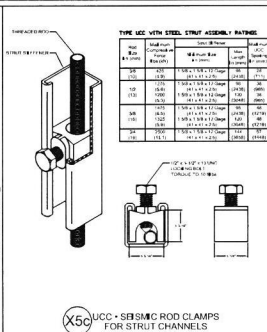
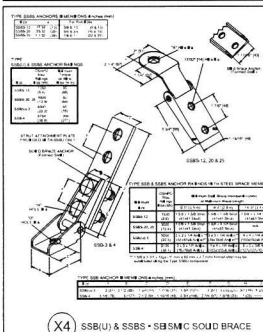
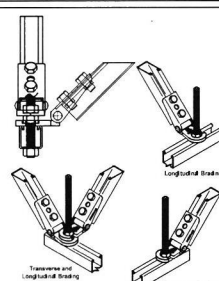
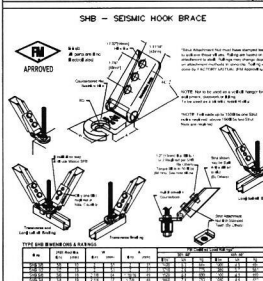
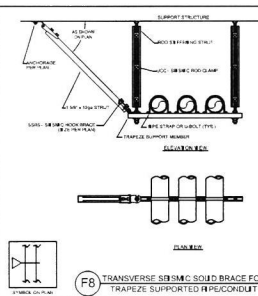
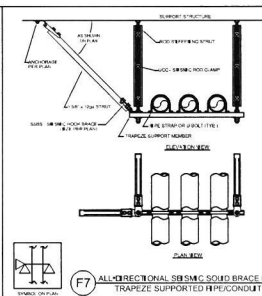
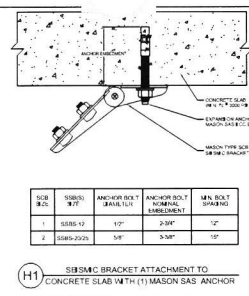
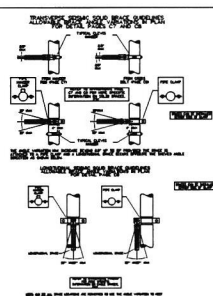
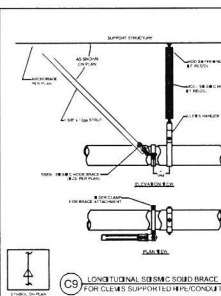
DWN: WL

CHKD: GR

DATE: 1/8/19

DWG. No. X5C

SECTION 2F



SCR or SSB(S) Size	Support Rod Dia. (in)	Maxium Unbraced Rod Length (ft)	Maxium Unbraced Rod Length (in)	Max. VCC Spacing (in)	Strut Brace (in)
SCR#0	3.8	18	96	28	1.5 ft x 1.5 ft x 12
SCR#1	4.2	20	120	38	1.5 ft x 1.5 ft x 12
SSB#1	5.0	25	150	48	1.5 ft x 1.5 ft x 12
SSB#12	5.8	31	180	48	1.5 ft x 1.5 ft x 12
SCR#2	1.2	25	120	38	1.5 ft x 1.5 ft x 12
SCR#20	5.8	31	120	48	1.5 ft x 1.5 ft x 12
SCR#3	3.4	37	144	57	1.5 ft x 1.5 ft x 12
SSB#3	5.8	31	120	48	1.5 ft x 1.5 ft x 12
SSB#30	3.4	37	144	57	1.5 ft x 1.5 ft x 12

No.	Regulation/Issue	On
-----	------------------	----



M MASON INDUSTRIES, INC.
Manufacturers of Noise and Vibration Control Products
and Submittal Research Systems

350 RAMBO DRIVE
HAUPPAUGE, NY 11786
PHONE (831) 348-0282
FAX (831) 348-0279

2101 W. CRESCENT AVE. STE. D
ANAHEIM, CA 92801
PHONE (714) 535-2727
FAX (714) 535-5738

CUSTOMER NAME
MASON OREGON

PROJECT NAME
PRESS BLOCKS

SHEET TITLE

SEISMIC BRACING DETAILS
FOR SUSPENDED PIPING SYSTEM

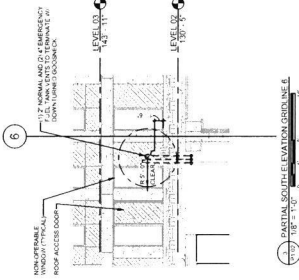
PERFORMANCE CRITERIA

1. MASONRY ENGINEERING SCOPE OF WORK IS LIMITED TO THE DESIGN OF SUB-STRUCTURING FOR THE SUSPENDED SLURFWORK / BEARING SYSTEM. THE PROFESSIONAL ENGINEER SHALL APPLY IN THE CONTRACT DOCUMENTS A RESPONSIBILITY FOR THE VERIFICATION OF ONLY THE DESIGNING ELEMENTS SHOWN HEREON AND NOT FOR ANY ARCHITECTURAL, CIVIL, MECHANICAL, ELECTRICAL OR ANY OTHER ENGINEERING OR DESIGN ASPECT OF THE WORK.
2. CONSTRUCTION SHALL NOT BEGIN UNTIL ALL APPROVALS ARE IN PLACE INCLUDING APPROVAL, AND SUBMITTALS BY OWNERS AGENTS, CONSULTANTS AND DESIGNING PROFESSIONAL ENGINEER. MASONRY ENGINEERING WILL NOT ASSUME ANY RESPONSIBILITY FOR CONSTRUCTION DONE PRIOR TO THE AFORESAIDED APPROVALS.

Master ID: 12198	PS-1
Date: 10/10	
Dem: 80, Chd: 0, Cb:	
File: (NONE)	

1 LAVATORY (COUNTER MOUNTED): 17" HW, 17" CW, 15" D. LAVATORY

- [illegible]



EMERGENCY GENERATOR FUEL TANK CALCULATION: NORMAL AND EMERGENCY VENT LINE SIZING - ALLIANT 6.12.19

PROJECT: PRESS BLOCKS - HALF BLOCK (CANVAS)	
GENERATOR MAKE/MODEL:	CATERPILLAR C15-500Ekw/625 Kva
TANK STYLE/MODEL	HORIZONTAL RECTANGULAR INTEGRAL
TANK FUEL CAPACITY	339 GALLONS

FUEL TANK VENT DETAILS			
VENT SERVICE	SIZE OF TANK CONNECTION	SIZE OF VENT EXTENSION	COMMENT
MAIN TANK NORMAL VENT	2"	2"	1
BASIN TANK EMERGENCY VENT	4"	6"	2
MAIN TANK EMERGENCY VENT	4"	6"	3
COMMENTS			
1. 2" NORMAL VENT DIAMETER EXCEEDS 1-1/2" FUEL FILL LINE SIZE. EXTEND NORMAL VENT FULL SIZE (2") TO EXTERIOR. TERMINATE W/ COMBINATION FLAME ARRESTOR CONFIGURED TO ALLOW INTAKE AND RELIEF AIRFLOW			
2. SEE CALCULATIONS FOR EMERGENCY VENT LINE SIZING BELOW. INCREASE EMERGENCY TANK VENT TO 6" AND EXTEND TO EXTERIOR. TERMINATE W/ PRESSURE RELIEF CAP			
3. BASIN TANK EMERGENCY VENT LINE SIZE TO MATCH EMERGENCY VENT LINE SIZE. INCREASE EMERGENCY BASIN TANK VENT TO 6" AND EXTEND TO EXTERIOR. TERMINATE W/ PRESSURE RELIEF CAP			

