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

OFFICE USE ONLY
APPLICATION #: OPM-0257-13

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: Dennis D. Villasenor, Engineering Manager

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

Telephone: 323-223-3882 Email: dv.caldyn@earthlink.net

Product Information

Product Name: Cummins Gensets with Caldyn VIWR

Product Type: Genset with CalDyn Vibration Isolation With Seismic Restraint (VIWR) - JQRA,JQRB,JQRC,JQRD

Product Model Number: C3500 D6

General Description: Genset 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, 2013.

Signature of Applicant: Donald Benkert Date: November 10, 2015

Title: President Company Name: California Dynamics Corporation

Registered Design Professional Preparing Engineering Recommendations

Company Name: Samamir Engineering

Name: Said Amirsolaimany California License Number: C37835 (EXP 3/31/2017)

Mailing Address: 196 The Masters Circle, Costa Mesa 92627

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

OSHPD Special Seismic Certification Preapproval (OSP)

☒ Special Seismic Certification is preapproved under OSP-0444-10
(Separate application for OSP is required)

☐ Special Seismic Certification is not preapproved

Certification Method(s)

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

☐ Other* (Please Specify):

*Use of test criteria other than those adopted by the California Building Standards Code, 2013 (CBSC 2013) 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 2013 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

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Signature: Date: 08-12-2016

Print Name: Jeffrey Kikumoto

Title: SSE

Condition of Approval (if applicable):

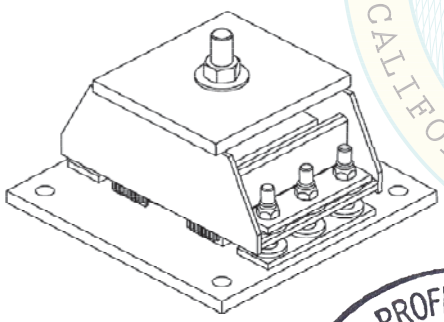
CALIFORNIA DYNAMICS CORP.

OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM)

OPM-0257-13

CALIFORNIA BUILDING CODE 2013

(CBC 2013)



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5572 ALHAMBRA AVENUE
LOS ANGELES, CA 90032
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Cummins Genset C3500 D6 with CalDyn

Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

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General Notes

1. This OSHPD Preapproval of Manufacturer's Certification (OPM) is based on the CBC 2013. The demand (design forces) for use with this OPM shall be based on the CBC 2013.

2. For Cummins Genset C3500 D6 supports and attachments, maximum seismic parameters are as follows:
   S_{DS} = 2.4 (Design Short Period Spectral Acceleration)
   z/h = 0.0 (Component Located at Grade)
   a_p = 2.5 (Component Amplification Factor)
   R_p = 2.0 (Response Modification coefficient)
   I_p = 1.5 (Component Importance Factor)
   Ω_0 = 2.0 (Overstrength Factor)

3. Strength and Stiffness for CalDyn Vibration Isolator with Restraints (VIWRs) are applicable to any S_{DS} and z/h, 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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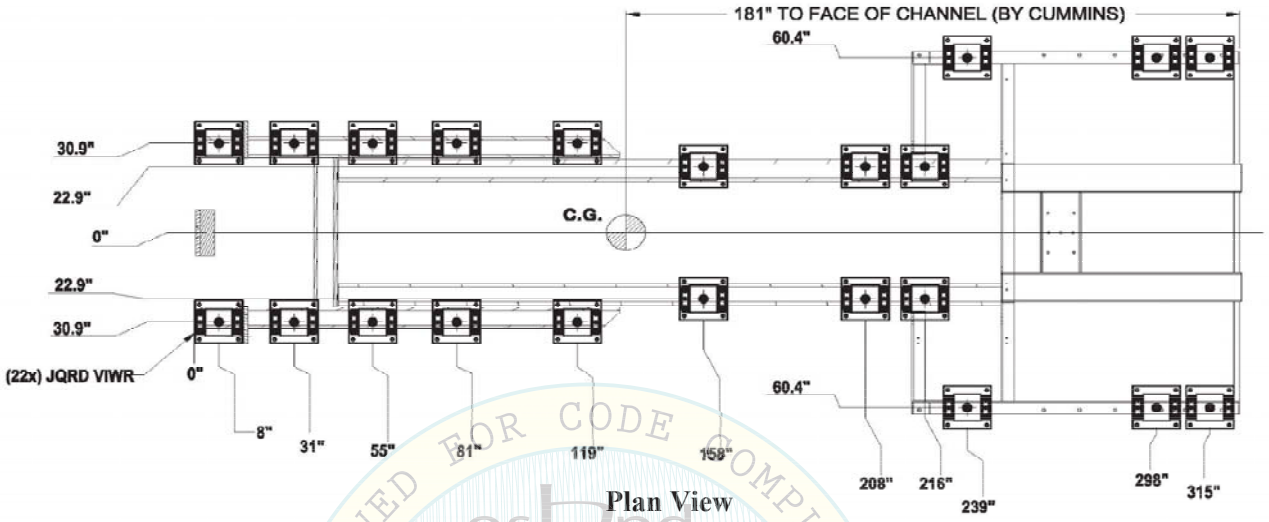
Cummins C3500 D6 Generator on CalDyn type VIWRs

Attachments between VIWRs and minimum 1" thick supporting plate (by SEOR)

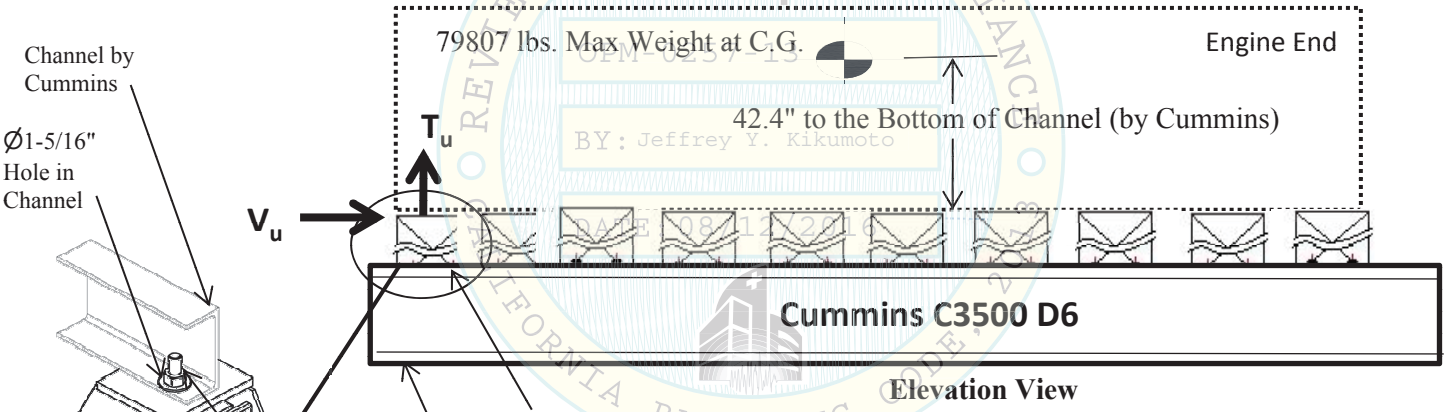
3/8 fillet weld 3 inches per corner along length (two per side) and 3 inches long along width (two per side).

Mounting Surface

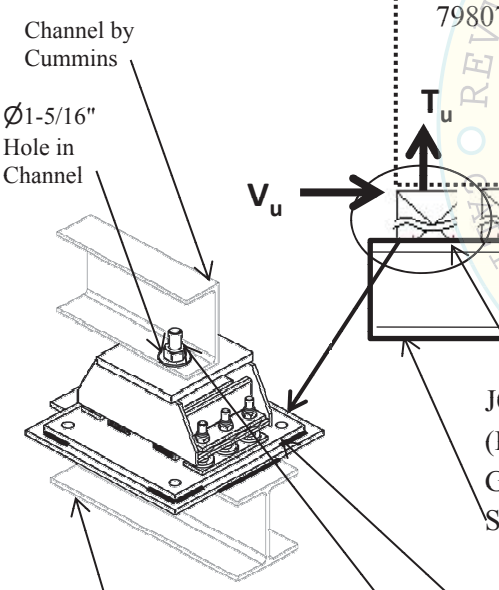
Substrate: Minimum 1 inch thick A36 steel plate welded on top of WF Beam Platform (designed by SEOR).



Plan View



Elevation View



JQRD (Quantity= 22) (Bolted Attachment to Generator Skid) See Note 1

CalDyn JQRD VIWR

Ø1-1/4" Grade 8 Bolt

Note:

1) WF Steel Beam and plate on top supporting VIWRs are part of primary structure to be provided by the SEOR to support the weights and forces shown in addition to all other loads.

2) See General Notes of OPM-0257-13 for additional requirements.

