XCell ATF® Devices and XCell™ Controllers

Seismic Anchorage Report

- WJE No. 2021.3262 | Final Report | MARCH 10, 2022

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1. About this document

Repligen Corporation, an ISO 9001 company, commits to supporting customers in installation, operation, service and troubleshooting of our products in line with our mission of inspiring advances in bioprocessing.

Repligen engaged a third-party service to evaluate seismic loading of XCell™ Controllers and XCell ATF® Devices. Where seismic loading of equipment is required by the local building code, the equipment needs to be anchored to the building framing.

2. International Building Code and California Building Code

The procedures for nonstructural seismic forces in the CBC and the IBC are both based on the requirements in ASCE 7-16 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, published by the American Society of Civil Engineers (ASCE).

The seismic demands for nonstructural components using the CBC and IBC vary depending on several factors: the seismic hazard associated with the building site, the floor acceleration at the location where the nonstructural component is located within the building, and the expected seismic response of the component. Assumptions for each of these factors are described below.

2.1 Seismic Hazard

For the IBC and the CBC, each building is assigned to be in a Seismic Design Category (SDC) based on the expected ground shaking and the Risk Category. The SDC varies from A to F depending on the seismic hazard at the site and the Risk Category of the building. The values for Risk Category vary from I to IV depending on the use and occupancy of the building. The combination of the ground shaking parameters and the Risk Category are used to define the SDC. Ground shaking is defined by two parameters used for design: Short-Period Response Design Acceleration (SDS) and 1-Second Period Response Design Acceleration (SD1). For the design of nonstructural components, only the value of SDS is required. For this assessment, the values for SDS were assumed to be equal to the upper bound for SDC B for Risk Categories I through III (0.32), the upper bound for SDC C for Risk Categories I through III (0.50), and three values applicable to SDC D (1.0, 1.5, and 2.0). These represent a range of values throughout the United States for which seismic design is required.

2.2 Floor Acceleration Within the Building

Floor accelerations are expressed as a ratio of the floor acceleration to the acceleration of the ground. Using the ASCE 7-16 procedure, this ratio varies from a value of 1 at the ground level to a value of 3 at the roof of the building. For the purpose of this evaluation, the component is assumed to be located at the either the ground floor level or at top of the structure, where the lateral seismic force is greatest.

2.3 Component Seismic Response

The ASCE 7-16 procedure provides values of two parameters that define the seismic response characteristics of a nonstructural component. These are ap, which is the component amplification factor related to the response of the component, and Rp which is the component response modification factor. A value for ap of 2.5 is prescribed by ASCE 7-16 for components that are flexible or flexibly supported. This value was assumed for this evaluation. A value of 2.5 for Rp is prescribed by ASCE 7-16 for mechanical and electrical components that have limited deformability. This value was assumed for this evaluation.

2.4 Component Importance Factor

The ASCE 7-16 procedure includes a parameter that relates to the importance of the nonstructural component. A value for this importance factor of 1.0 is applied for most components. A value for the importance factor of 1.5 is used for components that are either critical to the safety of the public, such as the fire protection system, or that are in critical facilities, such as emergency facilities. For this evaluation,

3. Building Standard Law of Japan

The most recent edition of the Building Standard Law of Japan was published in 2016. The BSLJ includes Construction Ministry Notifications that provide design requirements in addition to provisions in the articles of the law. Construction Ministry Notification No. 1388 provides provisions for structural strength of building equipment. This notification requires that building equipment be anchored to the building structure. The horizontal seismic force for which the equipment needs to resist is a function of the horizontal seismic intensity and the location within the building.

we have assumed that the equipment is not critical and will not affect the functioning of the building following an earthquake and therefore, the importance factor is 1.0.

3.1 Horizontal Seismic Intensity

The values for the horizontal seismic intensity are specified by the Minister of Land, Infrastructure, Transport and Tourism and range from 0.7 to 1.0 depending on the seismic activity of the region where the building is located. We assumed for the analysis that the building would be located in the areas of highest seismic activity with a value of 1.0.

3.2 Location Within the Building

The horizontal seismic force for nonstructural components varies depending on the location within the building. For components located at the first floor or in the basement, the value is 0.4. For components located at middle floors, the value is 0.6. For components located at the top floor or roof, the value is 1.0. For our evaluation, we considered components to be located at either the ground floor or at the roof.

Figure 1. Original WJE Seismic Anchorage Report cover (XCell ATF® 1 Single-use Device)

WJE

Seismic Anchorage

XCell ATF® 1 Single-use Device

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

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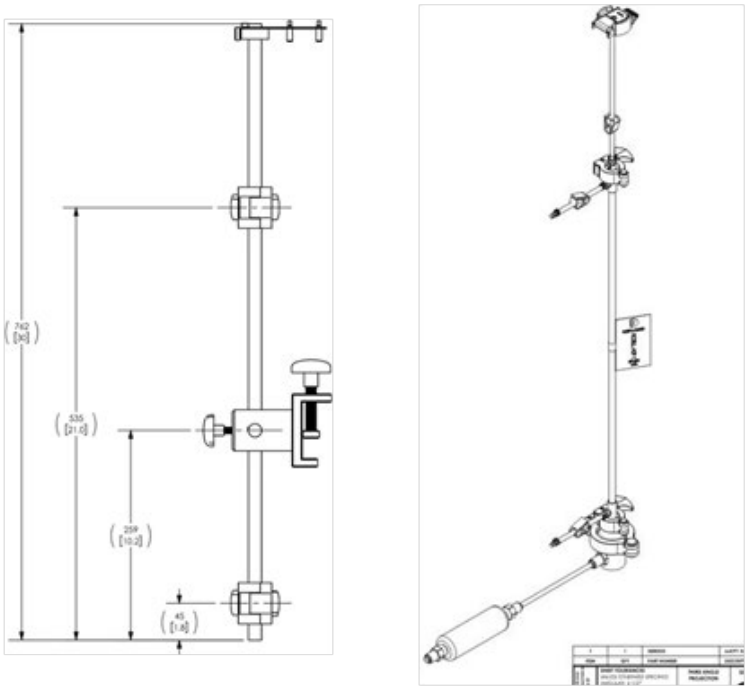
4. Evaluating XCell ATF® 1 Single- use Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 1 Single- use Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 1 Single-use Device, is required by the local building code, the equipment needs to be anchored to the building

5. Description: XCell ATF® 1 Single-use Device



The XCell ATF® 1 Single-use Device components include a diaphragm pump, filter module, and a hollow fiber filter fitted within the filter module. The cylindrical housing for the filter is about ½-inch (13 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 28 inches (711 mm), with an additional tube extending 9 inches (229 mm) above the top of the filter module. Inlet and outlet ports are provided at the top and bottom.

The stainless-steel clamp-on stand includes a clamp to secure the stand to a table or surface, and two snap grips to hold the filter housing near the top and bottom of the device. The stand is about 30 inches tall (762 mm).

6. Design Criteria: XCell ATF® 1 Single-use Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 1 Single- use Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

7. Seismic Anchorage Analysis: XCell ATF® 1 Single-use Device

The XCell ATF® 1 Single-use Device includes a mounting stand. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. Although friction due to the weight of the component is not permitted to resist seismic forces, friction due to clamping is acceptable. The calculated forces include the weight of the ATF® 1 Single-use Device that is filled with liquid with a specific gravity of water. The seismic design force for the ATF® 1 Single-use Device has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 1. The values in this table have been round up to the nearest 5 pounds (0.02 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 2. These values were rounded up to the nearest 0.02 kN (5 pounds).

Table 1. Seismic Design Force for XCell ATF® 1 Single-use Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	5 lb (0.02 kN)
SDC C	Roof	5 lb (0.02 kN)
SDC D (S_{DS} = 1.0)	Roof	10 lb (0.05 kN)
SDC D (SDS = 1.5)	Ground Floor	5 lb (0.02 kN)
SDC D (S_{DS} = 1.5)	Roof	10 lb (0.05 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	5 lb (0.02 kN)
SDC D (S_{DS} = 2.0)	Roof	15 lb (0.07 kN)

Table 2. Seismic Design Force for XCell ATF® 1 Single-use Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	5 lb (0.02 kN)
0.7	Roof	5 lb (0.02 kN)
0.8	Ground Floor	5 lb (0.02 kN)
0.8	Roof	5 lb (0.02 kN)
1.0	Ground Floor	5 lb (0.02 kN)
1.0	Roof	5 lb (0.02 kN)

8. Seismic Anchorage Recommendations: XCell ATF® 1 Single-use Device

To meet the seismic design requirements, the XCell ATF® 1 Single-use Device mounting stand (Figure 2) should be securely tightened to a table or shelf. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, the attachment needs to resist a lateral force of 15 pounds (0.07 kN) applied in any horizontal direction parallel to the table/shelf. If the mounting stand is securely tightened, the clamping force will provide sufficient capacity to resist the design lateral forces. Periodic verification that the clamp is tight is recommended.