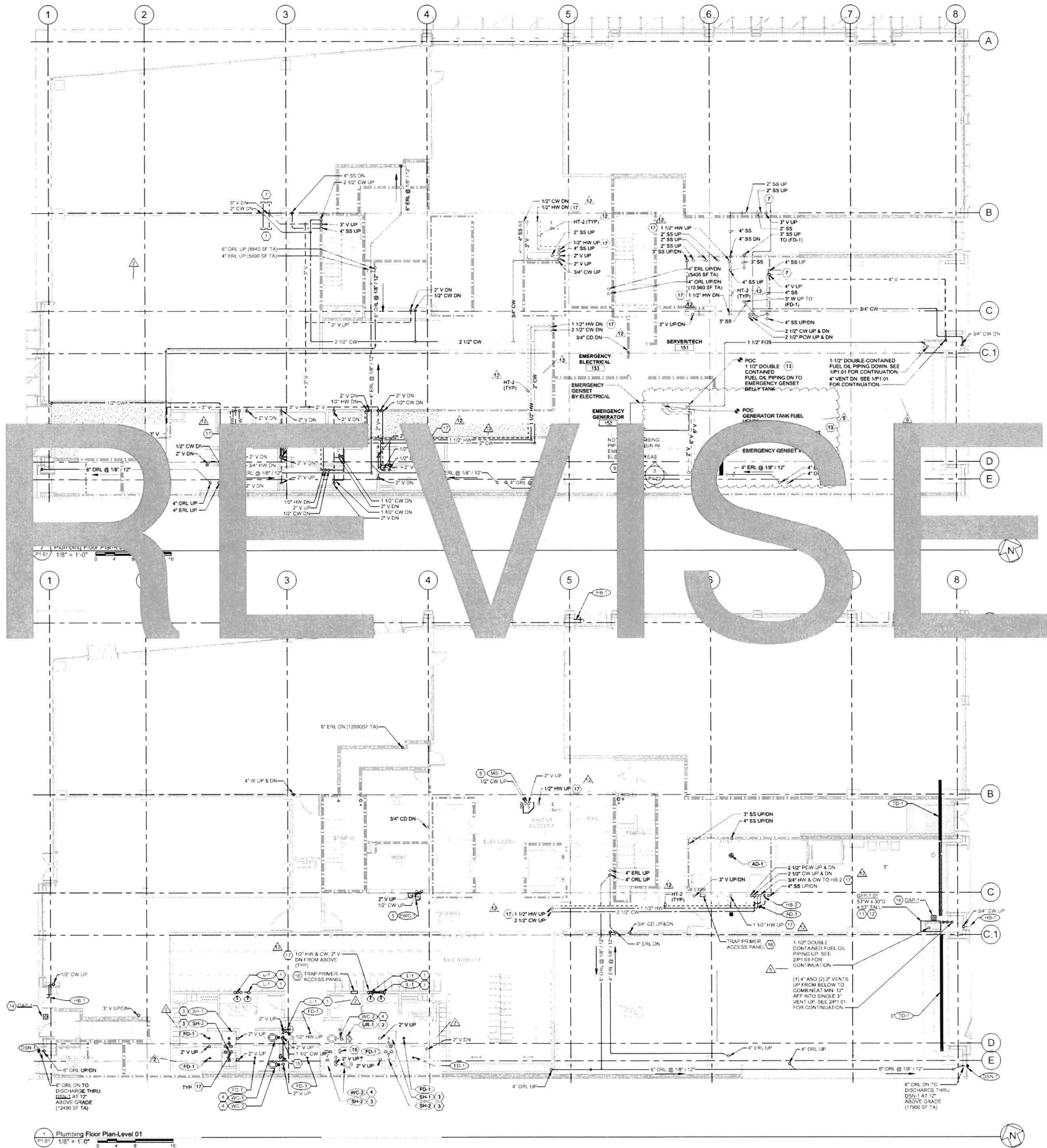
STORAGE TANK DIMENSIONS			
HORIZONTAL RECTANGULAR TANK	WIDTH (FT)	DEPTH (FT)	HEIGHT (FT)
	10.9	5.34	1.6

WETTED AREA CALCULATION		
AREA TANK BOTTOM (SF)	58.21	SF
AREA TANK SIDES (SF)	51.97	SF
WETTED AREA	58.21	SF
PER 2014 NFPA 30 22.7.3.2.2		

VENT LINE CHARACTERISTICS		
LENGTH OF STRAIGHT PIPE	33.00	FEET
NUMBER OF 45 DEG ELBOWS	1	3 FT EQUIVALENT LENGTH
NUMBER OF 90 DEGREE ELBOWS	3	6 FT EQUIVALENT LENGTH
EQUIVALENT LENGTH OF PIPE	54.00	FEET

VENT AIRFLOW CALCULATIONS		
REQUIRED EMERGENCY RELIEF VENT FREE AIR FLOW	115,679	CFH
PER 2014 NFPA 30 TABLE 22.7.3.2		
HEAT ABSORPTION (BTUH)	2,200,000	CFH
PER 2014 NFPA 30 ANNEX B, B.2		
LATENT HEAT VAPORIZATION HEXANE	144.00	BTU/LB
MOLECULAR WEIGHT HEXANE	86.20	g/MOL
EMERGENCY RELIEF VENTING	116,010	CFH
PER 2014 NFPA 30 ANNEX B, B.3		

VENT LINE SIZING TO ACHIEVE MAXIMUM 2.5 PSI PRESSURE LOSS		
SCHEDULE 40 STEEL PIPE (ASME B36)		
RELIEF VENT AIRFLOW	116,010	CFH
NOMINAL PIPE SIZE	6.00	INCHES
INSIDE DIAMETER PIPE	6.07	INCHES
ABSOLUTE ROUGHNESS PIPE	0.0018	INCHES
KINEMATIC VISCOSITY	0.87	FT2/HR
REYNOLDS NUMBER	336,815	
FRICTION FACTOR	0.0151	
VELOCITY WITHIN PIPE	160.36	FT/S
RESULTING PRESSURE LOSS 6" DIA.	1.03	PSI
MINIMUM DIAMETER EMERGENCY VENT LINE PIPING SIZE	6	INCH NOMINAL PIPE



PLUMBING GENERAL NOTES

A ALL WATER FILLED PIPING INCLUDING WATER MAINS, TRAP PRIMERS AND TRAPS IN NON-CONDITIONED AIR SPACES SHALL BE HEAT TRACED AT 5W PER FOOT AND INSULATED.

