



OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT
FACILITIES DEVELOPMENT DIVISION

APPLICATION FOR OSHPD PREAPPROVAL
OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY

APPLICATION #: OPM-0401-13

OSHPD Preapproval of Manufacturer's Certification (OPM)

Type: ☒ New ☐ Renewal ☐ Update to Pre-CBC 2013 OPA Number: _____

Manufacturer Information

Manufacturer: California Dynamics Corporation

Manufacturer's Technical Representative: Efrain Escobedo

Mailing Address: 5572 Alhambra Avenue, Los Angeles, CA 90032

Telephone: 323-223-3882 Email: ee@caldyn.com

Product Information

Product Name: HVAC equipment by Loren Cook Company with Caldyn CQA VIWR (CQA Style V VIWR)

Product Type: Support under Cook Fans

Product Model Number: CPV 60 – CPV 135 (see OSP-0102-10)

General Description: Fan Unit Supports and Attachments

This OPM includes CalDyn Vibration Isolator With Seismic Restraint (VIWR) Strength and Stiffness that can potentially be used with any equipment.

Applicant Information

Applicant Company Name: California Dynamics Corporation

Contact Person: Donald Benkert

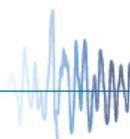
Mailing Address: 5572 Alhambra Avenue

Telephone: 323-223-3882 Email: ee@caldyn.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2016.

Signature of Applicant:  Date: May 30, 2019

Title: President Company Name: California Dynamics Corporation





OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT FACILITIES DEVELOPMENT DIVISION

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 1/24/13)

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Registered Design Professional Preparing Engineering Recommendations

Company Name: Independent Consulting Engineer

Name: Said Amirsolaimany California License Number: C37835

Mailing Address: 196 The Masters Circle, Costa Mesa 92627

Telephone: Cell 818-239-6180 Email: samamir1234@yahoo.com

OSHPD Special Seismic Certification Preapproval (OSP)

☒ Special Seismic Certification is preapproved under
OSP-0102-10
(Separate application for OSP is required)

☐ Special Seismic Certification is no preapproved

Certification Method(s)

☒ Testing in accordance with: ☐ ICC-ES AC156 ☒ FM 1950-10

☐ Other* (Please Specify): OPM-0401-13

*Use of test criteria other than those adopted by the California Building Standards Code, 2016 (CBSC 2016) for component supports and attachments are not permitted. For distribution system, interior partition wall, and suspended ceiling seismic bracings, test criteria other than those adopted in the CBSC 2016 may be used when approved by OSHPD prior to testing.

☐ Analysis

☐ Experience Data

☐ Combination of Testing, Analysis, and/or Experience Data (Please Specify):

List of Attachments Supporting the Manufacturer's Certification

☒ Test Report ☒ Drawings ☒ Calculations ☐ Manufacturer's Catalog

☒ Other(s) (Please Specify): Test Report sent under separate cover

OFFICE USE ONLY – OSHPD APPROVAL VALID FOR CBC 2016 & ALL PRE-2016 CODE BASED PROJECTS

Signature:  Date: 6/11/2019

Print Name: Jeffrey Kikumoto

Title: SE

Condition of Approval (if applicable):

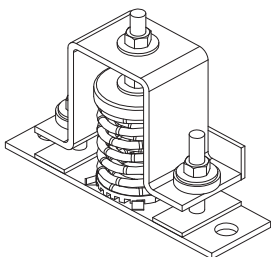
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OSHDP PREAPPROVAL OF
MANUFACTURER'S CERTIFICATION (OPM)

BY: Jeffrey Kikumoto
OPM-0401-13
DATE: 06/11/2019

CALIFORNIA BUILDING CODE 2016
(CBC 2016)



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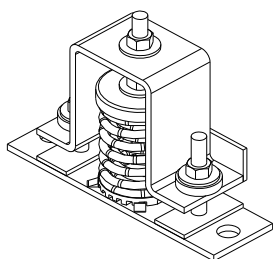
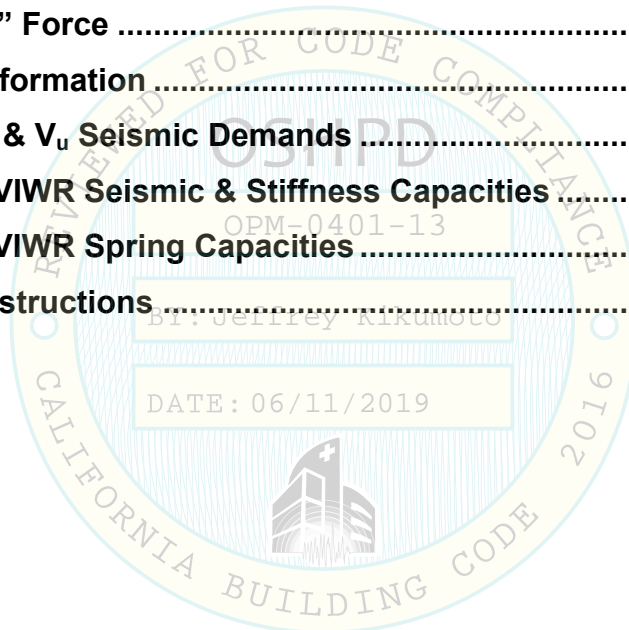
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Loren Cook Company CPV60 to CPV135
HVAC Fans w/ CalDyn CQA Vibration Isolator
With Restraint (CQA Style V VIWR)

