PRMH20231683

City of Puyallup Building ACCEPTED JMontgomery 12/07/2023 10:26:03 AM

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Structural Calculation Report

GOOD SAM HOSPITAL MECH EQUIPMENT REPLACEMENT STRUCTURAL CALCULATIONS

Project	GOOD SAM HOSPITAL
Location	401 15TH AVE SE PUYALLUP, WA 98372
McKinstry Project	124212
McKinstry Drawings	EQ-001
Date	11/9/23

EXPIRES: 9-23-24

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PROJECT GOOD SAM HOSPITAL		
TITLE STRUCTURAL CALCS		
BY RB/HBS	SCALE NTS	JOB # 124212
DATE 11/9/23	REF.DWG	SHEET

SCOPE: (1) DESIGN ANCHORAGE FOR INCOMING MECH EQUIPMENT.

PROJECT: GOOD SAM HOSPITAL
401 15TH AVE SE
PUYALLUP, WA 98372

REFERENCE DRAWINGS

MECHANICAL DRAWINGS: MCKINSTRY M-001 - M-500 STAMPED BY DANIAL MA
WEST WING STRUCTURAL DRAWINGS: MARTENS CHAN CONSULTING ENGINEERS S1.0.1 - S7.1.1 STAMPED BY RANDOLF G MARTENS ON 10/15/99
D & T WING STRUCTURAL DRAWINGS: AHBL S0.1 - S2.1 STAMPED BY THOMAS R HICKS ON 11/27/00

LOCATIONS: INTERIOR PENTHOUSE GRID M.8-4 AND K.8-4.7
INTERIOR PENTHOUSE GRID D-3

DESIGN PARAMETERS:

CODES: IBC 2018, ASCE 7-16, ACI 318-14, AISC 15TH ED

LOADS: DEAD:
H-SF-1 WT = 1450 LB; LXWXH = 55"X30"X30"
H-SF-2 WT = 1450 LB; LXWXH = 55"X30"X30"
H-AHU-SS WT = 950 LB; LXWXH = 55"X30"X20"

DOES NOT INCLUDE 2' LEGS

SEISMIC FACTORS:
S_{DS} = 1.01
I_p = 1.5
A_p = 1.0
R_p = 1.5
z/h = 1.0
Ω = 2.0 FOR CONCRETE CONNECTIONS

DESIGN APPROACH:
1. USE EXCEL TO DETERMINE WORST GRAVITY AND SEISMIC LOADS.
2. DESIGN ANCHORAGE FOR WORST CASE REACTIONS.

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PROJECT	GOOD SAM HOSPITAL		
TITLE	STRUCTURAL CALCS		
BY	RB/HBS	SCALE NTS	JOB # 124212
DATE	11/9/23	REF.DWG	SHEET

PARTIAL PLAN:

REFERENCE DRAWING: M10-05
LOCATION: ROOF GRID (A.3-5)
STEAM GENERATOR [H-SF-1]: W = 1450 LB; LXWXH = 55"X30"X30"
STEAM GENERATOR [H-SF-2]: W = 1450 LB; LXWXH = 55"X30"X30"