PLUMBING NOTES BY SYMBOL

1 LAVATORY (COUNTER MOUNTED) - 1/2\"/>

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PLUMBING NOTES BY SYMBOL

1 LAVATORY (COUNTER MOUNTED) - 1/2\"/>

ALLIANT SYSTEMS

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REGISTERED PROFESSIONAL ENGINEER
OREGON
NO. 22473
DATE: 06/25/2019
EXPIRES 12-31-20

PROJECT
PRESS BLOCKS -
HALF BLOCK
817 SW 17TH AVE
PORTLAND, OR 97205

CLIENT
THE PRESS BLOCK
COLLABORATIVE
(OFFICE) LLC
1211 SW 5TH AVE, STE 2230
PORTLAND, OR 97205

DOCUMENT ORIGINAL SIZE
34" x 44"

REVISIONS	
NO.	DESCRIPTION
1	GENSET MEAT
2	REV
3	REV
4	REV
5	REV
6	REV
7	REV
8	REV
9	REV
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11	REV
12	REV
13	REV
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DATE
MAY 31, 2019

PROJECT NUMBER
20166042

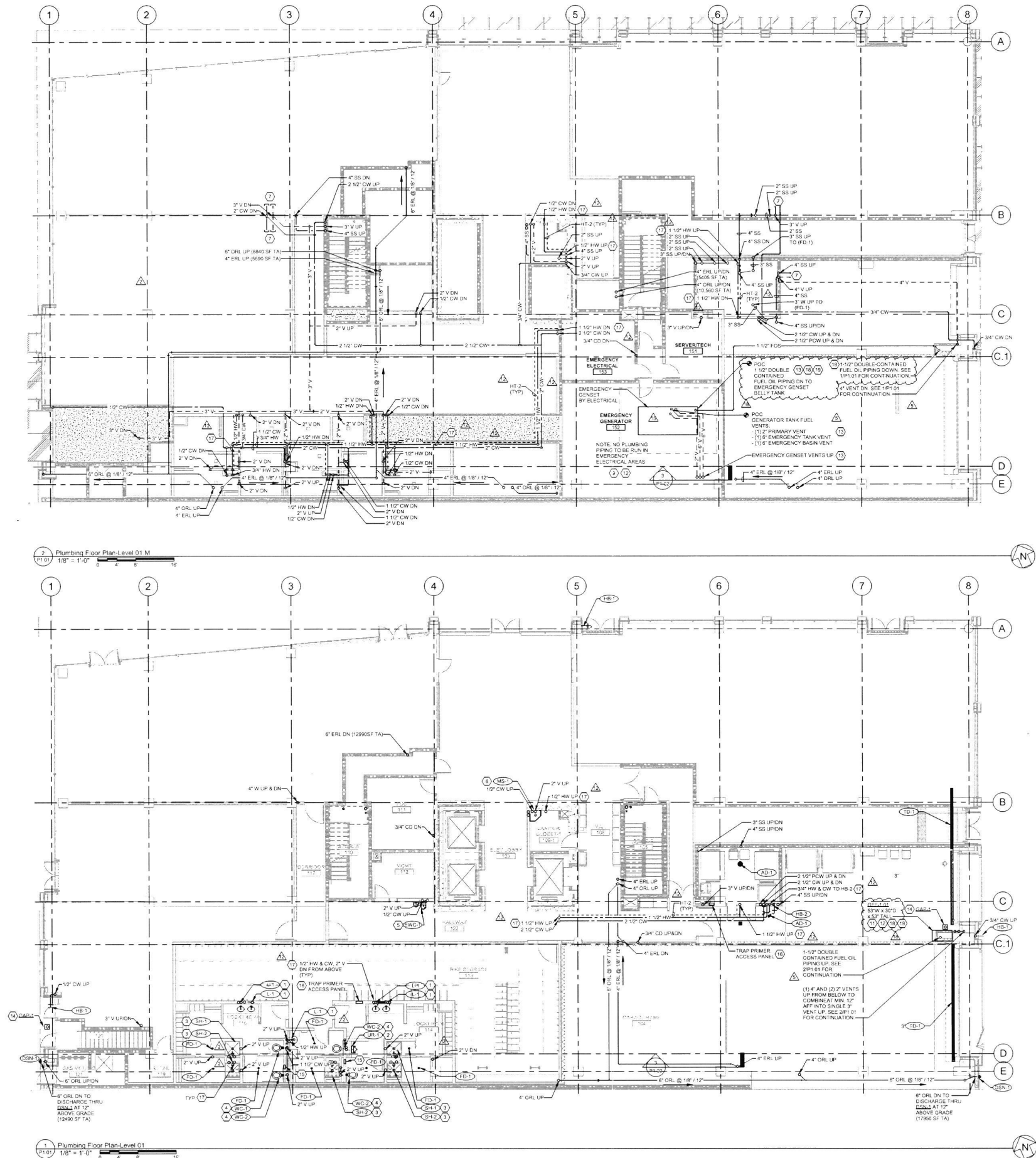
SCALE
1/8" = 1'-0"

SHEET TITLE
PLUMBING FLOOR
PLANS - LEVELS 01 &
01 M

P1.01

ISSUED FOR CONSTRUCTION - 2019.05.31

8/12/2019 8:33:34 AM C:\temp\Revit\Project\17251 - PRESS BLOCKS - HALF BLOCK AS_R18_huggard.rvt



PLUMBING GENERAL NOTES

A ALL WATER FILLED PIPING INCLUDING WATER MAINS, TRAP PRIMERS AND TRAPS IN NON-CONDITIONED AIR SPACES SHALL BE HEAT TRACED AT 5W PER FOOT AND INSULATED.

PLUMBING NOTES BY SYMBOL

1 LAVATORY (COUNTER MOUNTED) - 1/2" HW, 1/2" CW, 1-1/2" V DN, 1-1/2" W UP TO LAVATORY. CW, HW & V IS ROUTED FROM LEVEL 01 M MEZZANINE CEILING SPACE.

2 URINAL - 1-1/2" V, 3/4" CW DN, 2" W UP TO WALL. HUNG URINAL CW & V IS ROUTED FROM LEVEL 01 M MEZZANINE CEILING SPACE.

3 SHOWER - 1/2" HW, 1/2" CW, 1-1/2" V DN, 2" W UP TO SHOWER. CW, HW & V IS ROUTED FROM LEVEL 01 M MEZZANINE CEILING SPACE.

4 WATER CLOSET (FLUSH VALVE) - 1" CW, 2" V DN, 4" W UP TO WALL HUNG WATER CLOSET. CW & V IS ROUTED FROM LEVEL 01 M MEZZANINE CEILING SPACE.

5 ELECTRIC WATER COOLER - 1-1/2" V, 1/2" CW DN, 1-1/2" W UP TO WALL HUNG DRINKING FOUNTAIN. CW & V IS ROUTED FROM LEVEL 01 M MEZZANINE CEILING SPACE.

6 MOP SINK (FLOOR MOUNTED) - 2" V, 3/4" HW, 3/4" CW DN, 3" SW UP TO FLOOR MOUNTED WOP. CW & V IS ROUTED FROM LEVEL 01 M MEZZANINE CEILING SPACE.

7 PLUMBING UTILITIES STUBBED OUT FOR FUTURE RETAIL TENANT CONNECTION. 2" CW, 3" VENT AT CEILING.

8 (1) 2" NORMAL AND (2) 4" EMERGENCY GENSET FUEL TANK VENTS TO EXTEND FROM EMERGENCY GENSET TO VERTICAL TERMINATION AT LEVEL 2 ROOF ABOVE.

10 LOCATE EMERGENCY GENERATOR FUEL TANK VENTS MIN. 12' ABOVE GRADE & 5' FROM ANY OPENING OR MECH AIR INTAKE. TERMINATE 2" NORMAL VENT W/ FLAME ARRESTOR CAP. TERMINATE EMERGENCY VENTS WITH PRESSURE RELIEF CAPS.