Code: CBC 2016, ASCE 7-10

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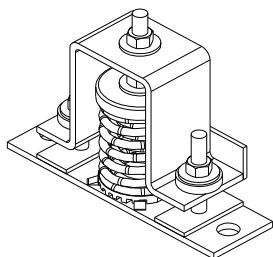
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GENERAL NOTES

1. This OSHPD Preapproval of Manufacturer's Certification (OPM) is based on the CBC 2016. The demand (design forces) for use with this OPM shall be based on the CBC 2016.
2. For support and attachment of Cook Fans (applicable to various models as listed on this report), the maximum seismic parameters are as follows:
 $S_{DS} = 2.0$ (Design Short Period Spectral Acceleration)
 $z/h \leq 1.0$ (Component Located at Roof or below)
 $a_p = 2.5$ (Component Amplification Factor)
 $R_p = 2.0$ (Response Modification coefficient)
 $I_p = 1.5$ (Component Importance Factor)
 $\Omega_0 = 2.0$ (Overstrength Factor)
3. Strength and Stiffness for CalDyn Vibration Isolator with Restraints (VIWRs) are applicable to any z/h & $S_{DS} \leq 2.0$, subject to project specific review and OSHPD approval of supports and attachments design. Registered Design Professional (RDP) shall coordinate with CalDyn in selection of VIWRs.
4. The Structural Engineer of Record (SEOR) shall verify the adequacy of the supporting structure and shall be responsible for obtaining project specific OSHPD approval for structures, components, supports and attachments.



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VIWR DESIGN PROCEDURE EXAMPLE

1) DETERMINE 'G' FORCE:

LATERAL F_{ph} & VERTICAL F_{pv} USING ASCE 7-10, CHAPTER 13 NON-STRUCTURAL COMPONENTS, SITE SPECIFIC S_{DS} (5% DAMPED DESIGN SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS) AND z/h (HEIGHT IN STRUCTURE OF COMPONENT / AVERAGE ROOF HEIGHT).

EXAMPLE: DETERMINE THE "g" FORCES FOR EXAMPLE LOREN COOK FAN MODEL # CPV 60

<u>BUILDING CODE</u>	<u>LOAD COMBINATION</u>
CBC-2016	1.2D + 1.0E (CBC 2016 EQ. 16A-5) 0.9D - 1.0E (CBC 2016 EQ. 16A-7)

<u>SEISMIC DESIGN</u>	<u>BLDG. ELEVATION / EQUIPMENT LOCATION</u>
$S_{DS} = 2.0$	$z/h \leq 1.0$ (ROOF Level installation)
$I_p = 1.5$	WORST CASE
$a_p = 2.5$	
$R_p = 2.0$	

I_p (COMPONENT IMPORTANCE FACTOR PER CBC 2016 §1616A.1.17)

a_p (COMPONENT AMPLIFICATION FACTOR PER ASCE 7-10, SECTION 13.6 TABLE 13.6-1)

R_p (COMPONENT RESPONSE FACTOR PER ASCE 7-10, SECTION 13.6 TABLE 13.6-1)

z (HEIGHT IN STRUCTURE OF POINT OF ATTACHMENT OF COMPONENT WITH RESPECT TO THE BASE)

h (AVERAGE ROOF HEIGHT OF STRUCTURE WITH RESPECT TO THE BASE)

$W_p = 250$ LBS (EXAMPLE LOREN COOK FAN)

$$F_p / W_p = \frac{(0.4) a_p S_{DS}}{\left(\frac{R_p}{I_p}\right)} \left(1 + 2 \frac{z}{h}\right) \dots \dots \text{(EQUATION 13.3-1)}$$

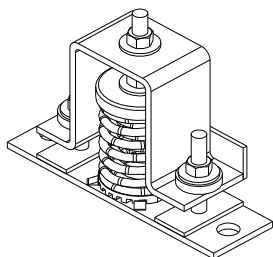
$$= \frac{(0.4 * 2.5 * 2.0)}{\left(\frac{2.0}{1.5}\right)} * \left(1 + 2[1.0]\right) = 4.5$$

$$F_{p(MAX)} / W_p = 1.6 S_{DS} I_p \dots \dots \text{(EQUATION 13.3-2)}$$

$$= 1.6 * 2.0 * 1.5 = 4.8 \text{ (MAX.)}$$

$$F_{p(MIN)} / W_p = 0.3 S_{DS} I_p \dots \dots \text{(EQUATION 13.3-3)}$$

$$= 0.3 * 2.0 * 1.5 = 0.9 \text{ (MIN.)}$$



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VIWR DESIGN PROCEDURE EXAMPLE - CONTINUE

2) Determine dimensions & operating weight from Manufacturer's literature.