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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 ACCELRATION AT SHORT PERIODS) AND z/h (HEIGHT IN STRUCTURE OF COMPONENT / AVERAGE ROOF HEIGHT).

EXAMPLE: DETERMINE THE "g" FORCES FOR EXAMPLE GENSET WITH SIMPLIFIED VIWRs LAYOUT FOR EXAMPLE ONLY

BUILDING CODE

CBC-2013

LOAD COMBINATION

1.2D + 1.0E (CBC 2013 EQ. 16A-5)
0.9D - 1.0E (CBC 2013 EQ. 16A-7)

SEISMIC DESIGN

S_{DS} = 2.4
I_p = 1.5
a_p = 2.5
R_p = 2.0

BLDG. ELEVATION / EQUIPMENT LOCATION

z/h = 0.0 (Grade Level installation)

I_p (COMPONENT IMPORTANCE FACTOR PER ASCE 7-10, SECTION 13.1.3)

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 = 79,807 LBS (EXAMPLE GENSET)

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

$$= (0.4 * 2.5 * 2.4) \left(\frac{1}{\frac{2.0}{1.5}}\right) * 1 + 2[0.0]) = \mathbf{1.8}$$

$$F_{p\,(MAX)} / W_P = 1.6\, S_{DS}\, I_p \quad \text{.....(EQUATION 13.3-2)}$$
$$= 1.6 * 2.4 * 1.5 = 5.76 \text{ (MAX.)}$$

$$F_{p\,(MIN)} / W_P = 0.3\, S_{DS}\, I_p \quad \text{.....(EQUATION 13.3-3)}$$
$$= 0.3 * 2.4 * 1.5 = 1.07 \text{ (MIN.)}$$

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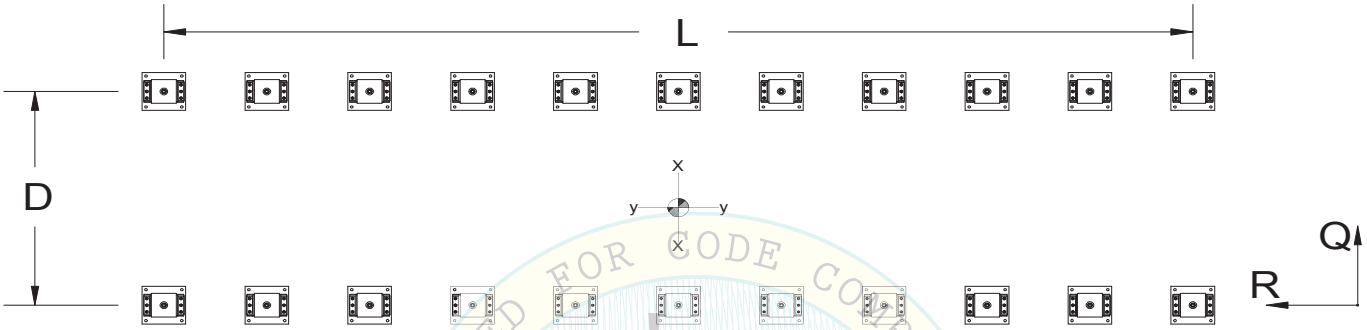
VIWR Design Procedure Example

2) Determine operating weight from Manufacturer's literature.
Example: The operating weight for Example Generator
(Wp) = 79,807 lbs

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



FOR EXAMPLE GENSET, ASSUME THE FOLLOWING WITH UNIFORM LOAD DISTRIBUTION OVER THE ENTIRE AREA:

W_P = MAX. OPERATING WEIGHT = 79,807 LBS
D = MOUNTING LENGTH = 61.8 in.
L = MOUNTING WIDTH = 295 in.
H_{cg} = VERTICAL CENTER OF GRAVITY= 42.4 in.
R = VIWR QUANTITY ALONG LENTH = 11
Q = VIWR QUANTITY ALONG WIDTH = 2
N = TOTAL VIWR QUANTITY = 22

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VIWR Design Procedure Example

Applied Seismic Force / Calculation:

$F_p / W_p = 1.8$

F_{ph} = Applied Lateral Seismic Force = $(F_p / W_p) * Wp$

$= 1.8 * 79{,}807 \text{ lbs} = 143{,}653 \text{ lbs}$

F_{pv} = Applied Component of Seismic Force = $0.2 * S_{ds} * W_p$

$= 0.2 * 2.4 * 79{,}807 \text{ lbs} = 38{,}308 \text{ lbs}$

$(0.9 * W_p) - E_V = (0.9 * 79807) - 38308 = 33{,}518 \text{ lbs}$

$(1.2 * W_p) + E_V = (1.2 * 79807) + 38308 = 134{,}076 \text{ lbs}$

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

M_{OT} = Overturning Moment = $(F_{ph} * H_{cg}) = 143{,}653 \text{ lbs} * 42.4 \text{ inch} = 6{,}119{,}601 \text{ lb-in.}$

T_{Ux} = Pullout Load Demand (about X-X) = $(M_{OT}) / (Q * L)$

$= (6{,}119{,}601 \text{ lb-in}) / (2 * 295 \text{ in}) = 10{,}372 \text{ lbs}$

T_{Uy} = Pullout Load Demand (about Y-Y) = $(M_{OT}) / (R * D)$

$= (6{,}119{,}601 \text{ lb-in}) / (11 * 61.8 \text{ in}) = 9{,}002 \text{ lbs}$

CALCULATE SHEAR LOAD (WORST CASE):

V_U = APPLIED LATERAL SEISMIC FORCE / TOTAL VIWR QUANTITY =

$= (F_{ph} / N) = 143{,}653 \text{ lbs} / 22 = 6{,}530 \text{ lbs}$

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

T_{UO} = [10,372 + (0.3 * 9,002)] * Ω_o = 26,146 lbs.

V_{UO} = [1.3 * 6,530] * Ω_o = 16,978 lbs.

LRFD TENSION & SHEAR using 0.9D-1.0E :

T_{Uxt} = -10,372 * Ω_o + (33,518 / 22) = -19,220 lbs; V_U = 6,530 * Ω_o = 13,060 lbs

T_{Uyt} = -9,002 * Ω_o + (33,518 / 22) = -16,480 lbs; V_U = 6,530 * Ω_o = 13,060 lbs

T_{Uot} = -13,073 * Ω_o + (33,518 / 22) = 24,622 lbs; V_{UO} = 1.3 * 6,530 * Ω_o = 16,978 lbs

LRFD TENSION & SHEAR using 1.2D-1.0E :

T_{Uxc} = 10,372 * Ω_o + (134,076 / 22) = 26,838 lbs; V_U = 6,530 * Ω_o = 13,060 lbs

T_{Uyc} = 9,002 * Ω_o + (134,076 / 22) = 24,098 lbs; V_U = 6,530 * Ω_o = 13,060 lbs

T_{Uoc} = 13,073 * Ω_o + (134,076 / 22) = 32,240 lbs; V_{UO} = 1.3 * 6,530 * Ω_o = 16,978 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 from Table S

V_S = LRFD Horizontal Seismic Strength Rating from Table S

DCR_X = (26,838 / 60,000) + (13,060 / 28,500) = 0.90 < 1.0

DCR_Y = (24,098 / 60,000) + (13,060 / 66,670) = 0.60 < 1.0

DCR_O = (32,240 / 60,000) + (16,978 / 39,500) = 0.98 < 1.0

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5) Select spring capacity using the spring Selection Procedure.

Project Name:	Example
Equipment Mark:	Example
Equipment Make/Model:	Example
Maximum Weight:	79807 lbs.
JQRD VIWR Selection:	See Table D1
Average Gravity Load Per VIWR=	3628 lbs.
Number of JQRD VIWR=	22

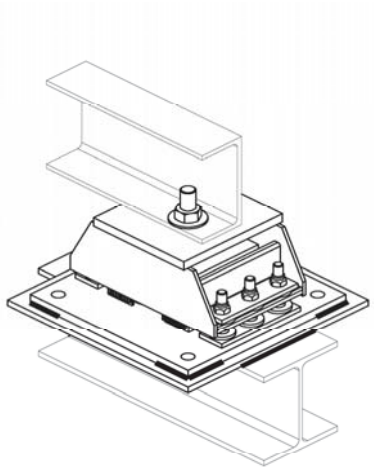

Table D1: JQRD VIWR Gravity Load Rating and Stiffness

JQRD 1" E SPRINGS							
JQRD VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) Ratings/ Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRD E4120	3804	3200	3150	E1030	4	-	0
JQRD E4920	4864	4092	-	E1230	4	-	0
JQRD E7240	6188	5205	-	E1810	4	-	0
JQRD NESE4V	7376	12162	-	E1810	4	511B	4
JQRD NESE4W	9400	15500	15667	E1810	4	1060B	4