11 FREE STANDING PACKAGED DIESEL FUEL FILL STATION FOR CURBSIDE FILLING OF REMOTE MEZZANINE LEVEL EMERGENCY GENERATOR FUEL TANK BY FUEL SERVICE VENDOR TRUCK. MANUFACTURED UNIT W/ LOCKABLE CABINET AND INTEGRAL PUMP, SPILL RECOVERY, AND OPERATING CONTROLS.

12 ELECTRICAL CONTROLS CONTRACTOR TO EXTEND CONTROLS INTERLOCK WIRING FROM REMOTE GENERATOR FUEL VALVE AND TANK LEVEL CONTROLS TO FUEL FILL SYSTEM CONTROL PANEL.

13 COORDINATE EXACT POINTS OF CONNECTION AND ROUTING FOR EMERGENCY GENSET FUEL FILL AND FUEL TANK PRIMARY AND EMERGENCY VENT PIPING W/ ELECTRICAL.

14 GAP - RECESSED, GRADE LEVEL ACCESS PORT FOR GREASE WASTE FLUID OUT. TRAFFIC RATED COVER W/ 8" TUBE TO ALLOW GREASE WASTE SERVICE TO ROUTE VACUUM HOSE TO LEVEL B1 BELOW.

15 UNLESS NOTED OTHERWISE, PROVIDE MINIMUM 12/12 WALL ACCESS PANEL FOR INSPECTION AND SERVICE OF CONCEALED WATER SHOCK ARRESTOR(S) AT 5' AFF IN LOCATION INDICATED. FINAL ACCESS PANEL SIZE AND LOCATION SHALL BE IDENTIFIED IN PLUMBING DETAILING DOCUMENTS FOR REVIEW BY ARCHITECT AND GC. PLUMBING ACCESS PANELS SHALL BE PROVIDED BY THE PLUMBING CONTRACTOR FOR INSTALLATION BY OTHERS AS DESIGNATED BY THE GENERAL CONTRACTOR.

16 UNLESS NOTED OTHERWISE, PROVIDE MINIMUM 18/18 WALL ACCESS PANEL FOR INSPECTION AND SERVICE OF CONCEALED TRAP PRIMER MAINFOLD(S) AT 2' AFF IN LOCATION INDICATED. FINAL ACCESS PANEL SIZE AND LOCATION SHALL BE IDENTIFIED IN PLUMBING DETAILING DOCUMENTS FOR REVIEW BY ARCHITECT AND GC. PLUMBING ACCESS PANELS SHALL BE PROVIDED BY THE PLUMBING CONTRACTOR FOR INSTALLATION BY OTHERS AS DESIGNATED BY THE GENERAL CONTRACTOR.

17 ALL HOT WATER PIPING ON THIS LEVEL SHALL BE INSULATED & HEAT TRACED. REFER TO HT 2 ON PLUMBING EQUIPMENT SCHEDULE SHEET P0.02 AND DOMESTIC WATER RISER DIAGRAM ON SHEET P2.01.

18 FUEL FILL SYSTEM TESTING REQUIREMENT - BEFORE BEING COVERED, ENCLOSED OR PLACED IN USE, DOCUMENTATION SHALL BE PROVIDED THAT PROCESS PIPING HAS BEEN TESTED IN ACCORDANCE WITH PORTLAND FIRE CODE PFC 5200.3.

AS DETAILED IN THE REFERENCED CODE SECTION, TESTING SHALL INCLUDE THE FOLLOWING MINIMUM REQUIREMENTS:

PIPING SHALL BE HYDROSTATICALLY TESTED TO 150% OF THE MAXIMUM ANTICIPATED PRESSURE OF THE SYSTEM OR PNEUMATICALLY TESTED TO 110% OF THE MAXIMUM ANTICIPATED PRESSURE OF THE SYSTEM, BUT NOT LESS THAN 5 POUNDS PER SQUARE INCH GAUGE (PSIG) (34.47 kPa) AT THE HIGHEST POINT OF THE SYSTEM.

THIS TEST SHALL BE MAINTAINED FOR SUFFICIENT TIME PERIOD TO COMPLETE VISUAL INSPECTION OF JOINTS AND CONNECTIONS. FOR A MINIMUM OF 10 MINUTES THERE SHALL BE NO LEAKAGE OR PERMANENT DISTORTION.

CARE SHALL BE EXERCISED TO ENSURE THAT THESE PRESSURES ARE NOT APPLIED TO VENTED STORAGE TANKS.

19 FUEL FILL PROCESS WITNESS REQUIREMENT - THE INITIAL (FIRST) FUEL FILL FOR THE GENERATOR DIESEL TANK IS REQUIRED TO BE WITNESSED BY THE FIRE MARSHAL'S OFFICE HAZARDOUS MATERIALS INSPECTOR. FULL PROCESS SHALL DEMONSTRATE THAT 90% ALARM AND 95% SHUT-OFF FUNCTIONS ARE INSTALLED AND PROPERLY FUNCTIONING.

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NO. 12345
EXPIRES 12-31-20

PROJECT
PRESS BLOCKS - HALF BLOCK
817 SW 17TH AVE
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CLIENT
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DOCUMENT ORIGINAL SIZE
34" X 44"

REVISIONS

NO.	DATE	DESCRIPTION
1	8/12/2019	GEN PERMIT SET
2	8/12/2019	P2 REVISION
3	8/12/2019	ALLIANT REV#
4	8/12/2019	PERMIT RESP #1
5	8/12/2019	PERMIT RESP #1

DATE
JUNE 12, 2019

PROJECT NUMBER
20166042

SCALE
1/8" = 1'-0"

SHEET TITLE
PLUMBING FLOOR PLANS - LEVELS 01 & 01 M

P1.01

BUILDING PERMIT SET



CANVAS @ PRESS BLOCKS
PORTLAND, OR

GBD

THE PRESS BLOCK COLLABORATIVE (OFFICE) LLC



ISSUED FOR CONSTRUCTION SPECIFICATION VOLUME 2

SEPTEMBER 14, 2018

Notice of Extended Payment Provision: The Contract will allow the owner to make payment within 30 days after the date a billing or estimate is submitted.

Notice of Alternate Billing Cycle: The contract will allow the owner to require the submission of billings or estimates in billing cycles other than 30-day cycles. Billings or estimates for the contract shall be submitted as follows: Each calendar month ending on the last day of the applicable month.

SECTION 26 3213**ENGINE GENERATOR****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, connection, and testing of the low-voltage engine generators.

1.2 RELATED WORK

- A. Section 03 30 00, CAST-IN-PLACE CONCRETE: Requirements for concrete equipment pads.
- B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirement for seismic restraint for nonstructural components.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: Requirements that apply to all sections of Division 26.
- D. Section 26 05 19, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES: Low-voltage conductors.
- E. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.
- F. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT: Requirements for pipe and equipment support and noise control.
- G. Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY: Short circuit and coordination study, and requirements for a coordinated electrical system.
- H. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION: Requirements for hot piping and equipment insulation.
- I. Section 25 10 10, ADVANCED UTILITY METERING: Requirements for electrical metering.
- J. Section 26 24 13, DISTRIBUTION SWITCHBOARDS: Requirements for secondary distribution switchboards.
- K. Section 26 36 23, AUTOMATIC TRANSFER SWITCHES: Requirements for automatic transfer switches for use with engine generators.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. A factory-authorized representative shall be capable of providing emergency maintenance and repairs at the project site within 4 hours maximum of notification.