Example: Loren Cook Fan MODEL# CPV 60

W_p = Operating Weight = 250 lbs

d = VIWR Mounting Depth = 24 in.

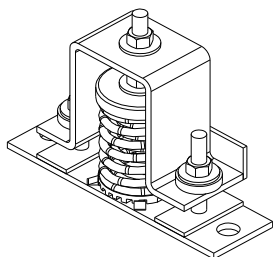
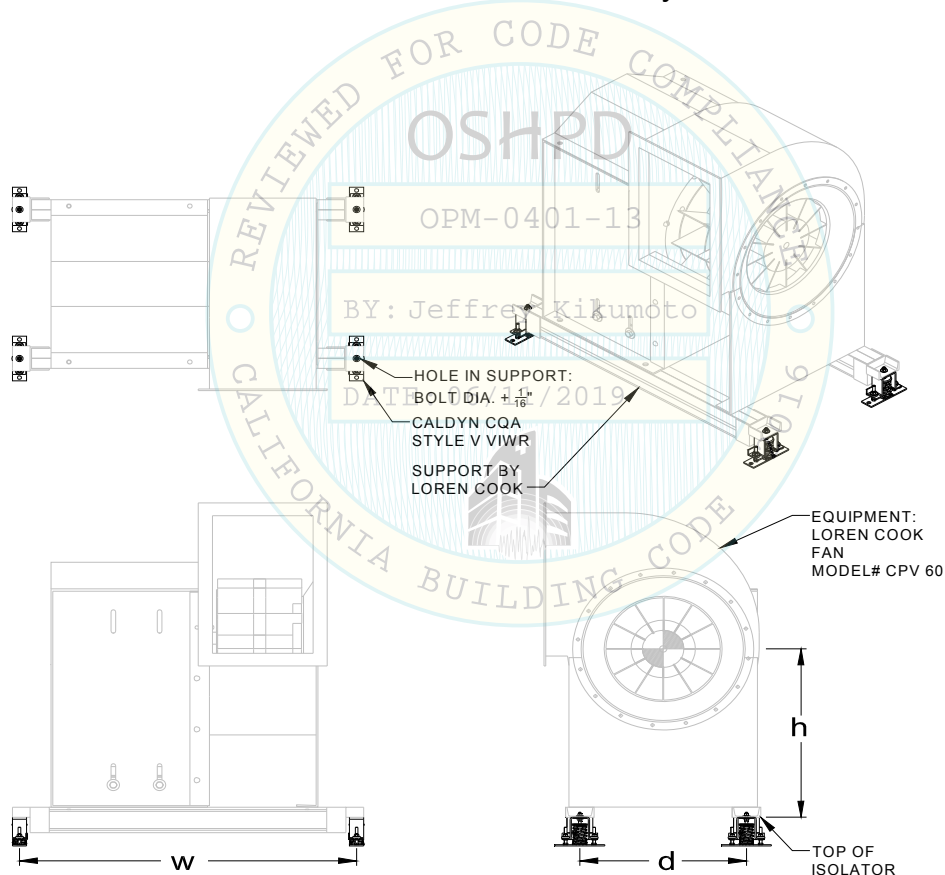
w = VIWR Mounting Width = 33.4 in.

h = Vertical Center of Gravity = 18 in.

R = VIWR Quantity along Width = 2

Q = VIWR Quantity along Depth = 2

N = Total VIWR Quantity = 4



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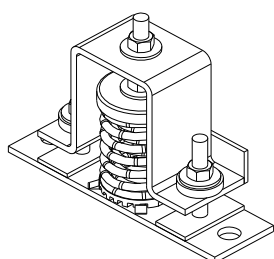
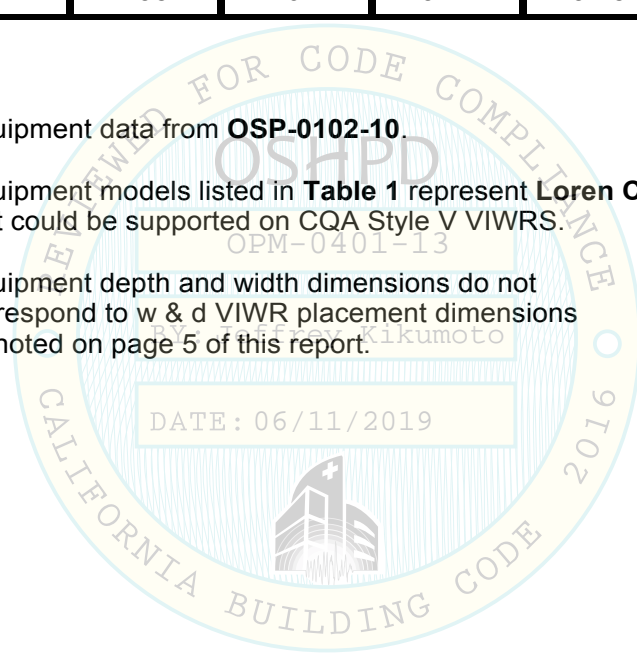
VIWR DESIGN PROCEDURE EXAMPLE - CONTINUE