Figure 2. Recommended seismic anchorage for attaching the XCell ATF® 1 Single-use Device stand to a table or shelf

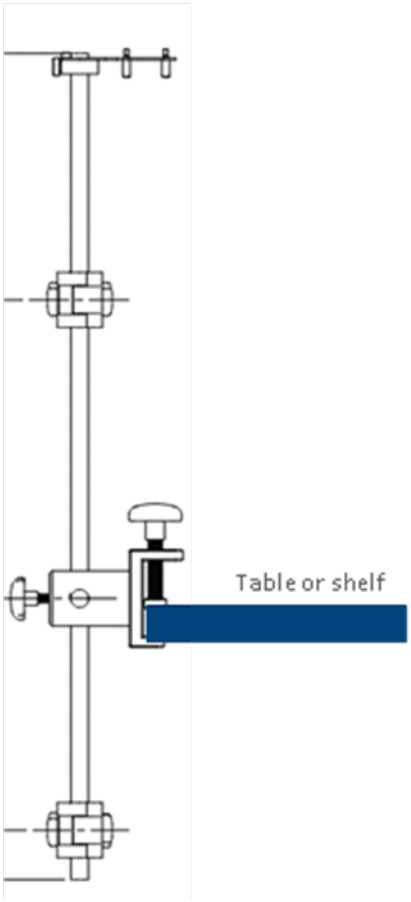


Figure 3. Original WJE Seismic Anchorage Report cover (XCell ATF® 2 Stainless Steel Device)

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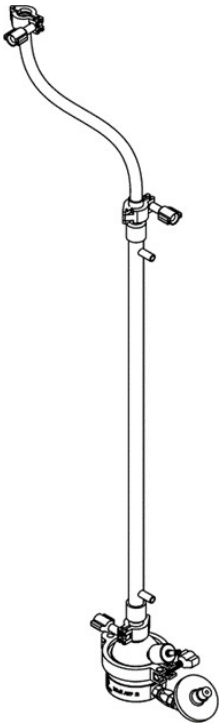
9. Evaluating XCell ATF® 2 Stainless Steel Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 2 Stainless Steel Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 2 Stainless Steel Device, is required by the local building code, the equipment needs to be anchored to the building framing.

10. Description: XCell ATF® 2 Stainless Steel Device



The XCell ATF® 2 Stainless Steel Device components include a diaphragm pump, filter module, and a hollow fiber filter fitted within the filter module. The cylindrical housing for the filter is about 0.8 inches (20 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 29.9 inches (759 mm) with an additional silicone tube extending out the top. Inlet and outlet ports are provided at the top and bottom.

The stainless-steel stand includes three brackets that screw onto the base to hold the XCell ATF® 2 Stainless Steel Device unit in place. The stand is about 5 inches tall (127 mm), and the base is about 9 (229 mm) inches by 7.5 inches (191 mm).

11. Design Criteria: XCell ATF® 2 Stainless Steel Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 2 Stainless Steel Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

12. Seismic Anchorage Analysis: XCell ATF® 2 Stainless Steel Device

The XCell ATF® 2 Stainless Steel Device includes an optional support stand. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated forces include the weight of the ATF® 2 Stainless Steel Device that is filled with liquid with a specific gravity of water. The seismic design force for the ATF® 2 Stainless Steel Device has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 3. The values in this table have been round up to the nearest 5 pounds (0.02 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 4. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 3. Seismic Design Force for XCell ATF® 2 Stainless Steel Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	5 lb (0.02 kN)
SDC C	Roof	10 lb (0.05 kN)
SDC D (S_{DS} = 1.0)	Roof	20 lb (0.10 kN)
SDC D (SDS = 1.5)	Ground Floor	10 lb (0.05 kN)
SDC D (S_{DS} = 1.5)	Roof	20 lb (0.10 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	10 lb (0.05 kN)
SDC D (S_{DS} = 2.0)	Roof	40 lb (0.20 kN)

Table 4. Seismic Design Force for XCell ATF® 2 Stainless Steel Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	5 lb (0.02 kN)
0.7	Roof	10 lb (0.05 kN)
0.8	Ground Floor	5 lb (0.02 kN)
0.8	Roof	10 lb (0.05 kN)
1.0	Ground Floor	5 lb (0.02 kN)
1.0	Roof	15 lb (0.07 kN)

13. Seismic Anchorage Recommendations: XCell ATF® 2 Stainless Steel Device

Where the XCell ATF® 2 Stainless Steel Device is supported on a floor, a stainless steel stand, such as the stand provided for the XCell ATF® 2 Stainless Steel Device should be used. To meet the seismic design requirements, a minimum of four anchors are required to connect the XCell ATF® 2 Stainless Steel Device with a mounting plate to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 80 pounds (0.40 kN) and a shear force of 10 pounds (0.05 kN) applied in any horizontal direction parallel to the floor.

The recommended anchorage of the stand to a concrete floor slab is the use of four 1/4-inch (6 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The recommended spacing of these anchors is 6.5 inches (16.5 cm) and 8 inches (20.3cm), as shown in Figure 4. In areas of high seismic demand and where the installation is considered critical, the XCell ATF® 2 Stainless Steel Device is to be anchored to the mounting base using a Velcro® strap or similar material wrapped around the mounting base and XCell ATF® 2 Stainless Steel Device.

Figure 4. Recommended support stand and seismic anchorage for attaching the stand for the XCell ATF® 2 Stainless Steel Device to the floor

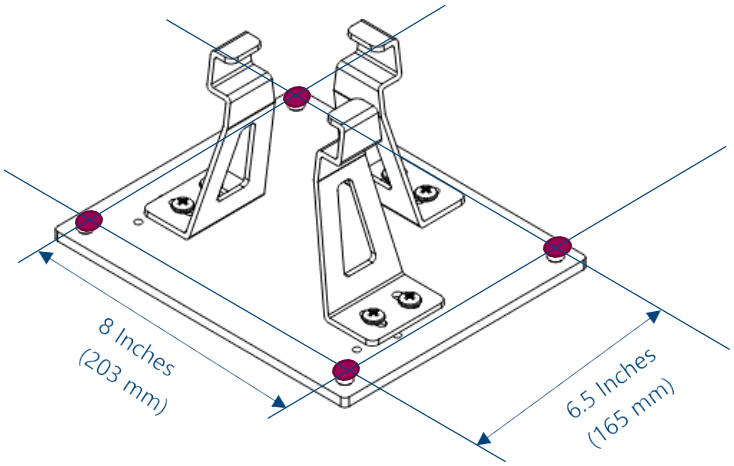


Figure 5. Original WJE Seismic Anchorage Report cover (XCell ATF® 2 Single- use Device)

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14. Evaluating XCell ATF® 2 Single-use Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 2 Single-use Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 2 Single-use Device, is required by the local building code, the equipment needs to be anchored to the building framing.

15. Description: XCell ATF® 2 Single-use Device

The XCell ATF® 2 Single-use Device components include a diaphragm pump, GE ReadyMate™ DAC, and a hollow fiber filter cartridge fitted to the upper hemisphere of the diaphragm pump. The cylindrical housing for the filter is about ¾-inch (19 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 29 inches (737 mm). Inlet and outlet ports are provided at the top and bottom.

The stainless-steel stand for the XCell ATF® 2 Single-use Device includes a ring to hold the bottom of the device securely and a snap ring to hold the filter housing near the top of the device. Four bumpers are provided at the bottom of the stand. The stand is about 21 inches tall (533 mm), and the base is about 11 inches (279 mm) by 8 inches (203 mm).

16. Design Criteria: XCell ATF® 2 Single-use Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 2 Single- use Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

17. Seismic Anchorage Analysis: XCell ATF® 2 Single-use Device

The XCell ATF® 2 Single-use Device includes the ATF® 2 Single-use Device unit and the mounting stand. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated seismic design forces include the weight of the ATF® 2 Single-use Device that is filled with liquid with a specific gravity of water. The seismic design force for the ATF® 2 Single-use Device has been calculated based on upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 5. The values in this table have been round up to the nearest 5 pounds (0.02 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 6. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 5. Seismic Design Force for XCell ATF® 2 Single-use Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	5 lb (0.02 kN)
SDC C	Roof	5 lb (0.02 kN)
SDC D (S_{DS} = 1.0)	Roof	10 lb (0.05 kN)
SDC D (SDS = 1.5)	Ground Floor	5 lb (0.02 kN)
SDC D (S_{DS} = 1.5)	Roof	10 lb (0.05 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	5 lb (0.02 kN)
SDC D (S_{DS} = 2.0)	Roof	15 lb (0.07 kN)

Table 6. Seismic Design Force for XCell ATF® 2 Single-use Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	5 lb (0.02 kN)
0.7	Roof	5 lb (0.02 kN)
0.8	Ground Floor	5 lb (0.02 kN)
0.8	Roof	5 lb (0.02 kN)
1.0	Ground Floor	5 lb (0.02 kN)
1.0	Roof	5 lb (0.02 kN)

18. Seismic Anchorage Recommendations: XCell ATF® 2 Single-use Device

The mounting stand for the XCell ATF® 2 Single-use Device is required to be anchored to the floor framing. To meet the seismic design requirements, a minimum of four anchors are required to connect the XCell ATF® 2 Single-use Device mounting stand to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 40 pounds (0.20 kN) and a shear force of 5 pounds (0.02 kN) applied in any horizontal direction parallel to the floor.

Where the XCell ATF® 2 Single-use Device is attached to the concrete floor slab, the recommended anchorage is the use of four 1/4-inch (6 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The recommended spacing of these anchors is 6 inches (16 cm) and as shown in Figure 6. In areas of high seismic demand and where the installation is considered critical, the XCell ATF® 2 Single-use Device is to be anchored to the mounting base using a Velcro® strap or similar material wrapped around the mounting base and XCell ATF® 2 Single-use Device.