WORST CASE EQUIPMENT

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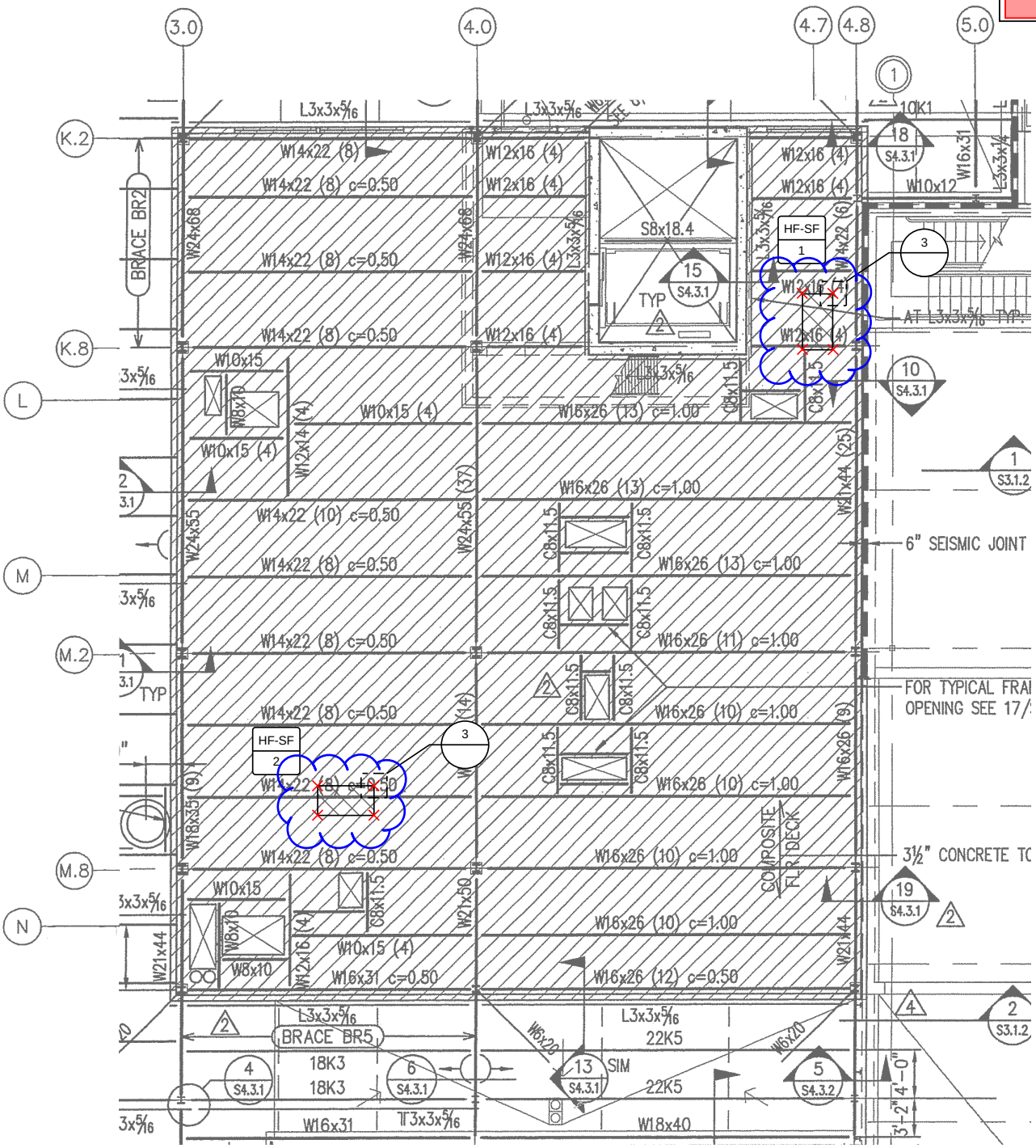

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SEISMIC ANALYSIS
MECHANICAL EQUIPMENT

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Seismic Demands on Non-Structural Components (Strength Level Forces): [§ 13.3.1 ASCE 7-16]

Design Factors:

Equipment Type, Tag:	H-SF-1	SDs:	1.01	Spectral Acc, short period
Equipment Location:	ROOF	Ap:	1	(T-13-6-1)
Equipment Weight (Wt):	1,450 LBS	Rp:	1.5	(T-13-6-1)
Equipment Mount:	RIGID	Ip:	1.5	Component importance factor
		z/h:	1.00	

Seismic Forces:

Fp =	1,757 LBS	[13.3-1]	*Fp(calc) = 0.4 x [(ap) x (Sds) x (Wt) x (1+2 x (z/h))]/(Rp/Ip)*
Fp(max) =	3,515 LBS	[13.3-2]	*Fp(max) = 1.6 x Sds x Wt x Ip*
Fp(min) =	659 LBS	[13.3-3]	*Fp(min) =0.3 x Sds x Wt x Ip*

Fp(min)<Fp<Fp(max), Use Fp [13.3-1]

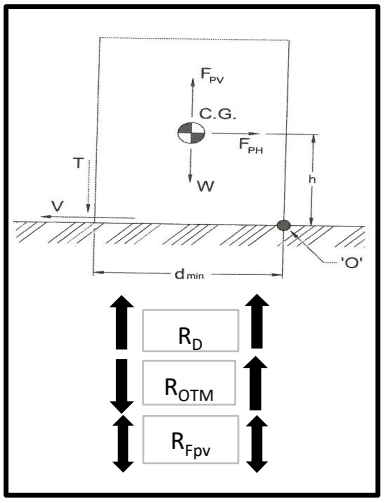
Design Fph =	**1,757 LBS**		
Fpv =	**293 LBS**	[Sect. 13.3]	*Fpv = 0.2 x Sds x Wt*

Seismic Analysis: (Rigid Equipment, Limiting Transverse Width Controls OTM)

dmin(Trans) =	30 in.	CG INCLUDES 2' LEGS SUPPORTING UNIT
CG Height =	39 in.	
N =	4	(Qnty of Conn; min 2)

Service Reactions:

R_D =	0.36 K (Per Conn)	= W/N
R_{OTM} =	1.14 K (+/- T&C)	= (Fph *CG)/dmin/(N/2)
R_{Fpv} =	0.07 K (+/-)	= Fpv/N



(Max Tension per ASCE 7, (U7): 0.9D + 1.0E)
Nu= 0.89 K **TENSION**

(Max Compression per ASCE 7, (U5): 1.2D+1.0E)
Pu= 1.65 K **COMPRESSION**

(Total Base Shear:)
Vu (Total)= 1.76 K

(Max Shear per Connection):
Vu= 0.44 K (Per Conn)

(Omega Factored Loads Per ASCE 7, For Concrete Anchors)

Ω:	2	[Supple. No 1, 13.6.1]
ΩNu=	**2.03 K**	($-0.9D+\Omega R_{OTM}+R_{FPV}$)
ΩVu=	**0.88 K (Per Conn)**	(ΩV_U)

Comments:

OTM =	Overturning Moment
RM =	Resisting Moment
W =	Equipment Operating Weight
F_{PH} =	Seismic Horizontal Force
F_{Pv} =	Seismic Vertical Force
d_{min} =	Mimimum Width of Equipment
T =	Maximum Tensile Force
V =	Maximum Shear Force
h =	Height to Center of Gravity

REACTIONS USED TO CHECK EQUIPMENT ANCHORAGE. SEE PROFIS OUTPUT ON FOLLOWING PAGES.

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PROJECT	REDMOND HILLTOP B18 & B19		
TITLE	STRUCTURAL CALCS		
BY HBS	SCALE NTS	JOB # 113271	
DATE 11/8/23	REF.DWG	SHEET	

WORST CASE SCREW CONNECTION:

CONVERT LRFD TO ASD LOADS:
N = 0.7*890 LBS = 623 LBS (TENSION ACTS AS SHEAR IN THE SCREWS)
V = 0.7*440 LBS = 308 LBS

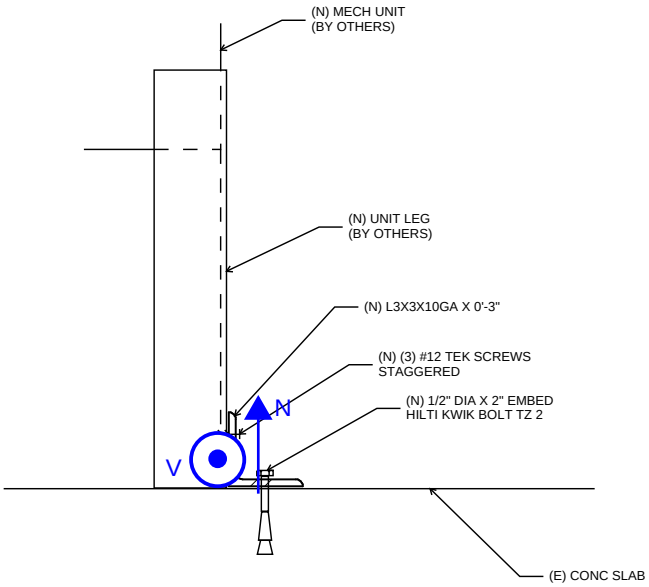
$Vt = SQRT(623^2 + 308^2) = 695$ LBS

CLIP CONNECTION:

TEK SCREW CAPACITY:
V = 394 LBS/SCREW

DCR = 695/(3 SCREWS * 394) = 0.588 < 1.0 CLIP OK

SEE HILTI REPORT FOR CONCRETE CONNECTION



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Hilti PROFIS Engineering 3.0.88

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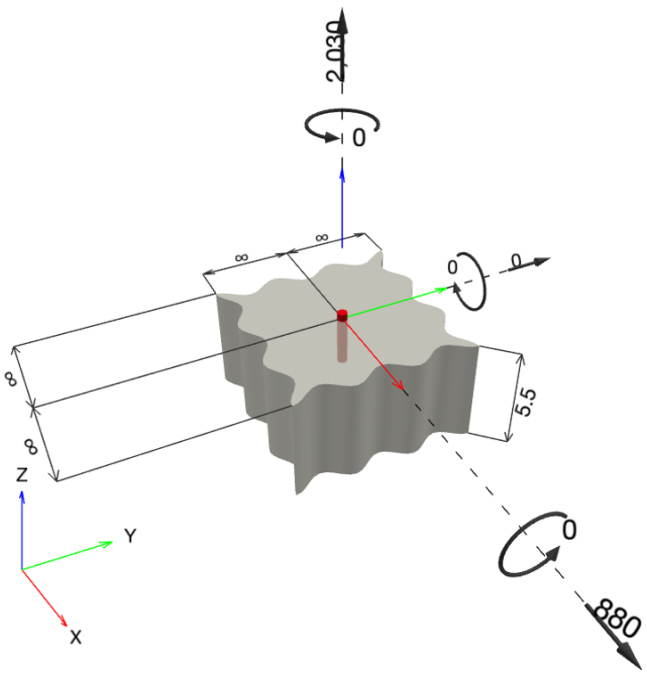
Company:		Page:	1
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Nov 8, 2023	Date:	11/8/2023
Fastening point:			

Specifier's comments:

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ2 - CS 1/2 (2 1/2) hnom3**
Item number:	2210254 KB-TZ2 1/2x3 3/4
Effective embedment depth:	$h_{ef,act}$ = 2.500 in., h_{nom} = 3.000 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-4266
Issued I Valid:	12/17/2021 | 12/1/2023
Proof:	Design Method ACI 318-19 / Mech
Stand-off installation:	
Profile:	
Base material:	cracked concrete, 4000, f_c' = 4,000 psi; h = 5.500 in.
Installation:	**hammer drilled hole, Installation condition: Dry**
Reinforcement:	tension: not present, shear: not present; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.10.5.3 (d)) Shear load: yes (17.10.6.3 (c))

Geometry [in.] & Loading [lb, in.lb]



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Company:		Page:	3
Address:		Specifier:	
Phone I Fax:	|	E-Mail:	
Design:	Concrete - Nov 8, 2023	Date:	11/8/2023
Fastening point:			