TABLE 1: Loren Cook Fan information

Mode Line	Model	Dimensions (in.)			Weight (lb)
		Depth	Width	Height	
CPV (Belt Drive)	60	22.3	25.6	36.8	250
	70	22.3	25.6	36.8	250
	80	22.3	25.6	36.8	250
	100	22.3	25.6	36.8	250
	120	24.8	29.6	36.8	265
	135	26.7	31.7	37.8	297

NOTES:

- 1) Equipment data from **OSP-0102-10**.
- 2) Equipment models listed in **Table 1** represent **Loren Cook Fans** that could be supported on CQA Style V VIWRs.
- 3) Equipment depth and width dimensions do not correspond to w & d VIWR placement dimensions as noted on page 5 of this report.



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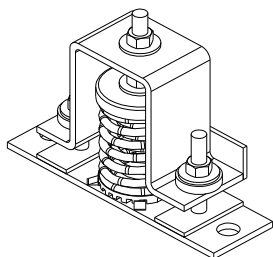
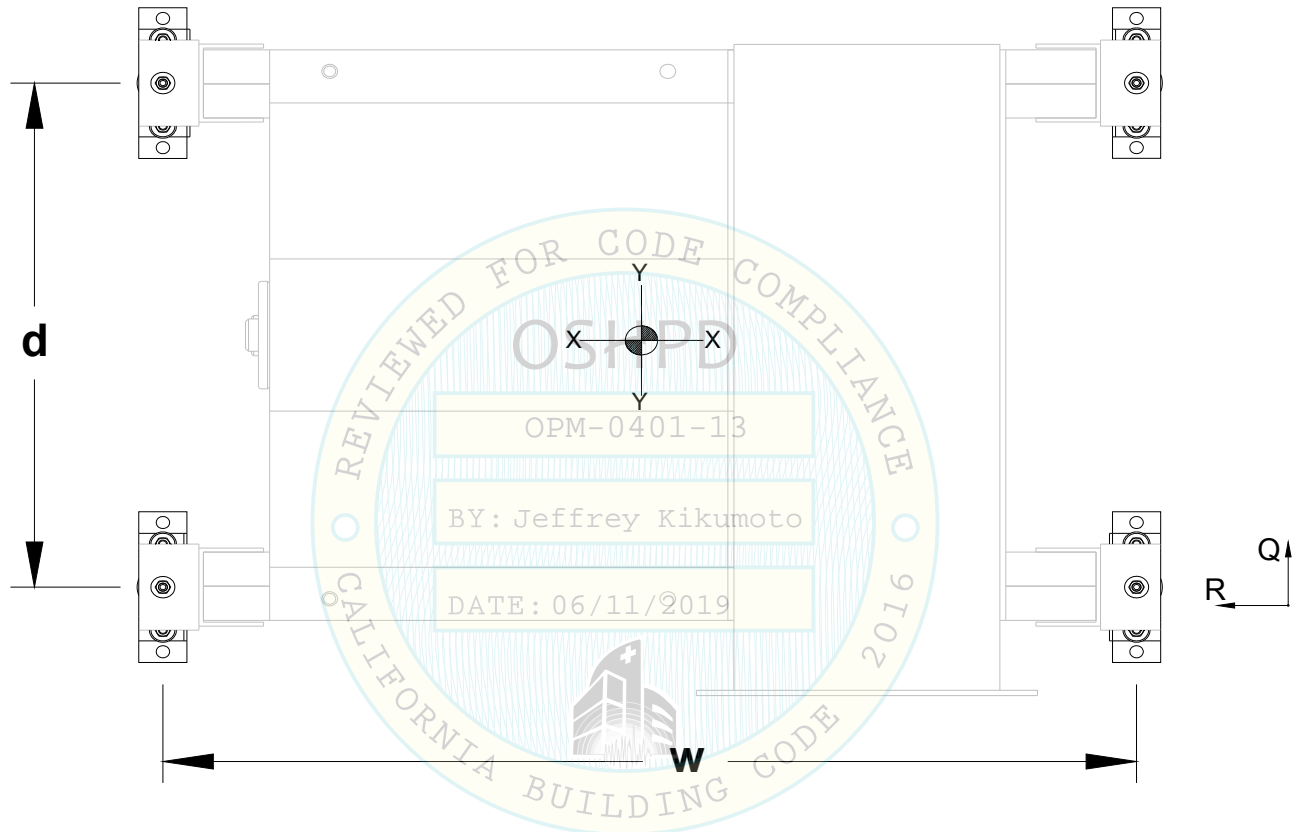
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VIWR DESIGN PROCEDURE EXAMPLE - CONTINUE

- 3) Determine seismic forces T_u & V_u using the sum of the moments overturning method.