Figure 6. Recommended seismic anchorage for attaching the ATF® 2 Single-use Device to the floor framing

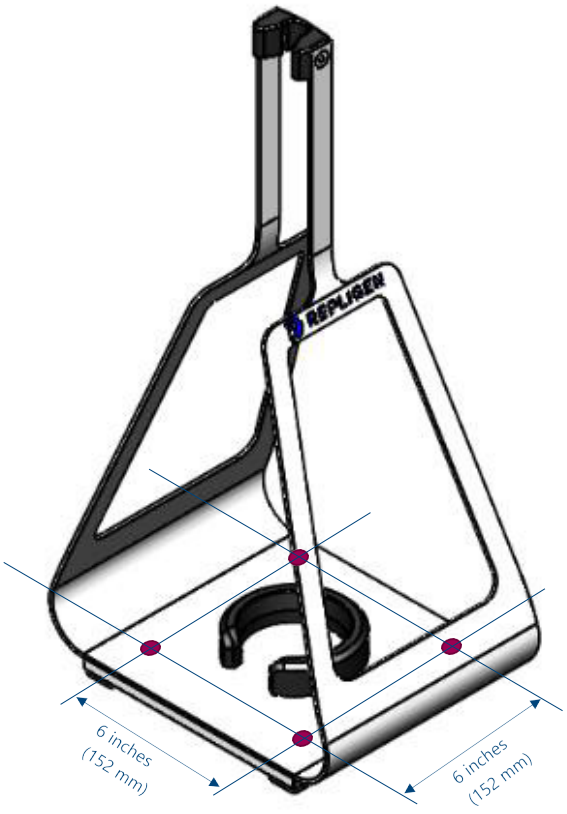

Figure 7. Original WJE Seismic Anchorage Report cover (XCell ATF® 4 Stainless Steel Device)

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Seismic Anchorage

XCell ATF® 4 Stainless Steel

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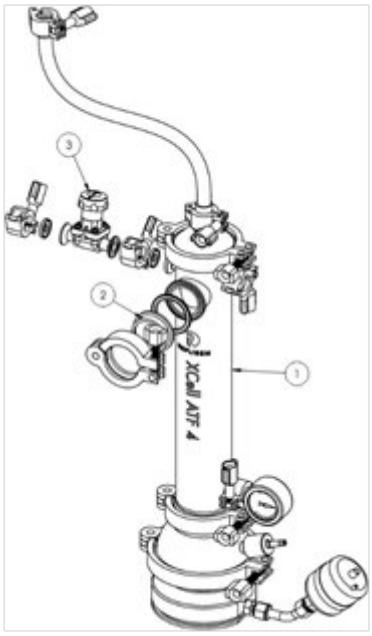
19. Evaluating XCell ATF® 4 Stainless Steel Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 4 Stainless Steel Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 4 Stainless Steel Device, is required by the local building code, the equipment needs to be anchored to the building framing.

20. Description: XCell ATF® 4 Stainless Steel Device



The XCell ATF® 4 Stainless Steel Device components include a diaphragm pump, filter module, and a hollow fiber filter fitted within the filter module. The stainless steel cylindrical housing for the filter is about 2.5 inches (64 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 20.1 inches (511 mm). Inlet and outlet ports are provided at the top and bottom.

No stand is provided as the XCell ATF® 4 Stainless Steel Device is intended to stand on its own.

21. Design Criteria: XCell ATF® 4 Stainless Steel Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 4 Stainless Steel Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

22. Seismic Anchorage Analysis: XCell ATF® 4 Stainless Steel Device

There is no support stand currently available for the XCell ATF® 4 Stainless Steel Device. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated forces include the weight of the XCell ATF® 4 Stainless Steel Device that is filled with liquid with a specific gravity of water. The seismic design force for the XCell ATF® 4 Stainless Steel Device has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 7. The values in this table have been round up to the nearest 5 pounds (0.02 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 8. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 7. Seismic Design Force for XCell ATF® 4 Stainless Steel Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	20 lb (0.10 kN)
SDC D (S_{DS} = 1.0)	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 1.5)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 1.5)	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	40 lb (0.20 kN)
SDC D (S_{DS} = 2.0)	Roof	60 lb (0.30 kN)

Table 8. Seismic Design Force for XCell ATF® 4 Stainless Steel Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	20 lb (0.10 kN)
0.7	Roof	20 lb (0.10 kN)
0.8	Ground Floor	20 lb (0.10 kN)
0.8	Roof	20 lb (0.10 kN)
1.0	Ground Floor	20 lb (0.10 kN)
1.0	Roof	40 lb (0.20 kN)

23. Seismic Anchorage Recommendations: XCell ATF® 4 Stainless Steel Device

To resist seismic forces, anchorage of the XCell ATF® 4 Stainless Steel Device to the floor framing is required. To meet the seismic design requirements, a support stand will need to be provided that can be attached to the unit and to the supporting floor framing with a minimum of four anchors to anchor the XCell ATF® 4 Stainless Steel Device. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 140 pounds (0.70 kN) and a shear force of 20 pounds (0.10 kN) applied in any horizontal direction parallel to the floor.

To connect the XCell ATF® 4 Stainless Steel Device unit to a concrete floor, the recommended anchorage requires four 3/8” Hilti KB TZ2 – SS 304 expansion anchors connecting the support stand to the floor. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The minimum spacing of these anchors is 4 inches (11 cm).

Figure 8. Original WJE Seismic Anchorage Report cover (XCell ATF® 6 Stainless Steel Device)

WJE

Seismic Anchorage

XCell ATF® 6 Stainless Steel Device

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

PREPARED FOR:
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Seismic Anchorage

XCell ATF® 6 Stainless Steel Device

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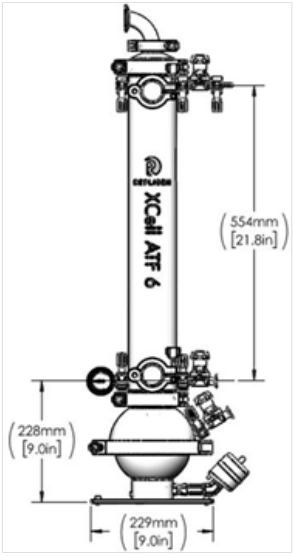
24. Evaluating XCell ATF® 6 Stainless Steel Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 6 Stainless Steel Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 6 Stainless Steel Device, is required by the local building code, the equipment needs to be anchored to the building framing.

25. Description: XCell ATF® 6 Stainless Steel Device



The XCell ATF® 6 Stainless Steel Device components include a diaphragm pump, filter module, and a hollow fiber filter fitted within the filter module. The cylindrical housing for the filter is about 3-3/4 inches (95 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 36 inches (914 mm). Inlet and outlet ports are provided at the top and bottom.

A 9 inch (229 mm) by 9 inch (229 mm) stainless-steel plate attached to the base of the unit with leveling screws supports the unit.

26. Design Criteria: XCell ATF® 6 Stainless Steel Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 6 Stainless Steel Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

27. Seismic Anchorage Analysis: XCell ATF® 6 Stainless Steel Device

The XCell ATF® 6 Stainless Steel Device includes an integral base plate. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated forces include the weight of the XCell ATF® 6 Stainless Steel Device that is filled with liquid with a specific gravity of water. The seismic design force for the XCell ATF® 6 Stainless Steel Device has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 9. The values in this table have been round up to the nearest 20 pounds (0.10 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 10. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 9. Seismic Design Force for XCell ATF® 6 Stainless Steel Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	40 lb (0.20 kN)
SDC C	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 1.0)	Roof	80 lb (0.40 kN)
SDC D (SDS = 1.5)	Ground Floor	40 lb (0.20 kN)
SDC D (S_{DS} = 1.5)	Roof	100 lb (0.50 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	60 lb (0.30 kN)
SDC D (S_{DS} = 2.0)	Roof	140 lb (0.70 kN)

Table 10. Seismic Design Force for XCell ATF® 6 Stainless Steel Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	20 lb (0.10 kN)
0.7	Roof	40 lb (0.20 kN)
0.8	Ground Floor	20 lb (0.10 kN)
0.8	Roof	60 lb (0.30 kN)
1.0	Ground Floor	40 lb (0.20 kN)
1.0	Roof	60 lb (0.30 kN)

28. Seismic Anchorage Recommendations: XCell ATF® 6 Stainless Steel Device

To resist seismic design forces, anchorage of the XCell ATF® 6 Stainless Steel Device to the floor framing is required. To meet the seismic design requirements, The leveling screws need to be removed to allow for the installation of a minimum of four anchors to connect the XCell ATF® 6 Stainless Steel Device base plate to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 340 pounds (1.7 kN) and a shear force of 40 pounds (0.20 kN) applied in any horizontal direction parallel to the floor.

Where the XCell ATF® 6 Stainless Steel Device is attached to the concrete floor slab, the recommended anchorage is to replace the leveling screws with four 3/8-inch (10 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The recommended spacing of these anchors is 8 inches (21 cm) and as shown in Figure 9.

Figure 9. Recommended seismic anchorage for attaching the ATF® 6-Stainless Steel to the floor framing

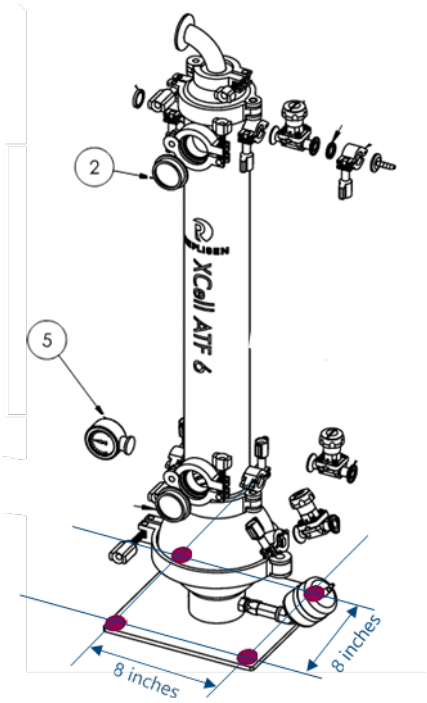


Figure 10. Original WJE Seismic Anchorage Report cover (XCell ATF® 6 Single- use Device)

WJE

Seismic Anchorage

XCell ATF® 6 Single-use Device

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March 10, 2022
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Seismic Anchorage

XCell ATF® 6 Single-use Device

Brian E. Kehoe, SE
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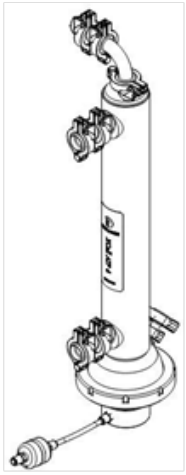
29. Evaluating XCell ATF® 6 Single-use Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 6 Single-use Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 6 Single-use Device, is required by the local building code, the equipment needs to be anchored to the building framing.