2 Proof I Utilization (Governing Cases)

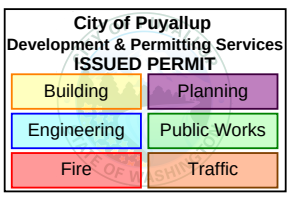
		Design values [lb]		Utilization	
Loading	**Proof**	**Load**	**Capacity**	**β_N / β_V [%]**	**Status**
Tension	Concrete Breakout Failure	2,030	2,559	80 / -	OK
Shear	Steel Strength	880	4,471	- / 20	OK

Loading	**β_N**	**β_V**	**ζ**	**Utilization $\beta_{N,V}$ [%]**	**Status**
Combined tension and shear loads	0.793	0.197	5/3	75	OK

3 Warnings

- Please consider all details and hints/warnings given in the detailed report!

Fastening meets the design criteria!



Detail Report

Project ID: 214742
Project name: copy CMS - Good Sam Replacements
System/tag : SF-1 (continued)

Options continued		
Enclosure type	None	
Support	Legs	
Steam valve controlled by	DriSteem	

Control Options		
Humidifier controller	Vapor-logic	
Interoperability	BACnet	
Display mounting	Shipped Loose	
Display cable (ft)	5	
Display language & units	English	Inch-pound
Input signal: DriSteem	Humidity Transmitter	
Control cabinet	NEMA4	
Mounted on humidifier	No	

Steam Connections

Dispersion	
NA	

Generator		
Outlet type and diameter (inches)	Welded Flange	5

Accessories

Dispersion Accessories
NA

Generator Accessories
· Drane-kooler : Suspension Mount
· Strainer (inches) : 1.5" Cast Iron, Qty 2
· Steam trap (inches) : 1.25" Cast Iron F& T, Qty 2

System Accessories

· High-limit humidistat : Electric, Modulating

· Airflow proving switch : Electric Pressure

· Humidity transmitter : Duct

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Detail Report

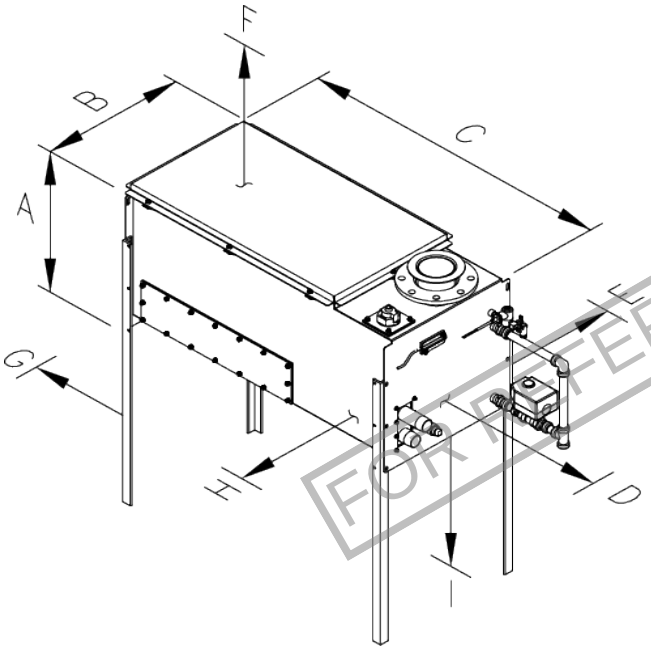
Project ID: 214742

Project name: copy CMS - Good Sam Replacements

System/tag SF-1

System Drawings

Steam generator dimensions and clearances



Dimensions (in.)			Clearances (in.)					
A	B	C	D	E	F	G	H	I
29.75	30.25	55.15	36	6	18	6	36	24

Detail Report

Project ID: 214742
Project name: copy CMS - Good Sam Replacements
System/tag : SF-2 (continued)