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VIWR DESIGN PROCEDURE EXAMPLE - CONTINUE

APPLIED SEISMIC FORCE / CALCULATION:

$$z / h \leq 1.0; S_{DS} = 2.0$$

$$\begin{aligned} F_{ph} &= \text{Applied Lateral Seismic Force} = (F_p / W_p) * W_p \\ &= 4.5 * 250 \text{ lbs} = 1,125 \text{ lbs} \end{aligned}$$

$$\begin{aligned} F_{pv} &= \text{Applied Component of Seismic Force} = 0.2 * S_{ds} * W_p \\ &= 0.2 * 2.0 * 250 \text{ lbs} = 100 \text{ lbs} \end{aligned}$$

$$\begin{aligned} (0.9 * W_p) - E_v &= (0.9 * 250) - 100 = 125 \text{ lbs} \\ (1.2 * W_p) + E_v &= (1.2 * 250) + 100 = 400 \text{ lbs} \end{aligned}$$

CALCULATE PULLOUT LOAD DUE TO OVERTURNING (WORST CASE @ VIWR):

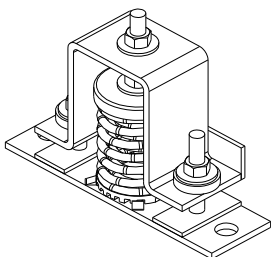
$$M_{OT} = \text{Overturning Moment} = (F_{ph} * h_{cg}) = 1,125 \text{ lbs} * 18 \text{ inch} = 20,250 \text{ lb-in.}$$

$$\begin{aligned} T_{ux} &= \text{Pullout Load Demand (about Y-Y)} = (M_{OT}) / (w * Q) \\ &= (20,250 \text{ lb-in}) / (33.4 \text{ in} * 2) = 303 \text{ lbs} \end{aligned}$$

$$\begin{aligned} T_{uy} &= \text{Pullout Load Demand (about X-X)} = (M_{OT}) / (d * R) \\ &= (20,250 \text{ lb-in}) / (24 \text{ in} * 2) = 422 \text{ lbs} \end{aligned}$$

CALCULATE SHEAR LOAD (WORST CASE):

$$\begin{aligned} V_U &= \text{APPLIED LATERAL SEISMIC FORCE / TOTAL VIWR QUANTITY} = \\ &= (F_{ph} / N) = 1,125 \text{ lbs} / 4 = 281 \text{ lbs} \end{aligned}$$



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VIWR DESIGN PROCEDURE EXAMPLE - CONTINUE

T_u & V_u with orthogonality effect (ASCE 7-10 Section 13.3-1):

$$T_{UO} = [422 + (0.3 * 303)] * \Omega_o = 1026 \text{ lbs.}$$

$$V_{UO} = [1.3 * 281] * \Omega_o = 731 \text{ lbs.}$$

LRFD TENSION & SHEAR using 0.9D-1.0E :

$$T_{Uxt} = -303 * \Omega_o + (125 / 4) = -575 \text{ lbs; } V_U = 281 * \Omega_o = 562 \text{ lbs}$$

$$T_{Uyt} = -422 * \Omega_o + (125 / 4) = -813 \text{ lbs; } V_U = 281 * \Omega_o = 562 \text{ lbs}$$

$$T_{Uot} = -513 * \Omega_o + (125 / 4) = -995 \text{ lbs; } V_{UO} = 1.3 * 281 * \Omega_o = 731 \text{ lbs}$$

LRFD TENSION & SHEAR using 1.2D-1.0E :

$$T_{Uxc} = 303 * \Omega_o + (400 / 4) = 706 \text{ lbs; } V_U = 281 * \Omega_o = 562 \text{ lbs}$$

$$T_{Uyc} = 422 * \Omega_o + (400 / 4) = 944 \text{ lbs; } V_U = 281 * \Omega_o = 562 \text{ lbs}$$

$$T_{Uoc} = 513 * \Omega_o + (400 / 4) = 1126 \text{ lbs; } V_{UO} = 1.3 * 281 * \Omega_o = 731 \text{ lbs}$$