30. Description: XCell ATF® 6 Single-use Device



The XCell ATF® 6 Single-use Device components include a diaphragm pump, filter housing, inlet elbow, and a hollow fiber filter cartridge fitted within the filter housing. The cylindrical housing for the filter is about 4 inches (102 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 32 inches (813 mm). Inlet and outlet ports are provided at the top and bottom.

The stainless-steel stand for the XCell ATF® 6 Single-use Device includes a ring to hold the bottom of the device securely and a snap ring to hold the filter housing near the top of the device. Four bumpers are provided at the bottom of the stand. The stand is about 27 inches (686 mm) tall, and the base is about 15 inches (381 mm) by 12 inches (305 mm).

31. Design Criteria: XCell ATF® 6 Single-use Device

Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 6 Single- use Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

32. Seismic Anchorage Analysis: XCell ATF® 6 Single-use Device

The XCell ATF® 6 Single-use Device includes a mounting stand. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated forces include the weight of the XCell ATF® 6 Single-use Device that is filled with liquid with a specific gravity of water. The seismic design force for the XCell ATF® 6 Single-use Device has been calculated based on the upper bound values determined by these codes and standards based on assumed seismic hazards and locations within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 11. The values in this table have been round up to the nearest 20 pounds (0.10 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 12. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 11. Seismic Design Force for XCell ATF® 6 Single-use Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 1.0)	Roof	60 lb (0.30 kN)
SDC D (SDS = 1.5)	Ground Floor	40 lb (0.20 kN)
SDC D (S_{DS} = 1.5)	Roof	80 lb (0.40 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	40 lb (0.20 kN)
SDC D (S_{DS} = 2.0)	Roof	100 lb (0.50 kN)

Table 12. Seismic Design Force for XCell ATF® 6 Single-use Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	20 lb (0.10 kN)
0.7	Roof	40 lb (0.20 kN)
0.8	Ground Floor	20 lb (0.10 kN)
0.8	Roof	40 lb (0.20 kN)
1.0	Ground Floor	20 lb (0.10 kN)
1.0	Roof	40 lb (0.20 kN)

33. Seismic Anchorage Recommendations: XCell ATF® 6 Single-use Device

The mounting stand for the XCell ATF® 6 Single-use Device is required to anchored to the floor framing to resist seismic design loads. To meet the seismic design requirements, a minimum of four anchors are required to connect the XCell ATF® 6 Single-use Device mounting stand to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 160 pounds (0.8 kN) and a shear force of 40 pounds (0.20 kN) applied in any horizontal direction parallel to the floor.

Where the XCell ATF® 6 Single-use Device is attached to the concrete floor slab, the recommended anchorage is four 3/8-inch (10 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The recommended spacing of these anchors is 8 inches (21 cm) and as shown in Figure 11. In areas of high seismic demand and where the installation is considered critical, the XCell ATF® 6 Single-use Device is to be secured to the mounting base using a Velcro® strap or similar material wrapped around the mounting base and XCell ATF® 6 Single-use Device.

Figure 11. Recommended seismic anchorage for attaching the XCell ATF® 6 Single-use Device to the floor framing

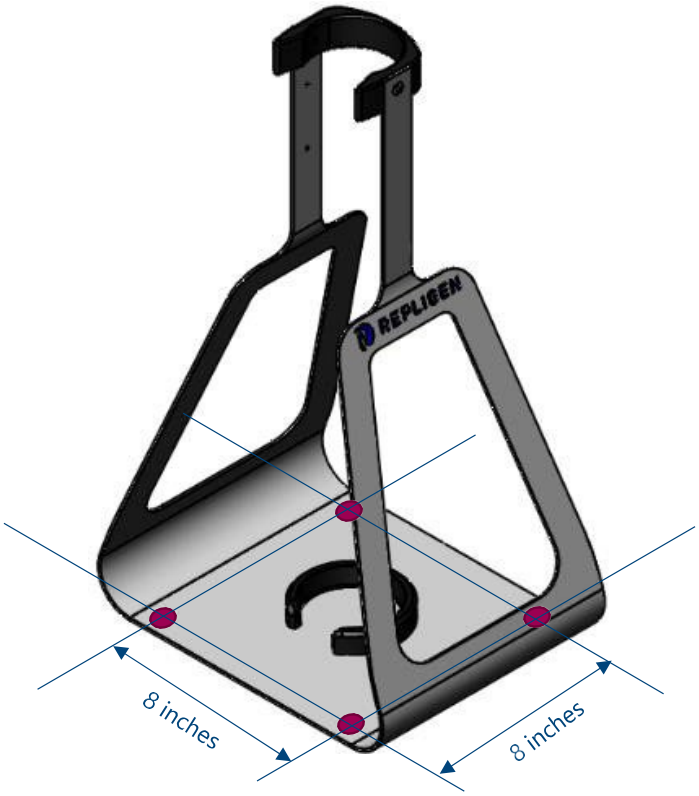


Figure 12. Original WJE Seismic Anchorage Report cover (XCell ATF® 10 Stainless Steel Device)

WJE

Seismic Anchorage

XCell ATF® 10 Stainless Steel Device

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Seismic Anchorage

XCell ATF® 10 Stainless Steel Device

Brian E. Kehoe, SE
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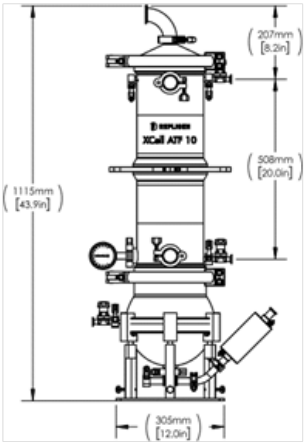
34. Evaluating XCell ATF® 6 Single-use Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 10 Stainless Steel Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 10 Stainless Steel Device is required by the local building code, the equipment needs to be anchored to the building framing.

35. Description: XCell ATF® 10 Stainless Steel Device



The XCell ATF® 10 Stainless Steel Device components include a diaphragm pump, filter module, and a hollow fiber filter fitted within the filter module. The cylindrical housing for the filter is about 7.5 inches (191 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 43.9 inches (1245 mm). Inlet and outlet ports are provided at the top and bottom.

Three legs attach the XCell ATF® 10 Stainless Steel Device to a 12 inch (305 mm) by 12 inch (305 mm) stainless-steel base plate to support the unit.

36. Design Criteria: XCell ATF® 10 Stainless Steel Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 10 Stainless Steel Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

37. Seismic Anchorage Analysis: XCell ATF® 10 Stainless Steel Device

The XCell ATF® 10 Stainless Steel Device includes a stainless steel base plate. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated forces include the weight of the XCell ATF® 10 Stainless Steel Device that is filled with liquid with a specific gravity of water. The seismic design force of the XCell ATF® 10 Stainless Steel Device has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 13. The values in this table have been round up to the nearest 20 pounds (0.10 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 14. These values were rounded up to the nearest 0.10 kN (20 pounds).

Table 13. Seismic Design Force for XCell ATF® 10 Stainless Steel Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	60 lb (0.30 kN)
SDC C	Roof	100 lb (0.40 kN)
SDC D (S_{DS} = 1.0)	Roof	180 lb (0.80 kN)
SDC D (SDS = 1.5)	Ground Floor	100 lb (0.40 kN)
SDC D (S_{DS} = 1.5)	Roof	280 lb (1.20 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	120 lb (0.60 kN)
SDC D (S_{DS} = 2.0)	Roof	380 lb (1.60 kN)

Table 14. Seismic Design Force for XCell ATF® 10 Stainless Steel Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	40 lb (0.20 kN)
0.7	Roof	100 lb (0.50 kN)
0.8	Ground Floor	60 lb (0.20 kN)
0.8	Roof	120 lb (0.60 kN)
1.0	Ground Floor	60 lb (0.30 kN)
1.0	Roof	160 lb (0.70 kN)

38. Seismic Anchorage Recommendations: XCell ATF® 10 Stainless Steel Device

The base plate for the XCell ATF® 10 Stainless Steel Device is required to anchored to the floor framing. To meet the seismic design requirements, a minimum of four anchors are required to connect the base plate for XCell ATF® 10 Stainless Steel Device to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 1060 pounds (5.3 kN) and a shear force of 100 pounds (0.5 kN) applied in any horizontal direction parallel to the floor.

Where the XCell ATF® 10 Stainless Steel Device is attached to the concrete floor slab, the recommended anchorage is four 5/8-inch (10 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 5 inches (100 mm). The recommended spacing of these anchors is 8.8 inches (22 cm) and 7.7 inches (20 cm), as shown in Figure 13. The anchors near the two support legs that are in line with each other should be offset towards the edge of the plate by one inch to avoid conflict between anchors and support legs and should be located with one-inch minimum spacing between the center of the anchors and edge of the plate.

Figure 13. Recommended seismic anchorage locations for attaching the ATF® 10 Stainless Steel Device to the floor framing

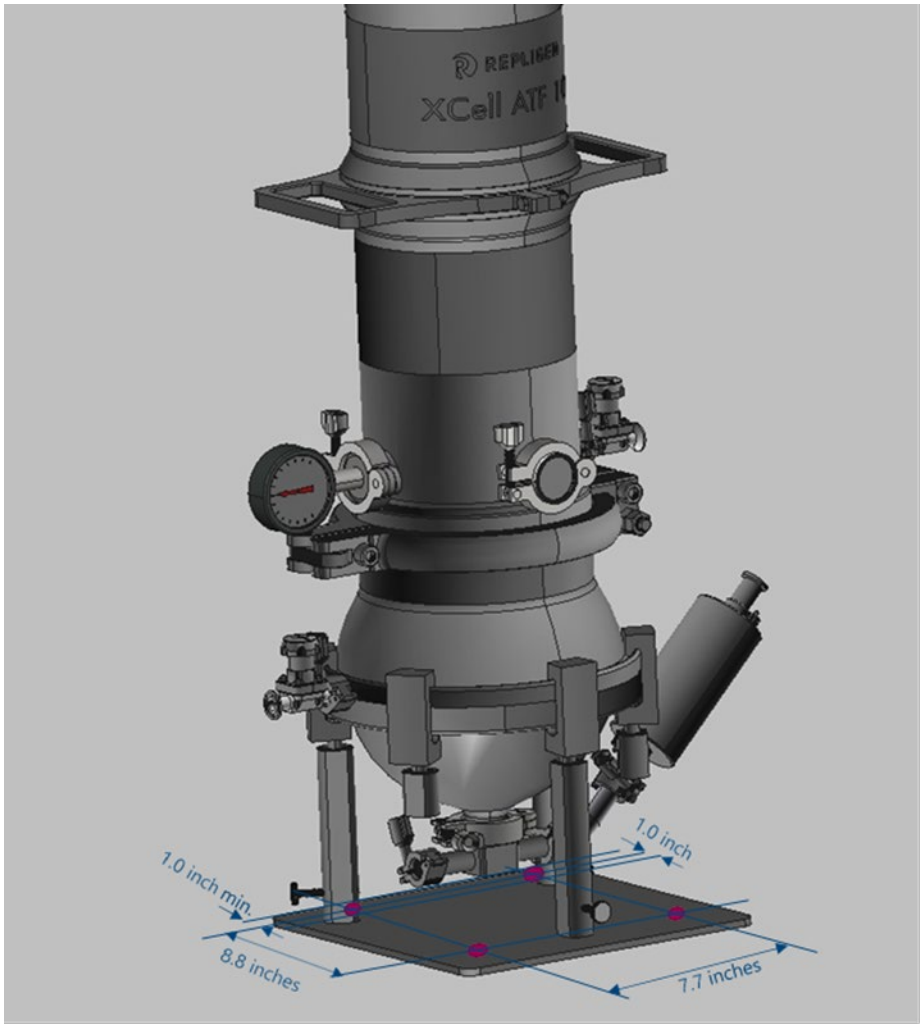


Figure 14. Original WJE Seismic Anchorage Report cover (XCell ATF® 10 Single-use Device)

WJE

Seismic Anchorage

XCell ATF® 10 Single-use Device

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XCell ATF® 10 Single-use Device

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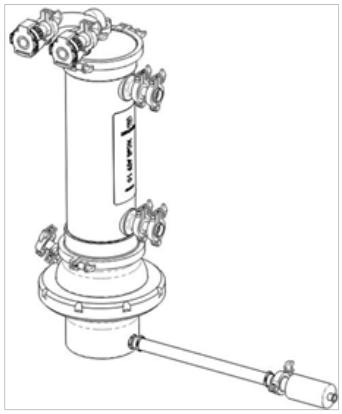
39. Evaluating XCell ATF® 10 Single-use Device for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell ATF® 10 Single-use Device for seismic loads. Where seismic loading of equipment, such as the XCell ATF® 10 Single-use Device is required by the local building code, the equipment needs to be anchored to the building framing.

40. Description: XCell ATF® 10 Stainless Steel Device



The XCell ATF® 10 Single-use Device components include a diaphragm pump, filter housing, inlet elbow, and a hollow fiber filter cartridge fitted within the filter housing. The cylindrical housing for the filter is about 7.5 inches (191 mm) in diameter and is attached to the top of the diaphragm pump. The total height of the diaphragm pump and filter is about 40 inches (1016 mm). Inlet and outlet ports are provided at the top and bottom.

The stainless-steel stand includes a ring to hold the bottom of the device securely and a snap ring to hold the filter housing near the top of the device. Four bumpers are provided at the bottom of the stand. The stand is about 29 inches (737 mm) tall, and the base is about 21 inches (533 mm) by 18 inches (457 mm).

41. Design Criteria: XCell ATF® 10 Single-use Device

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell ATF® 10 Single- use Device, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

42. Seismic Anchorage Analysis: XCell ATF® 10 Single-use Device

The XCell ATF® 10 Single-use Device includes the XCell ATF® 10 Single-use Device and the mounting stand. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The calculated forces include the weight of the XCell ATF® 10 Single-use Device that is filled with liquid with a specific gravity of water and the weight of the stand. The seismic design force for the XCell ATF® 10 Single-use Device has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 15. The values in this table have been round up to the nearest 20 pounds (0.1 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 16. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 15. Seismic Design Force for XCell ATF® 10 Single-use Device Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	40 lb (0.20 kN)
SDC C	Roof	60 lb (0.30 kN)
SDC D (S_{DS} = 1.0)	Roof	120 lb (0.60 kN)
SDC D (SDS = 1.5)	Ground Floor	60 lb (0.30 kN)
SDC D (S_{DS} = 1.5)	Roof	200 lb (0.80 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	80 lb (0.40 kN)
SDC D (S_{DS} = 2.0)	Roof	260 lb (1.10 kN)

Table 16. Seismic Design Force for XCell ATF® 10 Single-use Device Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	40 lb (0.10 kN)
0.7	Roof	80 lb (0.30 kN)
0.8	Ground Floor	80 lb (0.20 kN)
0.8	Roof	80 lb (0.40 kN)
1.0	Ground Floor	40 lb (0.20 kN)
1.0	Roof	100 lb (0.50 kN)

43. Seismic Anchorage Recommendations: XCell ATF® 10 Single-use Device

The mounting stand for the XCell ATF® 10 Single-use Device is required to anchored to the floor framing. To meet the seismic design requirements, a minimum of four anchors are required to connect the XCell ATF® 10 Single-use Device mounting stand to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 360 pounds (1.7 kN) and a shear force of 65 pounds (0.3 kN) applied in any horizontal direction parallel to the floor.

Where the XCell ATF® 10 Single-use Device is attached to the concrete floor slab, the recommended anchorage is four 3/8-inch (10 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The recommended spacing of these anchors is 15 inches (38 cm) in both horizontal directions, as shown in Figure 15.

In areas of high seismic demand and where the installation is considered critical, the XCell ATF® 10 Single-use Device is to be anchored to the mounting base using a Velcro® strap or similar material wrapped around the mounting base and XCell ATF® 10 Single-use Device.

Figure 15. Recommended seismic anchorage for attaching the ATF® 10 Single-use Device to the floor framing

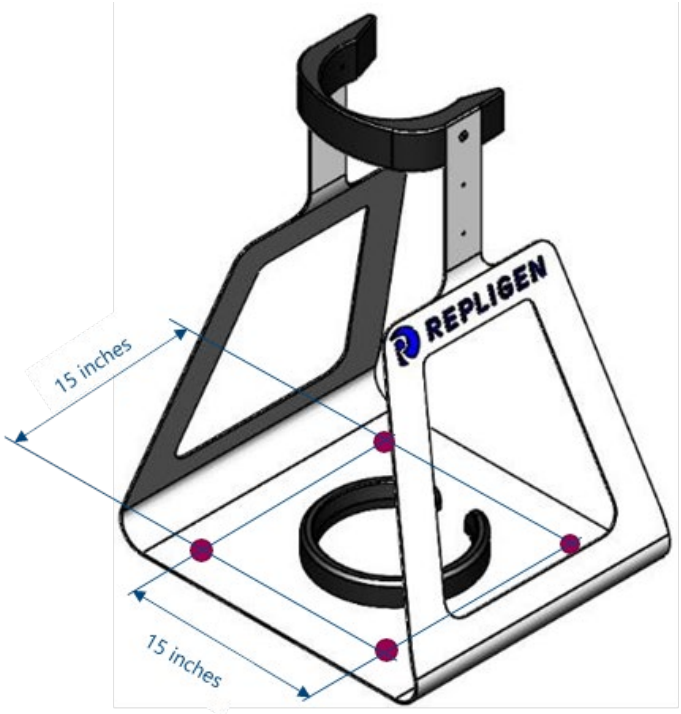


Figure 16. Original WJE Seismic Anchorage Report cover (XCell™ Lab Controller)

WJE

Seismic Anchorage

XCell™ Lab Controller

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

PREPARED FOR:
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Waltham, MA 02453

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Seismic Anchorage

XCell™ Lab Controller

Brian E. Kehoe, SE
Associate Principal and Project Manager

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

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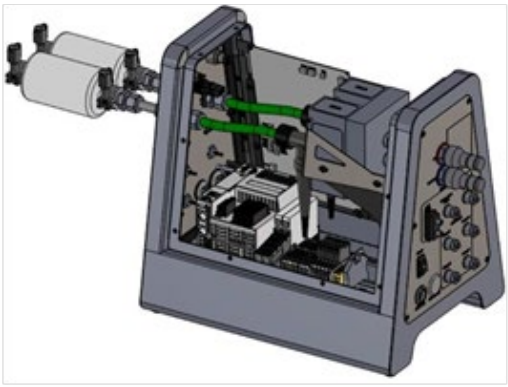
44. Evaluating XCell™ Lab Controller for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell™ Lab Controller for seismic loads. Where seismic loading of equipment, such as the XCell™ Lab Controller, is required by the local building code, the equipment needs to be anchored to the building framing.