1.5 SUBMITTALS

A. Submit one CD of the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Scaled drawings, showing plan views, side views, elevations, and cross-sections.
 - c. Certification from the manufacturer that a representative engine generator has been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.
2. Diagrams:
 - a. Control system diagrams, control sequence diagrams or tables, wiring diagrams, interconnections diagrams (between engine generators, automatic transfer switches, paralleling switchgear, local control cubicles, remote annunciator panels, and fuel storage tanks, as applicable), and other like items.
3. Technical Data:
 - a. Published ratings, catalog cuts, pictures, and manufacturer's specifications for engine generator, governor, voltage regulator, radiator, muffler, dampers, day tank, pumps, fuel tank, batteries and charger, jacket heaters, torsional vibration, and control and supervisory equipment.
 - b. Description of operation.
 - c. Short-circuit current capacity and subtransient reactance.
 - d. Sound power level data.
 - d. Vibration isolation system performance data from no-load to full-load. This must include seismic qualification of the engine generator mounting, base, and vibration isolation.
4. Calculations:
 - a. Calculated performance derations appropriate to installed environment.
5. Manuals:
 - a. When submitting the shop drawings, submit complete maintenance and operating manuals, to include the following:
 - 1) Technical data sheets.
 - 2) Wiring diagrams.

- 3) Include information for testing, repair, troubleshooting, and factory recommended periodic maintenance procedures and frequency.
- 4) Provide a replacement and spare parts list. Include a list of tools and instruments for testing and maintenance purposes.
- b. If changes have been made to the maintenance and operating manuals originally submitted, submit updated maintenance and operating manuals two weeks prior to the final inspection.
6. Test Reports:
 - a. Submit field test reports two weeks prior to the final inspection.
7. Certifications:
 - a. Prior to fabrication of the engine generator, submit the following for approval:
 - 1) A certification in writing that an engine generator of the same model and configuration, with the same bore, stroke, number of cylinders, and equal or higher kW/kVA ratings as the proposed engine generator, has been operating satisfactorily with connected loads of not less than 75% of the specified kW/kVA rating, for not fewer than 2,000 hours without any failure of a crankshaft, camshaft, piston, valve, injector, or governor system.
 - 2) A certification in writing that devices and circuits will be incorporated to protect the voltage regulator and other components of the engine generator during operation at speeds other than the rated RPM while performing maintenance. Submit thorough descriptions of any precautions necessary to protect the voltage regulator and other components of the system during operation of the engine generator at speeds other than the rated RPM.
 - 3) A certification from the engine manufacturer stating that the engine exhaust emissions meet the applicable federal, state, and local regulations and restrictions. At a minimum, this certification shall include emission factors for criteria pollutants including nitrogen oxides, carbon monoxide, particulate matter, sulfur dioxide, non-methane hydrocarbon, and hazardous air pollutants (HPAs).
 - c. Two weeks prior to the final inspection, submit the following.
 - 1) Certification by the manufacturer that the engine generators conform to the requirements of the drawings and specifications.
 - 2) Certification by the Contractor that the engine generators have been properly installed, adjusted, and tested.

1.6 STORAGE AND HANDLING

ENGINE GENERATORS SHALL WITHSTAND SHIPPING AND HANDLING STRESSES IN ADDITION TO THE ELECTRICAL AND MECHANICAL STRESSES WHICH OCCUR DURING OPERATION OF THE SYSTEM. PROTECT RADIATOR CORE WITH WOOD SHEET.

- A. Store the engine generators in a location approved by the Engineer.

1.7 JOB CONDITIONS

- A. Job conditions shall conform to the arrangements and details shown on the drawings. The dimensions, enclosures, and arrangements of the engine generator system shall permit the operating personnel to safely and conveniently operate and maintain the system in the space designated for installation.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.

- B. American National Standards Institute (ANSI):

C37.50-07.....Low-Voltage AC Power Circuit Breakers Used In Enclosures-
Test Procedures

C39.1-81 (R1992)Requirements for Electrical Analog Indicating Instruments

- C. American Society of Testing Materials (ASTM):

A53/A53M-10Standard Specification for Pipe, Steel, Black, and Hot-Dipped,
Zinc Coated Welded and Seamless

B88-09.....Specification for Seamless Copper Water Tube

B88M-11.....Specification for Seamless Copper water Tube (Metric)

D975-11b.....Diesel Fuel Oils

- D. Institute of Electrical and Electronic Engineers (IEEE):

C37.13-08.....Low Voltage AC Power Circuit Breakers Used In Enclosures

C37.90.1-02.....Surge Withstand Capability (SWC) Tests for Relays and Relay
Systems Associated with Electric Power Apparatus

- E. International Code Council (ICC):

IBC-12International Building Code

F. National Electrical Manufacturers Association (NEMA):

ICS 6-06	Enclosures
ICS 4-10	Application Guideline for Terminal Blocks
MG 1-11	Motor and Generators
MG 2-07	Safety Standard and Guide for Selection, Installation and Use of Electric Motors and Generators
PB 2-11	Dead-Front Distribution Switchboards
250-08	Enclosures for Electrical Equipment (1000 Volts Maximum)

G. National Fire Protection Association (NFPA):

30-12	Flammable and Combustible Liquids Code
37-10	Installations and Use of Stationary Combustion Engine and Gas Turbines
70-11	National Electrical Code (NEC)
99-12	Health Care Facilities
110-10	Standard for Emergency and Standby Power Systems

H. Underwriters Laboratories, Inc. (UL):

50-07	Enclosures for Electrical Equipment
142-06	Steel Aboveground Tanks for Flammable and Combustible Liquids
467-07	Grounding and Bonding Equipment
489-09	Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
508-99	Industrial Control Equipment
891-05	Switchboards
1236-06	Battery Chargers for Charging Engine-Starter Batteries

2085-97Insulated Aboveground Tanks for Flammable and Combustible
Liquids

2200-98Stationary Engine Generator Assemblies

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. The engine generator system shall be in accordance with NFPA, UL, NEMA and ANSI, and as specified herein.
- B. Provide a factory-assembled, wired (except for field connections), complete, fully automatic engine generator system.
- C. Engine Generator Parameter Schedule:
 - 1. Power Rating: Emergency Standby
 - 2. Voltage: 277/480V
 - 3. Rated Power: 800 kW 1,000 kVA continuous)
 - 5. Power Factor: 0.8lagging
 - 6.
 - 5. Engine Generator Application: standby
 - 7. Fuel: diesel
 - 8. Voltage Regulation: + 2% (maximum) (No Load to Full Load) (standalone applications)
 - 9. Phases: 3 Phase, Wye
 - 10. Each component of the engine generator system shall be capable of operating at 100meters (100 feet) above sea level in a ventilated room which will have average ambient air temperature ranging from a minimum of 30 °C (52F) in winter to maximum of (90 °F) in summer.
- C. Assemble, connect, and wire the engine generator at the factory so that only the external connections need to be made at the construction site.
- D. Engine Generator Unit shall be factory-painted with manufacturer's primer and standard finishes.
- E. Connections between components of the system shall conform to the recommendations of the manufacturer.
- F. Couplings, shafts, and other moving parts shall be enclosed and guarded. Guards shall be metal, ruggedly constructed, rigidly fastened, and readily removable for convenient servicing of the equipment without disassembling any pipes and fittings.
- G. Engine generator shall have the following features:
 - 1. Factory-mounted on a common, rigid, welded, structural steel base.