- 4) **Select VIWR size based on seismic forces T_u & V_u in X, Y & Orthogonal directions (Capacity at 45° is permitted to be used for orthogonal direction) using the interaction graph or equation.**

$T_{UX} - V_U$, $T_{UY} - V_U$, and $T_{UO} - V_{UO}$ all must satisfy the following LRFD Demand to Capacity Ratio (DCR) equation:

$$(T_U / T_S) + (V_U / V_S) < 1.0$$

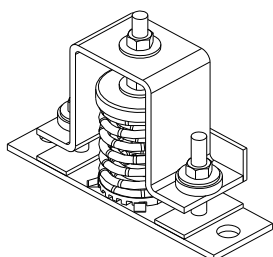
T_S = LRFD Vertical Seismic Strength Rating in Tables 2 & 3 (on page 10 & 11 of this report)

V_S = LRFD Horizontal Seismic Strength Rating in Tables 2 & 3 (on page 10 & 11 of this report)

$$DCR_X = (706 / 3176) + (562 / 1983) = 0.51 < 1.0$$

$$DCR_Y = (944 / 3176) + (562 / 1163) = 0.78 < 1.0$$

$$DCR_O = (1126 / 3176) + (731 / 1212) = 0.96 < 1.0$$



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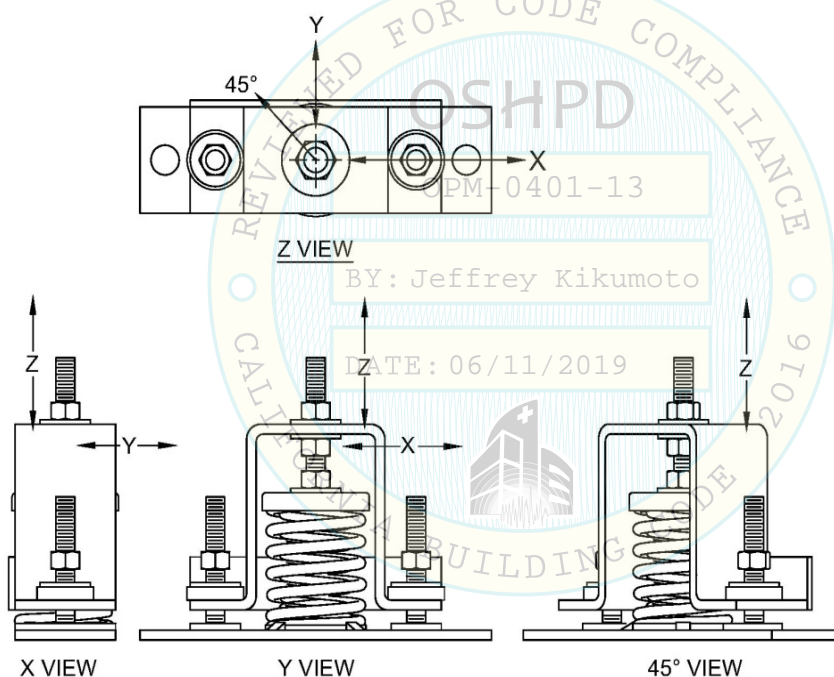
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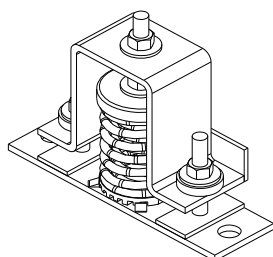
VIWR DESIGN PROCEDURE EXAMPLE - CONTINUE

Table 2: CQA Seismic Capacity (LRFD)

VIWR	Rated Vertical (Z) Seismic Capacity lbs	Rated Perpendicular (X) Horizontal Seismic Capacity lbs	Rated Parallel (Y) Horizontal Seismic Capacity lbs	Rated Orthogonal (45° to X-Y) Horizontal Seismic Capacity lbs
CQA	3,176	1,983	1,163	1,212