Control Options continued	
Control cabinet	NEMA4
Mounted on humidifier	No

Steam Connections

Dispersion	
NA	

Generator		
Outlet type and diameter (inches)	Welded Flange	5

Accessories

Dispersion Accessories
NA

Generator Accessories
· Drane-kooler : Suspension Mount
· Strainer (inches) : 1.5" Cast Iron, Qty 2
· Steam trap (inches) : 1.25" Cast Iron F& T, Qty 2

System Accessories

· High-limit humidistat : Electric, Modulating

· Airflow proving switch : Electric Pressure

Detail Report

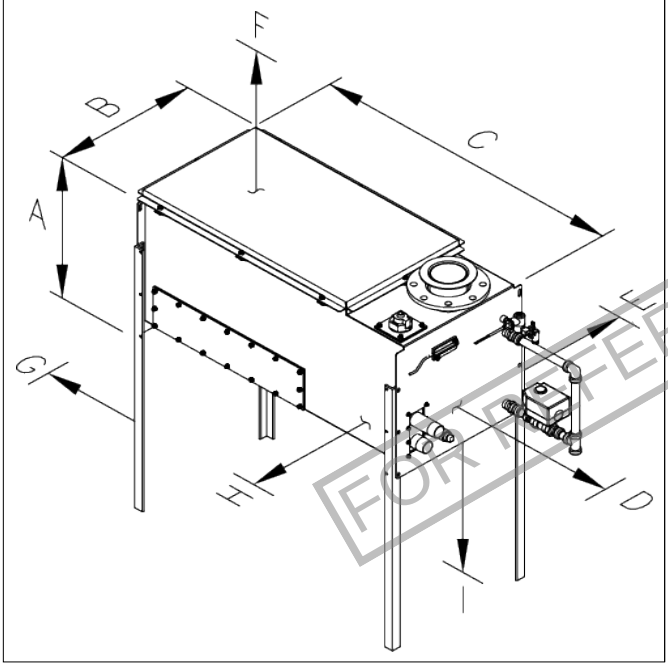
Project ID: 214742

Project name: copy CMS - Good Sam Replacements

System/tag SF-2

System Drawings

Steam generator dimensions and clearances



Dimensions (in.)			Clearances (in.)					
A	B	C	D	E	F	G	H	I
29.75	30.25	55.15	36	6	18	6	36	24

Detail Report

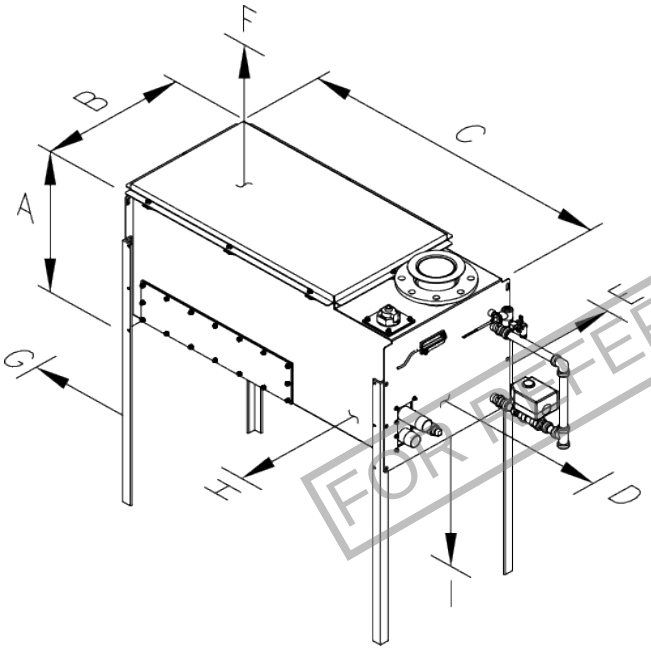
Project ID: 214742

Project name: copy CMS - Good Sam Replacements

System/tag Support Services

System Drawings

Steam generator dimensions and clearances



Dimensions (in.)			Clearances (in.)					
A	B	C	D	E	F	G	H	I
19.5	30.25	55.15	36	6	18	6	36	24