45. Description: XCell™ Lab Controller



The XCell™ Lab Controller is housed in a trapezoidal enclosure that is 15.3 inches (388 mm) tall, and 16.3 inches (413 mm) by 12 inches (305 mm) at the base. The XCell™ Lab Controller is a control device for the XCell ATF® 1 Single use, ATF® 2 Single use, ATF® 2 Stainless Steel, and ATF® 4 Stainless Steel Devices. The controller is comprised of the controller housing and a tablet based graphical control interface that can be placed on the controller, or any other surface.

The base of the XCell™ Lab Controller includes four rubber bearing pads.

46. Design Criteria: XCell™ Lab Controller

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell™ Lab Controller, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

47. Seismic Anchorage Analysis: XCell™ Lab Controller

The XCell™ Lab Controller is made up of a rectangular controller box. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The seismic design force for the XCell™ Lab Controller has been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are to be considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 17. The values in this table have been round up to the nearest 20 pounds (0.10 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 18. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 17. Seismic Design Force for XCell™ Lab Controller Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 1.0)	Roof	60 lb (0.30 kN)
SDC D (SDS = 1.5)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 1.5)	Roof	80 lb (0.40 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	40 lb (0.20 kN)
SDC D (S_{DS} = 2.0)	Roof	120 lb (0.60 kN)

Table 18. Seismic Design Force for XCell™ Lab Controller Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force (Pounds)
0.7	Ground Floor	20 lb (0.10 kN)
0.7	Roof	40 lb (0.20 kN)
0.8	Ground Floor	20 lb (0.10 kN)
0.8	Roof	40 lb (0.20 kN)
1.0	Ground Floor	20 lb (0.10 kN)
1.0	Roof	60 lb (0.30 kN)

48. Seismic Anchorage Recommendations: XCell™ Lab Controller

To meet the seismic design requirements, a minimum of four anchors are required to connect the XCell™ Lab Controller to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 80 pounds (0.40 kN) and a shear force of 40 pounds (0.20 kN) applied in any horizontal direction parallel to the floor.

To connect the controller to the floor framing, four anchorage brackets are needed with at least one No. 8 sheet metal screws connecting the bracket and the controller, and a ¼-inch (6 mm) diameter Hilti KB TZ2– SS 304 expansion anchor between the angle and the concrete floor slab. The anchors should be embedded at least 1-3/4 inches (45 mm) into the concrete and the concrete slab thickness should be at least 4 inches (100 mm). The recommended spacing of these anchors is 15 inches (38 cm) in the longitudinal direction and 10 inches (25 cm) in the transverse direction as shown in Figure 17.

Figure 17. Recommended seismic anchorage for attaching the XCell™ Lab Controller to the floor framing

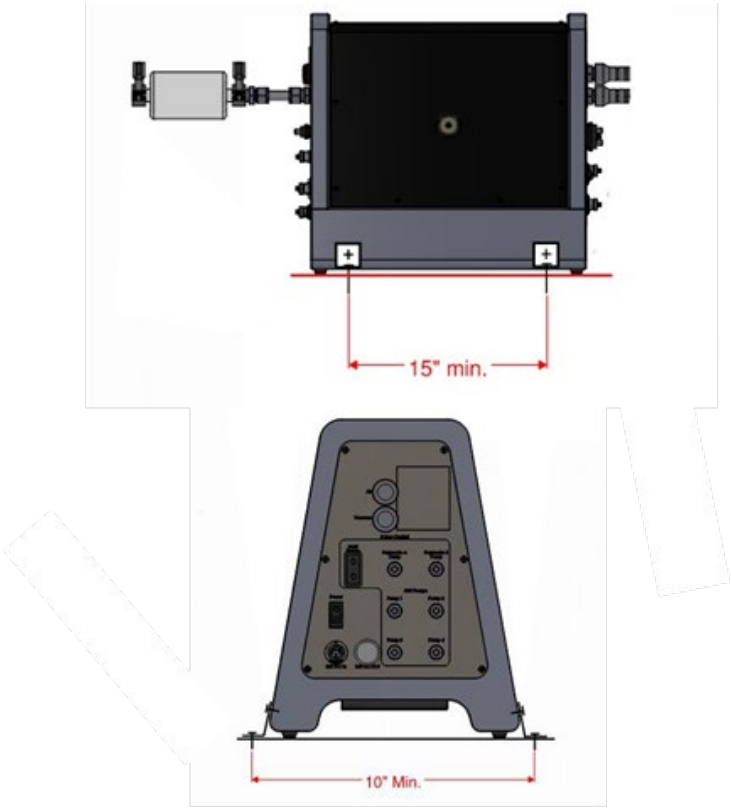


Figure 18. Original WJE Seismic Anchorage Report cover (XCell™ C24 Controller)

WJE

Seismic Anchorage

XCell™ C24 Controller

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

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Seismic Anchorage

XCell™ C24 Controller

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FINAL REPORT
March 10, 2022
WJE No. 2021.3262

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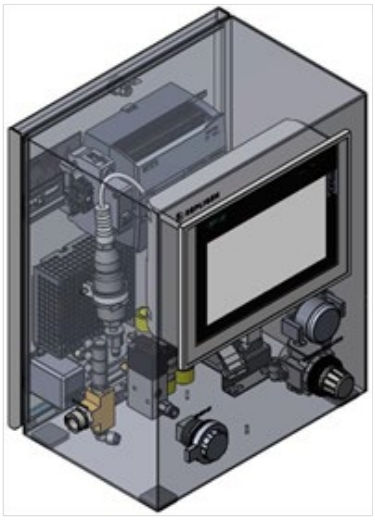
49. Evaluating XCell™ C24 Controller for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell™ C24 Controller for seismic loads. Where seismic loading of equipment, such as the XCell™ C24 Controller is required by the local building code, the equipment needs to be anchored to the building framing.

50. Description: XCell™ C24 Controller



The XCell™ C24 Controller is housed in a rectangular enclosure with a height of about 13 inches (330 mm), a width of about 10.5 inches (267 mm), and depth of about 8 inches (203 mm). The device includes electrical and data connection ports and several ports. A Human Machine Interface screen is provided on the front of the unit. The XCell™ C24 Controller is for use with the XCell ATF® 4 and XCell ATF® 6 series devices.

The XCell™ C24 is intended for bench-top use. The base of the unit includes four rubber bearing pads.

51. Design Criteria: XCell™ C24 Controller

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell™ C24 Controller, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

52. Seismic Anchorage Analysis: XCell™ C24 Controller

The XCell™ C24 Controller is comprised of a control box. Attachment to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The seismic design force for the parts of the XCell™ C24 Controller have been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are to be considered to act in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 19. The values in this table have been round up to the nearest 20 pounds (0.10 kN). The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 20. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 19. Seismic Design Force for XCell™ C24 Controller Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	20 lb (0.10 kN)
SDC D (S_{DS} = 1.0)	Roof	20 lb (0.10 kN)
SDC D (SDS = 1.5)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 1.5)	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 2.0)	Roof	60 lb (0.30 kN)

Table 20. Seismic Design Force for XCell™ C24 Controller Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	20 lb (0.10 kN)
0.7	Roof	20 lb (0.10 kN)
0.8	Ground Floor	20 lb (0.10 kN)
0.8	Roof	20 lb (0.10 kN)
1.0	Ground Floor	20 lb (0.10 kN)
1.0	Roof	20 lb (0.10 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

53. Seismic Anchorage Recommendations: XCell™ C24 Controller

The XCell™ C24 Controller can be anchored to a table or lab bench. To meet the seismic design requirements, a minimum of four anchors are required to connect the base of the XCell™ C24 Controller to the floor framing. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, each anchor is required to have a capacity to resist a pullout force of 40 pounds (0.2 kN) and a shear force of 20 pounds (0.1 kN) applied in any horizontal direction parallel to the floor.

Where the XCell™ C24 Controller is attached to a table or lab bench, the recommended anchorage is four 1/4-inch (10 mm) diameter stainless steel grade SS 304 bolts, through-bolted to the table or lab bench. Where the XCell™ C24 Controller is attached to the concrete floor slab, the recommended anchorage is the use of four 1/4-inch (6 mm) diameter stainless steel Hilti KB TZ2 anchors. The minimum embedment of the anchors is 1-3/4 inches (45 mm) and the minimum concrete thickness is 4 inches (100 mm). The recommended spacing of the anchors for either floor or table/lab bench anchors is 12 inches (30 cm) and 7 inches (18 cm), as shown in Figure 19.