CQA STYLE V
X, Y, Z & 45° DIRECTIONS



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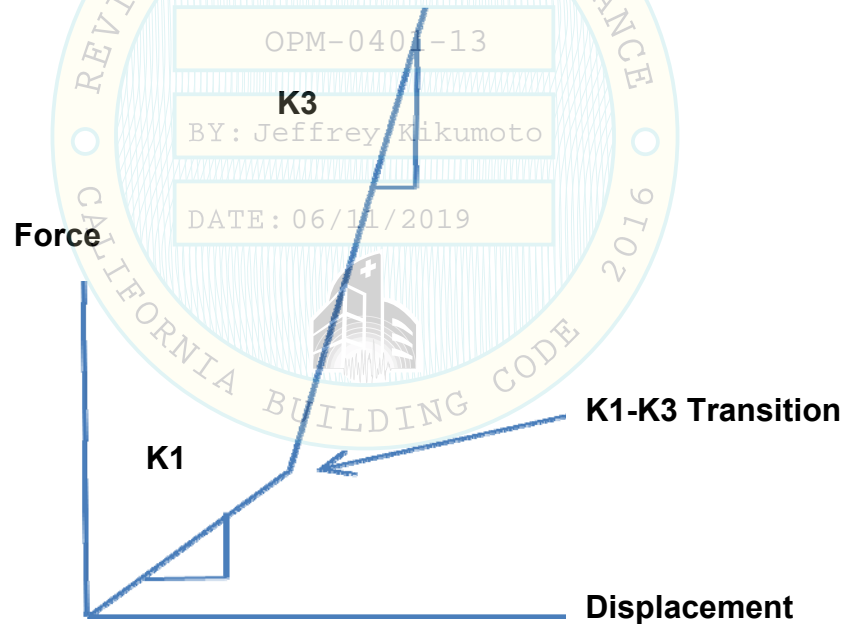
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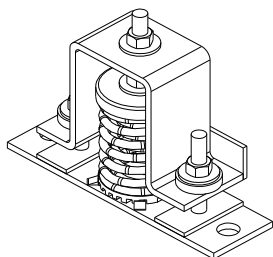
VIWR DESIGN PROCEDURE EXAMPLE – CONTINUE

Table 3: CQA Stiffness for X, Y, Z & 45° Direction with the weakest spring

CQA-	Rated K1 Stiffness (lbs/in)	Rated K3 Stiffness (lbs/in)	Rated K1-K3 Transition Load (lbs)	Rated K1-K3 Transition Displacement (in.)
X Direction	1,686	2,353	833	0.43
Y Direction	2,411	943	717	0.33
Z Direction	2,918	8,583	1,150	0.33
45° Direction	2,119	1,312	500	0.29



K1, K3 and K1-K3 Transition in Graphical Form



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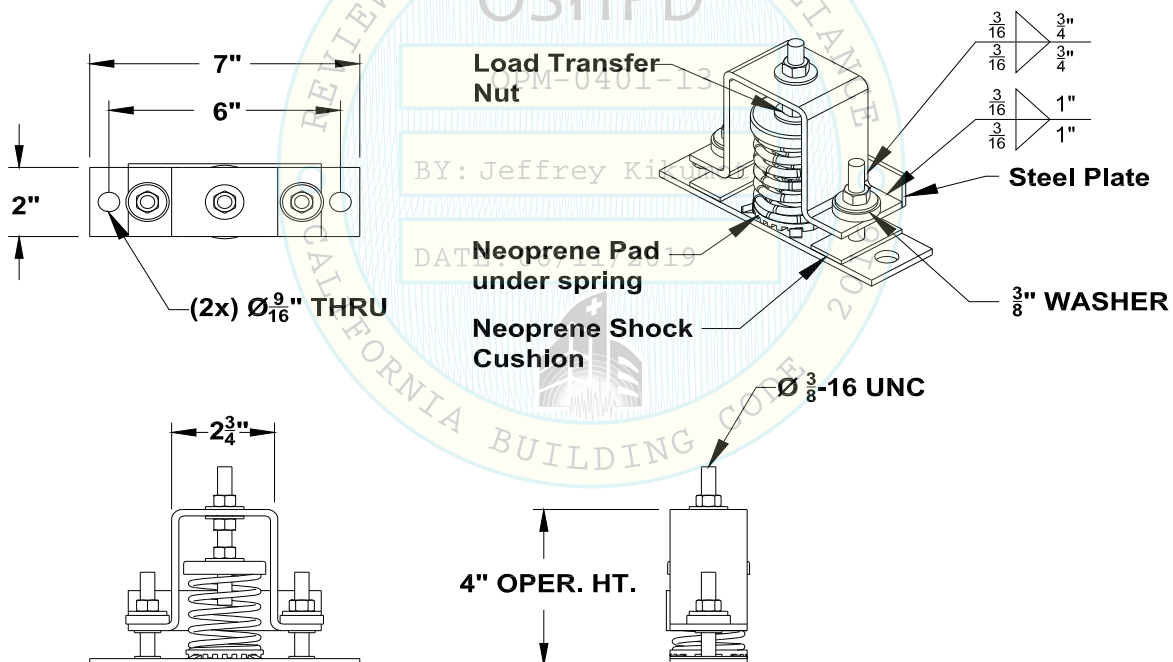
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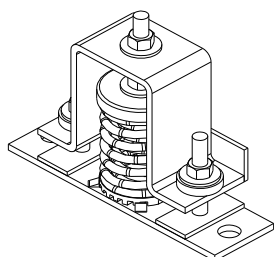
VIWR DESIGN PROCEDURE EXAMPLE – CONTINUE

5) Select Spring Capacity using the spring Selection Procedure.