2. Engine generator shall be statically and dynamically balanced so that the maximum vibration in the horizontal, vertical, and axial directions shall be limited to 0.15 mm (0.0059 inch), with an overall velocity limit of 24 mm/sec (0.866 inch per second) RMS, for all speeds.
 3. The isolators shall be constrained with restraints capable of withstanding static forces in any direction equal to twice the weight of the supported equipment.
 4. Shall be capable of operating satisfactorily as specified for not fewer than 10,000 hours between major overhauls.
- H. Each engine generator specified for parallel operation shall be configured for automatic parallel operation.

2.2 ENGINE

- A. The engine shall be coupled directly to a generator.
- B. Minimum four cylinders.
- C. The engine shall be able to start in a 4.5 °C (40 °F) ambient temperature while using No. 2 diesel fuel oil without the use of starting aids such as glow plugs and ether injections.
- D. The engine shall be equipped with electric heater for maintaining the coolant temperature between 32-38 °C (90-100 °F), or as recommended by the manufacturer.
 1. Install thermostatic controls, contactors, and circuit breaker-protected circuits for the heaters.
 2. The heaters shall operate continuously except while the engine is operating or the water temperature is at the predetermined level.

2.3 GOVERNOR

- A. Isochronous, electronic type.
- B. Steady-state speed band at 60 Hz shall not exceed plus or minus 0.33%.

2.4 LUBRICATION OIL SYSTEM

- A. Pressurized type.
- B. Positive-displacement pump driven by engine crankshaft.
- C. Full-flow strainer and full-flow or by-pass filters.
- D. Filters shall be cleanable or replaceable type and shall remove particles as small as 3 microns without removing the additives in the oil. For by-pass filters, flow shall be diverted without flow interruption.
- E. Extend lube oil sump drain line out through the skid base and terminate it with a drain valve and plug.

2.5 FUEL SYSTEM

- A. Shall comply with NFPA 37 and NFPA 30, and have the following features:
 1. Injection pump(s) and nozzles.
 2. Plungers shall be carefully lapped for precision fit and shall not require any packing.

3. Filters or screens that require periodic cleaning or replacement shall not be permitted in the injection system assemblies.
4. Return surplus oil from the injectors to the main storage tank by gravity or a pump.
5. Filter System:
 - a. Dual primary filters shall be located between the main fuel oil storage and day tank.
 - b. Secondary filters (engine-mounted) shall be located such that the oil will be thoroughly filtered before it reaches the injection system assemblies.
 - c. Filters shall be cleanable or replaceable type and shall entrap and remove water from oil as recommended by the engine manufacturer.
- B. Sub Base Fuel Tank:
 1. Each engine generator shall be provided with a welded steel separate self-supporting base tank with UL 142 Fire Rated, 500gal double-wall fuel containment.
 2. Each base tank shall have capacity to supply fuel to the engine for a 8 hour period at 100% rated load without being refilled, including fuel that is returned to the main fuel storage tank.
 3. Secure, pipe, and connect the tank adequately for maximum protection from fire hazards, including oil leaks.
 4. Incorporate a vent, drain cock, shutoff cocks, and gauge glass. Terminate the vent piping outdoors with mushroom vent cap.
- C. Remote Fuel Fill System:
 1. Lockable, weatherproof, dual door enclosure with flush mounting adaptor, safety solenoid valve and alarm horn. Compartments shall be separated between electrical controls/alarms and fueling compartment with Camlock connector, check valve and manual shut-off valve, integral 7½ gallon containment sump with drain fitting. Paint custom color to match adjacent metal panels by Division 9 Sub-Contractor.

2.6 cooling system

- A. Liquid-cooled, closed loop, with fin-tube radiator mounted on the engine generator, fin-tube remote radiator, and integral engine driven circulating pump, as shown on the drawings.
- B. Cooling capacity shall not be less than the cooling requirements of the engine generator and its lubricating oil while operating continuously at 100% of its specified rating.
- C. Water circulating pumps shall be the centrifugal type driven by engine. Incorporate pressure relief devices where required to prevent excessive pressure increase after the engine stops.
- D. Coolant shall be extended-life antifreeze solution, 50% ethylene glycol and 50% soft water, with corrosion inhibitor additive as recommended by the manufacturer.
- E. Fan shall be driven by multiple belts from engine shaft
- F. Coolant hoses shall be flexible, per manufacturer's recommendation.

- G. Self-contained thermostatic-control valve shall modulate coolant flow to maintain optimum constant coolant temperature, as recommended by the engine manufacturer.
- H. Motor-Operated Dampers:
1. Dampers, which are provided under Section 23 31 00, HVAC DUCTS AND CASINGS, shall be two-position, electric motor-operated.
 2. Dampers shall open simultaneously with the starting of the diesel engine and shall close simultaneously with the stopping of the diesel engine.

2.7 AIR INTAKE AND EXHAUST SYSTEMS

- A. Air Intake:
1. Provide an engine-mounted air cleaner with replaceable dry filter and dirty filter indicator.
- B. Exhaust System:
1. Where a turbocharger is required, they shall be engine-mounted, driven by the engine gases, securely braced against vibration and adequately lubricated by the engine's filtered lubrication system.
 2. Exhaust Muffler:
Shall be critical grade type and capable of the following noise attenuation:

Octave Band Hertz (Mid Frequency)	Minimum db Attenuation (.0002 Microbar Reference)
31	5
63	10
125	27
500	37
1000	31
2000	26
4000	25
8000	26

3. Pressure drop in the complete exhaust system shall be small enough for satisfactory operation of the engine generator while it is delivering 100% of its specified rating.
4. Exhaust pipe size from the engine to the muffler shall be as recommended by the engine manufacturer. Pipe size from muffler to air discharge shall be two pipe sizes larger than engine exhaust pipe.
5. Connections at the engine exhaust outlet shall be made with a flexible exhaust pipe. Provide bolted type pipe flanges welded to each end of the flexible section.

- C. Condensate drain at muffler shall be made with schedule 40 black steel pipe through a petcock.
- D. Exhaust Piping and Supports: Black steel pipe, ASTM A-53 standard weight with welded fittings. Spring type hangers, as specified in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT, shall support the pipe.

2.8 ENGINE STARTING SYSTEM

- A. The engine starting system shall start the engine at any position of the flywheel.
- B. Electric cranking motor:
 - 1. Shall be engine-mounted.
 - 2. Shall crank the engine via a gear drive.
 - 3. Rating shall be adequate for cranking the cold engine at the voltage provided by the battery system, and at the required RPM during five consecutive starting attempts of 10 seconds cranking each at 10-second intervals, for a total of 50 seconds of actual cranking without damage (the fifth starting attempt will be manually initiated upon failure of a complete engine cranking cycle).

- C. Batteries shall be lead-acid high discharge rate type.
 - 1. Each battery cell shall have minimum and maximum electrolyte level indicators and a flip-top flame arrestor vent cap.
 - 2. Batteries shall have connector covers for protection against external short circuits.
 - 3. With the charger disconnected, the batteries shall have sufficient capacity so that the total system voltage does not fall below 85% of the nominal system voltage with the following demands:

Five consecutive starting attempts of 10 seconds cranking at 10 second intervals for a total of 50 seconds of actual cranking (the fifth starting attempt will be manually initiated upon failure of a complete engine cranking cycle).