Figure 19. Recommended seismic anchorage for attaching the XCell™ C24 Controller to the support bench or floor

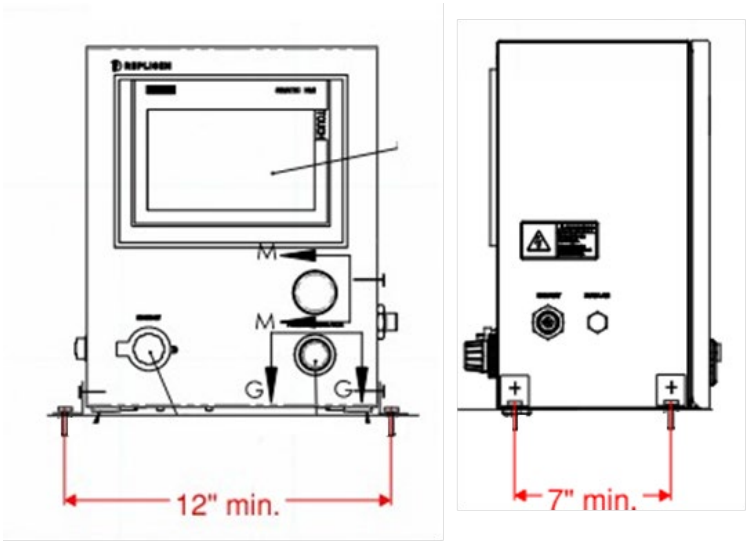


Figure 20. Original WJE Seismic Anchorage Report cover (XCell™ C410 Controller with Cart)

WJE

Seismic Anchorage

XCell™ C410 Controller With Cart

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

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Seismic Anchorage

XCell™ C410 Controller With Cart

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FINAL REPORT
March 10, 2022
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54. Evaluating XCell™ C410 Controller with Cart for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell™ C410 Controller for seismic loads. Where seismic loading of equipment, such as the XCell™ C410 Controller is required by the local building code, the equipment needs to be anchored to the building framing.

55. Description: XCell™ C410 Controller with Cart

The XCell™ C410 Controller with Cart is a control device for the XCell ATF® 4, ATF® 6, and ATF® 10 series devices. The XCell™ C410 Controller is comprised of three separate components: the E-Box, the P-Box, and the Power Separation box. The E-Box is a rectangular unit that is 24 inches (910 mm) tall by 24 inches (610 mm) wide by 9 inches (229 mm) deep. The P-box and Power Separation Box are both 16 inches (406 mm) tall by 15 inches (381 mm) wide by 9.5 inches (241 mm) deep.

The XCell™ C410 Controller is intended to be mounted to a wall or supported on the optional cart. The cart is fabricated with stainless steel and has a length of about 24.7 inches (628.7 mm), and width of about 23.5 inches (596.9 mm) and a height of about 55.6 inches (1411 mm). The cart includes four, 5-inch (127 mm) diameter casters for moving the controller. The rear casters include a brake.

56. Design Criteria: XCell™ C410 Controller with Cart

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell™ C410 Controller, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

57. Seismic Anchorage Analysis: XCell™ C410 Controller with Cart

The XCell™ C410 Controller includes three separate items: the Controller Electronic Panel (E-Box), the Pneumatic Enclosure (P-Box), and the Power Separation Box. The XCell™ C410 Controller has the option to be mounted onto a cart for portability. When the cart is stationary, attachment of the cart with the controllers to the structure is required to resist seismic forces as calculated by the CBC, IBC, and BSLJ to prevent overturning, rolling, or sliding.

The seismic design force for the parts of the C410 Controller and the cart have been calculated based on the upper bound values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces are considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 21 for the cart loaded with the three boxes. The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 22 for the cart loaded with the three boxes.

Table 21. Seismic Design Force for XCell™ C410 Controller E-Box Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	80 lb (0.40 kN)
SDC C	Roof	120 lb (0.60 kN)
SDC D (S_{DS} = 1.0)	Roof	240 lb (1.20 kN)
SDC D (SDS = 1.5)	Ground Floor	120 lb (0.60 kN)
SDC D (S_{DS} = 1.5)	Roof	360 lb (1.70 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	160 lb (0.80 kN)
SDC D (S_{DS} = 2.0)	Roof	480 lb (2.30 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

Table 22. Seismic Design Force for XCell™ C410 Controller E-Box Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	60 lb (0.30 kN)
0.7	Roof	140 lb (0.70 kN)
0.8	Ground Floor	60 lb (0.30 kN)
0.8	Roof	160 lb (0.80 kN)
1.0	Ground Floor	80 lb (0.40 kN)
1.0	Roof	200 lb (1.00 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

58. Seismic Anchorage Recommendations: XCell™ C410 Controller with Cart

Where the E-Box, P-Box, and Power Separation Box for the XCell™ C410 Controller are mounted to on the cart, the cart needs to be secured to an adjacent wall when stationary. Two straps or chains can be connected to the cart and secured to the adjacent wall framing. When securing the cart to wall framing, the strap or chain, the attachment of the strap or chain to the cart, and the attachment of the strap or chain to the wall are required to support the seismic loads of the cart and the seismic loads of the components on the cart. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, the strap or chain is required to resist 580 pounds (2.6 kN) in tension. The straps or chains should be secured to the cart with a minimum of four #10 sheet metal screws at a minimum height of 35 inches (89 mm) above the floor. When secured to the wall, the brakes for the casters should be engaged.

The attachment of the straps or chains to the wall should be at the same height as the attachment to the cart, as shown in Figure 21. The straps or chains should be splayed outward at an angle of about 45 degrees from the cart to the adjacent wall.

Where the wall to which the cart is to be anchored is constructed with steel studs, the anchors used to connect each end of the strap or chain to the wall should be four No. 10 sheet metal screws attached to the studs or to blocking. The studs or blocking need to have a minimum thickness of 0.0566 inches (1.44 mm).

Where the wall to which the cart is to be attached is constructed with wood studs, the anchors used to connect the straps for the cart to the wall should be two 1/4 inch (6 mm) diameter wood screws attached to the studs or to blocking with an embedment length of at least 2 inches (50 mm) into the wood studs or blocking. The wood studs or blocking should be a minimum of 3 inches (76 mm) in width and the screws need to be centered on the wood studs or blocking.

For many installations, it may be preferable to mount a horizontal steel channel, such as a Unistrut or b- line, to the wall using screws to attach to each stud along the length of the channel. A minimum of four screws are required along the length of the channel. For walls with wood studs.

Figure 21. Recommended seismic anchorage for attaching the XCell™ C410 Controller Cart to a wall

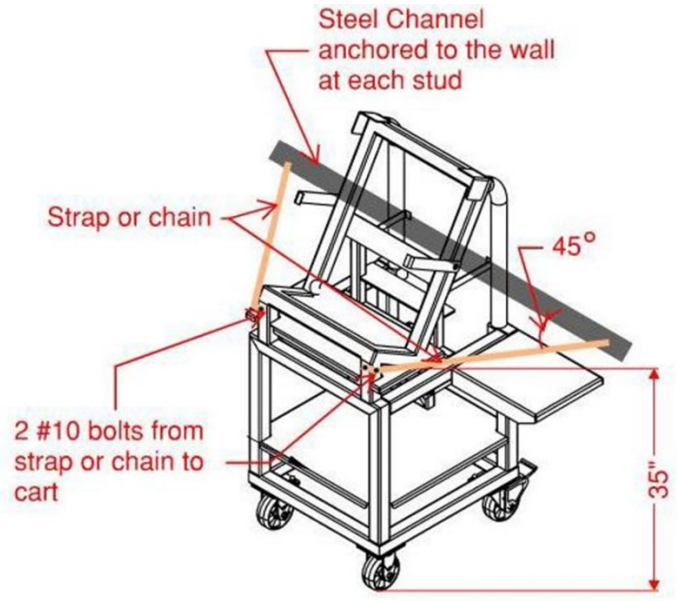

Figure 22. Original WJE Seismic Anchorage Report cover (XCell™ C410 Controller without Cart)

WJE

Seismic Anchorage

XCell™ C410 Controller Without Cart

FINAL REPORT
March 10, 2022
WJE No. 2021.3262

PREPARED FOR:
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Seismic Anchorage

XCell™ C410 Controller Without Cart

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FINAL REPORT
March 10, 2022
WJE No. 2021.3262

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59. Evaluating XCell™ C410 Controller for Seismic Loads

Wiss, Janney, Elstner Associates, Inc. (WJE) was engaged by Repligen to evaluate the XCell™ C410 Controller for seismic loads. Where seismic loading of equipment, such as the XCell™ C410 Controller is required by the local building code, the equipment needs to be anchored to the building framing.

60. Description: XCell™ C410 Controller

The XCell™ C410 Controller is a controller for the XCell ATF® 4, ATF® 6, and ATF® 10 series devices. The XCell™ C410 Controller is comprised of three separate components: the E- Box, the P-Box, and the Power Separation box. The E-Box is a rectangular unit that is 24 inches (910 mm) tall by 24 inches (610 mm) wide by 9 inches (229 mm) deep. The P-box and Power Separation Box are both 16 inches (406 mm) tall by 15 inches (381 mm) wide by 9.5 inches (241 mm) deep.

These XCell™ C410 Controller is intended to be mounted to a wall or supported on a cart.

61. Design Criteria: XCell™ C410 Controller

With limited exceptions, nonstructural components within buildings located in areas where seismic design loads are considered are required to be anchored to the structural framing for the building. Friction due to the weight of the component is not permitted as a means of resisting horizontal seismic forces. The component lateral seismic force, and related anchorage forces, used to evaluate the anchorage of nonstructural components are prescribed by the applicable building code. For the XCell™ C410 Controller, the forces are calculated based on the 2018 edition of the International Building Code (IBC) 2018, the 2019 edition of the California Building Code (CBC), and 2016 edition of Building Standard Law of Japan (BSLJ).

62. Seismic Anchorage Analysis: XCell™ C410 Controller

The XCell™ C410 Controller includes three separate items: the Controller Electronic Panel (E-Box), the Pneumatic Enclosure (P-Box), and the Power Separation Box. Attachment to the structure is required for each item to resist seismic forces as calculated by the CBC, IBC, and BSLJ. The seismic design force for the parts of the XCell™ C410 Controller have been calculated separately based on maximum values determined by these codes and standards based on seismic hazard and location within the building. The seismic forces considered as acting in any horizontal direction and the attachment to the structure is required to resist horizontal seismic forces and vertical forces resulting from overturning and gravity loads.

The design seismic forces for a range of seismic hazards and locations within the building for the IBC and CBC are summarized in Table 23, Table24, and Table 25 for the E-Box, the P-Box, and the Power Separation Box, respectively. The values in this table have been round up to the nearest 20 pounds (0.10 kN).The design seismic forces for various seismic hazards and locations within the building using Notification 1388 of the BSLJ are summarized in Table 26, Table 27, and Table 6 for the E-Box, the P-Box, and the Power Separation Box, respectively. These values were rounded up to the nearest 0.1 kN (20 pounds).

Table 23. Seismic Design Force for XCell™ C410 Controller E-Box Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	40 lb (0.20 kN)
SDC D (S_{DS} = 1.0)	Roof	100 lb (0.40 kN)
SDC D (SDS = 1.5)	Ground Floor	40 lb (0.20 kN)
SDC D (S_{DS} = 1.5)	Roof	140 lb (0.60 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	60 lb (0.30 kN)
SDC D (S_{DS} = 2.0)	Roof	180 lb (0.80 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

Table 24. Seismic Design Force for XCell™ C410 Controller P-Box Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	20 lb (0.10 kN)
SDC D (S_{DS} = 1.0)	Roof	40 lb (0.20 kN)
SDC D (SDS = 1.5)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 1.5)	Roof	60 lb (0.30 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 2.0)	Roof	80 lb (0.40 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

Table 25. Seismic Design Force for XCell™ C410 Controller Power Separation Box Using IBC and CBC

Seismic Hazard	Location Within the Building	Horizontal Seismic Force
SDC B	Roof	20 lb (0.10 kN)
SDC C	Roof	20 lb (0.10 kN)
SDC D (S_{DS} = 1.0)	Roof	20 lb (0.20 kN)
SDC D (SDS = 1.5)	Ground Floor	20 lb (0.10 kN)
SDC D (S_{DS} = 1.5)	Roof	40 lb (0.30 kN)
SDC D (S_{DS} = 2.0)	Ground Floor	20 lb (0.20 kN)
SDC D (S_{DS} = 2.0)	Roof	40 lb (0.40 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

Table 26. Seismic Design Force for XCell™ C410 Controller E-Box Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	20 lb (0.10 kN)
0.7	Roof	60 lb (0.20 kN)
0.8	Ground Floor	20 lb (0.10 kN)
0.8	Roof	60 lb (0.30 kN)
1.0	Ground Floor	40 lb (0.10 kN)
1.0	Roof	80 lb (0.30 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

Table 27. Seismic Design Force for XCell™ C410 Controller P-Box Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	10 lb (0.10 kN)
0.7	Roof	20 lb (0.10 kN)
0.8	Ground Floor	10 lb (0.10 kN)
0.8	Roof	20 lb (0.10 kN)
1.0	Ground Floor	20 lb (0.10 kN)
1.0	Roof	40 lb (0.20 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

Table 28. Seismic Design Force for XCell™ C410 Controller Power Separation Box Using BSLJ

Seismic Intensity	Location Within the Building	Horizontal Seismic Force
0.7	Ground Floor	5 lb (0.02 kN)
0.7	Roof	10 lb (0.05 kN)
0.8	Ground Floor	5 lb (0.05 kN)
0.8	Roof	15 lb (0.07 kN)
1.0	Ground Floor	10 lb (0.05 kN)
1.0	Roof	15 lb (0.07 kN)

Note: *Value rounded to the nearest 20 pounds (0.1 kN).*

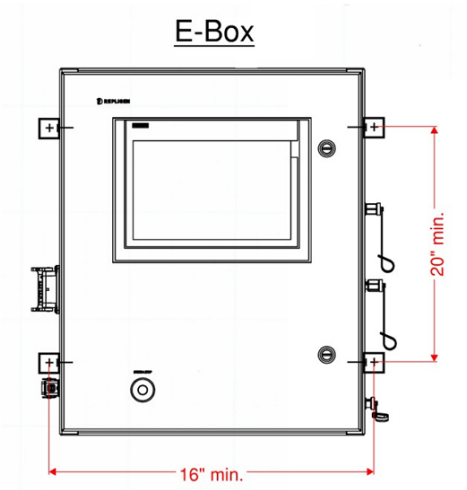
63. Seismic Anchorage Recommendations: XCell™ C410 Controller

The anchorage requirements for each of the components of the XCell™ C410 Controller where these components are mounted to a wall are described below.

63.1 E-Box Anchorage

When mounting the -Box to a wall where seismic loads are required to be resisted, the attachment of the E-Box is required to support its weight in addition to the seismic loads. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, a minimum of four anchors are required to connect the E-Box to the wall framing. Each anchor is required to have a capacity to resist a pullout force of 50 pounds (0.2 kN) and a shear force of 75 pounds (0.3 kN) applied in any direction parallel to the plane of the wall. The recommended spacing of these anchors is 16 inches (41 cm) in the vertical direction and 24 inches (61 cm) in the horizontal direction, as shown in Figure 23.

Figure 23. Recommended seismic anchorage for attaching the E-Box to a wall



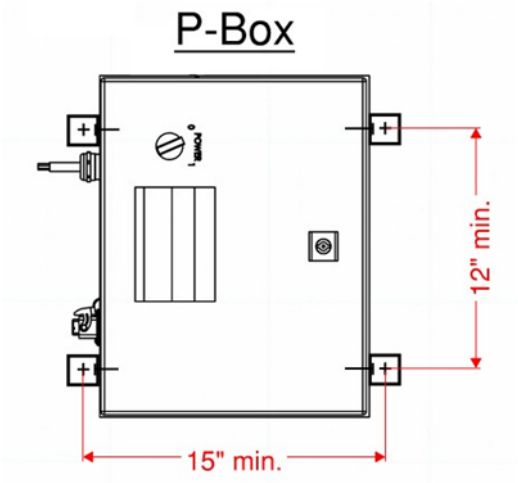
Where the wall to which the E-Box is to be attached is constructed with steel studs, the anchors used to connect the E-Box to the wall should be No. 10 sheet metal screws attached to the studs or to blocking. The studs or blocking need to have a minimum thickness of 0.0283 inches (0.72 mm).

Where the wall to which the E-Box is to be attached is constructed with wood studs, the anchors used to connect the E-Box to the wall should be No. 10 wood screws attached to the studs or to blocking with an embedment length of at least 1 inch (25 mm) into the wood studs or blocking.

63.2 P-Box Anchorage

When mounting the P-Box to a wall where seismic loads are required to be resisted, the attachment of the P-Box is required to support its weight in addition to the seismic loads. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, a minimum of four anchors are required to connect the P-Box to the wall framing. Each anchor is required to have a capacity to resist a pullout force of 50 pounds (0.25 kN) and a shear force of 50 pounds (0.25 kN) applied in any direction parallel to the plane of the wall. The recommended spacing of these anchors is 12 inches (31 cm) in the vertical direction and 15 inches (38 cm) in the horizontal direction, as shown in Figure 24.

Figure 24. Recommended seismic anchorage for attaching the P-Box to a wall



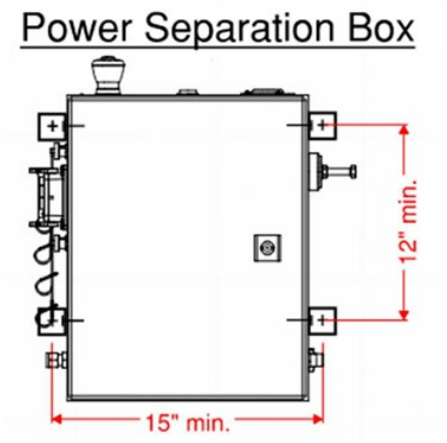
Where the wall to which the P-Box is to be attached is constructed with steel studs, the anchors used to connect the P-Box to the wall should be No. 8 sheet metal screws attached to the studs or to blocking. The studs or blocking need to have a minimum thickness of 0.0283 inches (0.72 mm).

Where the wall to which the P-Box is to be attached is constructed with wood studs, the anchors used to connect the P-Box to the wall should be No. 8 wood screws attached to the studs or to blocking with an embedment length of at least 1 inch (25 mm) into the wood studs or blocking.

63.3 Power Separation Box Anchorage

When mounting the Power Separation Box to a wall where seismic loads are required to be resisted, the attachment of the Power Separation Box is required to support its weight in addition to the seismic loads. For the maximum seismic design force corresponding to the highest seismic hazard for the CBC and IBC, a minimum of four anchors are required to connect the Power Separation Box to the wall framing. Each anchor is required to have a capacity to resist a pullout force of 20 pounds (0.10 kN) and a shear force of 20 pounds (0.10 kN) applied in any direction parallel to the plane of the wall. The recommended spacing of these anchors is 12 inches (31 cm) in the vertical direction and 15 inches (38 cm) in the horizontal direction, as shown in Figure 25.

Figure 25. Recommended seismic anchorage for attaching the Power Separation Box to a wall



Where the wall to which the Power Separation Box is to be attached is constructed with steel studs, the anchors used to connect the Power Separation Box to the wall should be No. 8 sheet metal screws attached to the studs or to blocking. The studs or blocking need to have a minimum thickness

of 0.0283 inches (0.72 mm).

Where the wall to which the Power Separation Box is to be attached is constructed with wood studs, the anchors used to connect the Power Separation Box to the wall should be No. 8 wood screws attached to the studs or to blocking with an embedment length of at least 1 inch (25 mm) into the wood studs or blocking.