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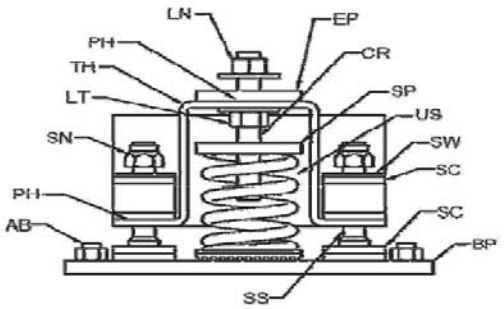
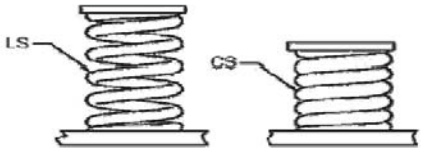
VIWR Installation Instructions

JQRA VIBRATION ISOLATOR WITH RESTRAINT LEGEND

CalDyn Lateral Motion Restraint Elements Not Shown



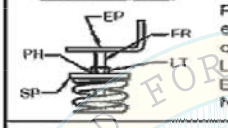


Attaching and Load Transfer Style V shown

Side plate removed for clarity

AB	Anchor Bolt
BP	Base Plate
CN	Coupling Nut
CR	Connecting Rod Threaded
CS	Collapsed Spring
EP	Equipment Plate
FR	Fixed Rod Threaded
LH	Lower Horizontal Extension
LN	Locking Nut
LS	Loaded Spring Rated
LT	Load Transfer Nut
PH	Plain Hole
RD	Rated Spring Deformation
SC	Shock Cushion
SN	Stop Nut
SP	Spring Plate
SS	Stabilizer Stud Threaded
SW	Stop Washer
TH	Top Housing
US	Unloaded Spring

CalDyn Style R



Style R With LT Nut traveling down FR Fixed Rod to bear on the SP Plate with a Plain Hole to compress the spring. When spring force up equals weight, the equipment is "floating" and the spring cannot be compressed more unless weight is increased. When "floating", moving LT Nut no longer alters spring compression and now alters EP Equipment height. Moving LT Nut down raises EP and moving LT Nut up lowers EP.

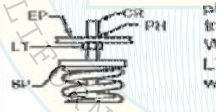
CalDyn Style T

Style T Turning the CR Rod traveling down through the threaded hole in EP Equipment Plate eventually causes the bottom end of the CR Rod to bear on SP Plate without a hole. Further turning compresses the spring. When spring force up equals weight, the equipment is now "floating" and continued CR turning immediately changes from affecting spring compression to affecting equipment height. When "floating", moving CR Rod down raises EP and moving CR Rod up lowers EP.

CalDyn Style K

Style K Features a turning but not traveling CR Rod passing through the plain hole in EP plate with the LT Nut pinned to the CR to enable turning of the CR that is screwed into the threaded SP plate. Proper turning of the CR compresses the spring. When spring force up equals weight, the equipment is "floating". Now, turning to compress the spring will instead raise EP and reversal will lower EP.

CalDyn Style V



Style V Has a traveling CR Rod passing through the plain hole in the EP plate and screwed into the threaded SP plate. Turning the LT Nut to travel up causes the CR Rod to travel down compressing the spring. When spring force up equals weight, the equipment is "floating". Turning LT Nut to compress the spring will instead now raise EP and reversal will lower EP.

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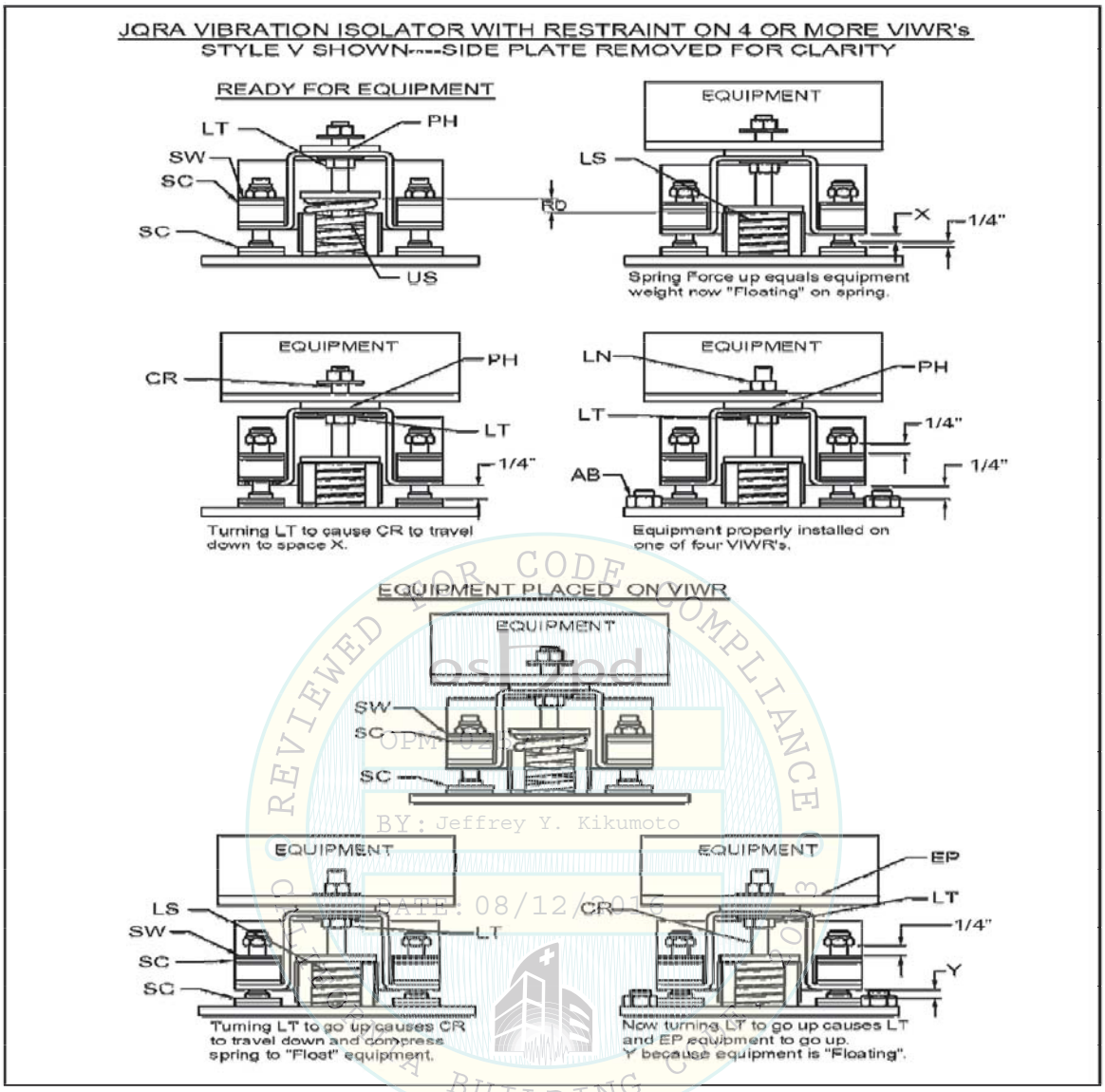
VIWR Installation Instructions



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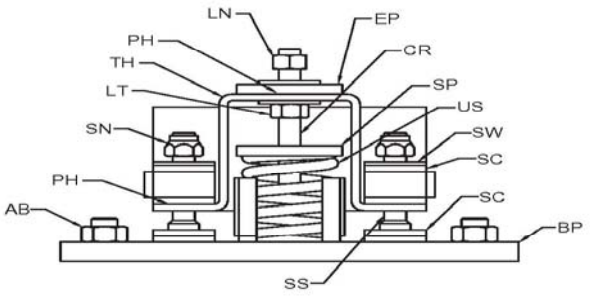
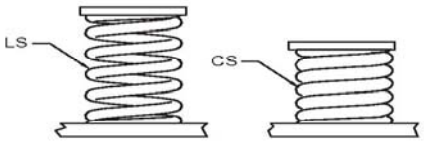
JQRB VIBRATION ISOLATOR WITH RESTRAINT LEGEND
CalDyn Lateral Motion Restraint Elements Not Shown





Attaching and Load Transfer Style V shown
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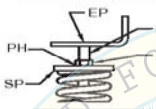
TH	Top Housing
US	Unloaded Spring

CalDyn Style R 	Style R With LT Nut traveling down FR Fixed Rod to bear on the SP Plate with a Plain Hole to compress the spring. When spring force up equals weight, the equipment is "floating" and the spring cannot be compressed more unless weight is increased. When "floating", moving LT Nut no longer alters spring compression and now alters EP Equipment height. Moving LT Nut down raises EP and moving LT Nut up lowers EP.
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CalDyn Style V 	Style V Has a traveling CR Rod passing through the plain hole in the EP plate and screwed into the threaded SP plate. Turning the LT Nut to travel up causes the CR Rod to travel down compressing the spring. When spring force up equals weight, the equipment is "floating". Turning LT Nut to compress the spring will instead now raise EP and reversal will lower EP.