- 3. Battery racks shall be metal with an alkali-resistant finish and thermal insulation, and secured to the floor.
- D. Battery Charger:
 - 1. A current-limiting battery charger, conforming to UL 1236, shall be provided and shall automatically recharge the batteries. The charger shall be capable of an equalize-charging rate for recharging fully depleted batteries within 24 hours and a floating charge rate for maintaining the batteries at fully charged condition.
 - 2. An ammeter shall be provided to indicate charging rate. A voltmeter shall be provided to indicate charging voltage.

2.10 JACKET COOLANT HEATER

- A. Provide a thermostatically-controlled electric heater mounted in the engine coolant jacketing to automatically maintain the coolant within plus or minus 1.7 °C (3 °F) of the temperature recommended by the engine manufacturer to meet the starting time specified at the minimum winter outdoor temperature.

2.11 GENERATOR

- A. Synchronous, amortisseur windings, bracket-bearing, self-venting, rotating-field type connected directly to the engine.
- B. Lifting lugs designed for convenient connection to and removal from the engine.
- C. Integral poles and spider, or individual poles dove-tailed to the spider.
- D. Designed for sustained short-circuit currents in conformance with NEMA Standards.
- E. Designed for sustained operation at 100% of the RPM specified for the engine generator without damage.
- F. Telephone influence factor shall conform to NEMA MG 1.
- G. Furnished with brushless excitation system or static-exciter-regulator assembly.
- H. Nameplates attached to the generator shall show the manufacturer's name, equipment identification, serial number, voltage ratings, field current ratings, kW/kVA output ratings, power factor rating, time rating, temperature rise ratings, RPM ratings, full load current rating, number of phases and frequency, and date of manufacture.
- I. The grounded (neutral) conductor shall be electrically isolated from equipment ground and terminated in the same junction box as the phase conductors.

2.12 GENERATOR OVERCURRENT AND FAULT PROTECTION

- A. Generator circuit breaker shall be molded-case, electronic-trip type, and 100% rated, complying with UL 489. Tripping characteristics shall be adjustable long-time and short-time delay and instantaneous. Provide shunt trip to trip breaker when engine generator is shut down by other protective devices.
- E. Overcurrent protective device cubicle shall contain terminations for neutral and equipment grounding conductors as necessary.

2.13 CONTROLS

- A. Shall include Engine Generator Control Cubicle(s) //and Remote Annunciator Panel
- B. General:
 - 1. Control equipment shall be in accordance with UL 508, NEMA ICS-4, ICS-6, and ANSI C37.90.1.
 - 2. Panels shall be in accordance with UL 50.
 - 2. Cubicles shall be in accordance with UL 891.

3. Coordinate controls with the automatic transfer switches shown on the drawings so that the systems will operate as specified.
 4. Cubicles:
 - a. Code gauge steel: manufacturer's recommended heavy gauge steel with factory primer and light gray finish.
 - b. Doors shall be gasketed, attached with concealed or semi-concealed hinges, and shall have a permanent means of latching in closed position.
 - c. Panels shall be wall-mounted or incorporated in other equipment as indicated on the drawings or as specified.
 - d. Door locks for panels and cubicles shall be keyed identically to operate from a single key.
 5. Wiring: Insulated, rated at 600 V.
 - a. Install the wiring in vertical and horizontal runs, neatly harnessed.
 - b. Terminate all external wiring at heavy duty, pressure-type, terminal blocks.
 6. The equipment, wiring terminals, and wires shall be clearly and permanently labeled.
 7. All indicating lamps and switches shall be accessible and mounted on the cubicle doors.
 8. Meters shall be per the requirements of Section 25 10 10, ADVANCED UTILITY METERING.
 9. The manufacturer shall coordinate the interconnection and programming of the generator controls with all related equipment, including automatic transfer switches and generator paralleling controls as applicable, specified in other sections.
- C. Engine generator Control Cubicle:
1. Starting and Stopping Controls:
 - a. A three-position, maintained-contact type selector switch with positions marked "AUTOMATIC," "OFF," and "MANUAL." Provide flashing amber light for OFF and MANUAL positions.
 - b. A momentary contact push-button switch with positions marked "MANUAL START" and "MANUAL STOP."
 - c. Selector switch in AUTOMATIC position shall cause the engine to start automatically when a single pole contact in a remote device closes. When the generator's output voltage increases to not less than 90% of its rated voltage, and its frequency increases to not less than 58 Hz, the remote devices shall transfer the load to the generator. An adjustable time delay relay, in the 0 to 15 minute range, shall cause the engine generator to continue operating without any load after completion of the period of operation with load. Upon completion of the additional 0 to 15 minute (adjustable) period, the engine generator shall stop.
 - d. Selector switch in OFF position shall prevent the engine from starting either automatically or manually. Selector switch in MANUAL position shall also cause the engine to start when the manual start push-button is depressed momentarily.

- e. With selector switch is in MANUAL position, depressing the MANUAL STOP push-button momentarily shall stop the engine after a cool-down period.
 - f. A maintained-contact, red mushroom-head push-button switch marked "EMERGENCY STOP" will cause the engine to stop without a cool-down period, independent of the position of the selector switch.
2. Engine Cranking Controls:
- a. The cranking cycles shall be controlled by a timer that will be independent of the battery voltage fluctuations.
 - b. The controls shall crank the engine through one complete cranking cycle, consisting of four starting attempts of 10 seconds each with 10 seconds between each attempt.
 - c. Total actual cranking time for the complete cranking cycle shall be 40 seconds during a 70-second interval.
 - d. Cranking shall terminate when the engine starts so that the starting system will not be damaged. Termination of the cranking shall be controlled by self-contained, speed-sensitive switch. The switch shall prevent re-cranking of the engine until after the engine stops.
 - e. After the engine has stopped, the cranking control shall reset.
3. Supervisory Controls:
- a. Overcrank:
 - 1) When the cranking control system completes one cranking cycle (four starting attempts), without starting the engine, the OVERCRANK signal light and the audible alarm shall be energized.
 - 2) The cranking control system shall lock-out, and shall require a manual reset.
 - b. Coolant Temperature:
 - 1) When the temperature rises to the predetermined first stage level, the HIGH COOLANT TEMPERATURE - FIRST STAGE signal light and the audible alarm shall be energized.
 - 2) When the temperature rises to the predetermined second stage level, which shall be low enough to prevent any damage to the engine and high enough to avoid unnecessary engine shutdowns, the HIGH COOLANT TEMPERATURE - SECOND STAGE signal light and the audible alarm shall be energized and the engine shall stop.
 - 3) The difference between the first and second stage temperature settings shall be approximately -12 °C (10 °F).
 - 4) Permanently indicate the temperature settings near the associated signal light.