Project Name:	Example
Equipment Mark:	Example
Equipment Make / Model:	Loren Cook Fan / CPV 60
Maximum Weight:	250 lbs
CQA VIWR Selection:	See Table 4 (on page 13)
Average Gravity Load Per VIWR:	75.0 lbs
Number of CQA VIWR:	4
CQA Seismic Capacity:	See Table 2 (on page 10)
CQA X, Y, Z & 45° Stiffness:	See Table 3 (on page 11)



CQA Style V



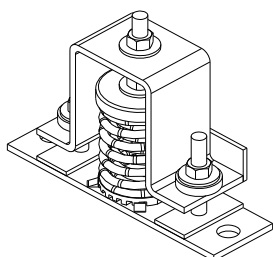
VIWR DESIGN PROCEDURE EXAMPLE – CONTINUE

Table 4: CQA VIWR Gravity Load Rating

CQA VIWR NUMBER	Pounds Theoretical Rated	Design Load Ratings (lbs)	Theoretical (K1) Spring Rate (lbs/in.)	Spring Arrangement
CQA-F59	59	47	27	Single Spring
CQA-F83	83	66	43	Single Spring
CQA-F120	120	96	56	Single Spring
CQA-F155	155	124	70	Single Spring
CQA-F195	195	156	85	Single Spring
CQA-F236	236	177	106	Double Spring
CQA-F300	300	225	139	Double Spring

6) Instructions For Use:

- Add 20% to the weight of the Non-Structural Component & divide by the number of VIWRs to get average weight per VIWR.
- Select Spring number closest to average weight per VIWR based on theoretical rating.
- Enter as **CQA-F83 VIWR Selection.**



06/11/2019

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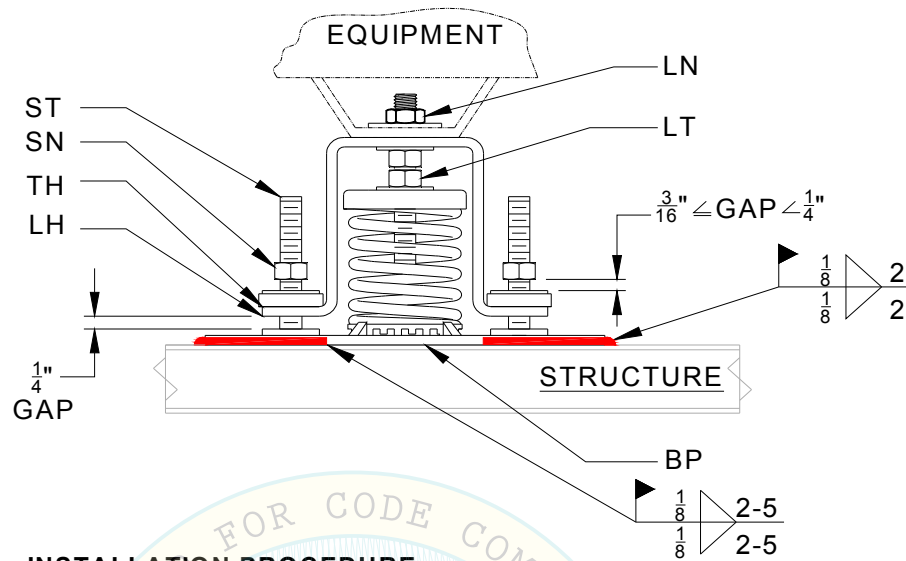
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OPM-0401-13

Loren Cook Company CPV60 to CPV135
HVAC Fans w/ CalDyn CQA Vibration Isolator
With Restraint (CQA Style V VIWR)

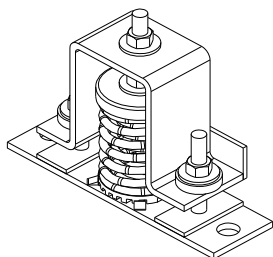
Code: CBC 2016, ASCE 7-10

VIWR INSTALLATION INSTRUCTIONS



INSTALLATION PROCEDURE:

1. Position the equipment squarely on the CQA VIWRs.
2. Secure the CQA VIWRs to the STRUCTURE (STEEL BEAMS) using WELD JOINTS AS PER THE DETAIL SHOWN ABOVE. STEEL BEAMS are part of the primary structure to be provided by the SEOR to support the weights and forces.
3. Run up the two STOP NUTS (SN) to the top of the STABILIZER STUD (ST).
4. Adjust the LOAD TRANSFER NUT (LT) on each CQA VIWR to level the equipment, allowing for a gap of $\frac{1}{4}$ " between the BASE PLATE (BP) AND THE LOWER TOP HOUSING (LH).
5. Run down the LOCKING NUTS (LN) to tighten the equipment in place to the CQA VIWRs.
6. Run down the STOP NUTS (SN) until the gap is between a minimum of $\frac{3}{16}$ " and MAXIMUM of $\frac{1}{4}$ " between the SN and the TOP HOUSING (TH).



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