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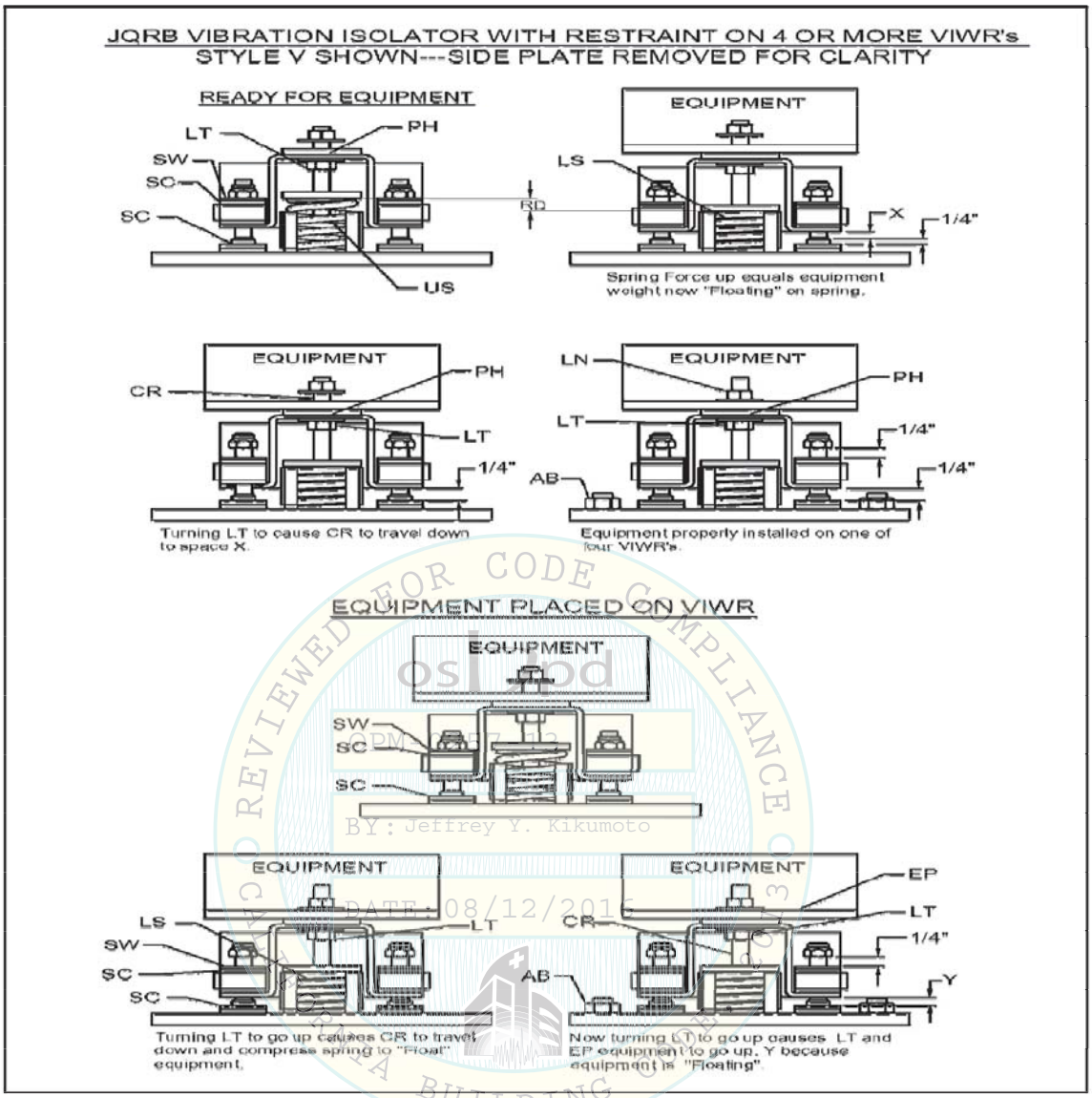
Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

VIWR Installation Instructions



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Cummins Genset C3500 D6 with CalDyn

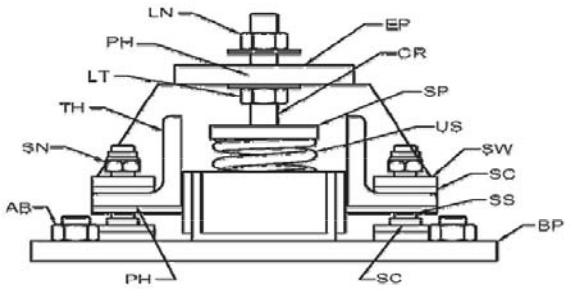
Vibration Isolator With Restraint (VIWR)

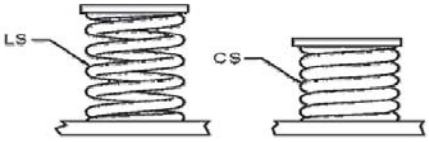
Code: CBC 2013, ASCE 7-10

VIWR Installation Instructions

JQRC VIBRATION ISOLATOR WITH RESTRAINT LEGEND

CalDyn Lateral Motion Restraint Elements Not Shown



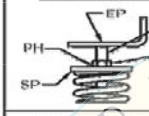


Attaching and Load Transfer Style V shown

Side plate removed for clarity

AB	Anchor Bolt
BP	Base Plate
CN	Coupling Nut
CR	Connecting Rod Threaded
CS	Collapsed Spring
EP	Equipment Plate
FR	Fixed Rod Threaded
LH	Lower Horizontal Extension
LN	Looking Nut
LS	Loaded Spring Rated
LT	Load Transfer Nut
PH	Plain Hole
RD	Rated Spring Deformation
SC	Shock Cushion
SN	Stop Nut
SP	Spring Plate
SS	Stabilizer Stud Threaded
SW	Stop Washer
TH	Top Housing
US	Unloaded Spring

CalDyn Style R

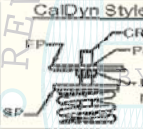


Style R With LT Nut traveling down FR Fixed Rod to bear on the SP Plate with a Plain Hole to compress the spring. When spring force up equals weight, the equipment is "floating" and the spring cannot be compressed more unless weight is increased. When "floating", moving LT Nut no longer alters spring compression and now alters EP Equipment height. Moving LT Nut down raises EP and moving LT Nut up lowers EP.

CalDyn Style T

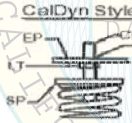
Style T Turning the CR Rod traveling down through the threaded hole in EP Equipment Plate eventually causes the bottom end of the CR Rod to bear on SP Plate without a hole. Further turning compresses the spring. When spring force up equals weight, the equipment is now "floating" and continued CR turning immediately changes from affecting spring compression to affecting equipment height. When "floating", moving CR Rod down raises EP and moving CR Rod up lowers EP.

CalDyn Style K



Style K Features a turning but not traveling CR Rod passing through the plain hole in EP plate with the LT Nut pinned to the CR to enable turning of the CR that is screwed into the threaded SP plate. Proper turning of the CR compresses the spring. When spring force up equals weight, the equipment is "floating". Now, turning to compress the spring will instead raise EP and reversal will lower EP.

CalDyn Style V



Style V Has a traveling CR Rod passing through the plain hole in the EP plate and screwed into the threaded SP plate. Turning the LT Nut to travel up causes the CR Rod to travel down compressing the spring. When spring force up equals weight, the equipment is "floating". Turning LT Nut to compress the spring will instead now raise EP and reversal will lower EP.

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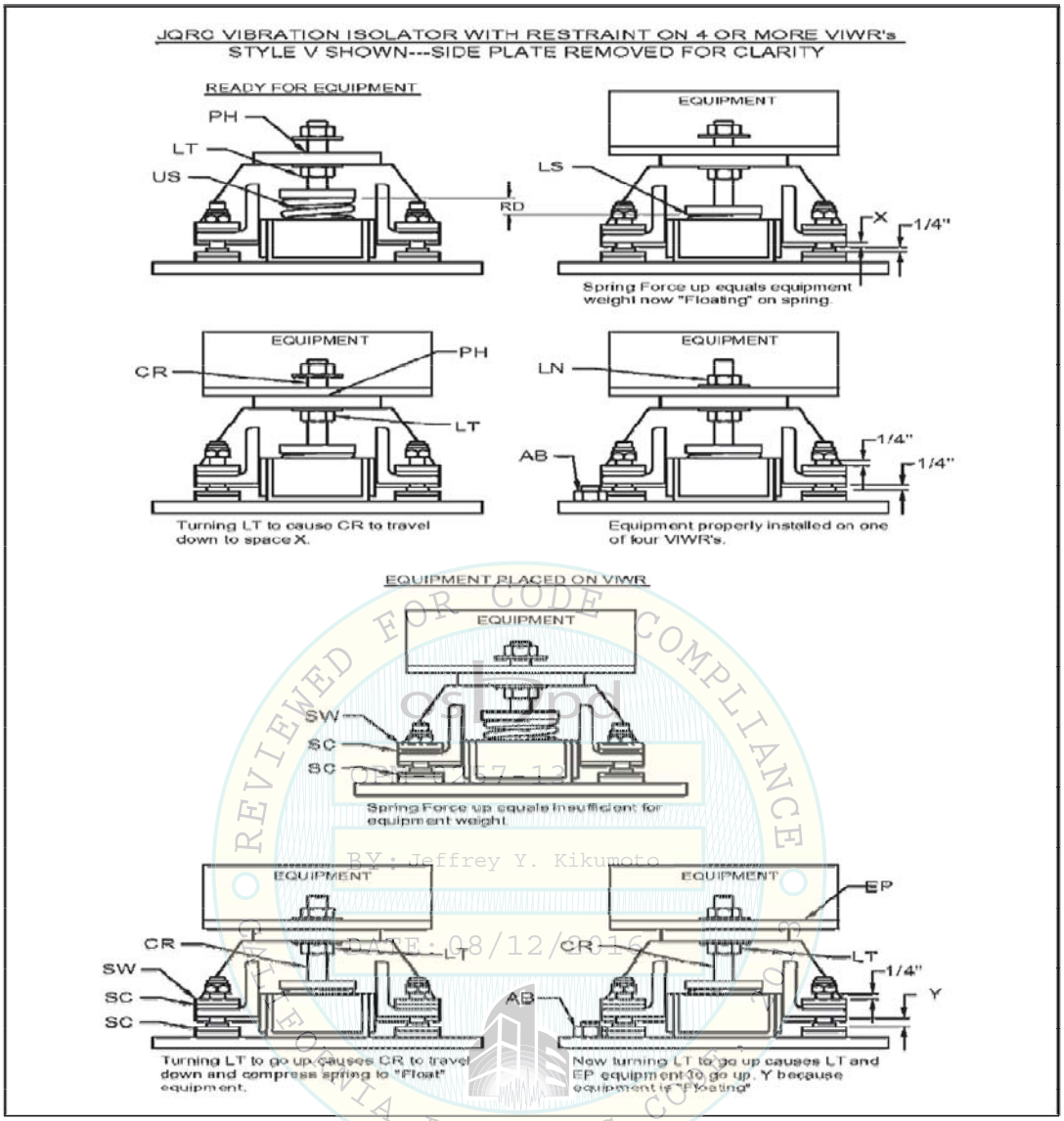
Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

VIWR Installation Instructions



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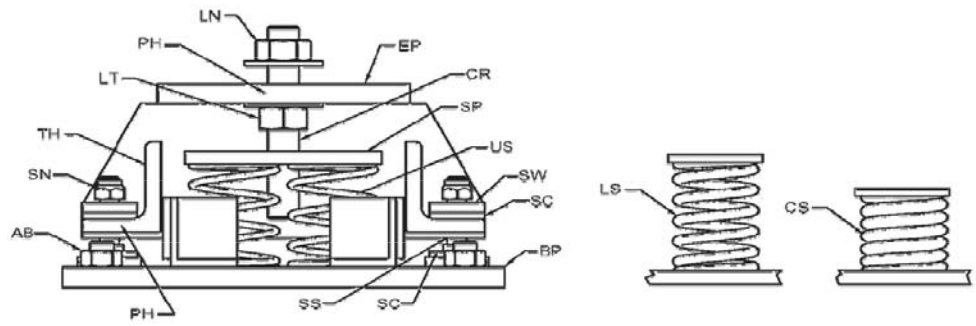
Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

VIWR Installation Instructions

JQRD VIBRATION ISOLATOR WITH RESTRAINT LEGEND

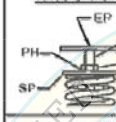
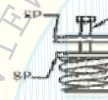
CalDyn Lateral Motion Restraint Elements Not Shown



Attaching and Load Transfer Style V shown

Side plate remove for clarity

AB Anchor Bolt
BP Base Plate
CN Coupling Nut
CR Connecting Rod Threaded
CS Collapsed Spring
EP Equipment Plate
FR Fixed Rod Threaded
LH Lower Horizontal Extension
LN Locking Nut
LS Loaded Spring Rated
LT Load Transfer Nut
PH Plain Hole
RD Rated Spring Deformation
SC Shock Cushion
SN Stop Nut
SP Spring Plate
SS Stabilizer Stud Threaded
SW Stop Washer
TH Top Housing
US Unloaded Spring

CalDyn Style R 	Style R With LT Nut traveling down FR Fixed Rod to bear on the SP Plate with a Plain Hole to compress the spring. When spring force up equals weight, the equipment is "floating" and the spring cannot be compressed more unless weight is increased. When "floating", moving LT Nut no longer alters spring compression and now alters EP Equipment height. Moving LT Nut down raises EP and moving LT Nut up lowers EP.
CalDyn Style T 	Style T Turning the CR Rod traveling down through the threaded hole in EP Equipment Plate eventually causes the bottom end of the CR Rod to bear on SP Plate without a hole. Further turning compresses the spring. When spring force up equals weight, the equipment is now "floating" and continued CR turning immediately changes from affecting spring compression to affecting equipment height. When "floating", moving CR Rod down raises EP and moving CR Rod up lowers EP.
CalDyn Style K 	Style K Features a turning but not traveling CR Rod passing through the plain hole in EP plate with the LT Nut pinned to the CR to enable turning of the CR that is screwed into the threaded SP plate. Proper turning of the CR compresses the spring. When spring force up equals weight, the equipment is "floating". Now, turning to compress the spring will instead raise EP and reversal will lower EP.
CalDyn Style V 	Style V Has a traveling CR Rod passing through the plain hole in the EP plate and screwed into the threaded SP plate. Turning the LT Nut to travel up causes the CR Rod to travel down compressing the spring. When spring force up equals weight, the equipment is "floating". Turning LT Nut to compress the spring will instead now raise EP and reversal will lower EP.

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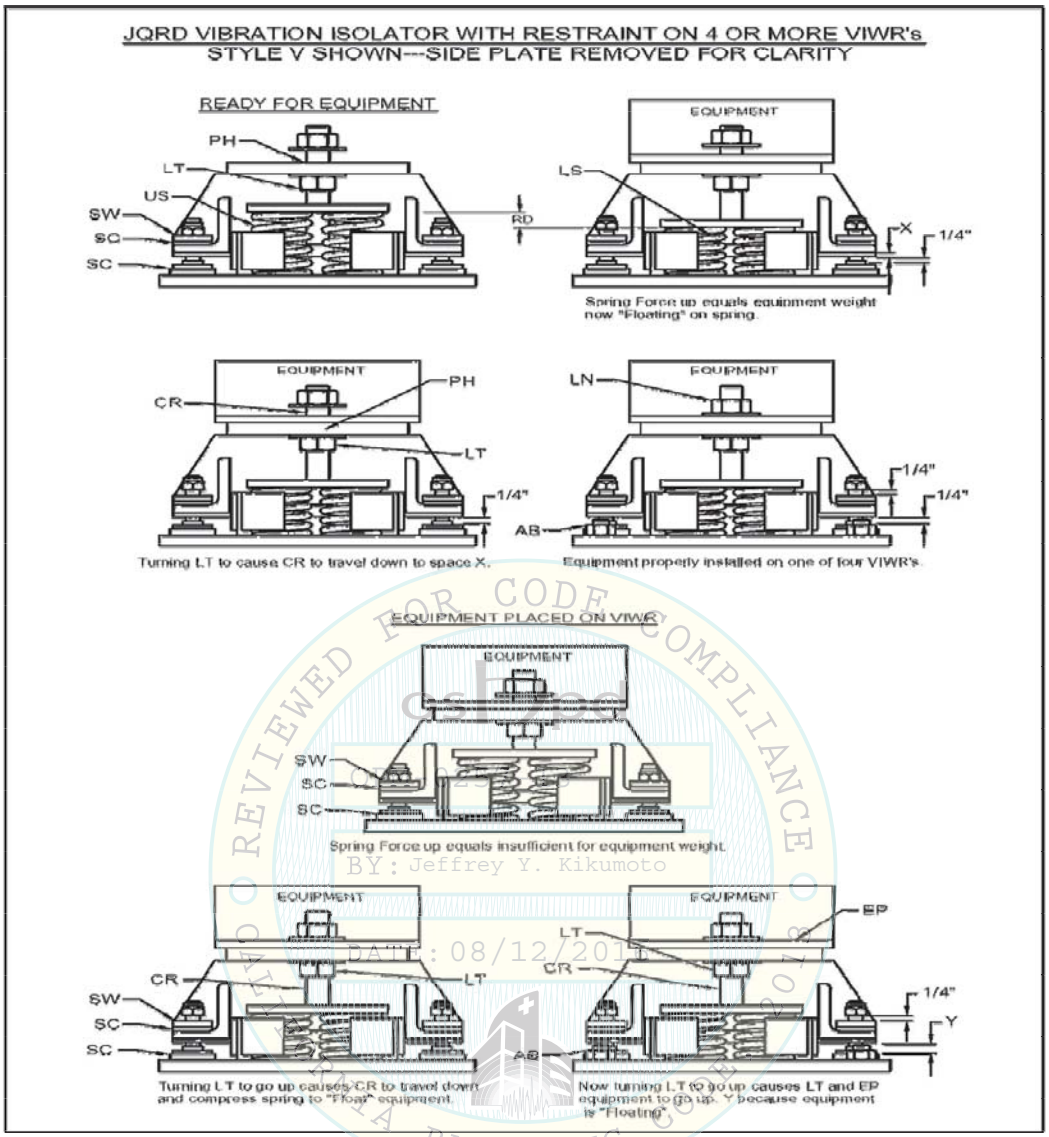
Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

VIWR Installation Instructions



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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRA VIWR (Vibration Isolator with Restraint)

Theoretical & Tested Strength & Stiffness

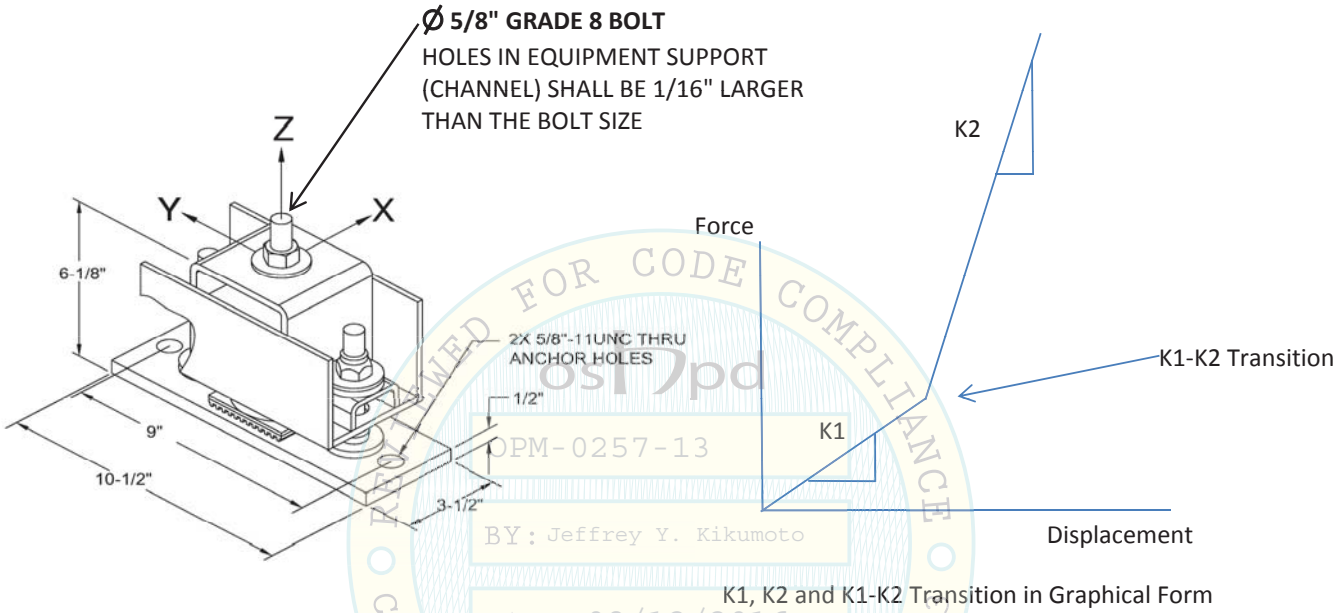
Project Name: _____

Equipment Mark: _____

Equipment Make/ Model: _____

JQRA VIWR Selection: _____

Number of JQRA: _____



K1, K2 and K1-K2 Transition in Graphical Form

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

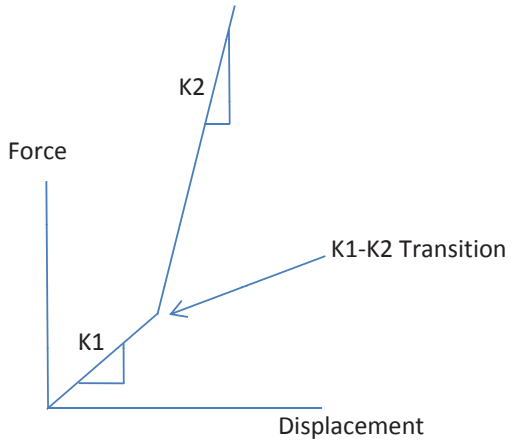
JQRA VIWR (Vibration Isolator with Restraint)

Table A1: JQRA VIWR Gravity Load Rating and Stiffness

JQRA 1" E SPRINGS							
JQRA VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRA ET20	24	13	20	ET20	1	-	0
JQRA ET42	40	22	-	ET42	1	-	0
JQRA ET80	77	42	-	ET80	1	-	0
JQRA ET129	121	66	-	ET129	1	-	0
JQRA ET194	174	94	-	ET194	1	-	0
JQRA ET255	230	125	-	ET255	1	-	0
JQRA ET347	366	94	-	ET347	1	-	0
JQRA ET473	496	127	-	ET473	1	-	0
JQRA E630	598	153	-	E1630	1	-	0
JQRA E806	805	207	-	E806	1	-	0
JQRA E1030	951	244	-	E1030	1	-	0
JQRA E1230	1216	312	1327	E1230	1	-	0

Table A2: JQRA VIWR Gravity Load Rating and Stiffness

JQRA 2" F SPRINGS							
JQRA VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRA FT30	30	17	30	FT30	1	-	0
JQRA FT41	44	25	-	FT41	1	-	0
JQRA FT60	60	34	-	FT60	1	-	0
JQRA FT85	81	46	-	FT85	1	-	0
JQRA FT121	113	83	-	FT121	1	-	0
JQRA FT171	174	127	-	FT171	1	-	0
JQRA FT241	228	167	-	FT241	1	-	0
JQRA F348	346	253	-	F348	1	-	0
JQRA F590	506	370	328	F590	1	-	0



K1, K2 and K1-K2 Transition in Graphical Form

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRA VIWR (Vibration Isolator with Restraint)

Instructions For Use:

1) Add 20% to the weight of the Non-Structural Component and divide by the number of VIWRs to get average weight per VIWR.

2) Select Spring number closest to average weight per VIWR based on theoretical rating. Select either 1 inch or 2 inch deflection.

3) Enter as **JQRA VIWR Selection**.

NOTES:

4) This OSHPD Preapproval of Manufacturer's Certification (OPM) is based on the CBC 2013. The demand (design forces) for use with this OPM shall be based on the CBC 2013.

5) SEOR to verify supporting structure has adequate capacity. See General Notes on page 3 of OPM-0257-13 for additional requirements.

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRB VIWR (Vibration Isolator with Restraint)

Theoretical & Tested Strength & Stiffness

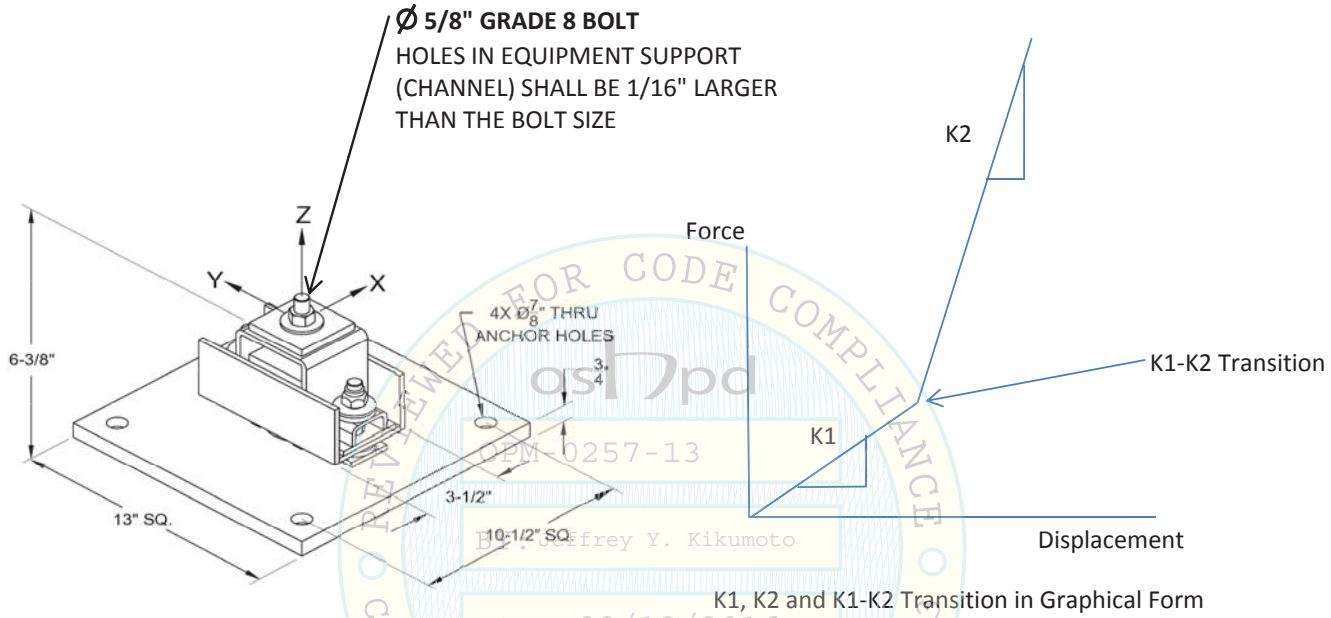
Project Name: _____

Equipment Mark: _____

Equipment Make/ Model: _____

JQRB VIWR Selection: _____

Number of JQRB: _____



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Cummins Genset C3500 D6 with CalDyn

Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

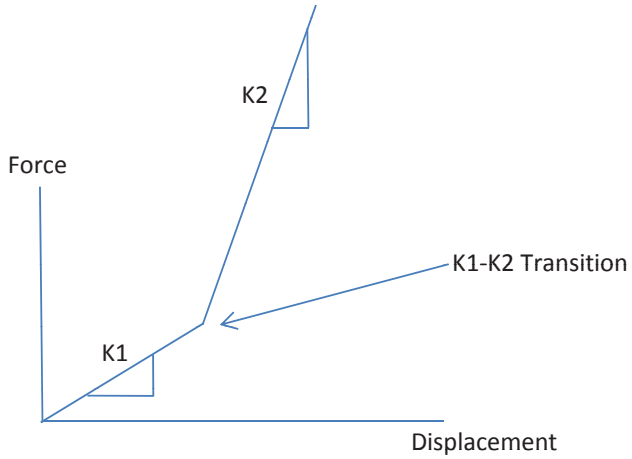
JQRB VIWR (Vibration Isolator with Restraint)

Table B1: JQRB VIWR Gravity Load Rating and Stiffness

JQRB 1" E SPRINGS							
JQRB VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRB ET347	366	147	403	ET347	1	-	0
JQRB ET473	496	199	-	ET473	1	-	0
JQRB E630	598	240	-	E630	1	-	0
JQRB E806	805	323	-	E806	1	-	0
JQRB E1030	951	382	-	E1030	1	-	0
JQRB E1230	1216	1533	-	E1230	1	-	0
JQRB E1810	1547	1950	-	E1810	1	-	0
JQRB NESE1V	1844	2324	-	E1810	1	511B	1
JQRB NESE1W	2350	3000	2801	E1810	1	1060B	1

Table B1: JQRB VIWR Gravity Load Rating and Stiffness

JQRB 2" F SPRINGS							
JQRB VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRB FT121	113	87	54	FT121	1	-	0
JQRB FT171	174	134	-	FT171	1	-	0
JQRB FT241	228	176	-	FT241	1	-	0
JQRB F348	346	266	-	F348	1	-	0
JQRB F590	506	518	-	F590	1	-	0
JQRB NESF1S	671	687	-	F590	1	F197B	1
JQRB NESF1T	824	844	539	F590	1	F328B	1



K1, K2 and K1-K2 Transition in Graphical Form

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRB VIWR (Vibration Isolator with Restraint)

Instructions For Use:

1) Add 20% to the weight of the Non-Structural Component and divide by the number of VIWRs to get average weight per VIWR.

2) Select Spring number closest to average weight per VIWR based on theoretical rating. Select either 1 inch or 2 inch deflection.

3) Enter as **JQRB VIWR Selection**.

NOTES:

4) This OSHPD Preapproval of Manufacturer's Certification (OPM) is based on the CBC 2013. The demand (design forces) for use with this OPM shall be based on the CBC 2013.

5) SEOR to verify supporting structure has adequate capacity. See General Notes on page 3 of OPM-0257-13 for additional requirements.

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRC VIWR (Vibration Isolator with Restraint)

Theoretical & Tested Strength & Stiffness

Project Name: _____

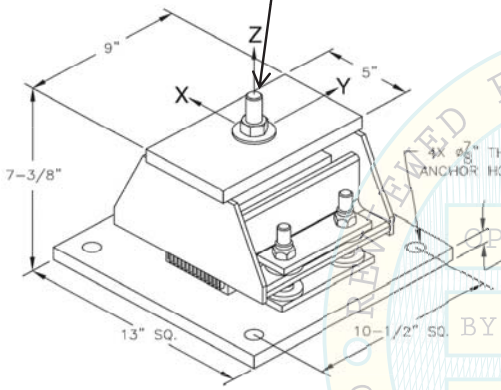
Equipment Mark: _____

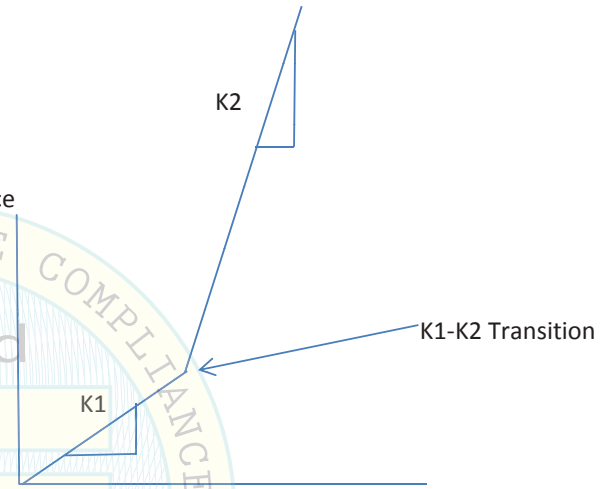
Equipment Make/ Model: _____

JQRC VIWR Selection: _____

Number of JQRC: _____

Ø 3/4" GRADE 8 BOLT
HOLES IN EQUIPMENT SUPPORT (CHANNEL) SHALL BE 1/16" LARGER THAN THE BOLT SIZE





K1, K2 and K1-K2 Transition in Graphical Form

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

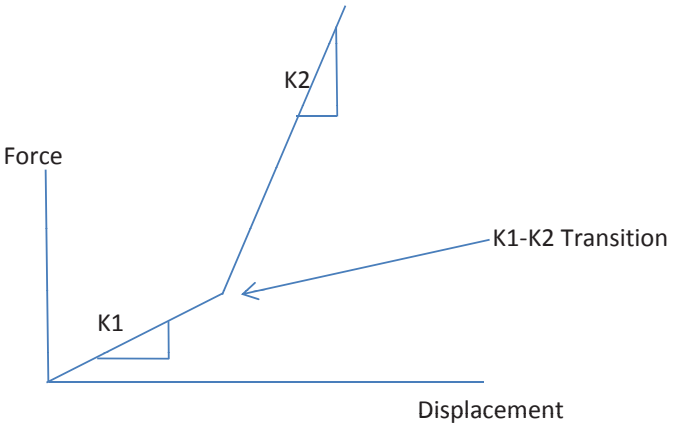
JQRC VIWR (Vibration Isolator with Restraint)

Table C1: JQRC VIWR Gravity Load Rating and Stiffness

JQRC 1" E SPRINGS							
JQRC VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRBC ET388	348	200	514	ET194	2	-	0
JQRC ET510	460	264	-	ET255	2	-	0
JQRC ET694	732	421	-	ET347	2	-	0
JQRC ET946	992	570	-	ET473	2	-	0
JQRC E1260	1192	685	-	E630	2	-	0
JQRC E1612	1610	925	-	E806	2	-	0
JQRC E2060	1902	1619	-	E1030	2	-	0
JQRC E2460	2432	2070	-	E1230	2		0
JQRC E3620	3094	2070	-	E1810	2		0
JQRC NESE2V	3688	3139	-	E1810	2	511B	2
JQRC NESE2W	4700	4000	4017	E1810	2	1060B	2

Table C2: JQRC VIWR Gravity Load Rating and Stiffness

JQRC 2" F SPRINGS							
JQRC VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRBC FT242	226	230	117	FT121	2	-	0
JQRC FT342	348	342	-	FT171	2	-	0
JQRC FT482	456	448	-	FT241	2	-	0
JQRC FT696	692	680	-	F348	2	-	0
JQRC F1180	1012	798	-	F590	2	-	0
JQRC NESF2S	1342	1059	-	F590	2	F197B	2
JQRC NESF2T	1648	1300	740	F590	2	F328B	2



K1, K2 and K1-K2 Transition in Graphical Form

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRC VIWR (Vibration Isolator with Restraint)

Instructions For Use:

1) Add 20% to the weight of the Non-Structural Component and divide by the number of VIWRs to get average weight per VIWR.

2) Select Spring number closest to average weight per VIWR based on theoretical rating. Select either 1 inch or 2 inch deflection.

3) Enter as **JQRC VIWR Selection**.

NOTES:

4) This OSHPD Preapproval of Manufacturer's Certification (OPM) is based on the CBC 2013. The demand (design forces) for use with this OPM shall be based on the CBC 2013.

5) SEOR to verify supporting structure has adequate capacity. See General Notes on page 3 of OPM-0257-13 for additional requirements.

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Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

JQRD VIWR (Vibration Isolator with Restraint)

Theoretical & Tested Strength & Stiffness

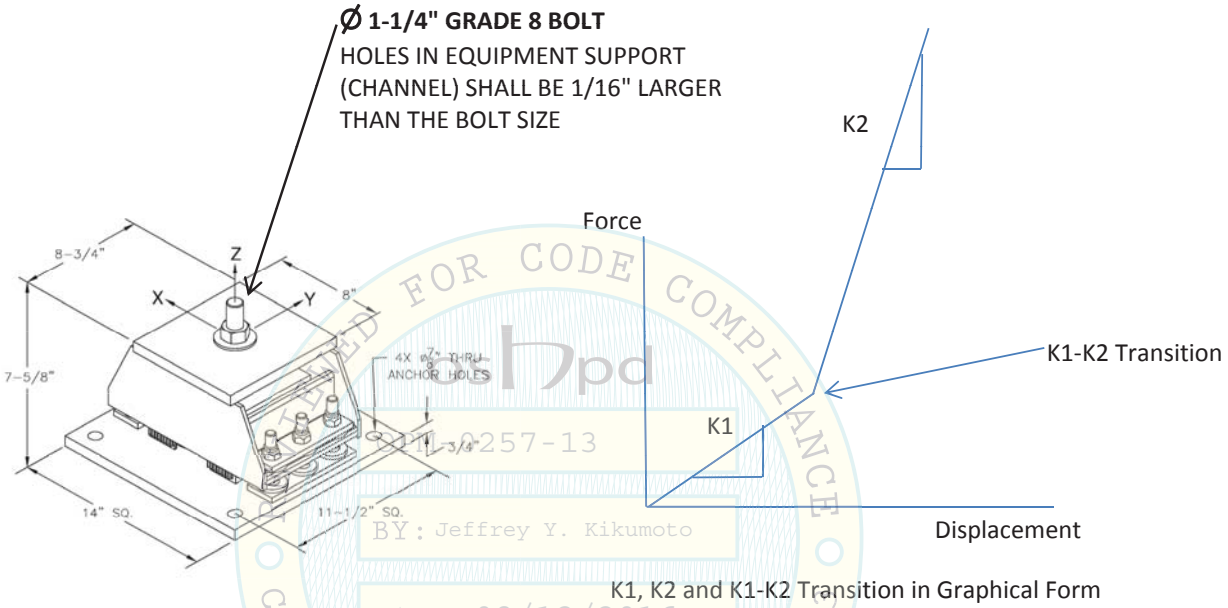
Project Name: _____

Equipment Mark: _____

Equipment Make/ Model: _____

JQRD VIWR Selection: _____

Number of JQRD: _____



K1, K2 and K1-K2 Transition in Graphical Form

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CALIFORNIA DYNAMICS CORP.
5572 ALHAMBRA AVENUE
LOS ANGELES, CA 90032
OFFICE (323) 223 3882 FAX (323) 223 7941
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Cummins Genset C3500 D6 with CalDyn

Vibration Isolator With Restraint (VIWR)

Code: CBC 2013, ASCE 7-10

OPM-0257-13

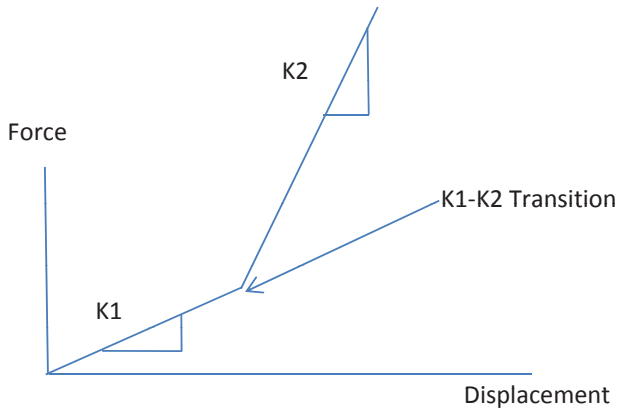
JQRD VIWR (Vibration Isolator with Restraint)

Table D1: JQRD VIWR Gravity Load Rating and Stiffness

JQRD 1" E SPRINGS							
JQRD VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRD E4120	3804	3200	3150	E1030	4	-	0
JQRD E4920	4864	4092	-	E1230	4	-	0
JQRD E7240	6188	5205	-	E1810	4	-	0
JQRD NESE4V	7376	12162	-	E1810	4	511B	4
JQRD NESE4W	9400	15500	15667	E1810	4	1060B	4

Table D2: JQRD VIWR Gravity Load Rating and Stiffness

JQRD 2" F SPRINGS							
JQRD VIWR NUMBER	Pounds Theoretical RATED	Tested Ratings (lbs)	Tested Gravity Initial Stiffness (K1) / Spring Set (Inner & Outer) lbs/in.	SPRINGS			
				OUTER		INNER	
				NUMBER	QUANTITY	NUMBER	QUANTITY
JQRD F1392	1384	1850	1850	F348	4	-	0
JQRD F2360	2024	1514	-	F590	4	-	0
JQRD NESF4S	2684	3033	-	F590	4	F197B	4
JQRD NESF4T	3296	2917	2917	F590	4	F328B	4



K1, K2 and K1-K2 Transition in Graphical Form

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JQRD VIWR (Vibration Isolator with Restraint)

Instructions For Use:

1) Add 20% to the weight of the Non-Structural Component and divide by the number of VIWRs to get average weight per VIWR.

2) Select Spring number closest to average weight per VIWR based on theoretical rating. Select either 1 inch or 2 inch deflection.

3) Enter as **JQRD VIWR Selection**.

NOTES:

4) This OSHPD Preapproval of Manufacturer's Certification (OPM) is based on the CBC 2013. The demand (design forces) for use with this OPM shall be based on the CBC 2013.

5) SEOR to verify supporting structure has adequate capacity. See General Notes on page 3 of OPM-0257-13 for additional requirements.

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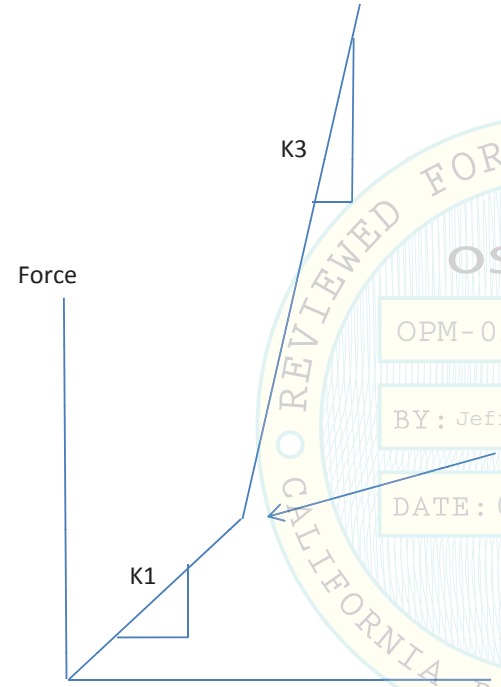
VIWR SEISMIC CAPACITY & HARDENING STIFFNESS

Table S: Isolator Seismic Capacity (LRFD) and Hardening Stiffness (K_3) with the Weakest Spring

VIWR	Rated Vertical (Z) Seismic Capacity lbs	Rated Vertical (Z) Seismic Stiffness (KZ_3) lbs/in	Rated Perpendicular (X) Horizontal Seismic Capacity lbs	Rated Perpendicular (X) Horizontal Stiffness (KX_3) lbs/in	Rated Parallel (Y) Horizontal Seismic Capacity lbs	Rated Parallel (Y) Horizontal Stiffness (KY_3) lbs/in	Rated Orthogonal (45° to X-Y) Horizontal Seismic Capacity lbs	Rated Orthogonal (45° to X-Y) Horizontal Seismic Stiffness (KO_3) lbs/in
JQRA	22,000	27,690	6,840	24,670	10,480	80,550	12,340	69,270
JQRB	18,673	115,000	11,630	86,430	13,220	73,350	11,530	123,330
JQRC	27,086	108,930	12,350	62,530	40,000	250,160	14,500	66,100
JQRD	60,000	92,580	28,500	156,110	66,670	375,000	39,500	253,333



K1, K3 and K1-K3 Transition in Graphical Form

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