- 5) When the coolant temperature drops to below 21 °C (70 °F), the "LOW COOLANT TEMPERATURE" signal light and the audible alarm shall be energized.
- c. Low Coolant Level: When the coolant level falls below the minimum level recommended by the manufacturer, the LOW COOLANT LEVEL signal light and audible alarm shall be energized.
- d. Lubricating Oil Pressure:
 - 1) When the pressure falls to the predetermined first stage level, the OIL PRESSURE - FIRST STAGE signal light and the audible alarm shall be energized.
 - 2) When the pressure falls to the predetermined second stage level, which shall be high enough to prevent damage to the engine and low enough to avoid unnecessary engine shutdowns, the OIL PRESSURE - SECOND STAGE signal light and the audible alarm shall be energized and the engine shall stop.
 - 3) The difference between the first and second stage pressure settings shall be approximately 15% of the oil pressure.
 - 4) The pressure settings near the associated signal light shall be permanently displayed so that the running oil pressure can be compared to the target (set point) value.
- e. Overspeed:
 - 1) When the engine RPM exceeds the maximum RPM recommended by the manufacturer of the engine, the engine shall stop.
 - 2) Simultaneously, the OVERSPEED signal light and the audible alarm shall be energized.
- f. Low Fuel - Base Tank:

When the fuel oil level in the base tank decreases to less than the level at which the fuel oil transfer pump should start to refill the tank, the LOW FUEL BASE TANK light and the audible alarm shall be energized. .
- g. Reset Alarms and Signals:

Overcrank, Coolant Temperature, Coolant Level, Oil Pressure, Overspeed, and Low Fuel signal lights and the associated audible alarms shall require manual reset. A momentary-contact silencing switch and push-button shall silence the audible alarm by using relays or solid state devices to seal in the audible alarm in the de-energized condition. Elimination of the alarm condition shall automatically release the sealed-in circuit for the audible alarm so that it will be automatically energized again when the next alarm condition occurs. The signal lights shall require manual reset after elimination of the condition which caused them to be energized. Install the audible alarm just outside the engine generator room in a location as directed by the //Resident Engineer// //COTR//. The audible alarm shall be rated for 85 dB at 3 M (10 feet).

- h. Generator Breaker Signal Light:
 - 1) A flashing green light shall be energized when the engine generator circuit breaker is in the OPEN or TRIPPED position.
 - 2) Simultaneously, the audible alarm shall be energized.
- 4. Monitoring Devices:
 - a. Electric type gauges for the cooling water temperatures and lubricating oil pressures. These gauges may be engine mounted with proper vibration isolation.
 - b. A running time indicator, totalizing not fewer than 9,999 hours, and an electric type tachometer.
 - c. A voltmeter, ammeter, frequency meter, kilowatt meter, manual adjusting knob for the output voltage, and the other items shown on the drawings shall be mounted on the front of the generator control panels.
 - d. Install potential and current transformers as required.
 - e. Visual Indications:
 - 1) OVERCRANK
 - 2) HIGH COOLANT TEMPERATURE - FIRST STAGE
 - 3) HIGH COOLANT TEMPERATURE - SECOND STAGE
 - 4) LOW COOLANT TEMPERATURE
 - 5) OIL PRESSURE - FIRST STAGE
 - 6) OIL PRESSURE - SECOND STAGE
 - 7) LOW COOLANT LEVEL
 - 8) GENERATOR BREAKER
 - 9) OVERSPEED
 - 10) LOW FUEL - DAY TANK
 - 11) LOW FUEL – MAIN STORAGE TANK
 - f. Lamp Test: The LAMP TEST momentary contact switch shall momentarily actuate the alarm buzzer and all the indicating lamps.
- 4. Automatic Voltage Regulator:
 - a. Shall correct voltage fluctuations rapidly and restore the output voltage to the predetermined level with a minimum amount of hunting.
 - b. Shall include voltage level rheostat located inside the control cubicle.
 - c. Provide a 3-phase automatic voltage regulator immune to waveform distortion.

2.14 REMOTE ANNUNCIATOR PANEL

- A. A remote annunciator panel shall be installed at the Fire Command Center as shown on the drawings.

- B. The annunciator shall indicate alarm conditions as required by NFPA 99 and 110.
- C. Include control wiring between the remote annunciator panel and the engine generator. Wiring shall be as required by the manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install concrete bases of dimensions shown on the drawings.
- B. Installation of the engine generator shall comply with manufacturer's written instructions and with NFPA 110.
- C. Mounting:
 - 1. Support the base of engine generator on vibration isolators, each isolator bolted to the floor (pad), and the generator base bolted to isolator.
 - 2. Install sufficient isolators so that the floor (pad) bearing pressure under each isolator is within the floor (pad) loading specification.
 - 3. Install equal number of isolators on each side of the engine generator's base.
 - 4. Locate isolators for approximately equal load distribution and deflection per isolator. The base of the engine generator shall be drilled at the factory for the isolator bolts.
 - 5. Isolators shall be shipped loose with the engine generator.
 - 6. All connections between the engine generator and exterior systems, such as fuel lines, electrical connections, and engine exhaust system and air exhaust shroud, shall be flexible.
- D. In seismic areas, engine generators shall be adequately anchored and braced per details on structural contract drawings to withstand the seismic forces at the location where installed.
- E. Balance:
 - 1. The vibration velocity in the horizontal, vertical, and axial directions shall not exceed 16.25 mm (0.65 inch) per second peak at any specific frequency. These limits apply to main structural components such as the engine block and the generator frame at the bearings.
- F. Connect all components of the generator system so that they will continue to be energized during failure of the normal electrical power supply system.
- G. Install piping between engine generator and remote components of cooling, fuel, and exhaust systems.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Provide the services of a factory-authorized, factory-trained representative of the engine generator manufacturer to inspect field-assembled components and equipment installation, and to supervise the field tests.
- B. When the complete engine generator system has been installed and prior to the final inspection, test all components of the system in the presence of the Owners Representative for proper operation of the individual components and the complete system and to eliminate electrical and mechanical defects.

- C. Furnish lubricating oil, anti-freeze liquid, water treatment, rust-inhibitor, and load bank for testing of the engine generator.
- D. Visual Inspection: Visually verify proper installation of engine generator and all components per manufacturer's pre-functional installation checklist.
- E. Set engine generator circuit breaker protective functions per Section 26 05 73, OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY.
- F. Field Tests:
 - 1. Perform manufacturer's after-starting checks and inspections.
 - 2. Test the engine generator for six hours of continuous operation as follows:
 - a. Two hours while delivering 100% of the specified kW.
 - b. Four hours while the engine generator is delivering 80% of its specified kW rating.
 - c. If during the 6-hour continuous test, an engine generator failure occurs or the engine generator cannot maintain specified power output, the test(s) are null and void. After repair and/or adjustments, the test(s) shall be repeated at no additional cost to the Government until satisfactory results are attained.
 - 2. Record the following test data at 30-minute intervals:
 - a. Time of day, as well as reading of running time indicator.
 - kW. Voltage on each phase.
 - b. Amperes on each phase.
 - c. Engine RPM.
 - d. Frequency.
 - e. Coolant water temperature
 - f. Fuel pressure.
 - g. Oil pressure.
 - h. Outdoor temperature.
 - i. Average ambient temperature in the vicinity of the engine generator.
 - 3. Demonstrate that the engine generator will attain proper voltage and frequency within the specified time limit from a cold start after the closing of a single contact.
 - 4. Furnish a resistance-type load for the testing of the engine generator. Test loads shall always include adequate resistance to assure stability of the loads and equipment during all of the testing operations. The test load kW rating shall not be less than 100% of the specified kW rating of the engine generator.
- G. Starting System Test: