Washington State School Seismic Safety Assessments Project

SEISMIC UPGRADES CONCEPT DESIGN REPORT

Lake Roosevelt Jr/Sr High, Lake Roosevelt Elementary – CTE/Gym Building

Grand Coulee Dam School District

June 2019

PREPARED FOR

Washington Department of Natural Resources

Superintendent of Public Instruction, Washington

PREPARED BY

DYKEMAN · rolluda architects · PRODIMS · BergerABAM · DCI Engineers · wrk engineers · Reid Middleton

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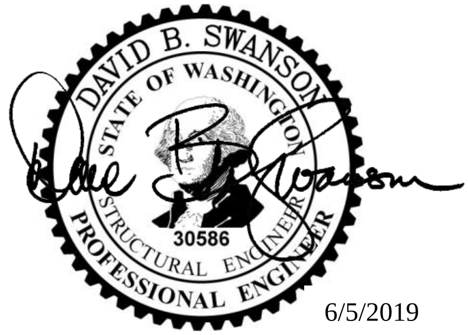

6/5/2019

Prepared by:

DCI ENGINEERS
707 W 2nd Ave
Spokane, WA 99201
509-455-4448
File No. 262018.063
info@dci-engineers.com

ReidMiddleton
728 134th Street SW, Suite 200
Everett, WA 98204
425-741-3800
File No. 262018.063
www.reidmiddleton.com

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EXECUTIVE SUMMARY

This report documents the findings of a preliminary seismic evaluation of the Lake Roosevelt High School Gymnasium and Career and Technical Education (CTE) building in Coulee Dam, Washington. The building is on the joint campus of the K-6 Elementary School and the 7-12 Junior/Senior High School. The campus serves approximately 375 elementary students and 340 junior and senior high students. The building serves as the gymnasium and classroom space for the Senior High School. The Gym/CTE building, approximately 46,300 square feet overall, includes a 19,000-square-foot, single-story metal building over a walk-out basement of approximately the same size and an 8,300-square-foot, single-story wood-framed wing to the east. The metal building contains a gymnasium, a stage, music rooms, and computer labs on the main floor, with locker rooms, a weight room, mechanical rooms, and maintenance rooms in the basement. The wood-framed wing contains classrooms and administrative offices. The structure was built in 1955, and an architectural remodel prior to 1995 updated the main entrance of the building. An architectural remodel around 2014 removed an additional wood-framed extension from the northeast end of the wood-framed wing.

The metal building consists of moment frames in the transverse direction with rod bracing in the longitudinal direction. The infill walls are wood-framed; the north end of the structure also appears to be wood-framed. The main floor is composed of wood joists supported by wide-flange steel beams on steel columns. The wood-framed wing is assumed to use bearing and shear exterior and corridor walls. The foundation system is continuous shallow foundations along the basement and stem walls, with shallow spread footings at the interior columns and moment frame columns.

DCI Engineers performed a Tier 1 screening in accordance with the ASCE 41-17 standard *Seismic Evaluation and Retrofit of Existing Buildings*. The evaluation included field observations and review of record drawings to verify the existing construction. The structural seismic evaluation indicated that the building has seismic deficiencies that are assumed to include noncompliant moment-resisting connections. Other deficient items include unanchored tall contents and unrestrained fall-prone contents. Unknown items that are assumed to be compliant include complete load paths, adequate diaphragm connectivity, adequate brace axial stress, and compact members.

Conceptual seismic upgrade recommendations for structural and nonstructural systems are provided to improve the performance of the building to meet the Life Safety structural performance objective of ASCE 41-17. Sketches for the concept-level seismic upgrades are provided in Appendix B. The structural upgrades include additional cross-bracing members and added flange cover plates. The recommendations for nonstructural upgrades include anchoring lockers, cabinets, and mobile storage units to adjacent structure and restraining fall-prone contents. Many nonstructural items were noted as unknown; general recommendations are included for many of those items.

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Acronyms

ADA	Americans with Disabilities Act
ASCE	American Society of Civil Engineers
BPOE	Basic Performance Objective for Existing Buildings
BSE	Basic Safety Earthquake
BU	Built-Up
CMU	Concrete Masonry Unit
CP	Collapse Prevention
DNR	Department of Natural Resources
DCR	Demand-to-Capacity Ratio
EERI	Earthquake Engineering Research Institute
EPAT	EERI Earthquake Performance Assessment Tool
FEMA	Federal Emergency Management Agency
IBC	International Building Code
ICOS	Information and Condition of Schools
IEBC	International Existing Building Code
IO	Immediate Occupancy
LS	Life Safety
MCE	Maximum Considered Earthquake
MEP	Mechanical/Electrical/Plumbing
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
OSPI	Office of the Superintendent of Public Instruction
PBEE	Performance-Based Earthquake Engineering
PR	Position Retention
ROM	Rough Order-of-Magnitude
SSSSC	School Seismic Safety Steering Committee
UBC	Uniform Building Code
USGS	United States Geological Survey
WF	Wide Flange
WGS	Washington Geological Survey

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Promoting Seismic Safety: Guidance for Advocates. Prepared by https://www.fema.gov/media-library/assets/documents/3229

Drawings

United States, Department of the Interior Bureau of Reclamation, Columbia Basin Project – Washington, Town of Coulee Dam.

1.0 Introduction

1.1 Background

The Washington Geological Survey (WGS), a division of the Department of Natural Resources (DNR), is conducting a seismic assessment of 222 school buildings and 5 fire stations across Washington State to better understand the current level of seismic risk of Washington State's public-school buildings. The two main components of this project are: (1) geologic site characterization, and (2) the seismic assessment of buildings. As a part of the seismic assessments, Tier 1 screening of structural systems and nonstructural assessments were performed in accordance with the American Society of Civil Engineers' (ASCE) Standard 41-17 *Seismic Evaluation and Retrofit of Existing Buildings*. Concept-level seismic upgrades were developed to address the identified deficiencies of a select number of school buildings to evaluate seismic upgrade strategies, feasibilities, and implementation costs.

Fifteen school buildings were selected in consultation with WGS and the School Seismic Safety Steering Committee (SSSSC) to receive concept-level seismic upgrade designs utilizing the ASCE 41 Tier 1 evaluation results. This report documents the concept-level seismic upgrade design for one of those school buildings. The concept-level seismic upgrades will include structural and nonstructural seismic upgrade recommendations, with concept-level sketches and rough order-of-magnitude (ROM) construction costs determined for each building. The fifteen school buildings were selected from the list of schools with the intent of representing a variety of regions, building uses, construction eras, and construction materials.

The overall goal of the project is to provide a better understanding of the current seismic risk of our state's K-12 school buildings and what needs to be done to improve the buildings in accordance with ASCE 41 to meet seismic performance objectives.

The seismic evaluation consists of a Tier 1 screening for the structural systems performed in accordance with ASCE 41-17.

1.2 Scope of Services

The project is being performed in several distinct and overlapping phases of work. The scope of this report is as listed in the following sections.

1.2.1 Information Review

1. Project Research: Reid Middleton and their project team researched available school building records, such as relevant site data and record drawings, in advance of the field investigations. This research included searching school building records and contacting the districts and/or the Office of Superintendent of Public Instruction (OSPI) to obtain building plans, seismic reports, condition reports, property records, or related construction information useful for the project.

2. Site Geologic Data: Site geological data provided by the WGS, including site shear wave velocities, was utilized to determine the project Site Class in accordance with ASCE 41, which is included in the Tier 1 checklists and concept-level seismic upgrades design work.

1.2.2 Field Investigations

1. Field Investigations: Each of the identified buildings was visited to observe the building's age, condition, configuration, and structural systems for the purposes of the ASCE 41 Tier 1 seismic evaluations. This task included confirmation of general information in building records or layout drawings and visual observation of the structural condition of the facilities. Engineer field reports, notes, photographs, and videos of the facilities were prepared and utilized to record and document information gathered in the field investigation work.

2. Limitations Due to Access and Worker Safety: Field observations at each site were typically performed by an individual engineer. Observation efforts were limited to areas and building elements that were readily observable and safely accessible. Observations requiring access to confined spaces, potential hazardous material exposure, access by unsecured ladder, work around energized equipment or mechanical hazards, access to areas requiring Occupational Safety and Health Administration (OSHA) fall-protection, steep or unstable slopes, deteriorated structural assemblies, or other conditions deemed potentially unsafe by the engineer were not performed. Removal of finishes (e.g., gypsum board, lathe and plaster, brick veneer, roofing materials) for access to concealed conditions or to expose elements that could not otherwise be visually observed and assessed was not performed. Material testing or sampling was not performed. The ASCE checklist items that were not documented due to access limitations are noted.

1.2.3 Seismic Evaluations

1. Preliminary Seismic Evaluations: Preliminary seismic assessments of the structural and nonstructural systems of the school buildings were performed in accordance with ASCE 41-17 Tier 1 Evaluation Procedures.

2. Concept-Level Designs: Further seismic evaluation work was performed to provide concept-level seismic retrofits and/or upgrade designs for the selected school buildings based on the results of the Tier 1 seismic evaluations. The concept-level seismic upgrades design work included narrative descriptions of proposed seismic retrofits and/or upgrade schemes and concept sketches depicting the extent and type of recommended structural upgrades.

3. Cost Estimating: Through the concept-level seismic upgrades design process, ProDims provided opinions of probable construction costs for the concept-level seismic upgrade designs for the selected school buildings. These concept-level seismic upgrade designs and the associated opinions of probable construction costs are intended to be representative samples that can be extrapolated to estimate the overall capital needs of seismically upgrading Washington State schools.

1.2.4 Reporting and Documentation

1. Project Reports: A preliminary seismic evaluation report on the overall Tier 1 seismic assessment of the schools will be provided to DNR/WGS and OSPI. The Tier 1 seismic evaluation of each building was documented by a standard report format that provides a summary of the structural systems of the building, Tier 1 checklist, building sketches/plans (if available), and site photographs. The reports will summarize the seismic evaluation, with concept-level seismic upgrade sketches and opinions of probable construction costs for seismic upgrades for each school building.

2. Building Photography: Photos and videos were taken of each building during on-site walkthroughs to document the existing building configurations, conditions, and structural systems.

3. Record Drawings: Record drawings and other information that was collected during the evaluation process are available for DNR/WGS, OSPI, and the school districts.

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2.0 Seismic Evaluation Procedures and Criteria

2.1 ASCE 41 Seismic Evaluation and Retrofit Overview

The current standard for seismic evaluation and retrofit (upgrades) of existing buildings is ASCE 41-17. ASCE 41 provides screening and evaluation procedures used to identify potential seismic deficiencies that may require further investigation or hazard mitigation. It presents a three-tiered review process, implemented by first following a series of predefined checklists and "quick check" structural calculations. Each successive tier is designed to perform an increasingly refined evaluation procedure for seismic deficiencies identified in previous tiers in the process. The flow chart in Figure 2.1 illustrates the evaluation process.

TIER 1 – Screening Phase
- Checklists of evaluation statements to quickly identify potential deficiencies
- Requires field investigation and/or review of record drawings
- Analysis limited to "Quick Checks" of global elements
- May proceed to Tier 2, Tier 3, or rehabilitation design if deficiencies are identified

TIER 2 – Evaluation Phase
- "Full Building" or "Deficiency Only" evaluation
- Address all Tier 1 seismic deficiencies
- Analysis more refined than Tier 1, but limited to simplified linear procedures
- Identify buildings not requiring rehabilitation

TIER 3 – Detailed Evaluation Phase
- Component-based evaluation of entire building using reduced ASCE 41 forces
- Advanced analytical procedures available if Tier 1 and/or Tier 2 evaluations are judged to be overly conservative
- Complex analysis procedures may result in construction savings equal to many times their cost

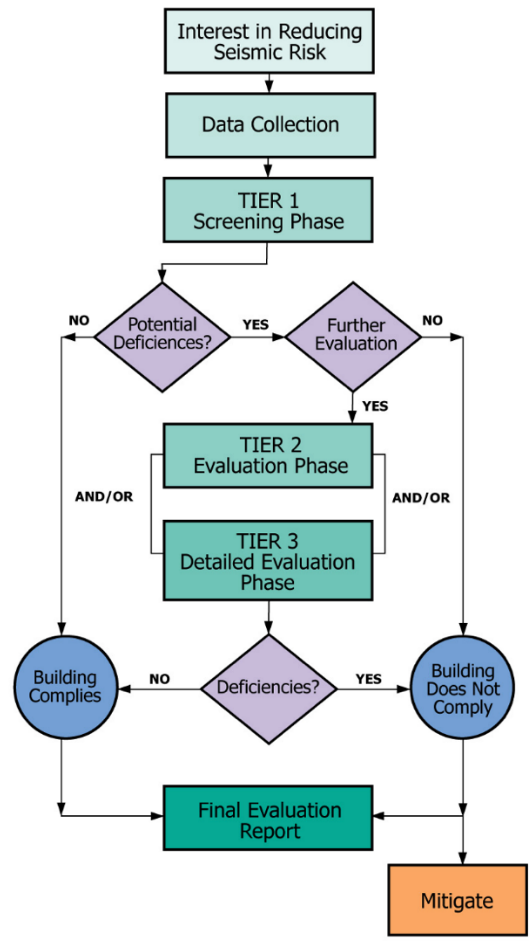

Figure 2-1. Flow Chart and Description of ASCE 41 Seismic Evaluation Procedure.

The Tier 1 checklists in ASCE 41 are specific to each common building type and contain seismic evaluation statements based on observed structural damage in past earthquakes. These checklists screen for potential seismic deficiencies by examining the lateral-force-resisting systems and details of construction that have historically caused poor seismic performance in similar buildings. Tier 1 screenings include basic "Quick Check" analyses for primary components of the lateral system: in this building's case, the metal building frames and braces as well as the shear walls and anchorage. Tier 1 screenings also include prescriptive checks for proper seismic detailing of connections, diaphragm spans and continuity, and overall system configuration.

Tier 2 evaluations then follow with more-detailed structural and seismic calculations and assessments to either confirm the potential deficiencies identified in the Tier 1 review or demonstrate their adequacy. A Tier 3 evaluation involves an even more detailed analysis and advanced structural and seismic computations to review each structural component's seismic demand and capacity. A Tier 3 evaluation is similar in scope and complexity to the types of analyses often required to design a new building in accordance with the International Building Code (IBC), with a comprehensive analysis aimed at evaluating each component's seismic performance. Generally, Tier 3 evaluations are not practical for typical and regular-type buildings due to the rigorous and complicated calculations and procedures. As indicated in the Scope of Services, this evaluation included a Tier 1 screening of the structural systems.

2.2 Seismic Evaluation and Retrofit Criteria

Performance-Based Earthquake Engineering (PBEE) can be defined as the engineering of a structure to resist different levels of earthquake demand in order to meet the needs and performance objectives of building owners and other stakeholders. ASCE 41 employs a PBEE design methodology that allows building owners, design professionals, and the local building code authorities to establish seismic hazard levels and performance goals for individual buildings.

2.2.1 Lake Roosevelt K-12 School Seismicity

Seismic hazards for the United States have been quantified by the United States Geological Survey (USGS). The information has been used to create seismic hazard maps, which are currently used in building codes to determine the design-level earthquake magnitudes for building design.

The Level of Seismicity is categorized as Very Low, Low, Moderate, or High based on the probabilistic ground accelerations. Ground accelerations and mass generate inertial (seismic) forces within a building (Force = mass x acceleration). Ground acceleration therefore is the parameter that classifies the level of seismicity. From geographic region to region, as the ground accelerations increase, so does the level of seismicity (from low to high). Where this building is located, the design short-period spectral acceleration, S_{DS}, is 0.298 g, and the design 1-second period spectral acceleration, S_{D1}, is 0.157 g. Based on ASCE 41 Table 2-4, the Level of Seismicity for this building is classified as **Low**.

The ASCE 41 Basic Performance Objective for Existing Buildings (BPOE) makes use of the Basic Safety Earthquake – 1E (BSE-1E) seismic hazard level and the Basic Safety Earthquake – 2E (BSE-2E). The BSE-1E earthquake is defined by ASCE 41 as the probabilistic ground motion with a 20 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 225-year return period. The BSE-2E earthquake is defined by ASCE 41 as the probabilistic ground motion with a 5 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 975-year return period. The BSE-2N seismic hazard level is the Maximum Considered Earthquake (MCE) ground motion used in current codes for the design of new buildings and is also used in ASCE 41 to classify the Level of Seismicity for a building. The BSE-2N has a statistical ground motion acceleration with 2 percent probability of exceedance in 50 years, or otherwise characterized as a ground motion acceleration with a probabilistic 2,475-year return period.

Table 2.2.1-1 provides the spectral accelerations for the 225-year, 975-year, and 2,475-year return interval events specific to Lake Roosevelt K-12 School that are considered in this study.

Table 2.2.1-1. Spectral Acceleration Parameters (Not Site-Modified).

BSE-1E 20%/50 (225-year) Event		BSE-1N 2/3 of 2,475-year Event		BSE-2E 5%/50 (975-year) Event		BSE-2N 2%/50 (2,475-year) Event	
0.2 Seconds	0.108 g	0.2 Seconds	0.249 g	0.2 Seconds	0.251 g	0.2 Seconds	0.373 g
1.0 Seconds	0.042 g	1.0 Seconds	0.095 g	1.0 Seconds	0.10 g	1.0 Seconds	0.142 g

2.2.2 Lake Roosevelt K-12 School Structural Performance Objective

The school building is an Educational Group E Occupancy (Risk Category III) structure and has not been identified as a critical structure requiring immediate use following an earthquake. However, Risk Category III buildings are structures that represent a substantial hazard to human life in the event of failure. According to ASCE 41, the BPOE for Risk Category III structures is the Damage Control structural performance level at the BSE-1E seismic hazard level and the Life Safety structural performance level at the BSE-2E seismic hazard level. The ASCE 41 Tier 1 evaluations were conducted in accordance with ASCE 41 requirements and ASCE 41 seismic performance levels. Concept-level upgrades were developed for the **Life Safety** structural performance level at the **BSE-2E** seismic hazard level in accordance with DNR direction, the project scope of work, and the project legislative language.

At the Life-Safety performance level, the building may sustain damage while still protecting occupants from life-threatening injuries and allowing occupants to exit the building. Structural and nonstructural components may be extensively damaged, but some margin against the onset of partial or total collapse remains. Injuries to occupants or persons in the immediate vicinity may occur during an earthquake; however, the overall risk of life-threatening injury as a result of structural damage is anticipated to be low. Repairs may be required before reoccupying the building, and, in some cases, repairs may be economically unfeasible.

Knowledge Factor

A knowledge factor, *k*, is an ASCE 41 prescribed factor that is used to account for uncertainty in the as-built data considering the selected Performance Objective and data collection processes (availability of existing drawings, visual observation, and level of materials testing). No in-situ testing of building materials was performed, however, some material properties and existing construction information were provided in the existing record drawings. If the concept design is developed further, additional materials tests and site investigations will be required to substantiate assumptions about the existing framing systems.

ASCE 41 Classified Building Type

Use of ASCE 41 for seismic evaluations requires buildings to be classified from a group of common building types historically defined in previous seismic evaluation standards (ATC-14, FEMA 310, and ASCE 31-03). The gymnasium is classified in ASCE 41 Table 3-1 as a Metal Building Frame, S3. Metal Building Frame (S3) buildings are those with transverse steel moment frames. They are one-story high with roof walls of lightweight metal, fiberglass, or cementitious panels.

2.3 Report Limitations

The professional services described in this report were performed based on available record drawing information and limited visual observation of the structure. No other warranty is made as to the professional advice included in this report. This report provides an overview of the seismic evaluation results and does not address programming and planning issues. This report has been prepared for the exclusive use of DNR/WGS and is not intended for use by other parties, as it may not contain sufficient information for purposes of other parties or their uses.

3.0 Building Description & Seismic Evaluation Findings

3.1 Building Overview

3.1.1 Building Description

Original Year Built: 1955
Building Code: Unknown

Number of Stories: 1 + Partial Basement
Attic Below Roof: Partial
Floor Area: 46,300 SF

FEMA Building Type: S3
ASCE 41 Level of Seismicity: Low
Site Class: D

The Gym/CTE building is approximately 46,300 square feet overall. It is comprised of a 19,000-square-foot, single-story metal building over a walk-out basement of approximately the same size and an 8,300-square-foot, single-story, wood-framed wing to the east. The original structure was built around 1955, and an architectural remodel prior to 1995 revamped the main entrance of the building. Another remodel around 2014 removed the northeast end of the wood-framed wing.

The structural system consists of a metal building frame with transverse moment frames and rod bracing in the longitudinal direction. The exterior basement walls are concrete. The interior basement walls are concrete beams spanning between concrete columns. The single-story wing is made up of wood-framed shear and bearing walls with a wood truss roof structure.

The foundation system for the main building consists of shallow continuous footings under the stem-and-basement walls and shallow spread footings below the concrete columns and at the moment-frame columns. The foundation system for the addition is shallow continuous footings under the interior and exterior bearing walls.

3.1.2 Building Use

The metal building contains a gymnasium, a stage, music rooms, and computer labs on the main floor, with locker rooms, a weight room, mechanical rooms, and maintenance rooms in the basement. The wood-framed wing contains classrooms and offices.

3.1.3 Structural System

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
Structural Roof	The roof is wood and steel framed. The roof over the gymnasium consists of 2x decking supported by steel purlins that span between steel moment frame arches. The roofs over the classroom/office areas are decking or sheathing supported by wood trusses.
Structural Floor(s)	The floor of the gymnasium wing is composed of wood planks over 2x12 purlins that span between steel wide-flange beams. The floors in the basement of the gymnasium and in the classroom wing to the east are concrete slabs on grade.
Foundations	Both the gymnasium and classroom wings are supported by conventional shallow concrete footings.
Gravity System	The gymnasium structure is composed mostly of 2x decking over steel roof purlins spanning between steel frames that clear span the gym and are supported by concrete basement walls. The roof at the north portion of this wing is wood-framed and supported by interior wood posts as well as the exterior wood bearing wall. The floor in this area is a post and beam system with wood joists spanning between steel beams that are supported by steel columns at the interior and concrete walls at the perimeter. The classroom wing has wood roof trusses supported by wood bearing walls at the interior and exterior.
Lateral System	In the gymnasium wing, the upper level of the building consists of moment frames in the transverse direction with rod bracing in the longitudinal direction. The north end of the structure appears to be wood-framed with the exterior wall being a wood shear wall. The south end wall may be a concrete shear wall, but this is not clear from the drawings or field investigation. The lower level of this building is composed of concrete shear walls around the perimeter. The classroom wing appears to have a wood diaphragm at the roof with wood shear walls at both the interior and exterior.

3.1.4 Structural System Visual Condition

Table 3.1.4-1. Structural System Condition Descriptions.

Structural System	Description
Structural Roof	Good. No visible signs of corrosion, damage, or deterioration.
Structural Floor(s)	Good. No visible signs of corrosion, damage, or deterioration.

Table 3.1.4-1. Structural System Condition Descriptions.

Structural System	Description
Foundations	Good. No visible signs of corrosion, damage, or deterioration.
Gravity System	Good. No visible signs of corrosion, damage, or deterioration.
Lateral System	Good. No visible signs of corrosion, damage, or deterioration.

3.2 Seismic Evaluation Findings

3.2.1 Structural Seismic Deficiencies

The structural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is provided based on this evaluation.

Table 3.2.1-1. Identified Structural Seismic Deficiencies Based on Tier 1 Checklists.

Deficiency	Description
Moment-Resisting Connections	The frame member connection could not be determined from the drawings provided; however, the connections were observed to be noncompliant, full penetration welds.

3.2.2 Structural Checklist Items Marked as "U"nknown

Where building structural component seismic adequacy was unknown due to lack of available information or limited observation, the structural checklist items were marked as "unknown". These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown structural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is provided based on the evaluation.

Table 3.2.2-1. Identified Structural Checklist Items Marked as Unknown.

Deficiency	Description
Load Path	The existing drawings we were able to review are incomplete, but there appears to be a complete load path and connections between the elements. This is likely compliant, but additional access and as-built information is needed to fully assess this item.
Liquefaction	The liquefaction potential of site soils is unknown at this time given available information. "Low" liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.

Table 3.2.2-1. Identified Structural Checklist Items Marked as Unknown.

Deficiency	Description
Slope Failure	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure.
Surface Fault Rupture	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.
Brace Axial Stress Check	Angle braces were seen, but the member sizes were not provided on the drawings we were able to review.
Transfer to Steel Frames	Detailing of the diaphragm-to-frame connection was not available for review.
Compact Members	The frame member sizes could not be determined from the drawings provided.
Wall Panels	The detailing of the end walls was not shown in the drawings provided.

3.2.3 Nonstructural Seismic Deficiencies

The nonstructural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is provided based on this evaluation. Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 3.2.3-1. Identified Nonstructural Seismic Deficiencies based on Tier 1 Checklists.

Deficiency	Description
S-2 Stair Details	The stairs are detailed as cast-in-place, with no drift/slip allowance at either end.
CF-2 Tall Narrow Contents	Lockers, cabinets, and mobile storage units were observed that meet this criteria and were not anchored to the structure or one another.
CF-3 Fall-Prone Contents	The weights of the instruments on the top shelf in the band room are not known, but some appeared to be greater than 20 pounds and were unrestrained.

3.2.4 Nonstructural Checklist Items Marked as "U"nknown

Where building nonstructural component seismic adequacy was unknown due to lack of available information or limited observation, the nonstructural checklist items were marked as "unknown". These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown nonstructural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is provided based on the evaluation.

Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 3.2.4-1. Identified Nonstructural Seismic Deficiencies based on Tier 1 Checklists.

Deficiency	Description
P-2 Heavy Partitions Supported by Ceilings	Interior concrete masonry unit (CMU) walls were observed and assumed to be connected at the floor and roof lines, but the tops of the walls could not be observed to verify their configuration
C-1 Suspended Lath & Plaster	The ceiling details could not be observed. Most were lay-in acoustic tile, but some lath and plaster type ceilings were also present.
C-2 Suspended Gypsum Board	The ceiling details could not be observed. Most were lay-in acoustic tile, but some gypsum board ceilings were also present.
LF-1 Independent Support	Lay-in light fixtures in suspended ceiling systems were observed, but the bracing details of those fixtures could not be verified.
CG-8 Overhead Glazing	There are a few window panes greater than 16 square feet, but the type of glass used could not be determined.
M-1 Ties	There is a small amount of masonry veneer around the base of a portion of the building, but its detailing could not be verified.
M-3 Weakened Planes	The veneer detailing could not be verified.
M-4 Unreinforced Masonry	The veneer detailing could not be verified.

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4.0 Conclusion and Recommendations

4.1 Seismic-Structural Upgrade Recommendations

The recommendations contained in Sections 4.1 and 4.2 are based on observations during a limited site visit and photographs of an incomplete set of original building drawings. After the site visit, it was noted that the metal building footprint on the drawings was approximately 13,700 square feet, whereas the as-built footprint is almost 19,000 square feet. It was also noted that the frame shapes observed in the field differ from what is shown in the drawings, and that many of the brace members present do not show up in the drawings. The following recommendations are based on limited knowledge of the existing structure, engineering judgement, and historic knowledge of buildings that are of similar age and composition. Prior to any seismic renovation, a thorough set of as-built drawings should be developed to establish the extent of the deficiencies. The assessment was done using the S3 Tier 1 evaluation criteria, with limited time spent investigating the compliance of the wood-framed structure. In a brief review of the Structural Checklist for the wood portion of the building, it is believed the existing structure is compliant.

4.1.1 Moment-Resisting Connections

The moment-resisting connections are assumed to be noncompliant, full-penetration welds. Flange cover plates should be added to each moment-resisting connection to increase the capacity of the connection. It is assumed there are three moment-resisting connections per frame, with six frames total.

4.2 Nonstructural Upgrade Recommendations

Several of the nonstructural items in the building are unknown; recommendations for most items are contained in this section.

4.2.1 Architectural Considerations

This section addresses existing construction that, while not posing specific hazards during a seismic event, would be affected by the seismic improvements proposed.

For existing building remodel projects, the International Existing Building Code (IEBC) is applicable. The intent of the IEBC is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety, and welfare insofar as they are affected by the work being done. Elements of the exterior building envelope being affected by the seismic work would also be required to be brought up to the current Washington State Energy Code per Chapter 5, where applicable.

It should also be noted that as a part of any upgrade to existing buildings, the IEBC will require that any altered primary function spaces (classrooms, gyms, entrances, offices) and routes to these spaces, be made accessible to current accessibility standards per the American with

Disabilities Act (ADA), unless technically infeasible. This would include, but is not limited to: accessible restrooms, paths of travel, entrances and exits, parking, signage, fire alarm system, etc. Under no circumstances should the facility be made less accessible. The IEBC does however have exceptions for areas that do not contain a primary function (storage room, utility rooms) and states that costs of providing the accessible route are not required to exceed 20 percent of the costs of the alterations affecting the area of Primary Function. As with any major renovation and modernization, an ADA study would be recommended to determine the extent to which an existing facility needs to be improved to be in compliance with the ADA.

Heavy Partitions

Concrete masonry unit (CMU) walls were observed in the basement and are assumed to be connected at the floor and ceiling lines, but the assumption could not be confirmed. The connection of the walls at each elevation should be verified.

Ceiling

The ceilings in the building are a combination of suspended acoustical ceiling tiles supported by steel channel systems, lath and plaster ceilings, and gypsum board ceilings. The seismic mitigation recommendations for the architectural systems are as follow:

- Provide ceiling attachments that resist seismic forces to suspended gypsum board and suspended lath and plaster ceilings for every 12 square feet of area. Suspended acoustical ceilings have suffered significant damage in past earthquakes, causing a falling hazard to the occupants during an earthquake.
- Provide independent support with a minimum of two wires diagonally at opposite corners of each fixture for the light fixtures that weigh more per square foot than the suspended ceiling they penetrate. Fluorescent light fixtures are often supported by the suspended ceiling system, causing the light fixtures to become overhead falling hazards during an earthquake. Therefore, light fixtures within the integrated suspended ceilings are required to be independently supported to the structure above with a minimum of two wires at opposite corners.

Overhead Glazing

For interior and exterior glazing panes more than 16 square feet in area, provide laminated annealed or laminated heat-strengthened glass that is detailed to remain in the frame when cracked. Non-laminated glazing that shatters during an earthquake can pose a severe life safety threat to occupants. Shattered exterior windows also compromise the exterior weather barrier, which can become disruptive to the operation of the building after an earthquake.

Stairs

The stair wells are cast-in-place and not detailed specifically to allow drift. The stairwells are assumed to be compliant, as they are flanked by concrete shear walls and will not adversely affect the performance of the lateral system.

Masonry Veneer

A small amount of masonry veneer is present around the base of a portion of the building. The detailing of the veneer could not be verified. The presence of adequate veneer ties should be verified through existing drawings or field verification. This work might impact existing wall and ceiling finishes.

The addition of connection cover plates at joints in wall-roof metal frames may impact interior finishes and ongoing Gymnasium activities.

Contents and Furnishings

The building contains various tall and narrow furniture, such as shelving and storage units, that are freestanding away from any backing walls. This furniture is highly susceptible to toppling if not anchored properly and can become a life safety hazard or adversely affect post-earthquake operations. The recommended seismic mitigation for tall and narrow furniture is:

- Anchor storage cabinets or shelving units that are more than 6 feet high and with a height-to-depth or height-to-width ratio greater than 3-to-1 to the structure or to each other to prevent toppling during an earthquake.
- Provide bracing or restraint for equipment, stored items, or other contents weighing more than 20 pounds and with a center of mass that is more than 4 feet above the adjacent floor level.

4.2.2 Mechanical/Electrical/Plumbing (MEP) Systems

The main seismic concerns for mechanical equipment, ducting, and piping are sliding, swinging, and overturning. Inadequate lateral restraint or anchorage can shift equipment off its supports or topple equipment to the ground or onto other equipment. Inadequate bracing of piping and ducting, or the inability for piping to tolerate differential movement from the equipment it is attached to, can damage or dislodge connections. Such damage in fluid piping can potentially lead to major leaks or loss and disruption by damaging contents. The recommended seismic mitigation for MEP systems is:

- Provide seismic bracing for equipment that weighs more than 20 pounds, has a center of mass more than 4 feet above the adjacent floor level, and is not in-line equipment.

4.3 Opinion of Conceptual Construction Costs

A preliminary opinion of probable construction costs to perform the concept-level seismic upgrade recommendations provided in this report is included in Appendix C. The input for these preliminary probable costs are the Tier 1 checklists and the preliminary concept-level seismic upgrades design recommendations and sketches. These preliminary concept-level design sketches depict a design concept that could be implemented to improve the seismic safety of the building structure. It is important to note that this preliminary seismic upgrades design concept is based on the results of the Tier 1 seismic screening checklists and engineering design judgement and has not been substantiated by detailed structural analyses and calculations. Consequently, the costs presented in this concept-level design report are very preliminary in nature and are only intended to be utilized in their aggregate form with the entire statewide school seismic safety assessments study.

For this preliminary opinion of probable construction costs, an estimate of the current year (2019) construction costs of the probable scope of work was developed. These costs were developed based on the Tier 1 checklist, concept-level seismic upgrade design sketches, and project narratives. Then a -20 percent (low) to +50 percent (high) range variance was used to develop the construction cost estimate range for the concept-level scope of work. The -20 percent to +50 percent range variance guidance is from Table 1 of the AACE International Recommended Practice 56R-08, *Cost Estimate Classification System for Class 5 Estimates*. The variable cost range of a Class 5 estimate is due to the limited design completeness and is defined as 0 percent to 2 percent Project Definition Deliverables.

The estimated structural and nonstructural construction cost to mitigate the deficiencies identified in the Tier 1 checklists of the Lake Roosevelt K-12 School Gymnasium and CTE Building ranges between approximately $141,000 and $266,000 (-20 percent/+50 percent). The estimated construction cost to seismically upgrade this building is approximately $177,000. On a per-square-foot basis, the seismic upgrade construction cost is estimated to be approximately $4 per square foot in 2019 dollars, with a variance range between $3 per square foot and $6 per square foot.

This preliminary opinion of construction cost includes labor, materials, equipment, and general contractor general conditions (mobilization), overhead, and profit. This is based on a public sector design-bid-build project delivery method. Project delivery methods such as negotiated, State of Washington GC/CM, and design-build are not the basis of the construction costs. Owner's project costs not included in the construction cost estimate are building permits, design fees, change order contingencies, escalation at a recommended 4.1 percent* per year to the midpoint of construction (currently unknown), materials testing/inspection, project planning and design schedule delay contingencies, and owner's overall project contingency. Additional owner's project costs would likely include owner's general overhead costs, including project management, financing/bond costs, administration/contract/accounting costs, review of plans, value engineering studies, equipment, fixtures, furnishings and technology, and relocation of the school staff and students during construction. These additional costs are not included in this preliminary concept-level design construction cost estimate.

Costs of all types excluded from the construction costs are site work, construction of replacement facilities, and mitigation of seismic risks for existing facilities and building code changes that occur over time after this report. Future planning budgets should not be set on the basis of the preliminary construction costs estimate based on the concept-level design ideas presented in this report. For budget planning purposes, it is highly recommended that a seismic upgrade budget be determined after the owner defines the scope of work and obtains the services of an A/E design team to study the proposed seismic mitigation strategies and to refine the concept-level seismic upgrades design approach contained in this report.

*-4.1%/year escalation rate for planning purposes should be compounded annually to the midpoint of construction and is sourced from *Engineering News Record (ENR),* November, 2017, the most recent rate representative of the escalation of construction costs throughout the state of Washington.

Table 4.3.1. Seismic Upgrades Opinion of Probable Construction Costs.

Building	FEMA Bldg Type	ASCE 41 Level of Seismicity / Site Class	Structural Performance Objective	Bldg Gross Area	Estimated Seismic Upgrade Cost Range $/SF (Total)	Estimated Seismic Upgrade Cost/SF (Total)
Lake Roosevelt K-12 CTE Bldg	S3	Low / D	**Structural**			
			Life Safety	46,336 SF	$0.50 ($21K) - $0.85 ($40K)	$0.55 ($26K)
			Nonstructural			
			Life Safety	46,336 SF	$2.60 ($121K) - $4.85 ($226K)	$3.25 ($151K)
			Total			
				46,336 SF	$3.10 ($142K) - $5.70 ($266K)	$3.80 ($177K)

·W: Wood-Framed; URM: Unreinforced Masonry; RM: Reinforced Masonry; C: Reinforced Concrete; PC: Precast concrete; S: Steel-framed

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Appendix A: Field Investigation Report and Tier 1 Checklists

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1. Grand Coulee Dam, Lake Roosevelt K-12, CTE Building

1.1 Building Description

Building Name:	CTE Building
Facility Name:	Lake Roosevelt K-12
District Name:	Grand Coulee Dam
ICOS Latitude:	47.972
ICOS Longitude:	-118.971
ICOS County/District ID:	13301
ICOS Building ID:	23616
ASCE 41 Bldg Type:	S3
Enrollment:	750
Gross Sq. Ft. :	46,336
Year Built:	1955
Number of Stories:	1
$S_{XS\ BSE\text{-}2E}$:	0.401
$S_{X1\ BSE\text{-}2E}$:	0.240
ASCE 41 Level of Seismicity:	High
Site Class:	D
V_{S30}(m/s):	304
Liquefaction Potential:	Low
Tsunami Risk:	None
Structural Drawings Available:	Yes
Evaluating Firm:	DCI Engineers - Spokane

The Gym/CTE building is approximately 46,300-square-feet overall; it is comprised of a 19,000-square-foot, single-story metal building over a walk-out basement of approximately the same size, and an 8,300-square-foot, single-story wood-framed wing to the east. The original structure was built around 1955, and an architectural remodel prior to 1995 revamped the main entrance of the building. Another remodel around 2014 removed the northeast end of the wood-framed wing.

1.1.1 Building Use

The metal building contains a gymnasium, a stage, music rooms, and computer labs on the main floor, with locker rooms, a weight room, mechanical rooms, and maintenance rooms in the basement. The wood-framed wing contains classrooms and offices.

1.1.2 Structural System

Table 1.1-1. Structural System Description of Lake Roosevelt K-12

Structural System	Description
Structural Roof	The roof is wood and steel framed. The roof over the gymnasium consists of 2x decking supported by steel purlins that span between steel moment frame arches. The roofs over the classroom/office areas are decking or sheathing supported by wood trusses.
Structural Floor(s)	The floor of the gymnasium wing is comprised of wood planks over 2x12 purlins that span between steel wide flange beams. The floors in the basement of the gymnasium and in the classroom wing to the east are concrete slabs on grade.
Foundations	Both the gymnasium and classroom wings are supported by conventional shallow concrete footings.
Gravity System	The gymnasium structure is comprised mostly of 2x decking over steel roof purlins spanning between steel frames that clear span the gym and are supported by concrete basement walls. The roof at the north portion of this wing is wood framed and supported by interior wood posts as well as the exterior wood bearing wall. The floor in this area is a post and beam system with wood joists spanning between steel beams that are supported by steel columns at the interior and concrete walls at the perimeter. The classroom wing has wood roof trusses supported by wood bearing walls at the interior and exterior.
Lateral System	In the gymnasium wing, the upper level of the building consists of moment frames in the transverse direction with rod bracing in the longitudinal direction. The north end of the structure appears to be wood-framed with the exterior wall being a wood shear wall. The south end wall may be a concrete shear wall, but this is not clear from the drawings or field investigation. The lower level of this building is comprised of concrete shear walls around the perimeter. Further investigation of the gymnasium wing lateral system by a licensed structural engineer is recommended. The classroom wing appears to have a wood diaphragm at the roof with wood shear walls at both the interior and exterior.

1.1.3 Structural System Visual Condition

Table 1.1-2. Structural System Condition Description of Lake Roosevelt K-12

Structural System	Description

Structural Roof	Good. No visible signs of corrosion, damage or deterioration.
Structural Floor(s)	Good. No visible signs of corrosion, damage or deterioration.
Foundations	Good. No visible signs of corrosion, damage or deterioration.
Gravity System	Good. No visible signs of corrosion, damage or deterioration.
Lateral System	Good. No visible signs of corrosion, damage or deterioration.

1.2 Seismic Evaluation Findings

1.2.1 Structural Seismic Deficiencies

The structural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is also provided based on this evaluation.

Table 1-3. Identified Structural Seismic Deficiencies for Grand Coulee Dam Lake Roosevelt K-12 CTE Building

Deficiency	Description
Moment-Resisting Connections	The frame member connection could not be determined from the drawings provided, however the connections were observed to be noncompliant, full penetration welds.

1.2.2 Structural Checklist Items Marked as 'U'nknown

Where building structural component seismic adequacy was unknown due to lack of available information or limited observation, the structural checklist items were marked as “unknown”. These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown structural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is also provided based on the evaluation.

Table 1-4. Identified Structural Checklist Items Marked as Unknown for Grand Coulee Dam Lake Roosevelt K-12 CTE Building

Unknown Item	Description
Load Path	The existing drawings we were able to review are incomplete, but there appears to be a complete load path and connections between the elements. This is likely compliant, but additional access and as-built information is needed to fully assess this item.
Liquefaction	The liquefaction potential of site soils is unknown at this time given available information. \Low\ liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.
Slope Failure	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure.
Surface Fault Rupture	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.
Brace Axial Stress Check	Angle braces were seen, but the member sizes were not provided on the drawings we were able to review.
Tansfer to Steel Frames	Detailing of the diaphragm to frame connection was not available for review.
Compact Members	The frame member sizes could not be determined from the drawings provided.
Wall Panels	The detailing of the end walls was not shown in the drawings provided.

1.3.1 Nonstructural Seismic Deficiencies

The nonstructural seismic deficiencies identified during the Tier 1 evaluation are summarized below. Commentary for each deficiency is also provided based on this evaluation. Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require more substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 1-5. Identified Nonstructural Seismic Deficiencies for Grand Coulee Dam Lake Roosevelt K-12 CTE Building

Deficiency	Description
S-2 Stair Details. HR-not required; LS-LMH; PR-LMH.	The stairs are detailed as cast-in-place with no drift/slip allowance at either end.
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Lockers, cabinets, and mobile storage units were observed that meet this criteria and were not anchored to the structure or one another.
CF-3 Fall-Prone Contents. HR-not required; LS-H; PR-H.	The weights of the instruments on the top shelf in the band room are not known, but some appeared to be greater than 20 lb and were unrestrained.

1.3.2 Nonstructural Checklist Items Marked as 'U'nknown

Where building nonstructural component seismic adequacy was unknown due to lack of available information or limited observation, the nonstructural checklist items were marked as “unknown”. These items require further investigation if definitive determination of compliance or noncompliance is desired. The unknown nonstructural checklist items identified during the Tier 1 evaluation are summarized below. Commentary for each unknown item is also provided based on the evaluation.

Some nonstructural deficiencies may be able to be mitigated by school district staff. Other nonstructural components that require more substantial mitigation may be more appropriately included in a long-term mitigation strategy. Some typical conceptual details for the seismic upgrade of nonstructural components can be found in the FEMA E-74 Excerpts appendix.

Table 1-6. Identified Nonstructural Checklist Items Marked as Unknown for Grand Coulee Dam Lake Roosevelt K-12 CTE Building

Unknown Item	Description
P-2 Heavy Partitions Supported by Ceilings. HR-LMH; LS-LMH; PR-LMH.	Interior CMU walls were observed and assumed to be connected off at the floor/roof lines, but the tops of the walls could not be observed to verify their configuration.
C-1 Suspended Lath and Plaster. HR-H; LS-MH; PR-LMH.	The ceiling details could not be observed. Most were lay-in acoustic tile, but some lath and plaster type ceilings were also present.
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	The ceiling details could not be observed. Most were lay-in acoustic tile, but some gypsum board ceilings were also present.
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	Lay-in light fixtures in suspended ceiling systems were observed, but the bracing details of those fixtures could not be verified.
CG-8 Overhead Glazing. HR-not required; LS-MH; PR-MH.	There are a few window panes greater than 16 ft2 but the type of glass used in them could not be determined.
M-1 Ties. HR-not required; LS-LMH; PR-LMH.	There is a small amount of masonry veneer around the base of a portion of the building, but its detailing could not be verified.
M-3 Weakened Planes. HR-not required; LS-LMH; PR-LMH.	The veneer detailing could not be verified.
M-4 Unreinforced Masonry Backup. HR-LMH; LS-LMH; PR-LMH.	The veneer detailing could not be verified.

Photos:

Figure 1-1. Interior view of gymnasium looking south.

Figure 1-2. Interior view of gymnasium looking west.

Figure 1-3. Band room with unsecured storage units and heavy instruments stored on top of units.

Figure 1-4. Band room with unsecured storage units and heavy instruments stored on top of units.

Figure 1-5. Maintenance room with unsecured shelving units.

Figure 1-6. Separation between gymnasium building (on the left) and the wood shop (on the right).

Figure 1-7. Exterior view of building from the northeast & facing west. The north end of the gym wing is in the center of the photo and the classroom wing extends to the left in the photo.

Figure 1-8. Exterior view of building from the northeast & facing south; showing the west end of the classroom wing.

Figure 1-9. Exterior view from the southeast corner of the overall building, facing northwest. This is the southeast corner of the classroom wing.

Figure 1-10. Exterior view from the southeast corner of the gymnasium, facing northwest.

Grand Coulee Dam, Lake Roosevelt K-12, CTE Building

17-2 Collapse Prevention Basic Configuration Checklist

Building record drawings have been reviewed, when available, and a non-destructive field investigation has been performed for the subject building. Each of the required checklist items are marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U). Items marked Compliant indicate conditions that satisfy the performance objective, whereas items marked Noncompliant or Unknown indicate conditions that do not. Certain statements might not apply to the building being evaluated.

Low Seismicity

Building System - General

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Load Path	The structure contains a complete, well-defined load path, including structural elements and connections, that serves to transfer the inertial forces associated with the mass of all elements of the building to the foundation. (Tier 2: Sec. 5.4.1.1; Commentary: Sec. A.2.1.10)				X	The existing drawings we were able to review are incomplete, but there appears to be a complete load path and connections between the elements. This is likely compliant, but additional access and as-built information is needed to fully assess this item.
Adjacent Buildings	The clear distance between the building being evaluated and any adjacent building is greater than 0.25% of the height of the shorter building in low seismicity, 0.5% in moderate seismicity, and 1.5% in high seismicity. (Tier 2: Sec. 5.4.1.2; Commentary: Sec. A.2.1.2)	X				
Mezzanines	Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Tier 2: Sec. 5.4.1.3; Commentary: Sec. A.2.1.3)			X		

Building System - Building Configuration

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Weak Story	The sum of the shear strengths of the seismic-force-resisting system in any story in each direction is not less than 80% of the strength in the adjacent story above. (Tier 2: Sec. 5.4.2.1; Commentary: Sec. A.2.2.2)	X				
Soft Story	The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting system stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Tier 2: Sec. 5.4.2.2; Commentary: Sec. A.2.2.3)	X				

Vertical Irregularities	All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Tier 2: Sec. 5.4.2.3; Commentary: Sec. A.2.2.4)	X				
Geometry	There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 5.4.2.4; Commentary: Sec. A.2.2.5)	X				
Mass	There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 5.4.2.5; Commentary: Sec. A.2.2.6)	X				
Torsion	The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Tier 2: Sec. 5.4.2.6; Commentary: Sec. A.2.2.7)	X				

Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)

Geologic Site Hazards

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Liquefaction	Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance do not exist in the foundation soils at depths within 50 ft (15.2 m) under the building. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.1)				X	The liquefaction potential of site soils is unknown at this time given available information. Low liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.
Slope Failure	The building site is located away from potential earthquake-induced slope failures or rockfalls so that it is unaffected by such failures or is capable of accommodating any predicted movements without failure. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.2)				X	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure.
Surface Fault Rupture	Surface fault rupture and surface displacement at the building site are not anticipated. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.3)				X	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.

High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)

Foundation Configuration

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Overturning	The ratio of the least horizontal dimension of the seismic-force-resisting system at the foundation level to the building height (base/height) is greater than 0.6Sa. (Tier 2: Sec. 5.4.3.3; Commentary: Sec. A.6.2.1)	X				
Ties Between Foundation Elements	The foundation has ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Site Class A, B, or C. (Tier 2: Sec. 5.4.3.4; Commentary: Sec. A.6.2.2)	X				

17-12 Collapse Prevention Structural Checklist for Building Type S3

Building record drawings have been reviewed, when available, and a non-destructive field investigation has been performed for the subject building. Each of the required checklist items are marked Compliant (C), Noncompliant (NC), Not Applicable (N/A), or Unknown (U). Items marked Compliant indicate conditions that satisfy the performance objective, whereas items marked Noncompliant or Unknown indicate conditions that do not. Certain statements might not apply to the building being evaluated.

Low and Moderate Seismicity

Seismic-Force-Resisting System

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Brace Axial Stress Check	The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than 0.50Fy. (Tier 2: Sec. 5.5.4.1; Commentary: Sec. A.3.3.1.2)				X	Angle braces were seen, but the member sizes were not provided on the drawings we were able to review.

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Tansfer to Steel Frames	Diaphragms are connected for transfer of seismic forces to the steel moment frames. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.2)				X	Detailing of the diaphragm to frame connection was not available for review.
Steel Columns	The columns in seismic-force-resisting frames are anchored to the building foundation. (Tier 2: Sec. 5.7.3.1; Commentary: Sec. A.5.3.1)	X				The building drawings showed a column to basement wall connection.

High Seismicity **(Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)**

Seismic-Force-Resisting System

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Moment-Resisting Connections	All moment connections are able to develop the elastic moment (FyS) of the adjoining members. (Tier 2: Sec. 5.5.2.2.1; Commentary: Sec. A.3.1.3.4)		X			The frame member connection could not be determined from the drawings provided, however the connections were observed to be noncompliant, full penetration welds.
Compact Members	All frame elements meet compact section requirements in accordance with AISC 360, Table B4.1. (Tier 2: Sec. 5.5.2.2.4; Commentary: Sec. A.3.1.3.8)				X	The frame member sizes could not be determined from the drawings provided.

Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Other Diaphragms	Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Tier 2: Sec. 5.6.5; Commentary: Sec. A.4.7.1)	X				The diaphragms appear to be of 2x wood decking, wood sheathing, and/or steel rod bracing.

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Roof Panels	Where considered as diaphragm elements for lateral resistance, metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. (Tier 2: Sec. 5.7.5; Commentary: Sec. A.5.5.1)			X		There did not appear to be any diaphragm elements of this nature.
Wall Panels	Where considered as shear elements for lateral resistance, metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. (Tier 2: Sec. 5.7.5; Commentary: Sec. A.5.5.2)				X	The detailing of the end walls was not shown in the drawings provided.

Grand Coulee Dam, Lake Roosevelt K-12, CTE Building

17-38 Nonstructural Checklist

Notes:
C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.
Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.
Level of Seismicity: L = Low, M = Moderate, and H = High

Life Safety Systems

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
LSS-1 Fire Suppression Piping. HR-not required; LS-LMH; PR-LMH.	Fire suppression piping is anchored and braced in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.1)			X		There is no fire suppression system in the building.
LSS-2 Flexible Couplings. HR-not required; LS-LMH; PR-LMH.	Fire suppression piping has flexible couplings in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.2)			X		There is no fire suppression system in the building.
LSS-3 Emergency Power. HR-not required; LS-LMH; PR-LMH.	Equipment used to power or control Life Safety systems is anchored or braced. (Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.1)			X		The building does not have emergency power.
LSS-4 Stair and Smoke Ducts. HR-not required; LS-LMH; PR-LMH.	Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.1)			X		There are no enclosed stairs present in the building.
LSS-5 Sprinkler Ceiling Clearance. HR-not required; LS-MH; PR-MH.	Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13. (Tier 2: Sec. 13.7.4; Commentary: Sec. A.7.13.3)			X		There is no fire suppression system in the building.
LSS-6 Emergency Lighting. HR-not required; LS-not required; PR-LMH	Emergency and egress lighting equipment is anchored or braced. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.1)			X		

Hazardous Materials

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
HM-1 Hazardous Material Equipment. HR-LMH; LS-LMH; PR-LMH.	Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.2)			X		Equipment of this type was not observed.
HM-2 Hazardous Material Storage. HR-LMH; LS-LMH; PR-LMH.	Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods. (Tier 2: Sec. 13.8.3; Commentary: Sec. A.7.15.1)			X		Hazardous material containers were not observed to be present in the building.
HM-3 Hazardous Material Distribution. HR-MH; LS-MH; PR-MH.	Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)			X		No piping of this type was observed.

HM-4 Shutoff Valves. HR-MH; LS-MH; PR-MH.	Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.3)			X		No piping of this type was observed.
HM-5 Flexible Couplings. HR-LMH; LS-LMH; PR-LMH.	Hazardous material ductwork and piping, including natural gas piping, have flexible couplings. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.15.4)			X		No piping of this type was observed.
HM-6 Piping or Ducts Crossing Seismic Joints. HR-MH; LS-MH; PR-MH.	Piping or ductwork carrying hazardous material that either crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.3, 13.7.5, 13.7.6; Commentary: Sec. A.7.13.6)			X		No piping of this type was observed.

Partitions

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
P-1 Unreinforced Masonry. HR-LMH; LS-LMH; PR-LMH.	Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft (3.0 m) in Low or Moderate Seismicity, or at most 6 ft (1.8 m) in High Seismicity. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.1)			X		URM partitions were not observed.
P-2 Heavy Partitions Supported by Ceilings. HR-LMH; LS-LMH; PR-LMH.	The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)				X	Interior CMU walls were observed and assumed to be connected off at the floor/roof lines, but the tops of the walls could not be observed to verify their configuration.
P-3 Drift. HR-not required; LS-MH; PR-MH.	Rigid cementitious partitions are detailed to accommodate the following drift ratios: in steel moment frame, concrete moment frame, and wood frame buildings, 0.02; in other buildings, 0.005. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.2)			X		No rigid cementitious partitions were observed.
P-4 Light Partitions Supported by Ceilings. HR-not required; LS-not required; PR-MH.	The tops of gypsum board partitions are not laterally supported by an integrated ceiling system. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.2.1)			X		
P-5 Structural Separations. HR-not required; LS-not required; PR-MH.	Partitions that cross structural separations have seismic or control joints. (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.3)			X		
P-6 Tops. HR-not required; LS-not required; PR-MH.	The tops of ceiling-high framed or panelized partitions have lateral bracing to the structure at a spacing equal to or less than 6 ft (1.8 m). (Tier 2: Sec. 13.6.2; Commentary: Sec. A.7.1.4)			X		

Ceilings

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
C-1 Suspended Lath and Plaster. HR-H; LS-MH; PR-LMH.	Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft2 (1.1 m2) of area. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)				X	The ceiling details could not be observed. Most were lay-in acoustic tile, but some lath and plaster type ceilings were also present.
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft2 (1.1 m2) of area. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.3)				X	The ceiling details could not be observed. Most were lay-in acoustic tile, but some gypsum board ceilings were also present.
C-3 Integrated Ceilings. HR-not required; LS-not required; PR-MH.	Integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) and ceilings of smaller areas that are not surrounded by restraining partitions are laterally restrained at a spacing no greater than 12 ft (3.6 m) with members attached to the structure above. Each restraint location has a minimum of four diagonal wires and compression struts, or diagonal members capable of resisting compression. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.2)			X		
C-4 Edge Clearance. HR-not required; LS-not required; PR-MH.	The free edges of integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) have clearances from the enclosing wall or partition of at least the following: in Moderate Seismicity, 1/2 in. (13 mm); in High Seismicity, 3/4 in. (19 mm). (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.4)			X		
C-5 Continuity Across Structure Joints. HR-not required; LS-not required; PR-MH.	The ceiling system does not cross any seismic joint and is not attached to multiple independent structures. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.5)			X		
C-6 Edge Support. HR-not required; LS-not required; PR-H.	The free edges of integrated suspended ceilings with continuous areas greater than 144 ft2 (13.4 m2) are supported by closure angles or channels not less than 2 in. (51 mm) wide. (Tier 2: Sec. 13.6.4 ; Commentary: Sec. A.7.2.6)			X		
C-7 Seismic Joints. HR-not required; LS-not required; PR-H.	Acoustical tile or lay-in panel ceilings have seismic separation joints such that each continuous portion of the ceiling is no more than 2,500 ft2 (232.3 m2) and has a ratio of long-to-short dimension no more than 4-to-1. (Tier 2: Sec. 13.6.4; Commentary: Sec. A.7.2.7)			X		

Light Fixtures

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	Light fixtures that weigh more per square foot than the ceiling they penetrate are supported independent of the grid ceiling suspension system by a minimum of two wires at diagonally opposite corners of each fixture. (Tier 2: Sec. 13.6.4, 13.7.9; Commentary: Sec. A.7.3.2)				X	Lay-in light fixtures in suspended ceiling systems were observed, but the bracing details of those fixtures could not be verified.
LF-2 Pendant Supports. HR-not required; LS-not required; PR-H.	Light fixtures on pendant supports are attached at a spacing equal to or less than 6 ft. Unbraced suspended fixtures are free to allow a 360-degree range of motion at an angle not less than 45 degrees from horizontal without contacting adjacent components. Alternatively, if rigidly supported and/or braced, they are free to move with the structure to which they are attached without damaging adjoining components. Additionally, the connection to the structure is capable of accommodating the movement without failure. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.3)			X		
LF-3 Lens Covers. HR-not required; LS-not required; PR-H.	Lens covers on light fixtures are attached with safety devices. (Tier 2: Sec. 13.7.9; Commentary: Sec. A.7.3.4)			X		

Cladding and Glazing

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CG-1 Cladding Anchors. HR-MH; LS-MH; PR-MH.	Cladding components weighing more than 10 lb/ft2 (0.48 kN/m2) are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft (1.8 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft (1.2 m) (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.1)			X		The cladding components on this building are light-weight metal panels.
CG-2 Cladding Isolation. HR-not required; LS-MH; PR-MH.	For steel or concrete moment-frame buildings, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.3)			X		The building does not have cladding panels.

CG-3 Multi-Story Panels. HR-MH; LS-MH; PR-MH.	For multi-story panels attached at more than one floor level, panel connections are detailed to accommodate a story drift ratio by the use of rods attached to framing with oversize holes or slotted holes of at least the following: for Life Safety in Moderate Seismicity, 0.01; for Life Safety in High Seismicity and for Position Retention in any seismicity, 0.02, and the rods have a length-to-diameter ratio of 4.0 or less. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.4)			X		The building does not have multi-story cladding panels.
CG-4 Threaded Rods. HR-not required; LS-MH; PR-MH.	Threaded rods for panel connections detailed to accommodate drift by bending of the rod have a length-to-diameter ratio greater than 0.06 times the story height in inches for Life Safety in Moderate Seismicity and 0.12 times the story height in inches for Life Safety in High Seismicity and Position Retention in any seismicity. (Tier 2: Sec. 13.6.1; Commentary: Sec. A.7.4.9)			X		The building does not have any panel connections.
CG-5 Panel Connections. HR-MH; LS-MH; PR-MH.	Cladding panels are anchored out of plane with a minimum number of connections for each wall panel, as follows: for Life Safety in Moderate Seismicity, 2 connections; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 connections. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.5)			X		The building does not have cladding panels.
CG-6 Bearing Connections. HR-MH; LS-MH; PR-MH.	Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.6)			X		The building does not have cladding panels.
CG-7 Inserts. HR-MH; LS-MH; PR-MH.	Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel. (Tier 2: Sec. 13.6.1.4; Commentary: Sec. A.7.4.7)			X		The building does not have cladding panels.
CG-8 Overhead Glazing. HR-not required; LS-MH; PR-MH.	Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft2 (1.5 m2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked. (Tier 2: Sec. 13.6.1.5; Commentary: Sec. A.7.4.8)				X	There are a few window panes greater than 16 ft2 but the type of glass used in them could not be determined.

Masonry Veneer

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
M-1 Ties. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft2 (0.25 m2), and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 in. (914 mm); for Life Safety in High Seismicity and for Position Retention in any seismicity, 24 in. (610 mm). (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.1)				X	There is a small amount of masonry veneer around the base of a portion of the building, but its detailing could not be verified.
M-2 Shelf Angles. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.2)	X				The veneer is partial height and supported at the stem wall.
M-3 Weakened Planes. HR-not required; LS-LMH; PR-LMH.	Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.3)				X	The veneer detailing could not be verified.
M-4 Unreinforced Masonry Backup. HR-LMH; LS-LMH; PR-LMH.	There is no unreinforced masonry backup. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.2)				X	The veneer detailing could not be verified.
M-5 Stud Tracks. HR-not required; LS-MH; PR-MH.	For veneer with coldformed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.)			X		The veneer is assumed to be backed by wood studs.
M-6 Anchorage. HR-not required; LS-MH; PR-MH.	For veneer with concrete block or masonry backup, the backup is positively anchored to the structure at a horizontal spacing equal to or less than 4 ft along the floors and roof. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.7.1)			X		The veneer is assumed to be backed by wood studs.
M-7 Weep Holes. HR-not required; LS-not required; PR-MH.	In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing. (Tier 2: Sec. 13.6.1.2; Commentary: Sec. A.7.5.6)			X		
M-8 Openings. HR-not required; LS-not required; PR-MH.	For veneer with cold-formed-steel stud backup, steel studs frame window and door openings. (Tier 2: Sec. 13.6.1.1, 13.6.1.2; Commentary: Sec. A.7.6.2)			X		

Parapets, Cornices, Ornamentation, and Appendages

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
PCOA-1 URM Parapets or Cornices. HR-LMH; LS-LMH; PR-LMH.	Laterally unsupported unreinforced masonry parapets or cornices have height-tothickness ratios no greater than the following: for Life Safety in Low or Moderate Seismicity, 2.5; for Life Safety in High Seismicity and for Position Retention in any seismicity, 1.5. (Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.1)			X		There are no parapets on the building.

PCOA-2 Canopies. HR-not required; LS-LMH; PR-LMH.	Canopies at building exits are anchored to the structure at a spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 10 ft (3.0 m); for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft (1.8 m). (Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.2)			X		There are no canopies on the building.
PCOA-3 Concrete Parapets. HR-H; LS-MH; PR-LMH.	Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement. (Tier 2: Sec. 13.6.5; Commentary: Sec. A.7.8.3)			X		There are no parapets on the building.
PCOA-4 Appendages. HR-MH; LS-MH; PR-LMH.	Cornices, parapets, signs, and other ornamentation or appendages that extend above the highest point of anchorage to the structure or cantilever from components are reinforced and anchored to the structural system at a spacing equal to or less than 6 ft (1.8 m). This evaluation statement item does not apply to parapets or cornices covered by other evaluation statements. (Tier 2: Sec. 13.6.6; Commentary: Sec. A.7.8.4)			X		These types of elements were not observed on this building.

Masonry Chimneys

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
MC-1 URM Chimneys. HR-LMH; LS-LMH; PR-LMH.	Unreinforced masonry chimneys extend above the roof surface no more than the following: for Life Safety in Low or Moderate Seismicity, 3 times the least dimension of the chimney; for Life Safety in High Seismicity and for Position Retention in any seismicity, 2 times the least dimension of the chimney. (Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.1)			X		There are no masonry chimneys present in this building.
MC-2 Anchorage. HR-LMH; LS-LMH; PR-LMH.	Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof. (Tier 2: Sec. 13.6.7; Commentary: Sec. A.7.9.2)			X		There are no masonry chimneys present in this building.

Stairs

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
S-1 Stair Enclosures. HR-not required; LS-LMH; PR-LMH.	Hollow-clay tile or unreinforced masonry walls around stair enclosures are restrained out of plane and have height-to-thickness ratios not greater than the following: for Life Safety in Low or Moderate Seismicity, 15-to-1; for Life Safety in High Seismicity and for Position Retention in any seismicity, 12-to-1. (Tier 2: Sec. 13.6.2, 13.6.8; Commentary: Sec. A.7.10.1)			X		Hollow-clay tile or unreinforced masonry walls were not observed around the stairs.

S-2 Stair Details. HR-not required; LS-LMH; PR-LMH.	The connection between the stairs and the structure does not rely on post-installed anchors in concrete or masonry, and the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.4.3.1 for moment-frame structures or 0.5 in. for all other structures without including any lateral stiffness contribution from the stairs. (Tier 2: Sec. 13.6.8; Commentary: Sec. A.7.10.2)		X			The stairs are detailed as cast-in-place with no drift/slip allowance at either end.

Contents and Furnishings

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
CF-1 Industrial Storage Racks. HR-LMH; LS-MH; PR-MH.	Industrial storage racks or pallet racks more than 12 ft high meet the requirements of ANSI/RMI MH 16.1 as modified by ASCE 7, Chapter 15. (Tier 2: Sec. 13.8.1; Commentary: Sec. A.7.11.1)			X		No industrial storage racks of this type were observed.
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Contents more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 are anchored to the structure or to each other. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.2)		X			Lockers, cabinets, and mobile storage units were observed that meet this criteria and were not anchored to the structure or one another.
CF-3 Fall-Prone Contents. HR-not required; LS-H; PR-H.	Equipment, stored items, or other contents weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level are braced or otherwise restrained. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.3)		X			The weights of the instruments on the top shelf in the band room are not known, but some appeared to be greater than 20 lb and were unrestrained.
CF-4 Access Floors. HR-not required; LS-not required; PR-MH.	Access floors more than 9 in. (229 mm) high are braced. (Tier 2: Sec. 13.6.10; Commentary: Sec. A.7.11.4)			X		
CF-5 Equipment on Access Floors. HR-not required; LS-not required; PR-MH.	Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor. (Tier 2: Sec. 13.7.7 13.6.10; Commentary: Sec. A.7.11.5)			X		
CF-6 Suspended Contents. HR-not required; LS-not required; PR-H.	Items suspended without lateral bracing are free to swing from or move with the structure from which they are suspended without damaging themselves or adjoining components. (Tier 2: Sec. 13.8.2; Commentary: Sec. A.7.11.6)			X		

Mechanical and Electrical Equipment

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
ME-1 Fall-Prone Equipment. HR-not required; LS-H; PR-H.	Equipment weighing more than 20 lb (9.1 kg) whose center of mass is more than 4 ft (1.2 m) above the adjacent floor level, and which is not in-line equipment, is braced. (Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.4)			X		Equipment of this type was not observed.
ME-2 In-Line Equipment. HR-not required; LS-H; PR-H.	Equipment installed in line with a duct or piping system, with an operating weight more than 75 lb (34.0 kg), is supported and laterally braced independent of the duct or piping system. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.5)			X		Equipment of this type was not observed.
ME-3 Tall Narrow Equipment. HR-not required; LS-H; PR-MH.	Equipment more than 6 ft (1.8 m) high with a height-to-depth or height-to-width ratio greater than 3-to-1 is anchored to the floor slab or adjacent structural walls. (Tier 2: Sec. 13.7.1 13.7.7; Commentary: Sec. A.7.12.6)			X		Equipment of this type was not observed.
ME-4 Mechanical Doors. HR-not required; LS-not required; PR-MH.	Mechanically operated doors are detailed to operate at a story drift ratio of 0.01. (Tier 2: Sec. 13.6.9; Commentary: Sec. A.7.12.7)			X		
ME-5 Suspended Equipment. HR-not required; LS-not required; PR-H.	Equipment suspended without lateral bracing is free to swing from or move with the structure from which it is suspended without damaging itself or adjoining components. (Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.8)			X		
ME-6 Vibration Isolators. HR-not required; LS-not required; PR-H.	Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning. (Tier 2: Sec. 13.7.1; Commentary: Sec. A.7.12.9)			X		
ME-7 Heavy Equipment. HR-not required; LS-not required; PR-H.	Floor supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure. (Tier 2: Sec. 13.7.1, 13.7.7; Commentary: Sec. A.7.12.10)			X		
ME-8 Electrical Equipment. HR-not required; LS-not required; PR-H.	Electrical equipment is laterally braced to the structure. (Tier 2: Sec. 13.7.7; Commentary: Sec. A.7.12.11)			X		
ME-9 Conduit Couplings. HR-not required; LS-not required; PR-H.	Conduit greater than 2.5 in. (64 mm) trade size that is attached to panels, cabinets, or other equipment and is subject to relative seismic displacement has flexible couplings or connections. (Tier 2: Sec. 13.7.8; Commentary: Sec. A.7.12.12)			X		

Piping

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
PP-1 Flexible Couplings. HR-not required; LS-not required; PR-H.	Fluid and gas piping has flexible couplings. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.2)			X		

PP-2 Fluid and Gas Piping. HR-not required; LS-not required; PR-H.	Fluid and gas piping is anchored and braced to the structure to limit spills or leaks. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.4)			X		
PP-3 C-Clamps. HR-not required; LS-not required; PR-H.	One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.5)			X		
PP-4 Piping Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Piping that crosses seismic joints or isolation planes or is connected to independent structures has couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.3, 13.7.5; Commentary: Sec. A.7.13.6)			X		

Ducts

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
D-1 Duct Bracing. HR-not required; LS-not required; PR-H.	Rectangular ductwork larger than 6 ft2 (0.56 m2) in cross-sectional area and round ducts larger than 28 in. (711 mm) in diameter are braced. The maximum spacing of transverse bracing does not exceed 30 ft (9.2 m). The maximum spacing of longitudinal bracing does not exceed 60 ft (18.3 m). (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.2)			X		
D-2 Duct Support. HR-not required; LS-not required; PR-H.	Ducts are not supported by piping or electrical conduit. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.3)			X		
D-3 Ducts Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.4)			X		

Elevators

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
EL-1 Retainer Guards. HR-not required; LS-H; PR-H.	Sheaves and drums have cable retainer guards. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.1)			X		The building does not have any elevators.
EL-2 Retainer Plate. HR-not required; LS-H; PR-H.	A retainer plate is present at the top and bottom of both car and counterweight. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.2)			X		The building does not have any elevators.
EL-3 Elevator Equipment. HR-not required; LS-not required; PR-H.	Equipment, piping, and other components that are part of the elevator system are anchored. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.3)			X		

EL-4 Seismic Switch. HR-not required; LS-not required; PR-H.	Elevators capable of operating at speeds of 150 ft/min or faster are equipped with seismic switches that meet the requirements of ASME A17.1 or have trigger levels set to 20% of the acceleration of gravity at the base of the structure and 50% of the acceleration of gravity in other locations. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.4)			X		
EL-5 Shaft Walls. HR-not required; LS-not required; PR-H.	Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.5)			X		
EL-6 Counterweight Rails. HR-not required; LS-not required; PR-H.	All counterweight rails and divider beams are sized in accordance with ASME A17.1. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.6)			X		
EL-7 Brackets. HR-not required; LS-not required; PR-H.	The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.7)			X		
EL-8 Spreader Bracket. HR-not required; LS-not required; PR-H.	Spreader brackets are not used to resist seismic forces. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.8)			X		
EL-9 Go-Slow Elevators. HR-not required; LS-not required; PR-H.	The building has a go-slow elevator system. (Tier 2: Sec. 13.7.11; Commentary: Sec. A.7.16.9)			X		

Appendix B: Concept-Level Seismic Upgrade Figures

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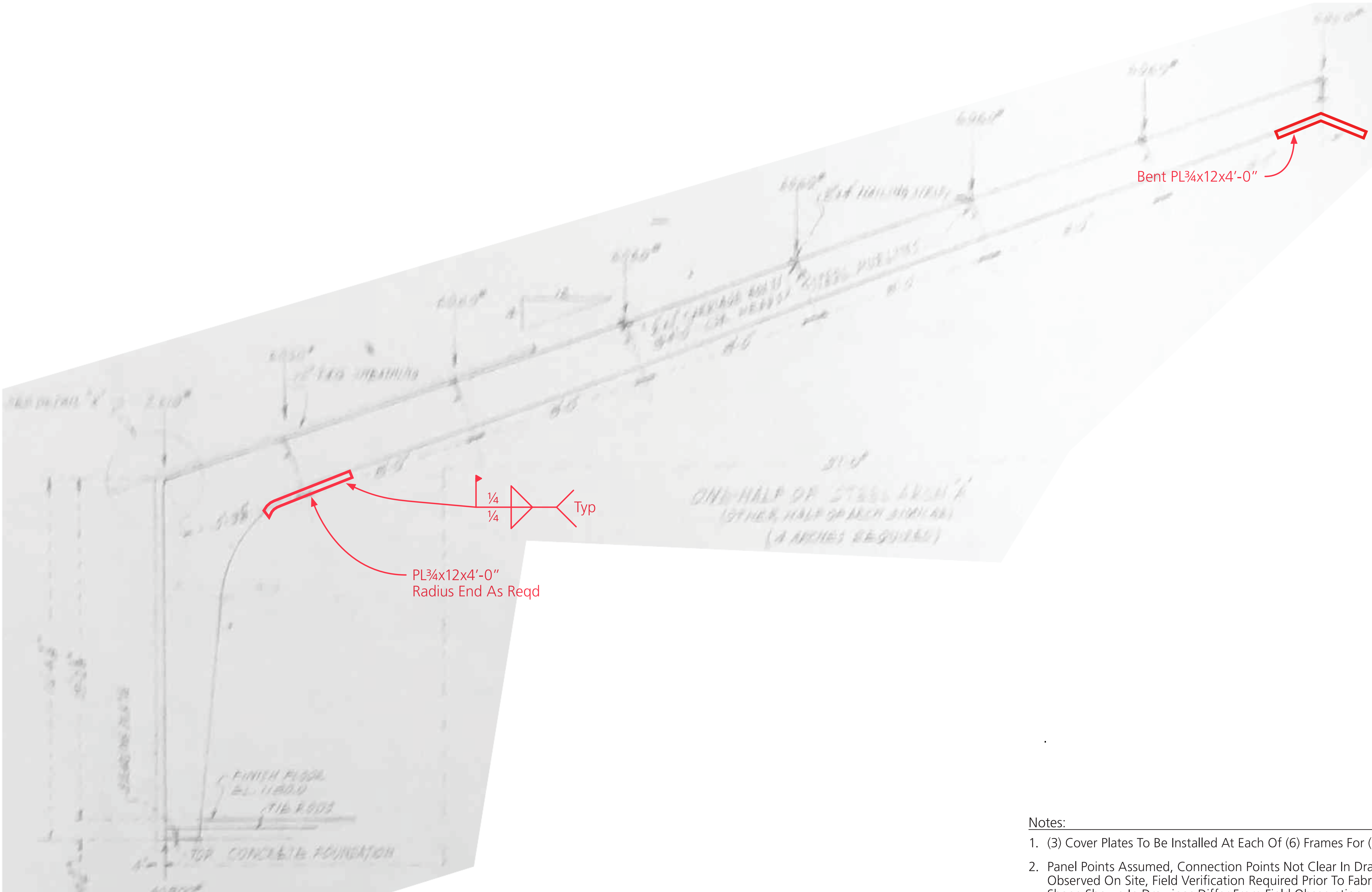

Notes:

1. (3) Cover Plates To Be Installed At Each Of (6) Frames For (18) Total Plates
2. Panel Points Assumed, Connection Points Not Clear In Drawings & Not Observed On Site, Field Verification Required Prior To Fabrication - Tframe Shape Shown In Drawings Differ From Field Observation

Figure 1 - Moment Resisting Connections

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Appendix C: Opinion of Probable Construction Costs

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PD PRODIMS
PROJECT MANAGEMENT SERVICES

520 Kirkland Way, Suite 301
Kirkland, WA 98033
tel: (425) 828-0500
fax: (425) 828-0700
www.prodims.com

Name:	**Wa State School Seismic Safety Assessment**
Second Name:	**Lake Roosevelt Jr/Sr High Gym**
Location:	**State of Washington**
Design Phase:	**ROM Cost Estimates**
Date of Estimate:	**April 25, 2019**
Date of Revision:	
Month of Cost Basis:	**1Q, 2019**

Lake Roosevelt Jr/Sr High Gym

Master Estimate Summary

Project Name		Total Estimated Construction Cost
Lake Roosevelt Jr/Sr High Gym	**Structural Costs**	**$26,413**
Lake Roosevelt Jr/Sr High Gym	**Non-Structural Costs**	**$150,680**
TOTAL ESTIMATED CONSTRUCTION COST		**$177,093**

Estimate Assumptions:

The ROM Construction Cost estimates are based on the Concept Design Report for the Project.
Construction Escalation is not included. Costs are current as of month of Cost Basis noted Above

Estimate Qualifications:

The ROM estimates are not be relied on solely for proforma development and financial decisions.
Further design work is required to determine construction budgets.
All Buildings Estimated to the 5' foot line for Utilities, All Sitework is estimated to go with any combination of the buildings and alternatives.
The ROM estimates do not include any Hazardous Material Abatement/Disposal.
For Construction Cost Markups they are additive, not cumulative. Percentages are added to the previous subtotal rather than the direct cost subtotal.
Owner Soft Costs are not included in the estimates. Soft costs can include design fees, sales tax, permits, owner's contingency and FF+E.
Estimated labor is based on an 8 hour per day shift 5 days a week. Accelerated schedule work of overtime has not been included.
Estimated labor is based on working on unoccupied facility without phased construction.
Estimate is based on a competitive public bid with at least 3 bona fide submitted and unrescinded general contractor bids.
Estimate is based on a competitive public bid with a minimum 6 week bidding schedule and no significant addendums within 2 weeks of bid opening.
State of Washington General Contractor/ Construction Manager (GC/CM) contracts typically raises construction costs. It is Not Included in this estimate.
Estimated construction cost is for the entire project. This estimate is not intended to be used for other projects.
Please consult the cost estimator for any modifications to this estimate. Unilaterally adding and deleting markups, scope of work, schedule, specifications, plans and bid forms could incorrectly restate the project construction cost.
Construction reserve contingency for change orders is not included in the estimate.
Sole source supply of materials and/ or installers typically results in a 40% to 100% premium on costs over open specifications.

PRODIMS

520 Kirkland Way, Suite 301
Kirkland, WA 98033
Phone: 425-828-0500 Fax: 425-828-0700
www.prodims.com

Structural Costs

Name:	Wa State School Seismic Safety Assessment	Areas	sqft
Second Name:	Lake Roosevelt Jr/Sr High Gym	1st Floor	46,336
Location:	Grand Coulee, WA		
Design Phase:	ROM Cost Estimates		
Date of Estimate:	April 25, 2019		
Date of Revision:			
Month of Cost Basis:	4Q, 2018, 1Q, 2019	Total Areas	46,336

Lake Roosevelt Jr/Sr High Gym

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 20,163

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 2,016	$ 22,179
General Conditions	10.0%	$ 2,016	$ 24,195
Home Office Overhead	5.0%	$ 1,008	$ 25,203
Profit	6.0%	$ 1,210	$ 26,413
Escalation Not Included-Costs in 1Q, 2019 Dollars	0.0%	$ -	$ 26,413
Washington State Sales Tax	0.0%	$ -	$ 26,413

Total Markups Applied to the Direct Cost 31.00%
Markups are multiplied from each subtotal- They are not multiplied from the direct cost

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--→	**$ 26,413**	**$ 0.57**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 21,130**	**$ 0.46**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 39,619**	**$ 0.86**

Please see the Master Summary for Assumptions and Qualifications for ROM Cost Estimates

Direct Cost of Construction

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	1 - Seismic Retrofit										
	Superstructure										
	Roof Systems										
	3/4" x 12" x 4'-0" long Steel Plates Welded onto Steel Moment Frames	1.3	tons	$ 11,100.00	$ 14,075.71	$ 3,900.00	$ 4,945.52	$ 900.00	$ 1,141.27	$ 15,900.00	$ 20,162.50
	Subtotal of the Direct Cost of Construction			**Lake Roosevelt Jr/Sr High Gym**							**$ 20,163**

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Kirkland, WA 98033
Phone: 425-828-0500 Fax: 425-828-0700
www.prodims.com

Non-Structural Costs

Name: **Wa State School Seismic Safety Assessment**
Second Name: **Lake Roosevelt Jr/Sr High Gym**
Location: **Grand Coulee, WA**
Design Phase: **ROM Cost Estimates**
Date of Estimate: **April 25, 2019**
Date of Revision:
Month of Cost Basis: **4Q, 2018, 1Q, 2019**

Areas	sqft
Building Area	46,336
Total Areas	**46,336**

Lake Roosevelt Jr/Sr High Gym

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 115,023

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 11,502	$ 126,525
General Conditions	10.0%	$ 11,502	$ 138,027
Home Office Overhead	5.0%	$ 5,751	$ 143,778
Profit	6.0%	$ 6,901	$ 150,680
Escalation Not Included-Costs in 1Q, 2019 Dollars	0.0%	$ -	$ 150,680
Washington State Sales Tax	0.0%	$ -	$ 150,680

Total Markups Applied to the Direct Cost 31.00%
Markups are multiplied from each subtotal- They are not multiplied from the direct cost

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--→	**$ 150,680**	**$ 3.25**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 120,544**	**$ 2.60**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 226,020**	**$ 4.88**

Please see the Master Summary for Assumptions and Qualifications for ROM Cost Estimates

Direct Cost of Construction

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	2- Non- Structural Demo/Restoration*										
	Interiors and M/E/P/FP systems										
	Interior Wall/Door/Casework/Specialties Systems										
	Small Amount of Masonry Veneer Reinforcement	1	set	$ 3,520.00	$ 3,520.00	$ 1,980.00	$ 1,980.00	$ 330.00	$ 330.00	$ 5,830.00	$ 5,830.00
	Reinforce Ceilings and Light Fixtures with Additional Attachments	46,336	sqft	$ 1.28	$ 59,356.42	$ 0.82	$ 37,949.18	$ 0.13	$ 5,838.34	$ 2.23	$ 103,143.94
	Mechanical/Electrical/Fire Protection Systems	46,336	sqft	$ 0.07	$ 3,138.50	$ 0.06	$ 2,567.87	$ 0.01	$ 342.38	$ 0.13	$ 6,048.75

*Allows 30 percent of existing nonstructural systems M/E/P/FP require upgrades/replacement.

Subtotal of the Direct Cost of Construction	**Lake Roosevelt Jr/Sr High Gym**	**$ 115,023**

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Appendix D: Earthquake Performance Assessment Tool (EPAT) Worksheet

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Washington Schools Earthquake Performance Assessment Tool (EPAT)
MAIN PAGE

Full District Name	Grand Coulee Dam		
Point of Contact	Paul Turner		
Telephone	509-633-2142		
E-Mail	pturner@gcdsd.org		
File Name	Grand Coulee Dam, Lake Roosevelt K12, CTE Building EPAT	**File Date:**	7/5/2018

District	Grand Coulee Dam
Facility Name	Lake Roosevelt High School
Building Part Name	CTE Building

Earthquake Ground Motion (% g)		**Earthquake Hazards**	
20% in 50 year PGA	6.5%	**Site Class**	D
10% in 50 year PGA	10.6%	**Ground Shaking Hazard**	Moderate
2% in 50 year PGA	24.7%	**Liquefaction Potential**	Low
Percentile S_s *Among all WA Campuses*	17%	**Combined Earthquake Hazard Level**	Moderate

Total Building Part Area (Square Feet)	**Building Evaluated By**	**Input Data by Person(s)**
46,336	DNR, Reid Middleton	Tim Green, Reid Middleton

The Earthquake Ground Motion and Earthquake Hazard Hazards data shown above are primarily for use and interpretation by engineers.

Refer to the EPAT User Guide for technical explanations of the Earthquake Ground Motion and the Earthquake Hazards information.

Washington Schools Earthquake Performance Assessment Tool (EPAT)
BUILDING DATA PAGE

Facility Name	Lake Roosevelt High School
Building Name	CTE Building
Building Use	Educational

Data Entry Item	User Entered Values	Default Values	Used for BCA
Seismic Data			
Decimal Latitude	47.970084	47.970084	47.970084
Decimal Longitude	-118.972695	-118.972695	-118.972695
Site Class (Soil/Rock Type)	D	D	D
Liquefaction Potential	Low	Low	Low
Geographic Region for Seismic Zones	Eastern	Eastern	Eastern
Building Structural Data			
HAZUS Building Type***	RM1	Reinforced Masonry Bearing Walls w/ Wood or Metal Diaphragms	RM1
Number of Stories (Excluding Basement)***	1		1
Year Built***	1955		1955
Code for Building Design (if known)	UBC	**Use the Drop-Down menus to Select Data Entries for the Bright Green Shaded data cells.**	UBC
Design Code Year (if known)	<1973		<1973
Severe Vertical Irregularity***	No		No
Moderate Vertical Irregularity***	No		No
Plan (Horizontal) Irregularity***	No		No

***** Mandatory Data Entry**

Washington Schools Earthquake Performance Assessment Tool (EPAT)
RESULTS SUMMARY

District Name	Grand Coulee Dam	**Existing Building Life Safety Risk & Priority for Retrofit or Replacement**
School Name	Lake Roosevelt High School	
Building Name	CTE Building	Low-Moderate

Building Data

HAZUS Building Type	RM1	Reinforced Masonry Bearing Walls w/ Wood or Metal Diaphragms
Year Built	1955	These parameters determine the capacity of the existing building to withstand earthquake forces.
Building Design Code	<1973 UBC	
Existing Building Code Level	Pre	
Geographic Area	Eastern	
Severe Vertical Irregularity	No	Buildings with irregularities have greater earthquake damage than otherwise similar buildings that are regular.
Moderate Vertical Irregularity	No	
Plan Irregularity	No	

Seismic Data

Earthquake Ground Shaking Hazard Level	Moderate	Frequency and severity of earthquakes at this site
Percentile S_s Among WA K-12 Campuses	17%	Earthquake ground shaking hazard is higher than 17% of WA campuses.
Site Class (Soil or Rock Type)	D	Stiff Soil
Liquefaction Potential	Low	Liquefaction increases the risk of major damage to a building
Combined Earthquake Hazard Level	Moderate	Earthquake ground shaking and liquefaction potential

Severe Earthquake Event (Design Basis Earthquake Ground Motion)[1]

Building State	**Building Damage Estimate[2]**	**Probability Building is not Repairable[3]**	**Life Safety[4] Risk Level**	**Most Likely Post-Earthquake Tagging[5]**
Existing Building	32%	28%	Low-Moderate	Red
Life Safety Retrofit Building	15%	11%	Very Low	Green/Yellow
Current Code Building	12%	7.2%	Very Low	Green/Yellow

1. 2/3rds of the 2% in 50 year ground motion
2. Percentage of building replacement value.
3. Probability building is in the Extensive or Complete damage states. For existing buildings, the probability that the building is not economically repairable may be higher: some buildings in the Moderate Damage state are also likely to be demolished.
4. Based on probability of Complete Damage State.
5. Most likely post-earthquake damage state per ATC-20.

Source for the Data Entered into the Tool

Building Evaluated By:	DNR, Reid Middleton
Person(s) Who Entered Data in EPAT:	Tim Green, Reid Middleton
User Overrides of Default Parameters:	Building Design Code Year, Latitude, Longitude, Site Class, Liquefaction, Geographic Region

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Appendix E: Lake Roosevelt K-12 School Record Drawings

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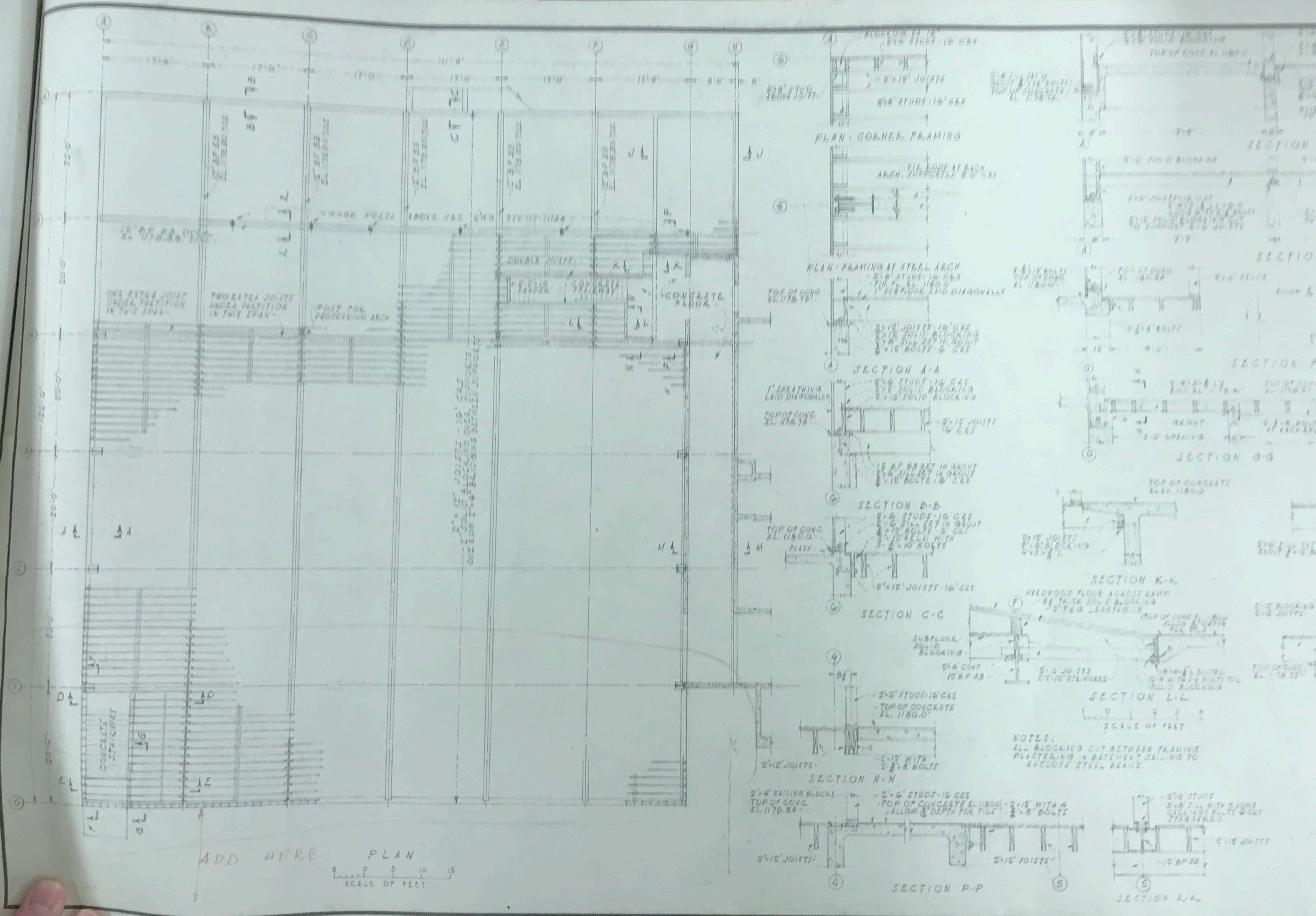
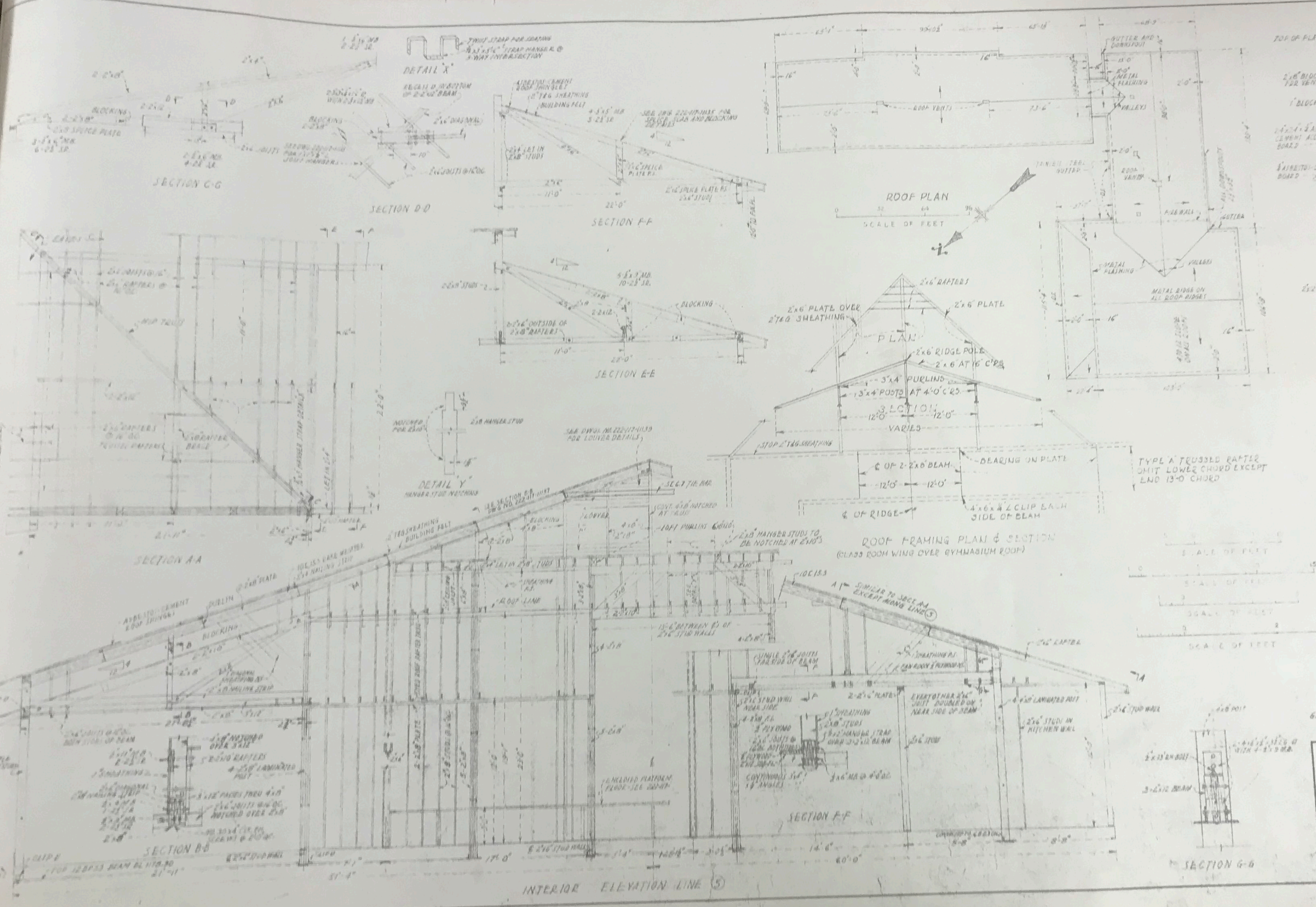


UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT - WASHINGTON
TOWN OF COULEE DAM
COULEE DAM HIGH SCHOOL
GYMNASIUM STRUCTURE
MAIN FLOOR WOOD FRAMING

DRAWN J.C.L. SUBMITTED
TRACED RECOMMENDED
CHECKED L.R. APPROVED

COULEE DAM, WASH. APRIL 11, 1950 — 222-117-1113


ROOF AND ATTIC PLAN
ONE-HALF OF STEEL ARCH "A"
SECTION G-G
DETAIL "Y"
SECTION A-A
SECTION B-B
SECTION D-D
DETAIL "Z"
NOTES:
ELEVATION LINE (G)
SECTION-C-C
SECTION E-E
REFERENCE DRAWINGS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT-WASH
TOWN OF COULEE D
COULEE DAM HIGH SCHOO
GYMNASIUM STRUCTURE
ATTIC AND ROOF FRAMING-PLAN AND S
DRAWN SUBMITTED
TRACED RECOMMENDED
CHECKED APPROVED
COULEE DAM, WASH



WALL SECTION
GYMNASIUM LEFT WALL

NOTES:

ALL SUPPORTS NOT DETAILED OF SUPPORTED MEMBERS TO BE ADEQUATELY ANCHORED.

REFER TO DRAWING NO. 222-117-1154 FOR LOCATION OF DUCTWORK.

LAMINATED STUDS AND POSTS TO BE SPIKED WITH 2-20D NAILS PER 2'-0" IN ADDITION TO THE ½" BOLTS @ 2'-0" REQUIRED FOR 3 OR MORE MEMBERS. SPIKING TO BE STAGGERED.

REFERENCE DRAWINGS

GYMNASIUM STRUCTURE	BASEMENT AND MAIN FLOOR PLAN	222-117-1135
"	ATTIC AND ROOF FRAMING	222-117-1137
"	ENCLOSED PLATFORM FRAMING	222-117-1139

UNITED STATES
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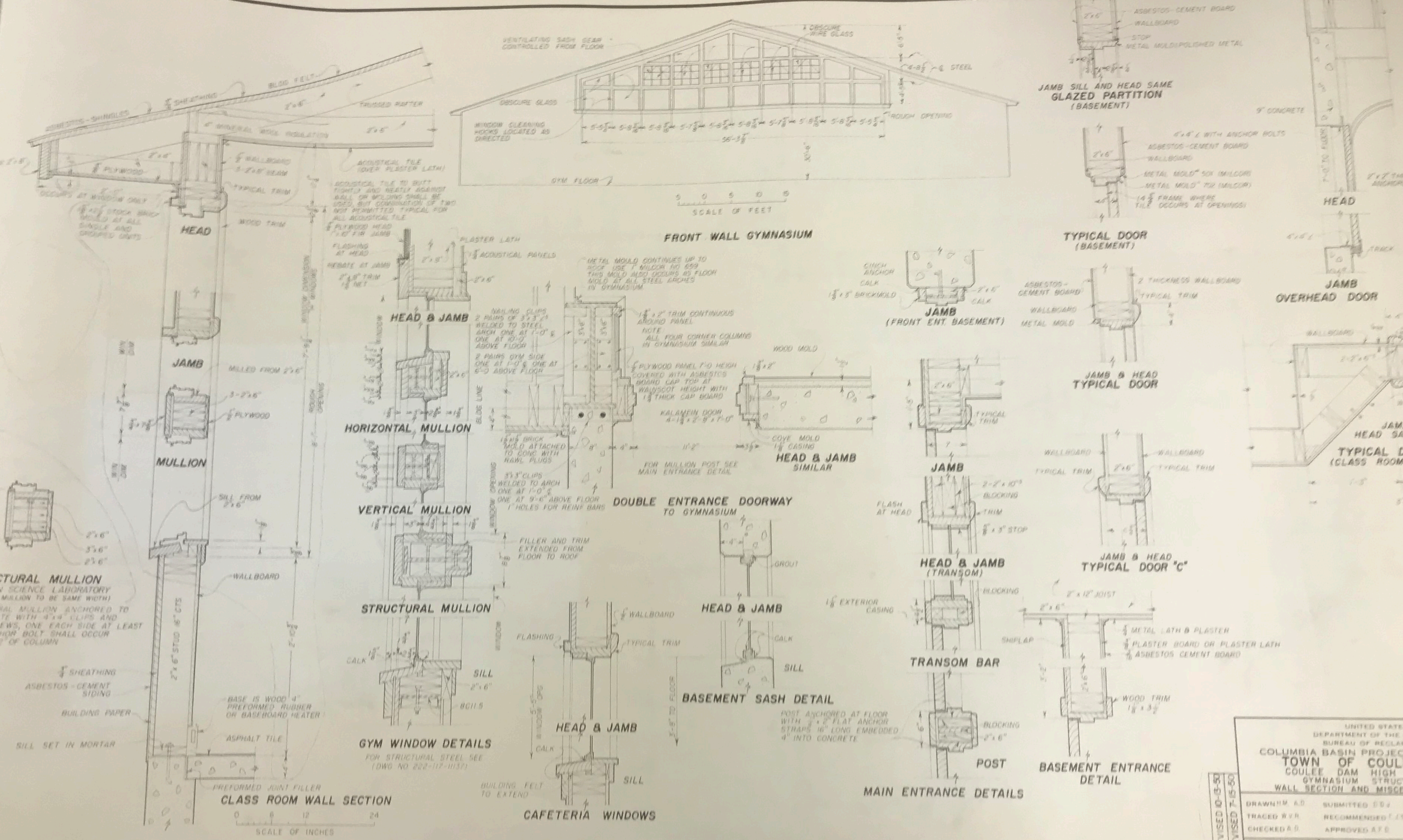
COLUMBIA BASIN PROJECT - WASHINGTON
TOWN OF COULEE DAM
COULEE DAM HIGH SCHOOL
GYMNASIUM STRUCTURE
WALL AND ROOF FRAMING

DRAWN RCR, J.L. SUBMITTED P.D. Johnson
TRACED RCR RECOMMENDED [signature]
CHECKED A.G. APPROVED [signature]

A | COULEE DAM, WASH. APRIL 1, 1950 | 222-117-1138


SECTION B-B
PLATFORM SECTION
BRACE THESE ROWS
HARDWOOD RAMP
DETAIL PROSCENIUM WALL AT ARCH
PROSCENIUM ARCH TRUSS
SECTION THRU PLATFORM
UNDER PLATFORM DOOR DETAILS
INTERIOR SPLICE
EXTERIOR SPLICE
SPLICE DETAIL
END ELEVATION
STAGE WALL TO ROOF
SCALE OF FEET
REFERENCE DRAWINGS
SECTION THRU FOUNTAIN
ELEVATION REAR WALL GYMNASIUM
PLAN CUSPIDOR & FOUNTAIN
PROSCENIUM POST PLAN
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT - WASHINGTON
TOWN OF COULEE DAM
COULEE DAM HIGH SCHOOL
GYMNASIUM STRUCTURE
ENCLOSED PLATFORM FRAMING DETAILS
DRAWN
TRACED
CHECKED
SUBMITTED
RECOMMENDED
APPROVED
COULEE DAM, WASH.
222



REVISED 10-13-50
REVISED 7-15-50

UNITED STATES
DEPARTMENT OF THE INT
BUREAU OF RECLAMAT
COLUMBIA BASIN PROJECT
TOWN OF COULEE
COULEE DAM HIGH SC
GYMNASIUM STRUCTU
WALL SECTION AND MISCELL

DRAWN H.M. A.D. SUBMITTED D.D.J.
TRACED W.V.R. RECOMMENDED T.J.S.
CHECKED A.D. APPROVED A.T.E.

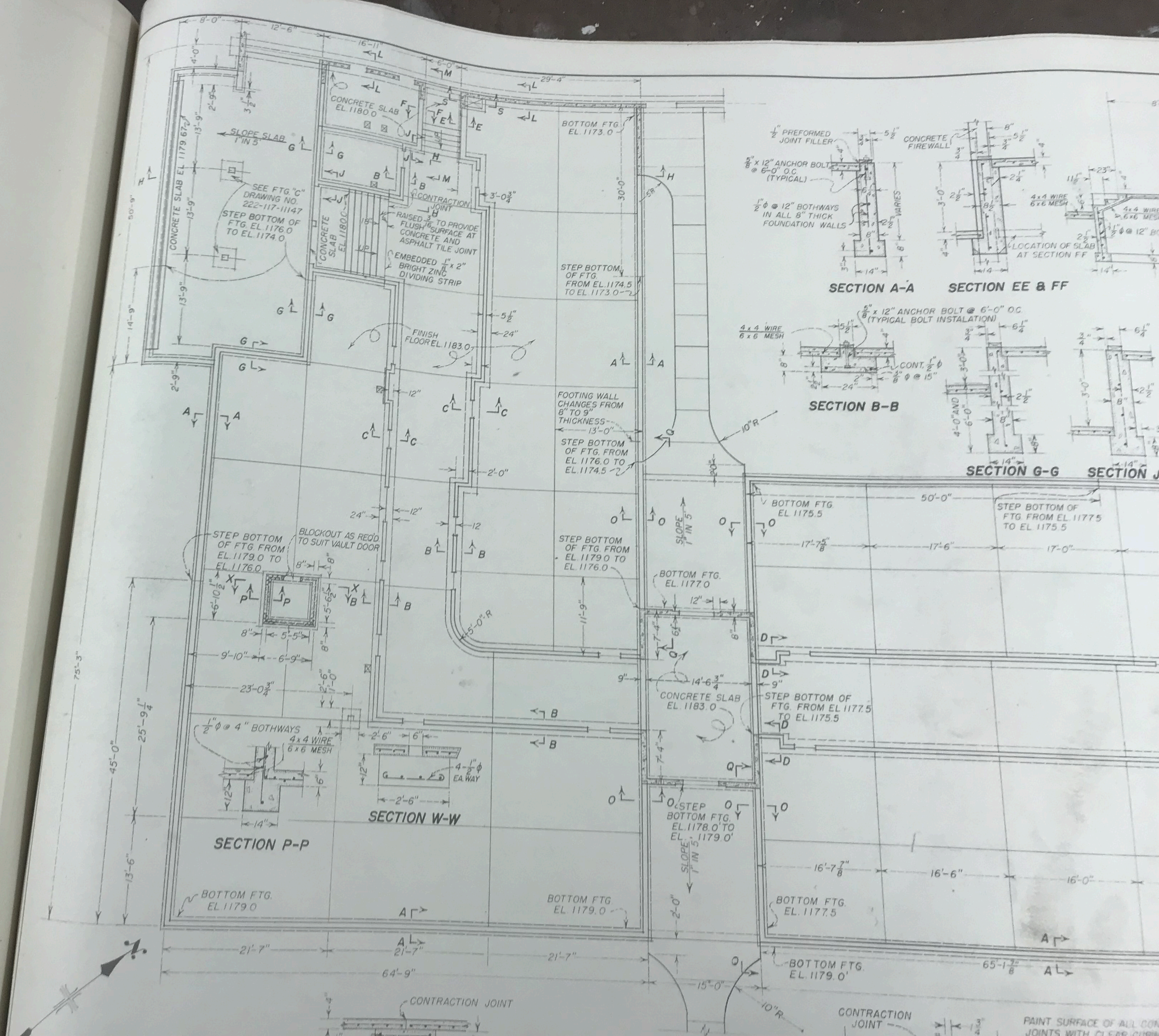
COULEE DAM, WASH.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT – WASHINGTON

TOWN OF COULEE DAM
COULEE DAM HIGH SCHOOL
MAIN ENTRANCE DETAILS

DRAWN C.Y.	SUBMITTED D.D. Johnson
TRACED C.Y.	RECOMMENDED
CHECKED A.O.	APPROVED
COULEE DAM, WASH.	222-117-1

Kimberly-Clark Series
AJ330402
SECTION A-A
SECTION EE & FF
SECTION H-H
SECTION M-M
SECTION T-T
SECTION S-5
SECTION N-N
SECTION O-O
SECTION Q-Q
SECTION B-B
SECTION G-G
SECTION J-J
SECTION L-L
SECTION R-R
SECTION X-X
SECTION W-W
SECTION P-P
SECTION C-C
SECTION D-D
SECTION K-K
CONTRACTION JOINT
FINISH FLOOR EL 1183.0
BLOCKOUTS
REFERENCE DRAWINGS
NOTES
TOWN OF COULEE
COULEE DAM HIGH
COLUMBIA BASIN PROJECT
CONCRETE OUTLINE AND REI
FOUNDATION PLAN AND SECTIONS


SECTION A-A
SECTION EE & FF
SECTION B-B
SECTION G-G
SECTION J
SECTION P-P
SECTION W-W
CONCRETE SLAB EL 1179.67
SEE FTG "C" DRAWING NO. 222-117-11147
STEP BOTTOM OF FTG. EL 1176.0 TO EL 1174.0
CONCRETE SLAB EL 1180.0
CONTRACTION JOINT
RAISED 3/16" TO PROVIDE FLUSH SURFACE AT CONCRETE AND ASPHALT TILE JOINT
EMBEDDED 1/8" x 2" BRIGHT ZINC DIVIDING STRIP
FINISH FLOOR EL. 1183.0
BOTTOM FTG. EL. 1173.0
STEP BOTTOM OF FTG. FROM EL. 1174.5 TO EL. 1173.0
FOOTING WALL CHANGES FROM 8" TO 9" THICKNESS
STEP BOTTOM OF FTG. FROM EL. 1176.0 TO EL. 1174.5
STEP BOTTOM OF FTG. FROM EL. 1179.0 TO EL. 1176.0
BLOCKOUT AS REQ'D. TO SUIT VAULT DOOR
BOTTOM FTG. EL. 1177.0
CONCRETE SLAB EL. 1183.0
STEP BOTTOM FTG. EL. 1178.0 TO EL. 1179.0
BOTTOM FTG. EL. 1179.0
BOTTOM FTG. EL. 1175.5
STEP BOTTOM OF FTG. FROM EL. 1177.5 TO EL. 1175.5
BOTTOM FTG. EL. 1177.5
SLOPE 1" IN 5'
1/2" PREFORMED JOINT FILLER
CONCRETE FIREWALL
5/8" x 12" ANCHOR BOLT @ 6'-0" O.C. (TYPICAL)
1/2" ϕ @ 12" BOTHWAYS IN ALL 8" THICK FOUNDATION WALLS
4x4 WIRE 6x6 MESH
LOCATION OF SLAB AT SECTION FF
5/8" x 12" ANCHOR BOLT @ 6'-0" O.C. (TYPICAL BOLT INSTALATION)
1/2" ϕ @ 4" BOTHWAYS
CONTRACTION JOINT
75'-3"
45'-0"
64'-9"
50'-0"


PLAN-WALL AND FOOTINGS
SCALE OF FEET
NOTE:
BASEMENT PLAN VIEWED FROM ABOVE ALL CONCRETE. BASEMENT FLOOR SLAB OMITTED IN VIEW PASSAGEWAY FLOOR SLAB IS SEEN.
FOR EXTENT OF BASEMENT SLAB SEE DWG 222-117-11133
BASEMENT FLOOR SLAB REINFORCEMENT TO BE 4X4 WIRE / 6X6 MESH UNLESS OTHERWISE NOTED.
COLUMN SCHEDULE
CAP PLATE SCHEDULE
SEE PLATE DETAILS
ALL FTGS TYPE "C" EXCEPT AS NOTED (9 REQ'D)
EL BOTTOM ALL FTGS-1166.75
EL TOP ALL FTG PIERS-1168.58
TYPE "C" FOOTING
COLUMN DETAILS
TYPE "B" CAP PL 11 REQ'D
COL. BASE & TYPE "A" CAP PLS, 41 REQ'D
SEE DWG NO. 222-117-11148 FOR STAIRS
SECTION A-A
SECTION B-B
SECTION C-C
TYPICAL SECTION
(EDGE SHOWER RECESS)
SECTION R-R
SECTION D-D
SECTION E-E
SECTION F-F
SECTION G-G
SECTION H-H
SECTION J-J
SECTION L-L
SECTION M-M
SECTION K-K
SEE DWG 222-117-11133 FOR DIMENSION OF WINDOW OPENING.
GENERAL NOTES
EMBEDMENT OF DOWELS AND LAPPED SPLICES TO BE 34 BAR DIAMETERS EXCEPT AS OTHERWISE SHOWN.
REINFORCEMENT STEEL TO EXTEND THROUGH ALL CONSTRUCTION JOINTS.
CORNERS OF EXPOSED CONCRETE TO BE CHAMFERED WITH NOT LESS THAN A 45° BEVEL 3/4 x 3/4 EXCEPT AS OTHERWISE NOTED.
DIMENSIONS TO REINFORCEMENT ARE TO THE CRS. OF BARS.
OPEN CIRCLES AT THE END OF BARS INDICATE BARS TURNED AWAY FROM OBSERVER.
FOR STANDARD BAR BENDS SEE X-D-3626
WALL AREA IN CONTACT WITH BASEMENT FLOOR SLAB AND CONTACT SURFACE OF ALL CONTRACTION JOINTS TO BE PAINTED WITH CLEAR CURING COMPOUND.
LAP WELDED WIRE FABRIC 9" EXCEPT AS OTHERWISE SHOWN.
PROTECTIVE COVER OF REINFORCEMENT BARS IS TO BE 1 1/2" CLEAR UNLESS OTHERWISE SHOWN.
FOR EMBEDDED ELECTRICAL EQUIPMENT SEE ELECTRICAL DWGS.
FOR LOCATION OF ALL HEATING AND VENTILATING DUCTS, SEE HEATING AND VENTILATING DRAWINGS.
NUMERALS IN PARENTHESIS ( ) FOLLOWING SECTION LETTERS OR NOTATIONS INDICATE THE DRAWING SHOWING SECTIONS OR DETAILS.
SLAB CONTRACTION JOINTS IN GYMNASIUM BASEMENT TO BE UNDER PARTITIONS OR ALONG COLUMN LINES.
ALL EXTERIOR EXPOSED CONCRETE SURFACES TO BE F3 FINISH, AND SACK RUBBED. ALL INTERIOR EXPOSED CONCRETE TO BE F3 FINISH EXCEPT: EXPOSED SURFACES IN PIPE TUNNEL AND TRANSFORMER VAULT, AND UNEXPOSED SURFACES OF FIREWALLS TO HAVE F2 FINISH. ALL WALLS AGAINST EARTH BACKFILL TO HAVE F1 FINISH.
REFERENCE DRAWINGS
CONCRETE OUTLINE AND REINFORCEMENT STAIRS AND WALL SECTIONS GYMNASIUM STRUCTURE ____ 222-117-11148
GYMNASIUM STRUCTURE BASEMENT FLOOR AND MAIN FLOOR PLAN ____ 222-117-11133
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT—WASHINGTON
TOWN OF COULEE DAM
COULEE DAM HIGH SCHOOL
CONCRETE OUTLINE AND REINFORCEMENT
BASEMENT PLAN AND SECTIONS—GYMNASIUM STRUCTU
DRAWN
SUBMITTED
TRACED
RECOMMENDED
CHECKED
APPROVED
COULEE DAM, WASH
222-117-

NOTE
FOR GENERAL NOTES SEE DWG. 222-117-1147

REFERENCE DRAWINGS

GYMNASIUM STRUCTURE BASEMENT FLOOR AND MAIN FLOOR PLANS .... 222-117-[illegible]
CONCRETE OUTLINE-BASEMENT PLAN AND SECTIONS-GYMNASIUM STRUCTURE 222-117-[illegible]

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA BASIN PROJECT—WASHINGTON
TOWN OF COULEE DAM
COULEE DAM HIGH SCHOOL
CONCRETE OUTLINE AND REINFORCEMENT
STAIRS AND WALL SECTIONS—GYMNASIUM STRUCTURE

DRAWN: [illegible]	SUBMITTED: [signature]
TRACED: [illegible]	RECOMMENDED: [signature]
CHECKED: [illegible]	... APPROVED: [signature]
A	COULEE DAM, WASH. [illegible] 222-117-1148

Appendix F: FEMA E-74 Nonstructural Seismic Bracing Excerpts

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Life Safety Systems

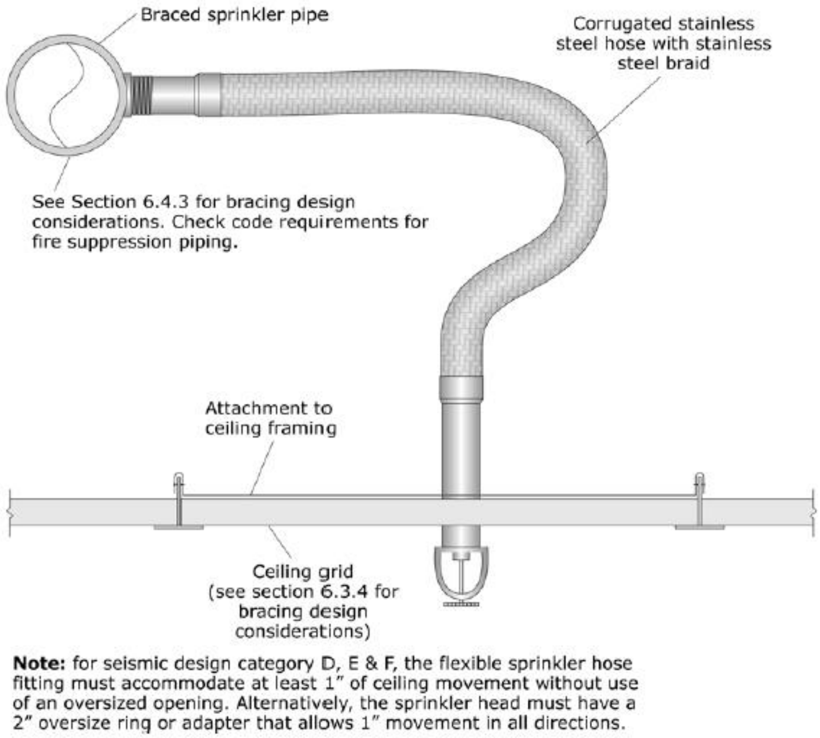


Figure G-1. Flexible Sprinkler Drop.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

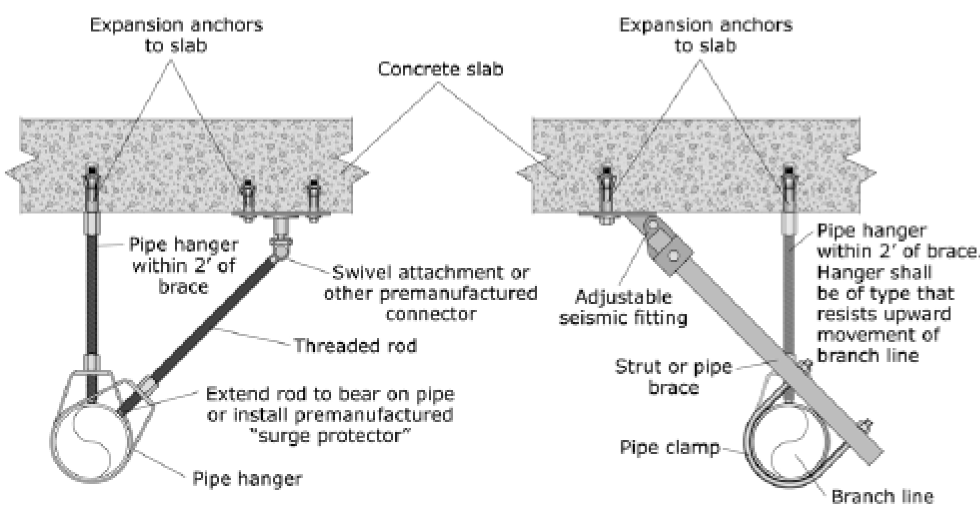


Figure G-2. End of Line Restraint.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Partitions

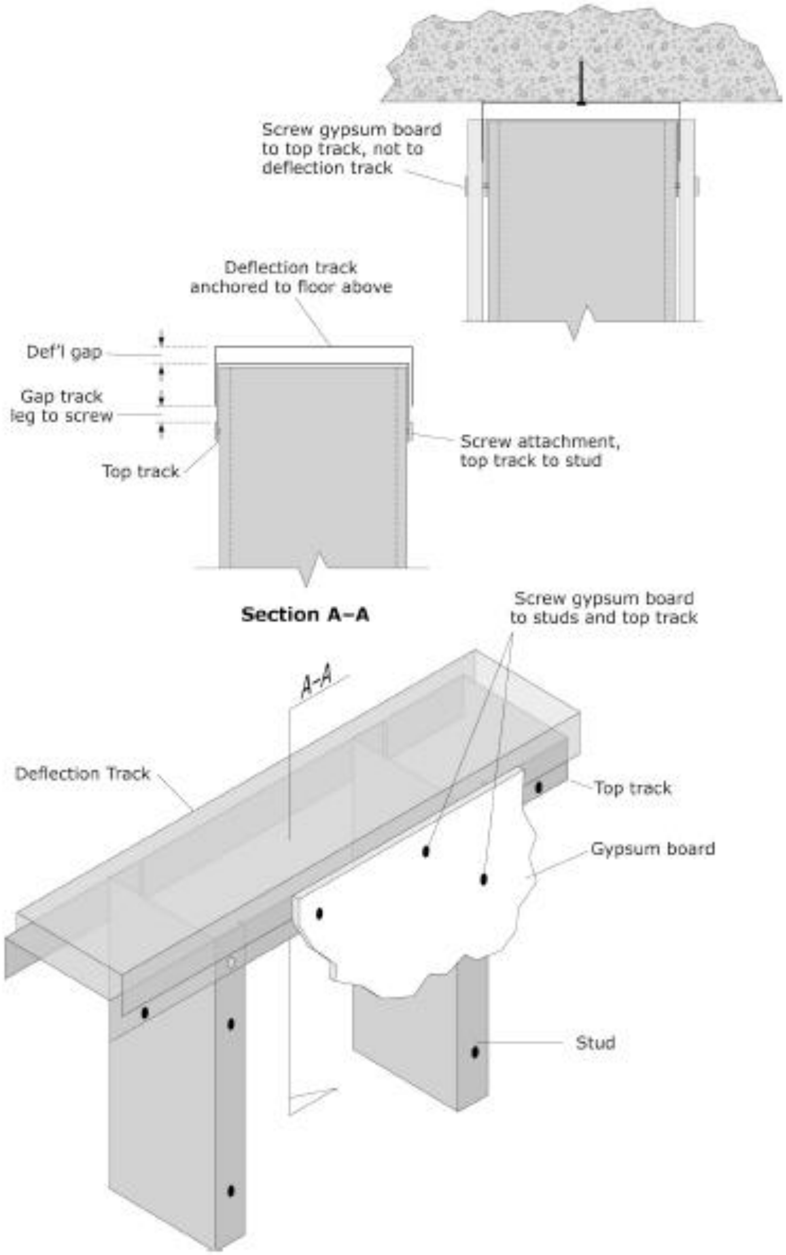


Figure G-3. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

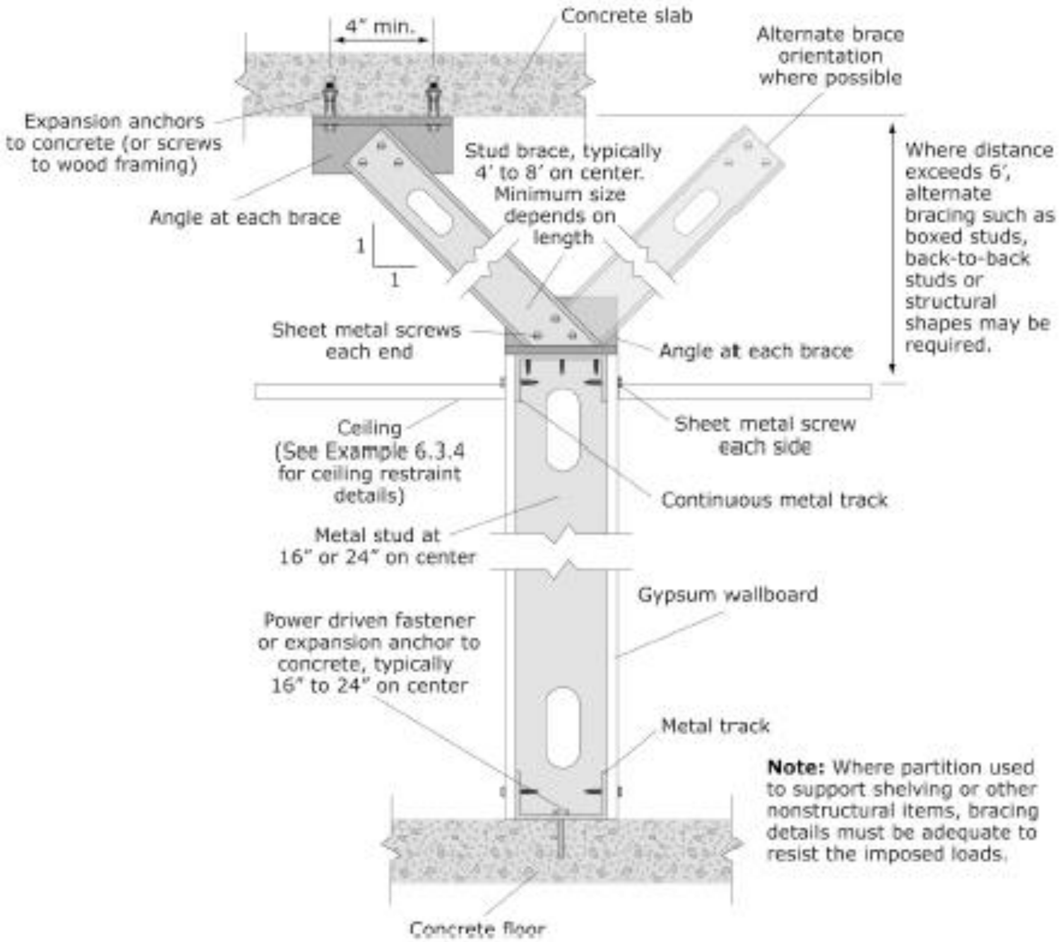


Figure G-4. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

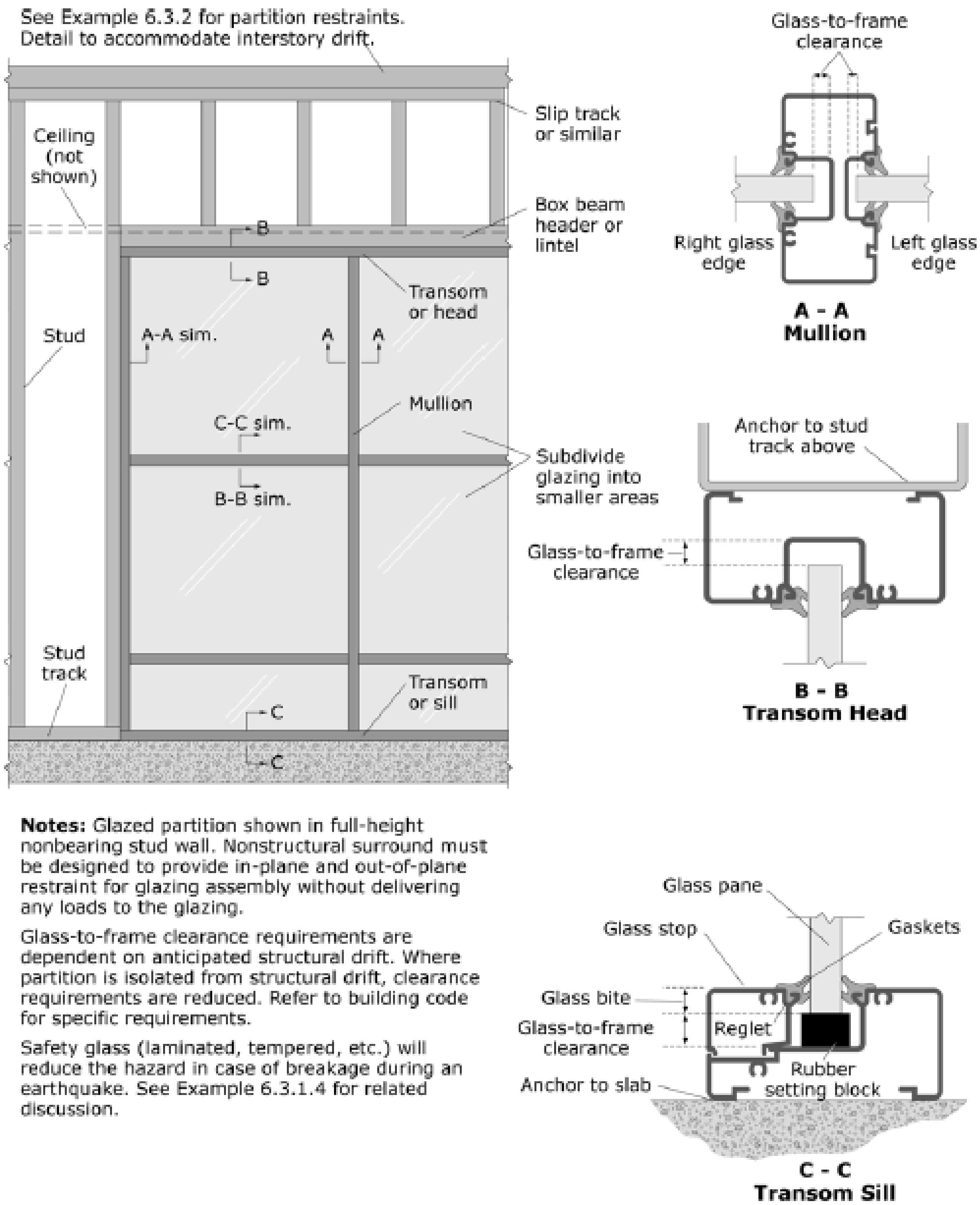


Figure G-5. Full-height Glazed Partition.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

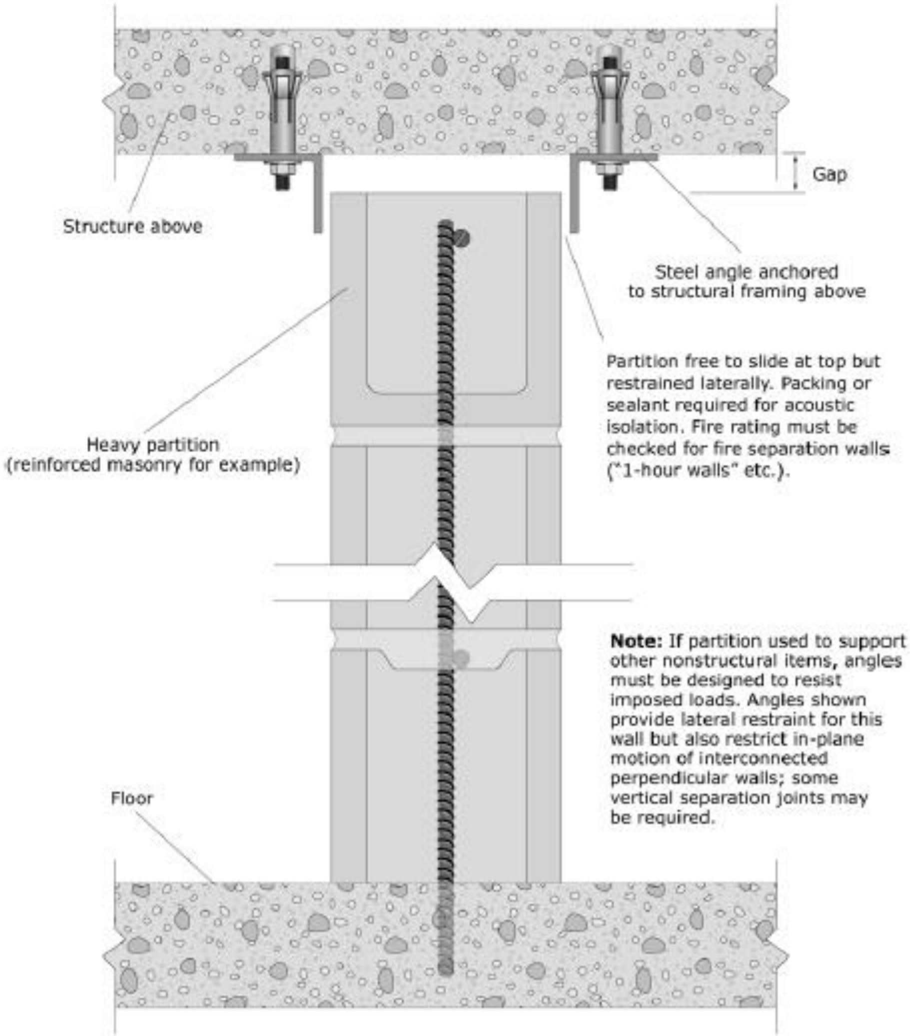


Figure G-6. Full-height Heavy Partition.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

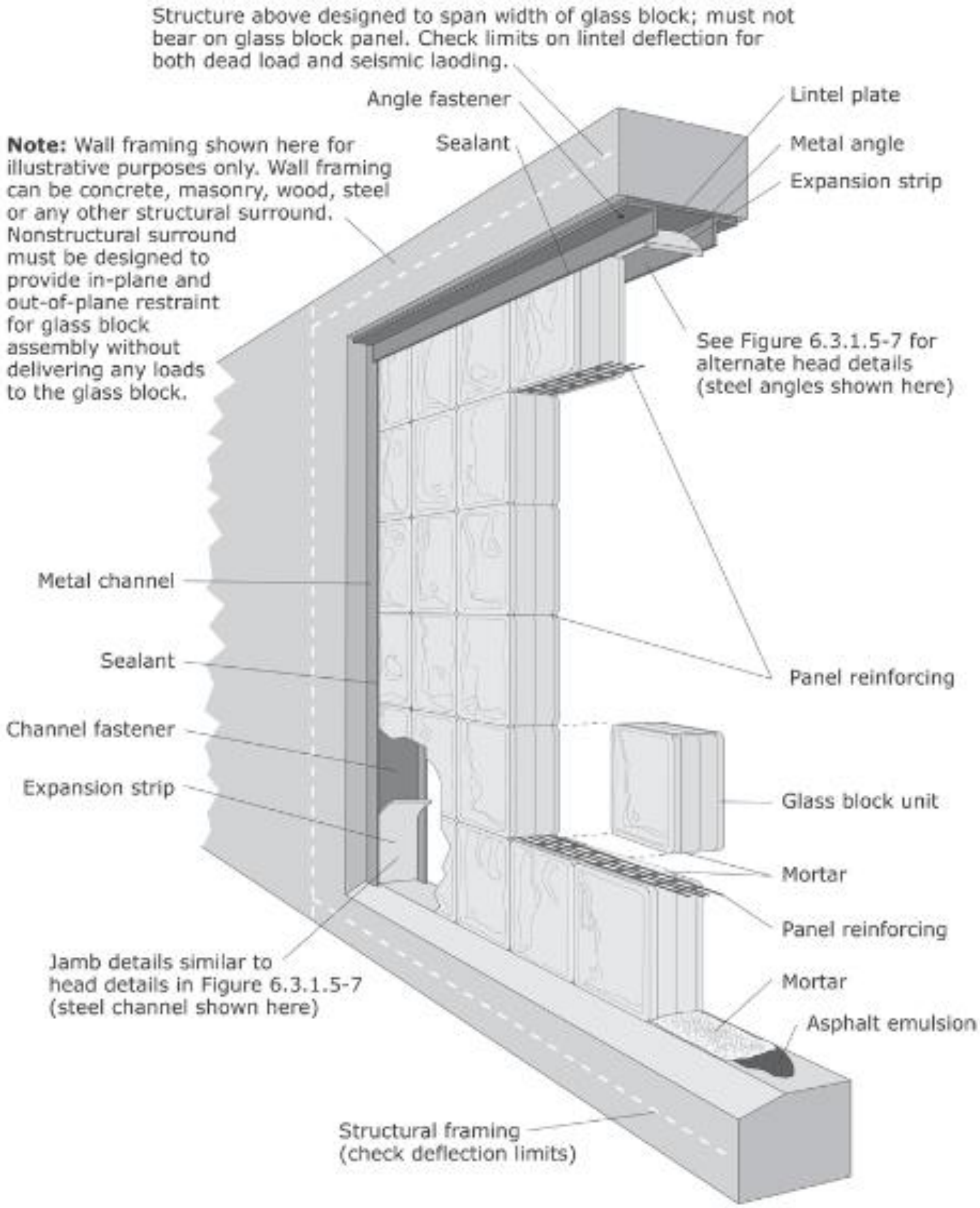


Figure G-7. Typical Glass Block Panel Details.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Ceilings

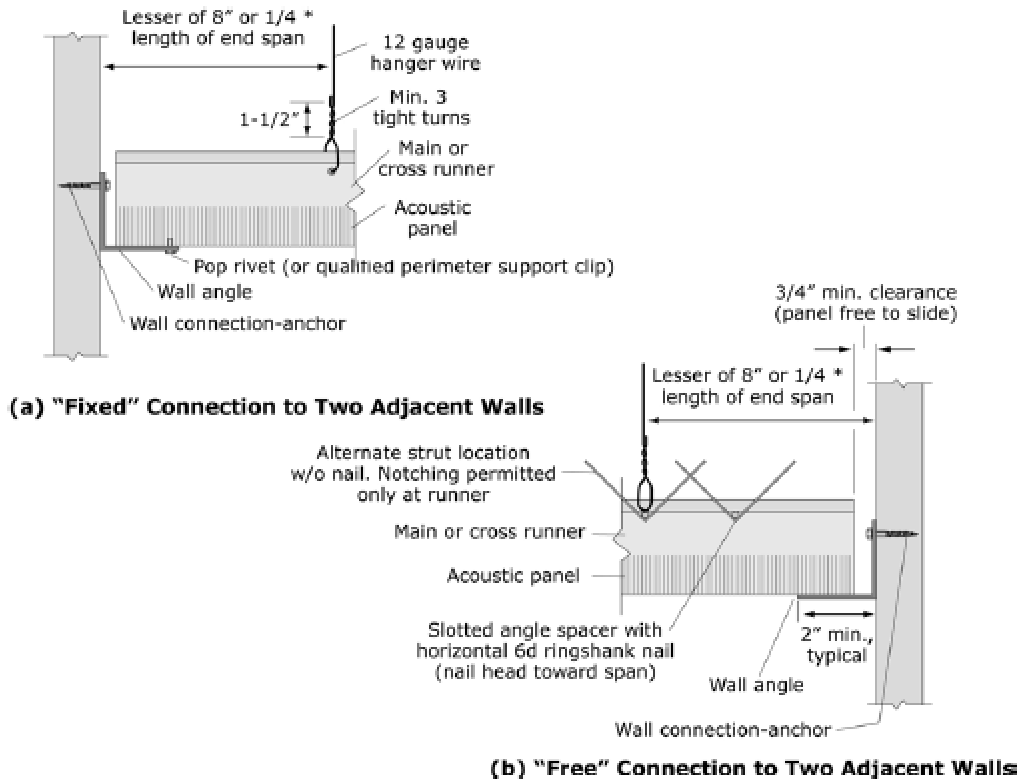
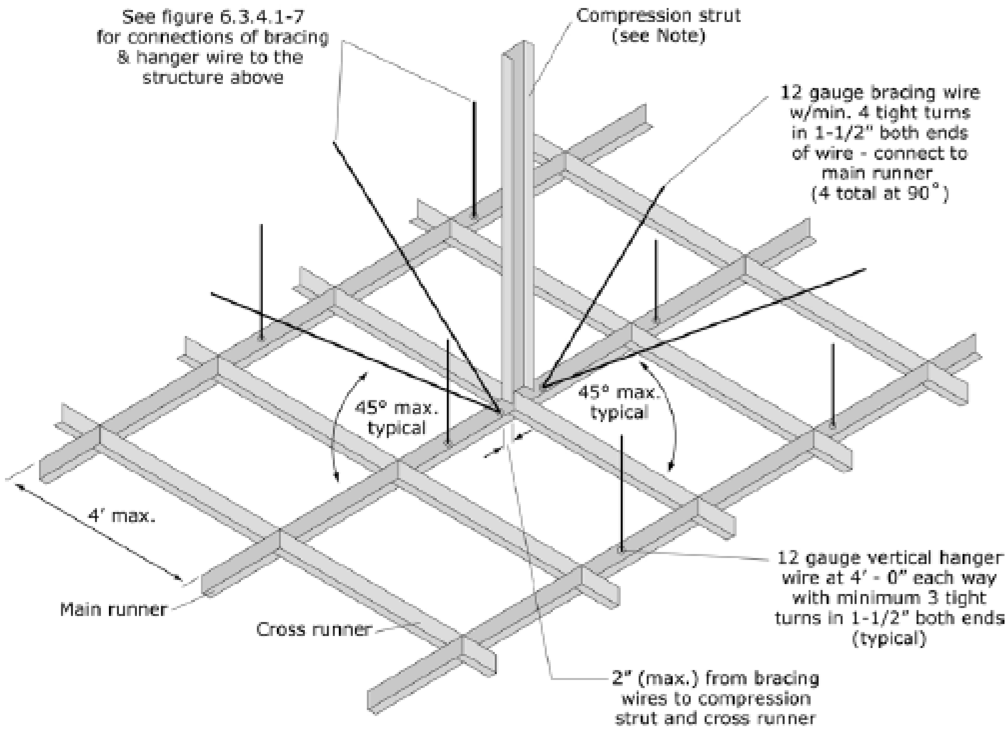


Figure G-8. Suspension System for Acoustic Lay-in Panel Ceilings – Edge Conditions.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Compression strut shall not replace hanger wire. Compression strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4" min. expansion anchor to structure. Size of strut is dependent on distance between ceiling and structure (l/r ≤ 200). A 1" diameter conduit can be used for up to 6', a 1-5/8" X 1-1/4" metal stud can be used for up to 10'

Per DSA IR 25-5, ceiling areas less than 144 sq. ft, or fire rated ceilings less than 96 sq. ft., surrounded by walls braced to the structure above do not require lateral bracing assemblies when they are attached to two adjacent walls. (ASTM E580 does not require lateral bracing assemblies for ceilings less than 1000 sq. ft.; see text.)

Figure G-9. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Assembly.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

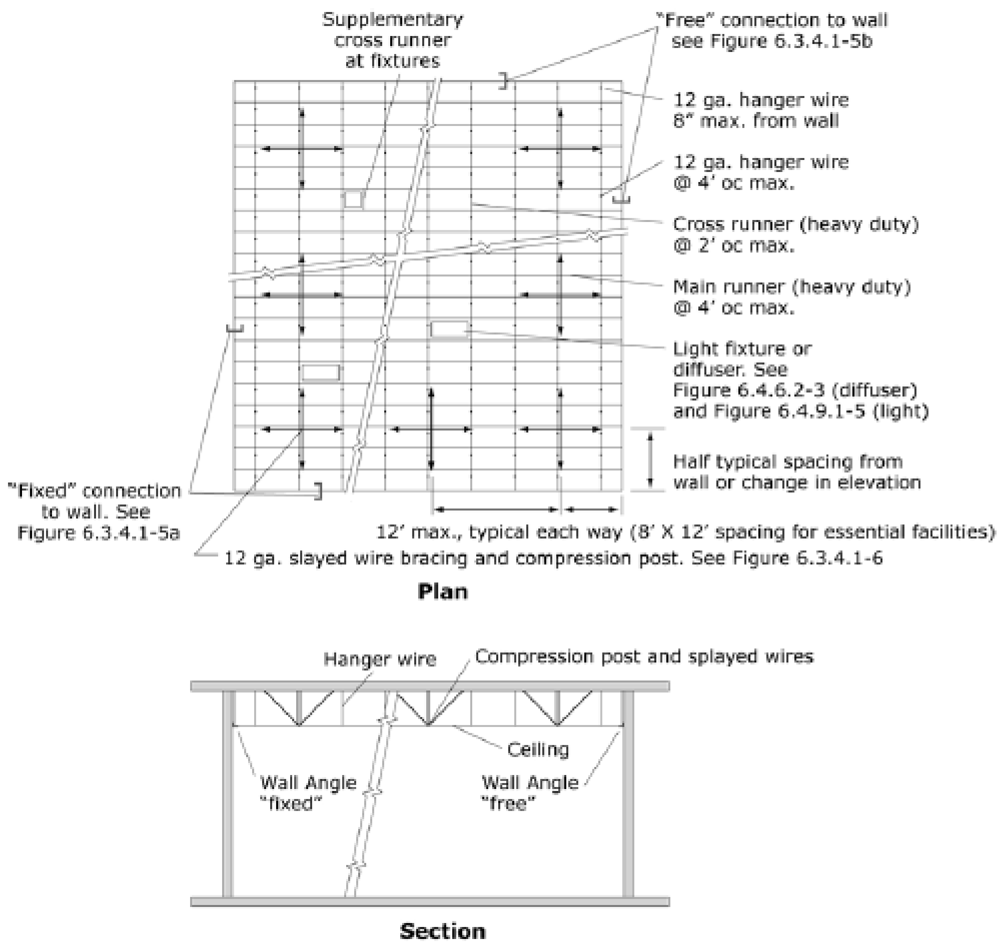


Figure G-10. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Layout.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

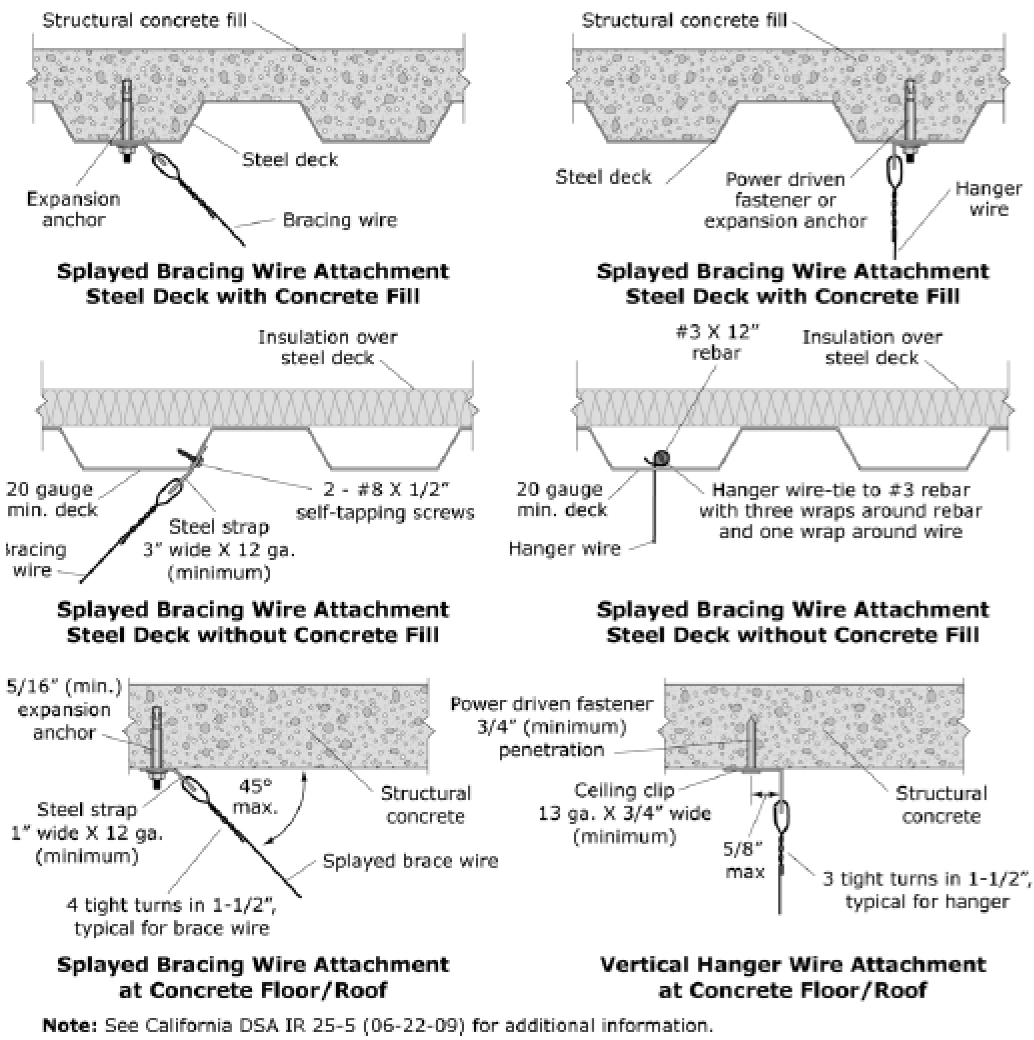
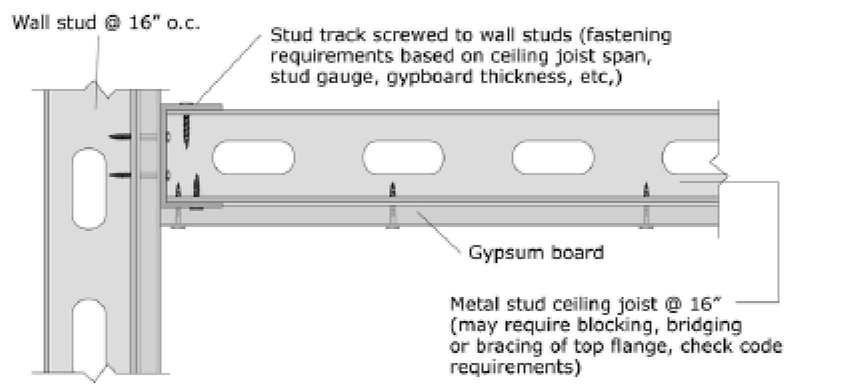
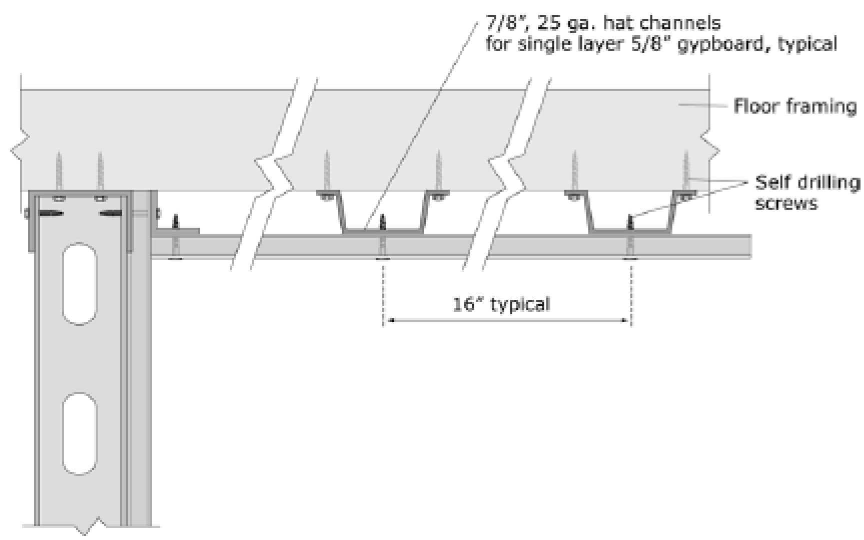


Figure G-11. Suspension System for Acoustic Lay-in Panel Ceilings – Overhead Attachment Details.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



a) Gypsum board attached directly to ceiling joists



b) Gypsum board attached directly to furring strips (hat channel or similar)

Note: Commonly used details shown; no special seismic details are required as long as furring and gypboard secured. Check for certified assemblies (UL listed, FM approved, etc.) if fire or sound rating required.

Figure G-12. Gypsum Board Ceiling Applied Directly to Structure.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

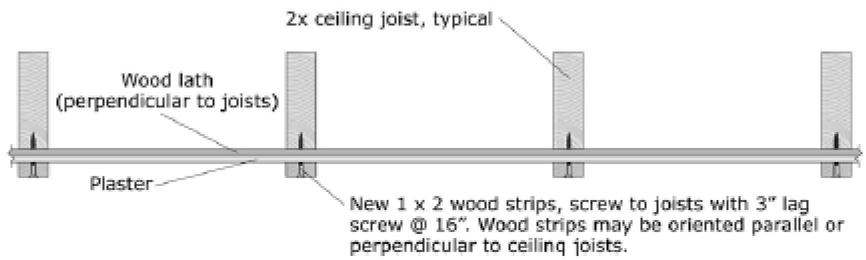


Figure G-13. Retrofit Detail for Existing Lath and Plaster.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

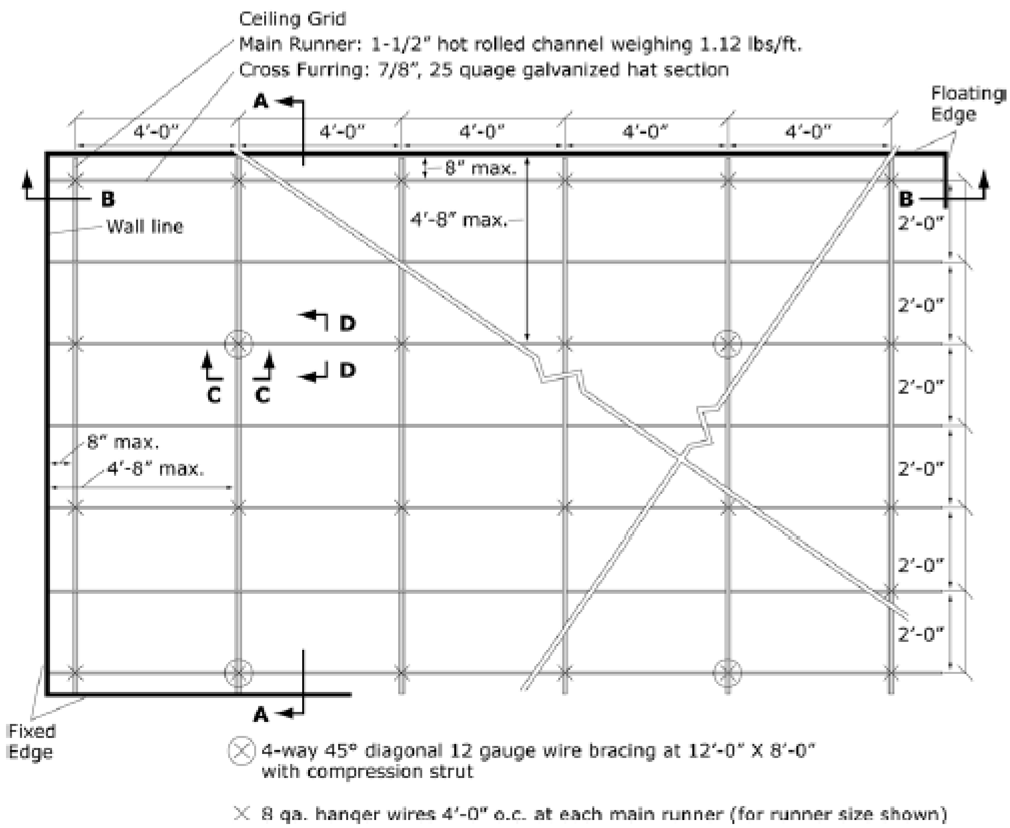
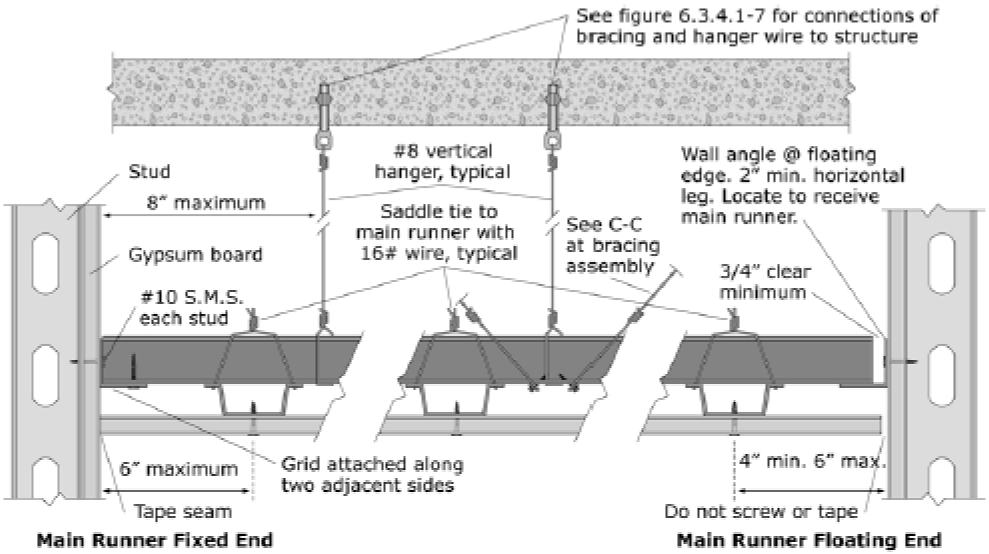
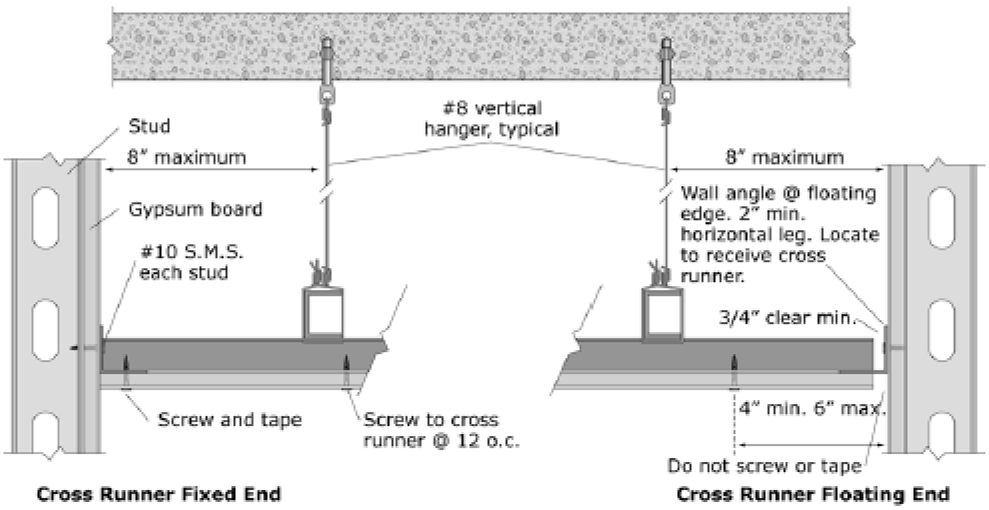


Figure G-14. Diagrammatic View of Suspended Heavy Ceiling Grid and Lateral Bracing.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



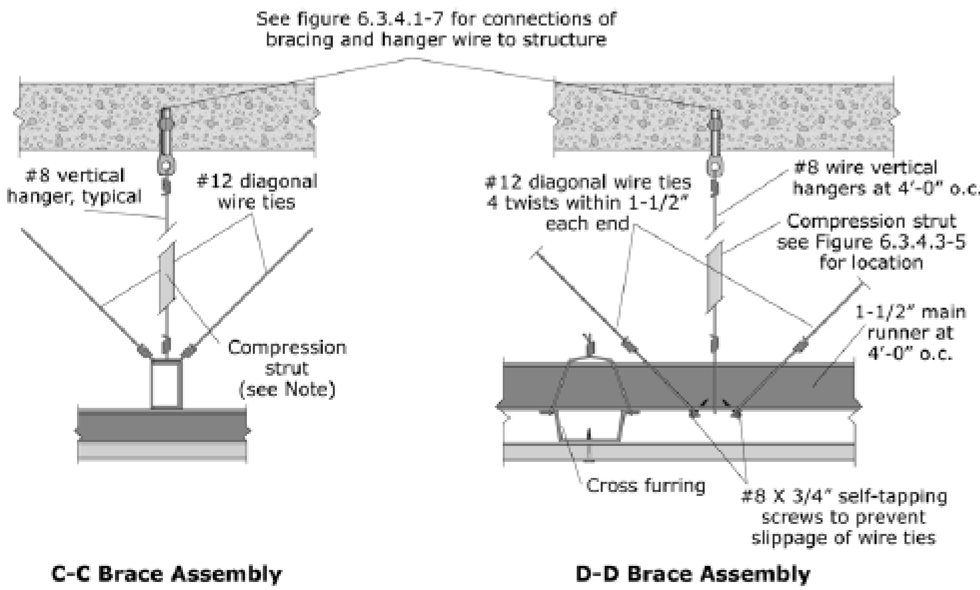
A-A Main Runner at Perimeter



B-B Cross Runner at Perimeter

Figure G-15. Perimeter Details for Suspended Gypsum Board Ceiling.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Note: Compression strut shall not replace hanger wire. Compresion strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4" min. expansion anchor to concrete. Size of strut is dependent on distance between ceiling and structure ($l/r \leq 200$). A 1" diameter conduit can be used for up to 6', a 1-5/8" X 1-1/4" metal stud can be used for up to 10'. See figure 6.3.4.1-6 for example of bracing assembly.

Figure G-16. Details for Lateral Bracing Assembly for Suspended Gypsum Board Ceiling.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Light Fixtures

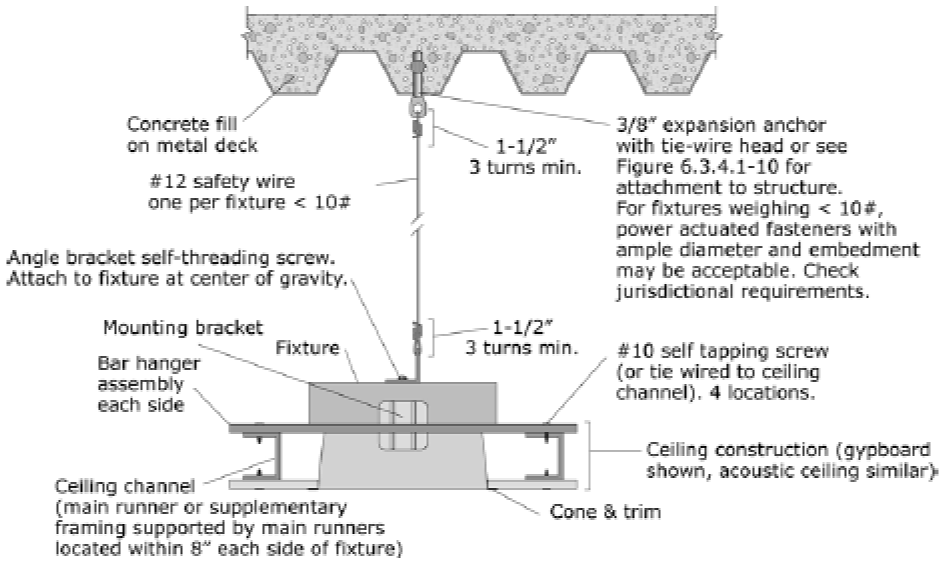


Figure G-17. Recessed Light Fixture in suspended Ceiling (Fixture Weight < 10 pounds).

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

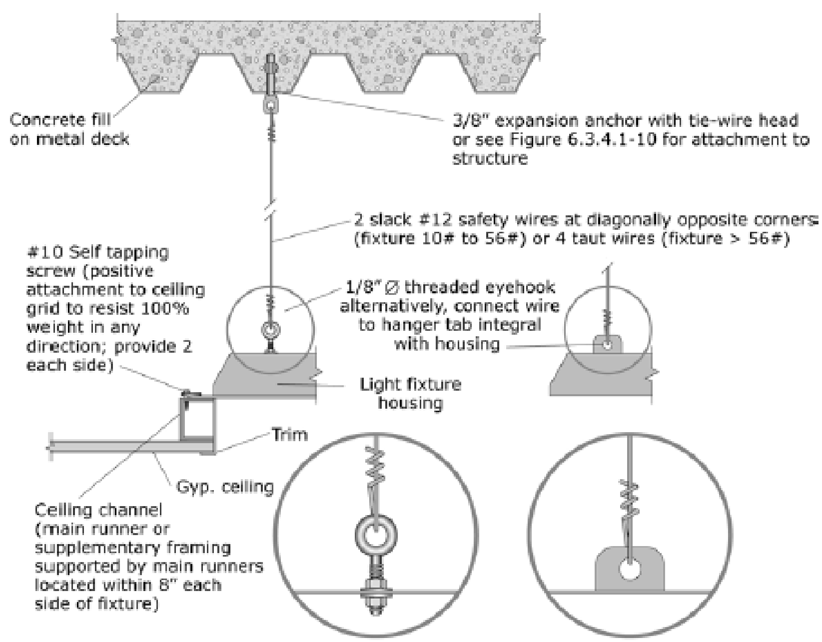


Figure G-18. Recessed Light Fixture in suspended Ceiling (Fixture Weight 10 to 56 pounds).

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Contents and Furnishings

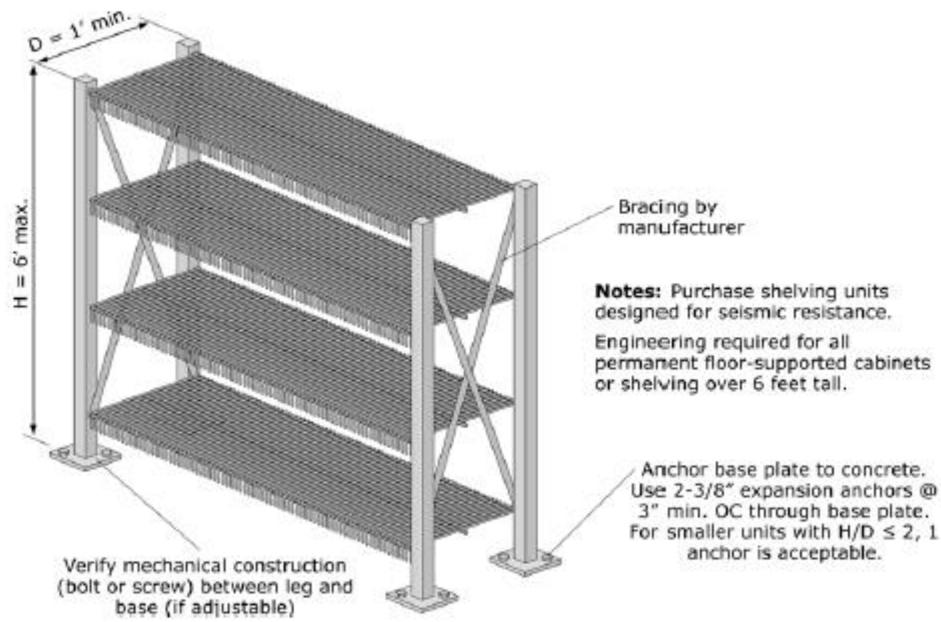


Figure G-19. Light Storage Racks.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

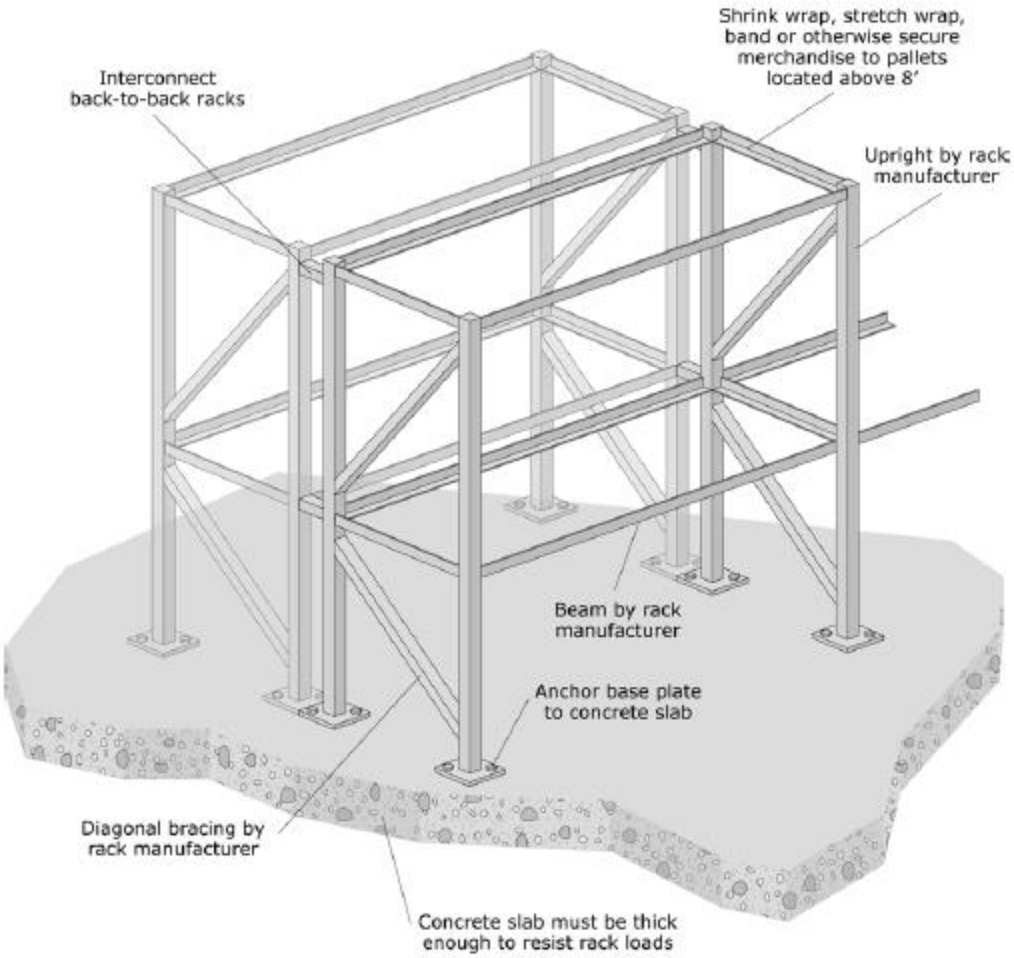


Figure G-20. Industrial Storage Racks.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

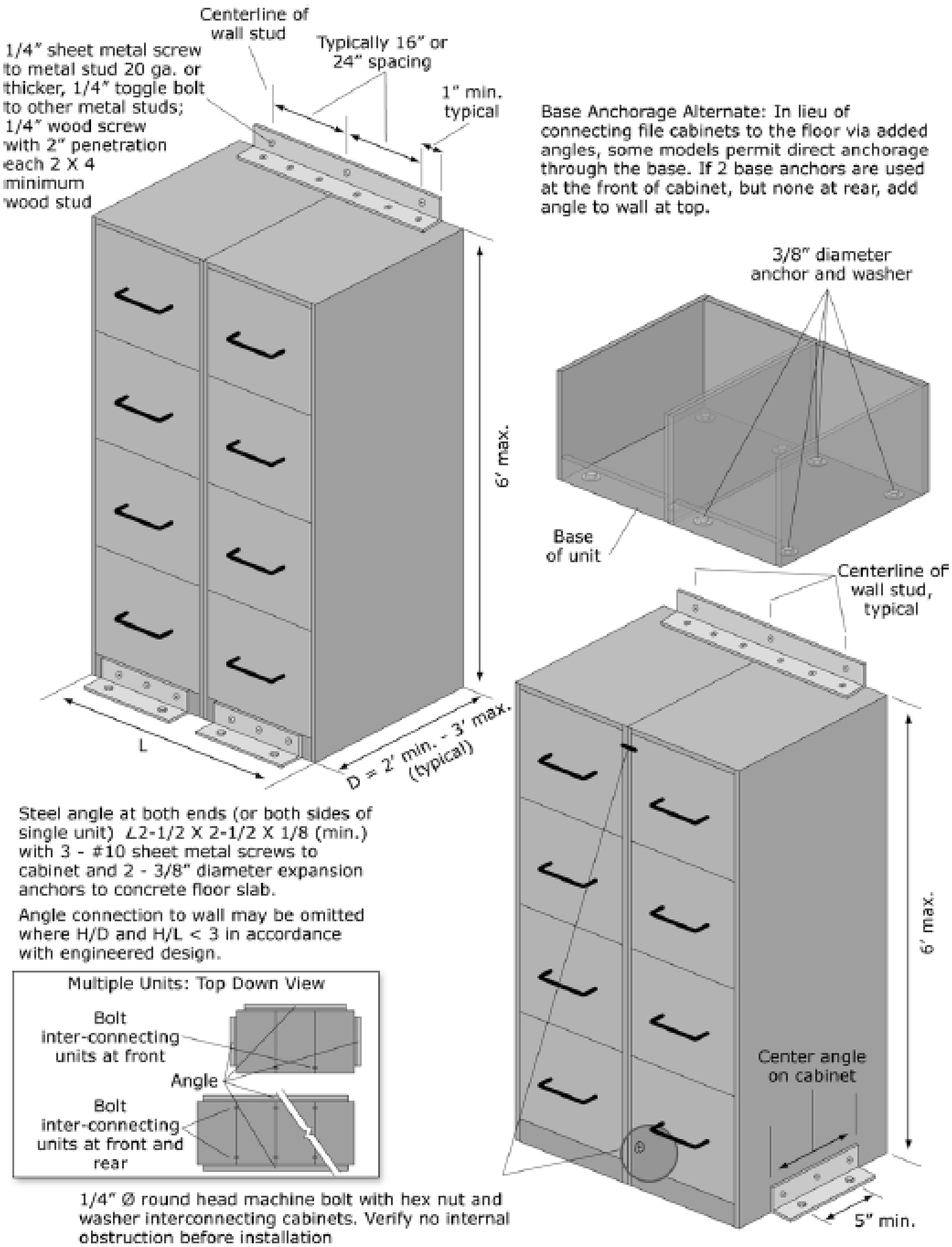


Figure G-21. Wall-mounted File Cabinets.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

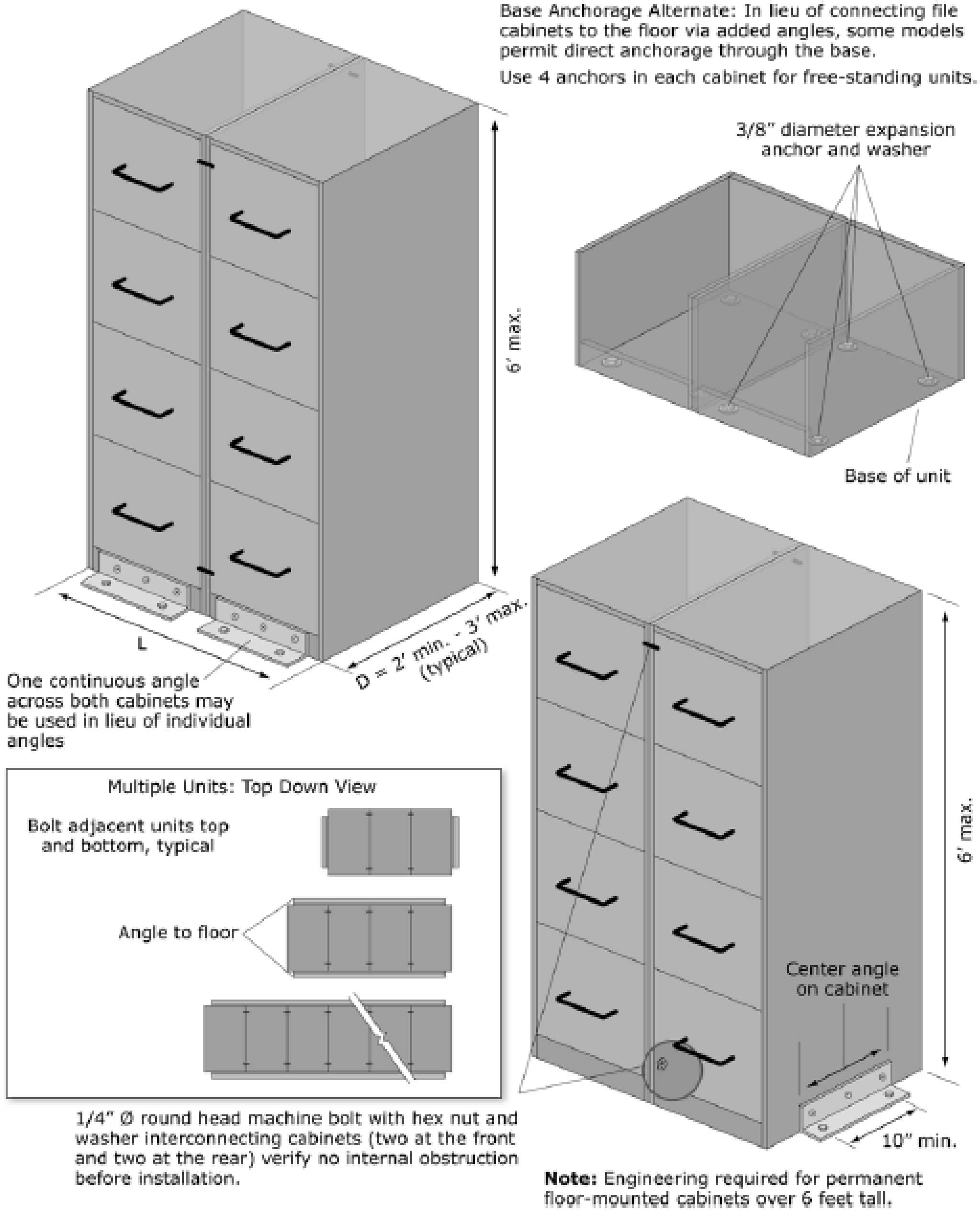


Figure G-22. Base Anchored File Cabinets.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

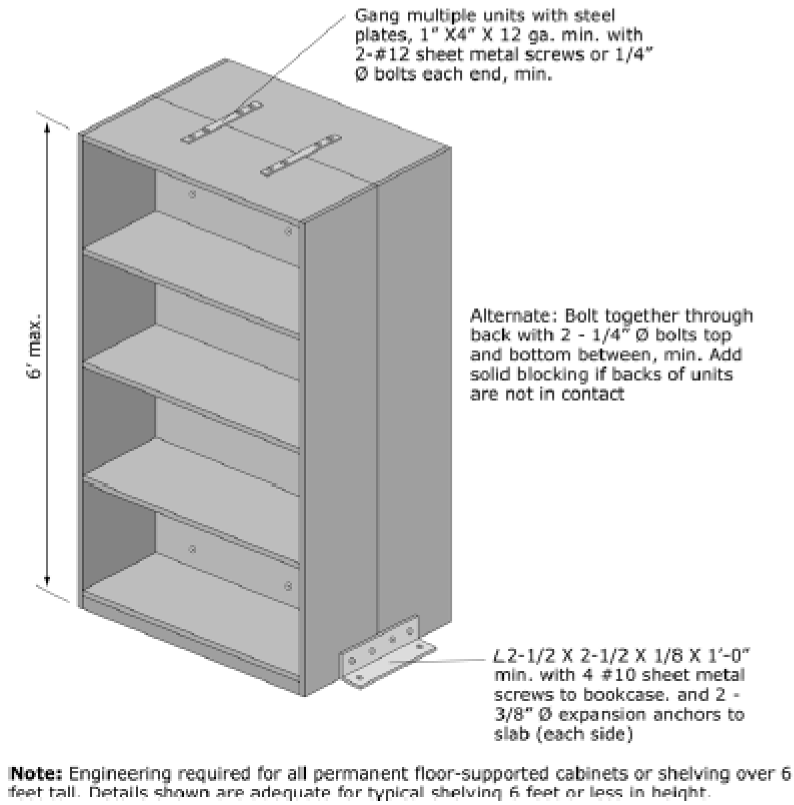


Figure G-23. Anchorage of Freestanding Book Cases Arranged Back to Back.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

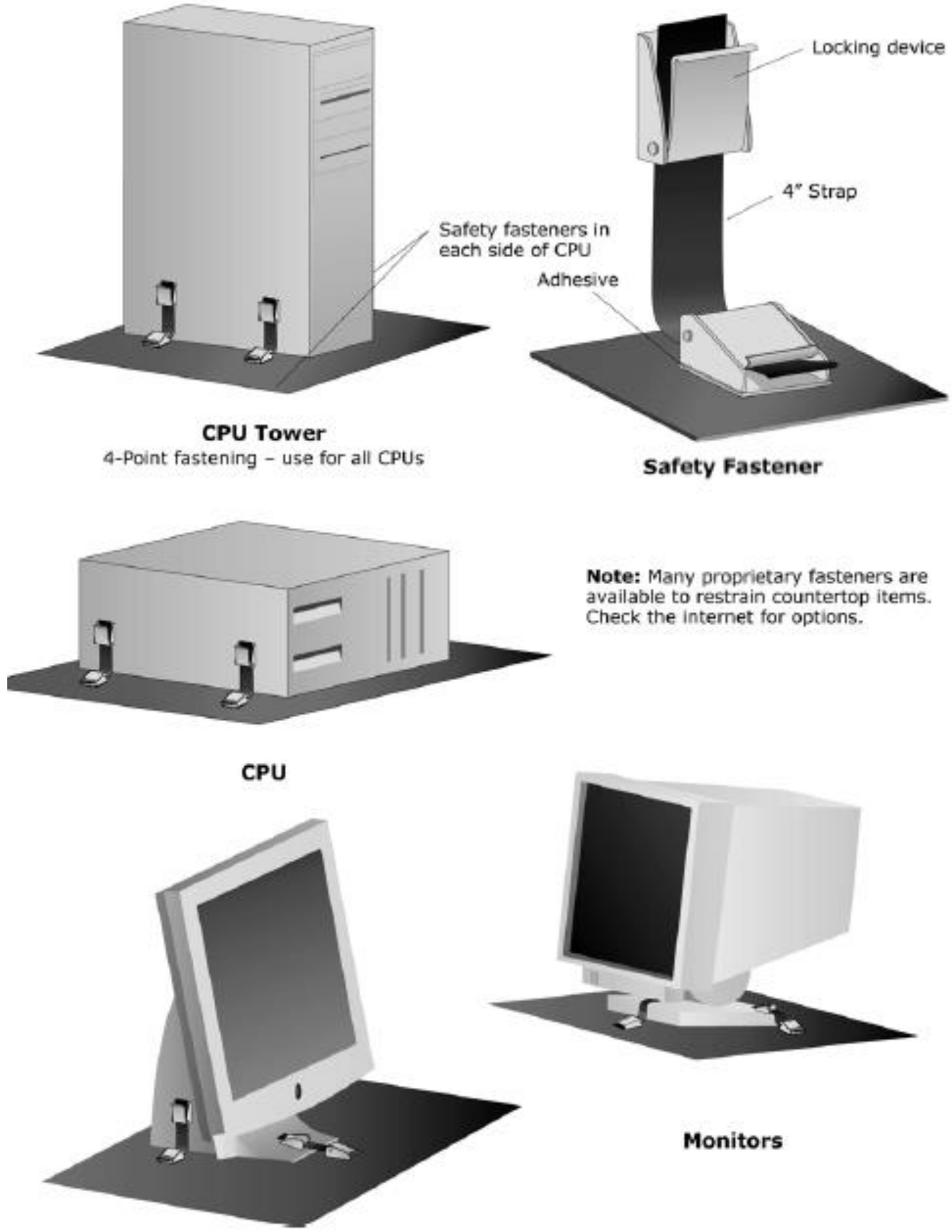
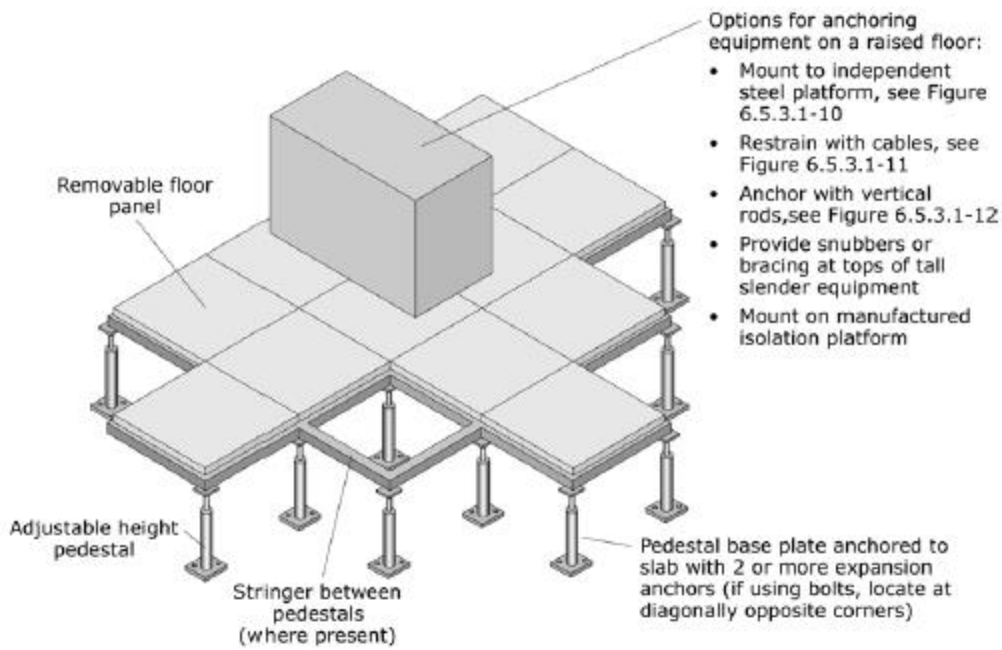
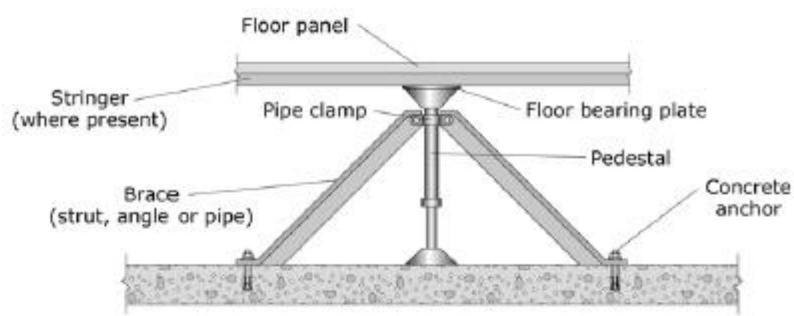


Figure G-24. Desktop Computers and Accessories.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Cantilevered Access Floor Pedestal



Braced Access Floor Pedestal
(use for tall floors or where pedestals are not strong enough to resist seismic forces)

Note: For new floors in areas of high seismicity, purchase and install systems that meet the applicable code provisions for "special access floors."

Figure G-25. Equipment Mounted on Access Floor.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

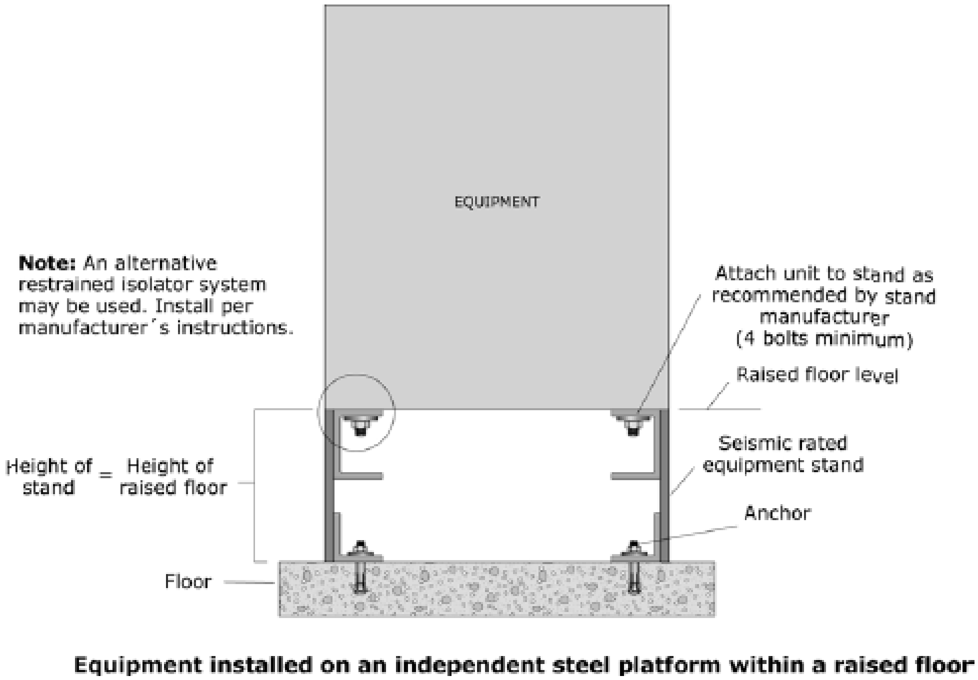


Figure G-26. Equipment Mounted on Access Floor – Independent Base.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

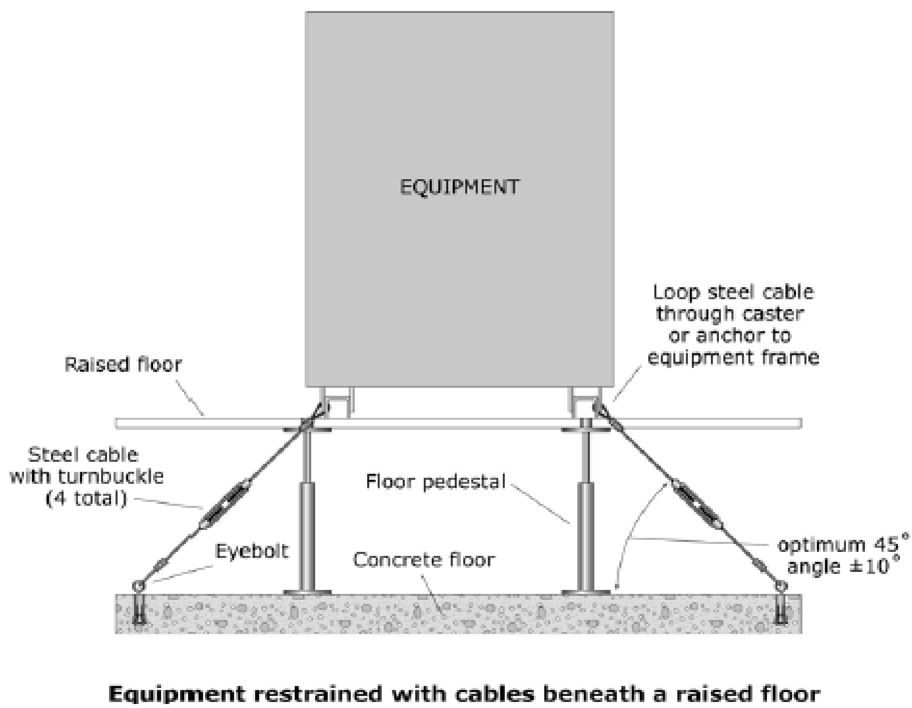


Figure G-27. Equipment Mounted on Access Floor – Cable Braced.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

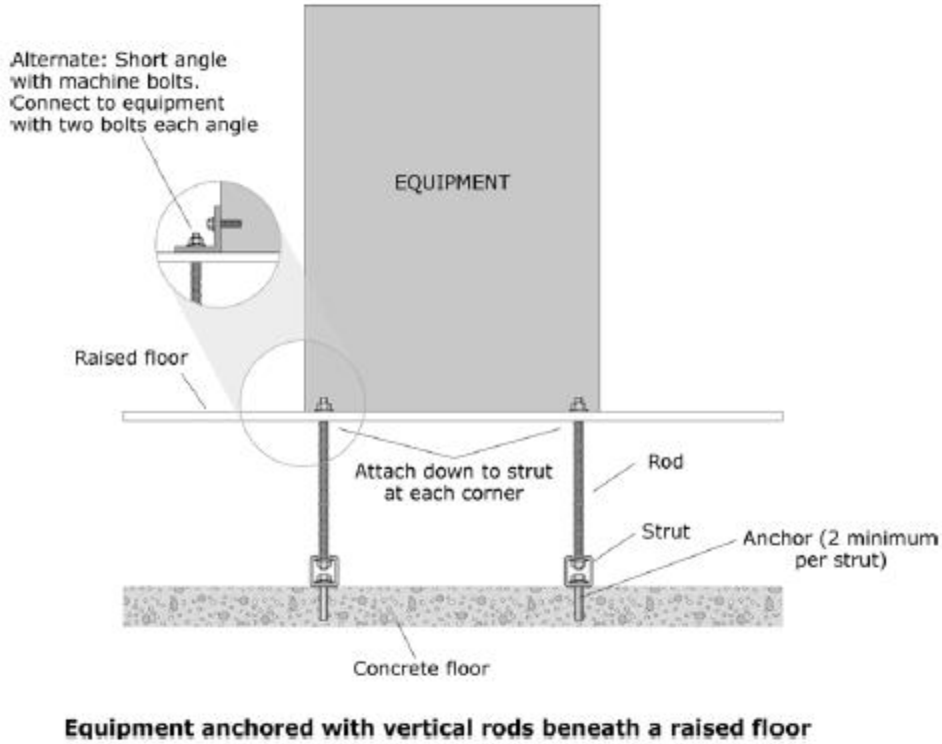
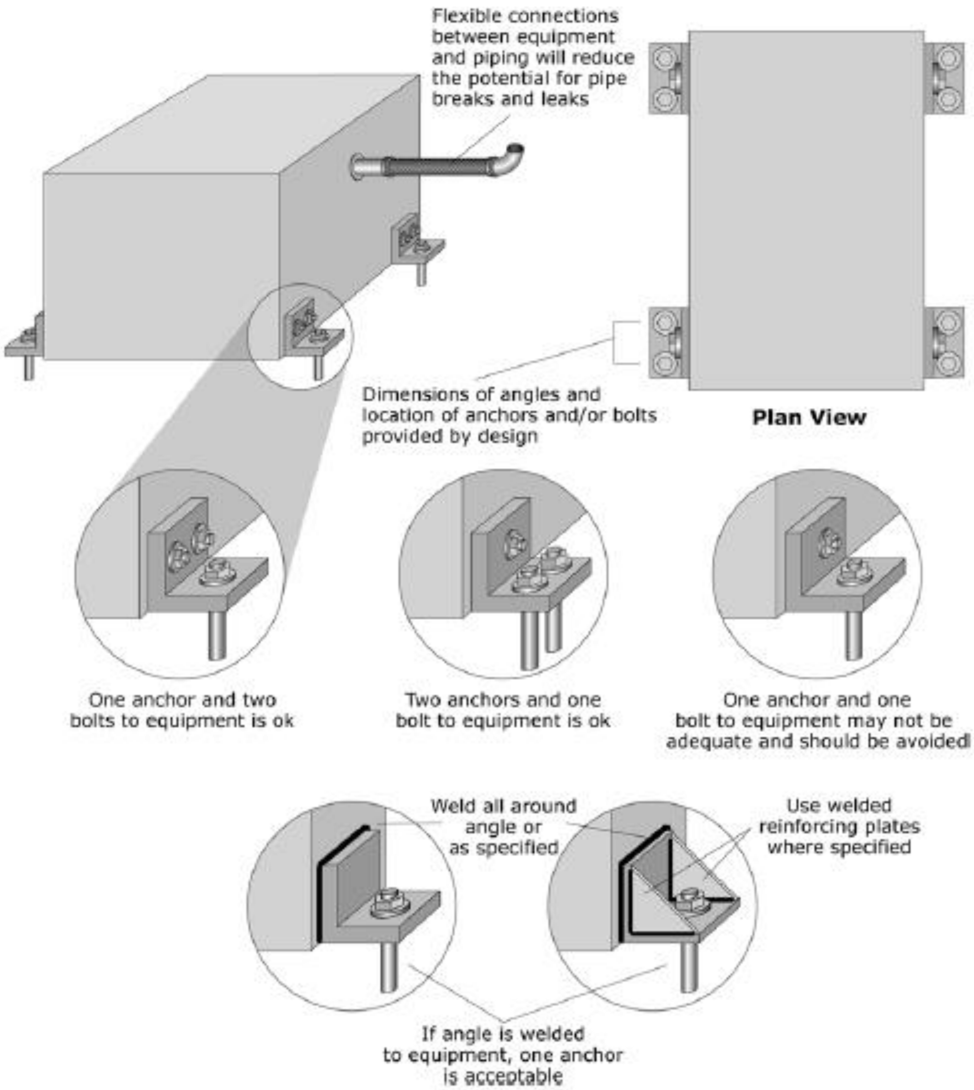


Figure G-28. Equipment Mounted on Access Floor – Tie-down Rods.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Mechanical and Electrical Equipment



Note: Rigidly mounted equipment shall have flexible connections for the fuel lines and piping.

Figure G-29. Rigidly Floor-mounted Equipment with Added Angles.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

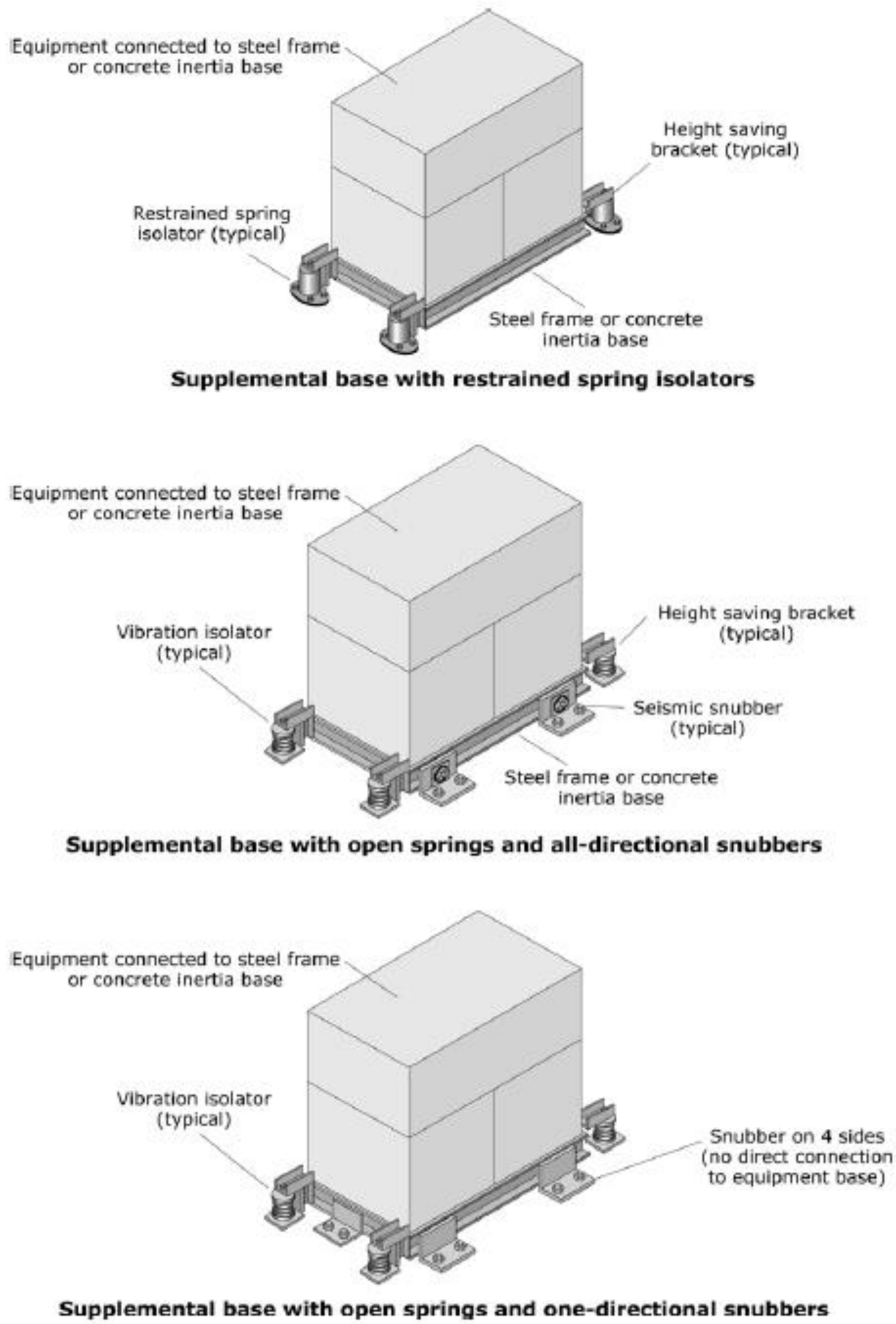


Figure G-30. HVAC Equipment with Vibration Isolation.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

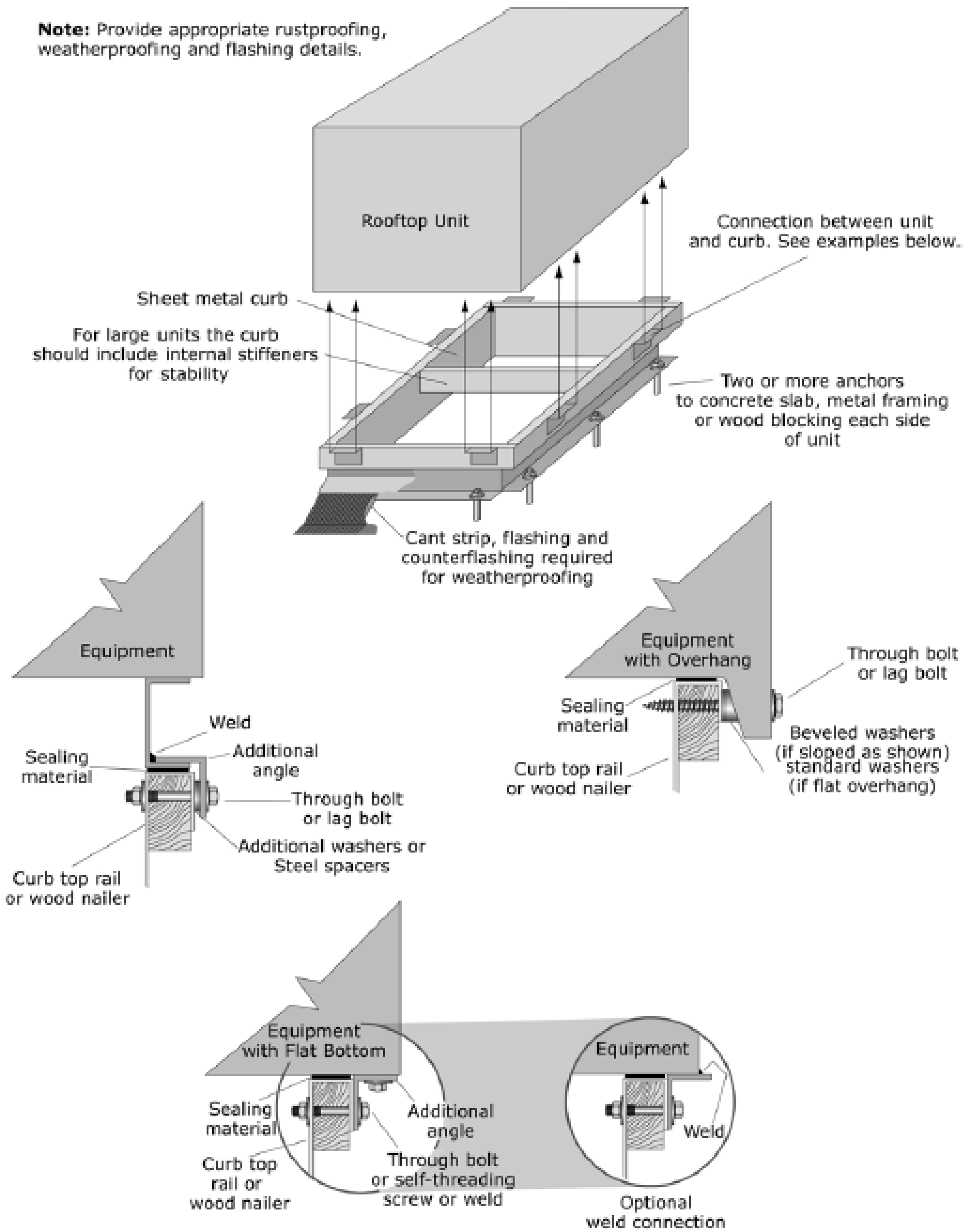


Figure G-31. Rooftop HVAC Equipment.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

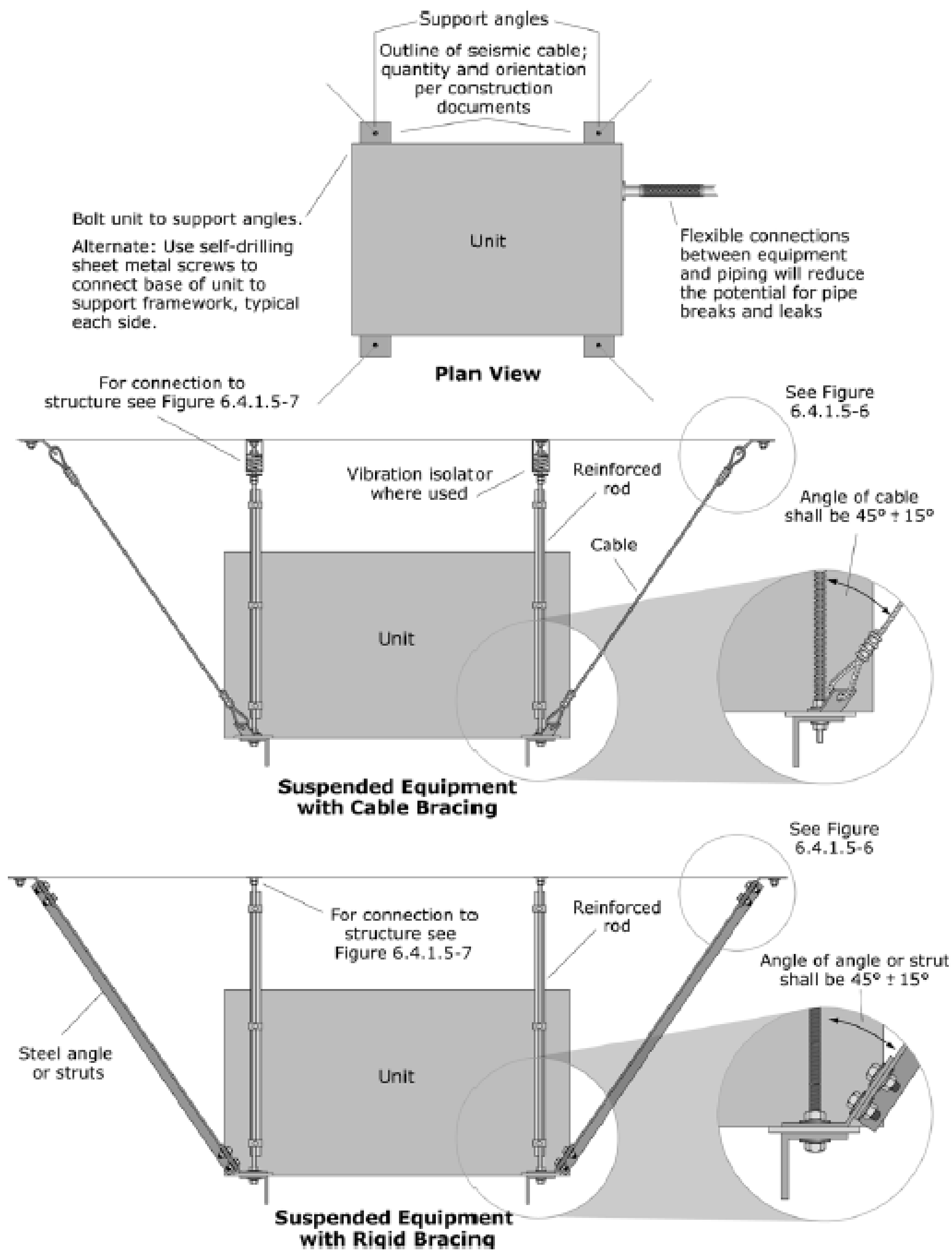


Figure G-32. Suspended Equipment.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

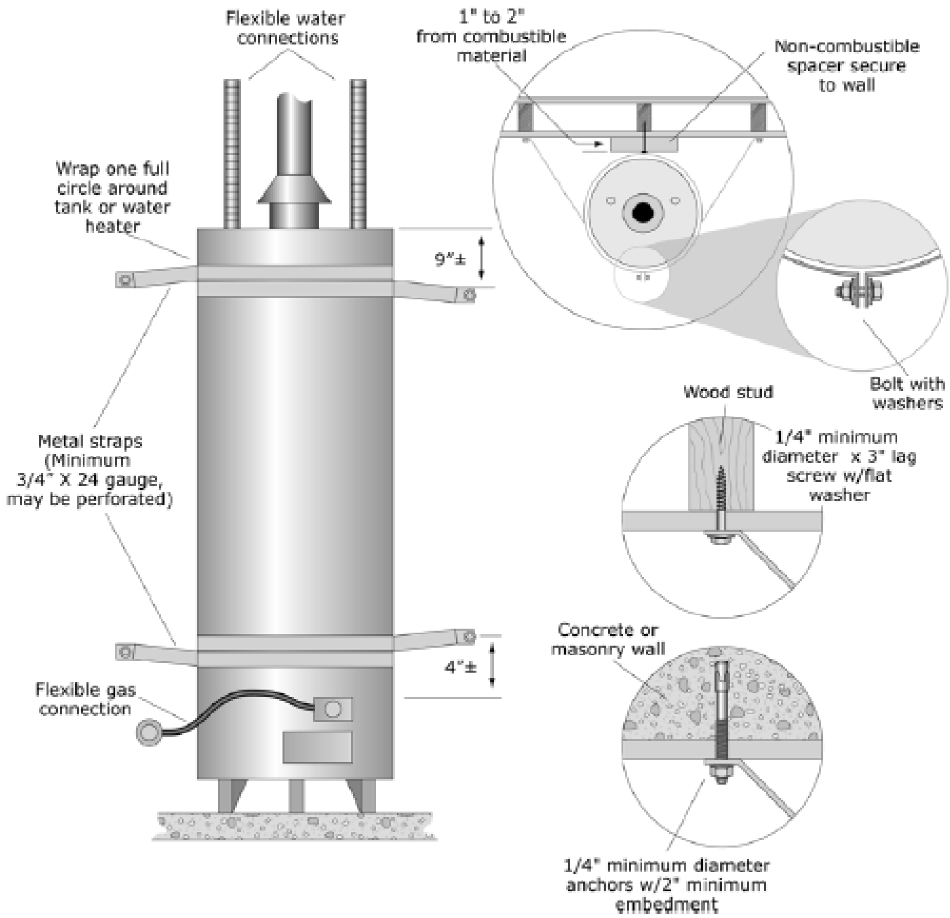


Figure G-33. Water Heater Strapping to Backing Wall.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

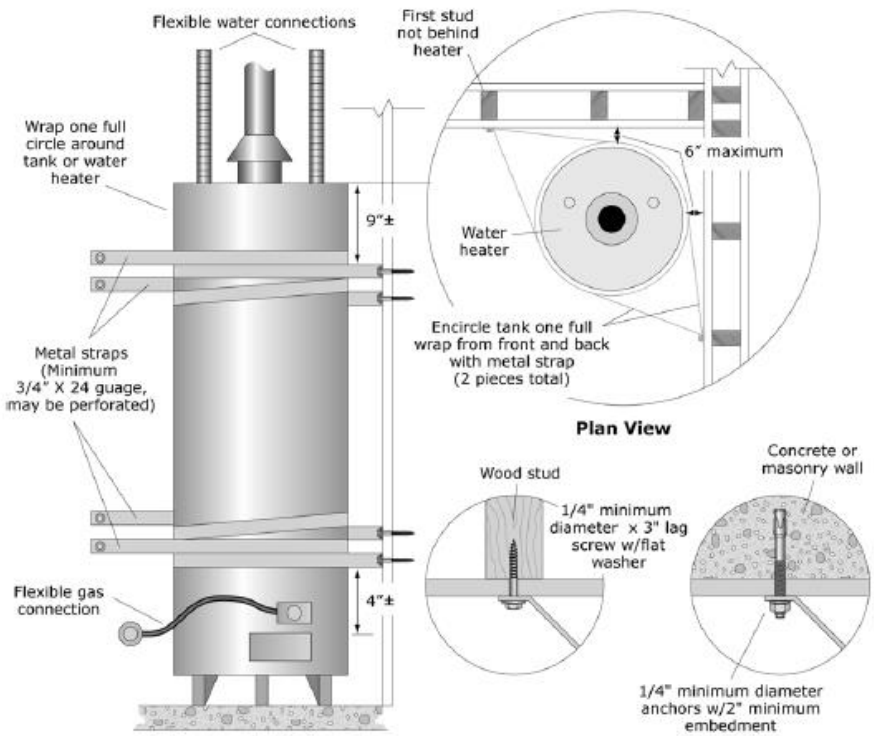


Figure G-34. Water Heater – Strapping at Corner Installation.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

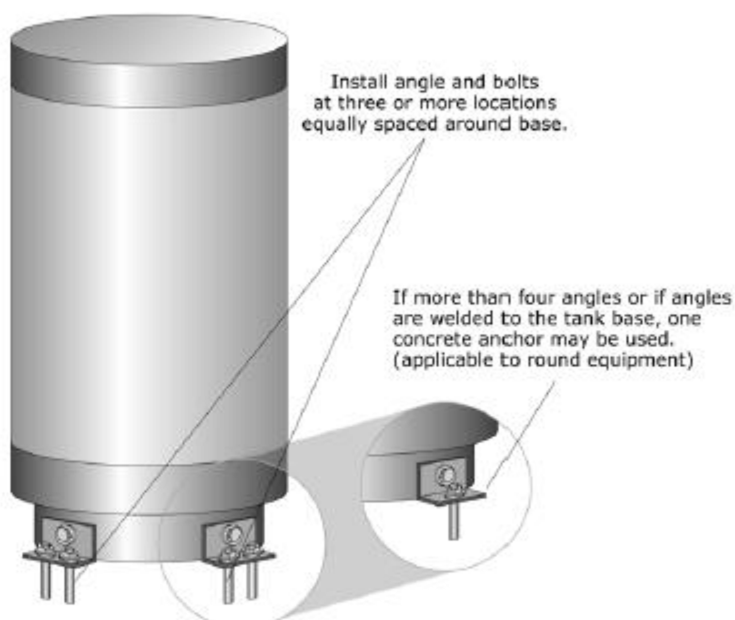


Figure G-35. Water Heater – Base Mounted.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

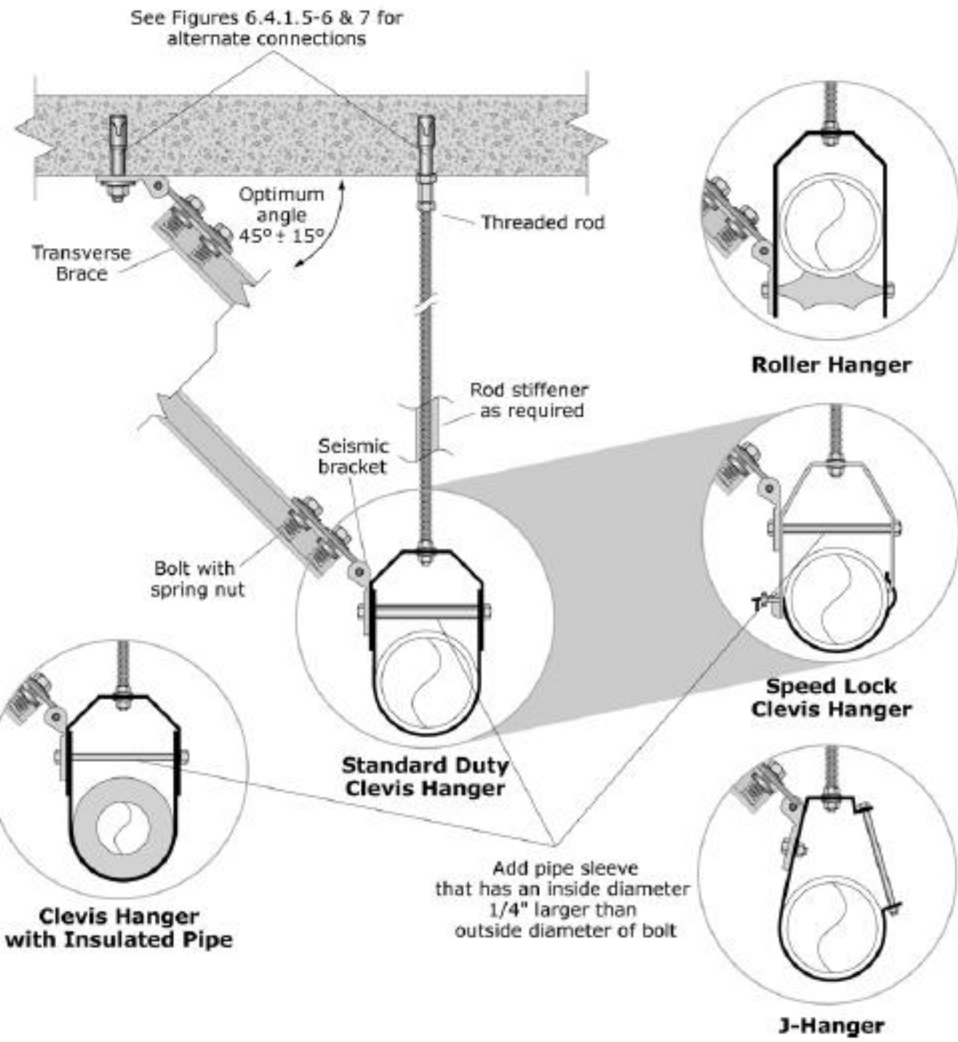


Figure G-36. Rigid Bracing – Single Pipe Transverse.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

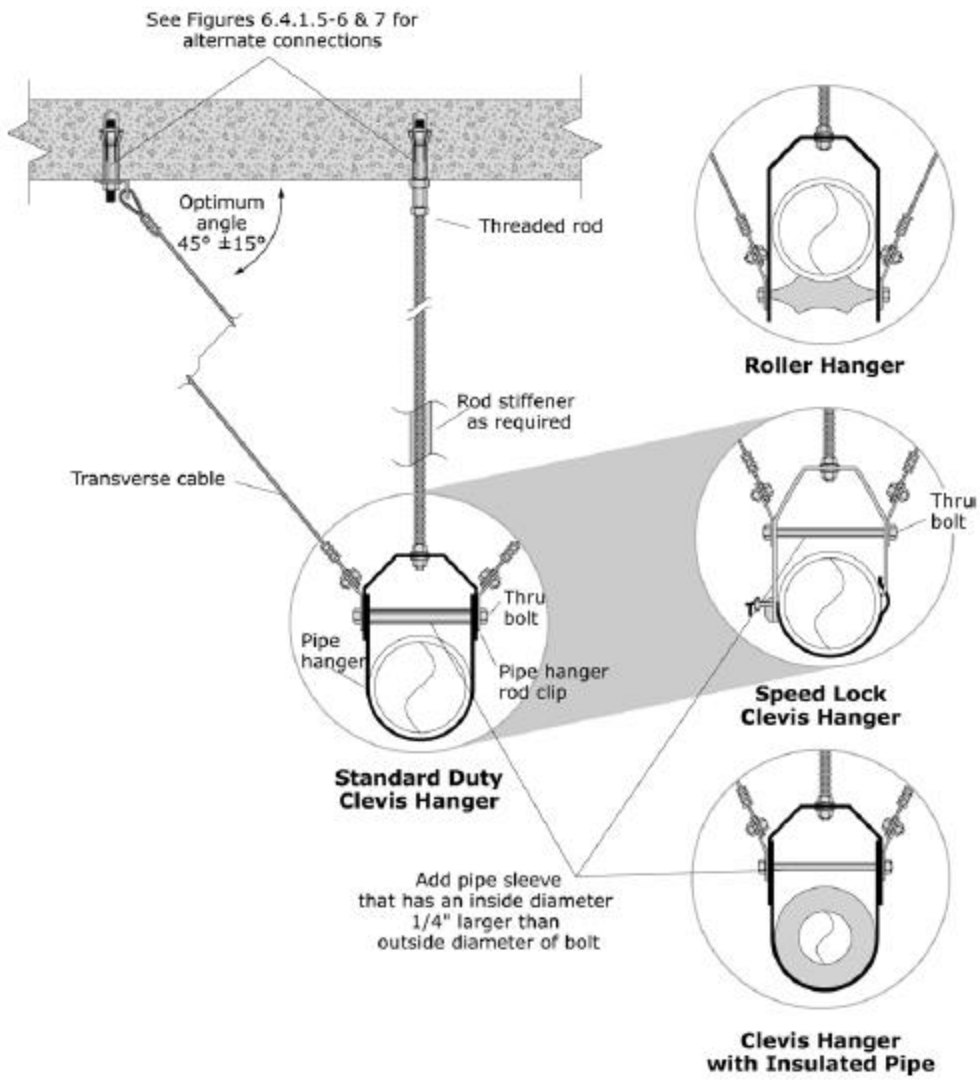


Figure G-37. Cable Bracing – Single Pipe Transverse.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

Electrical and Communications

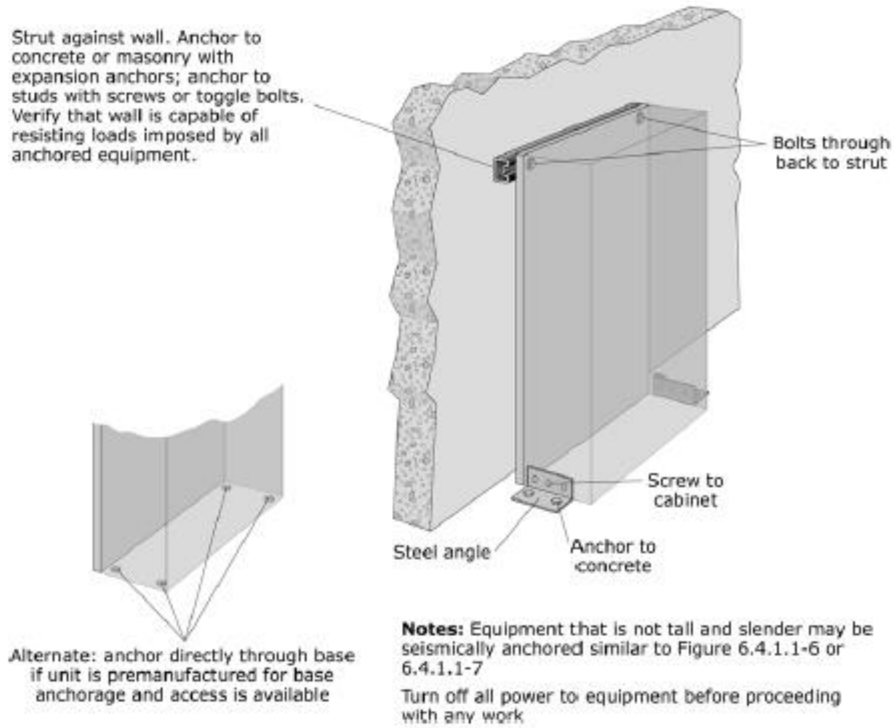


Figure G-38. Electrical Control Panels, Motor Controls Centers, or Switchgear.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

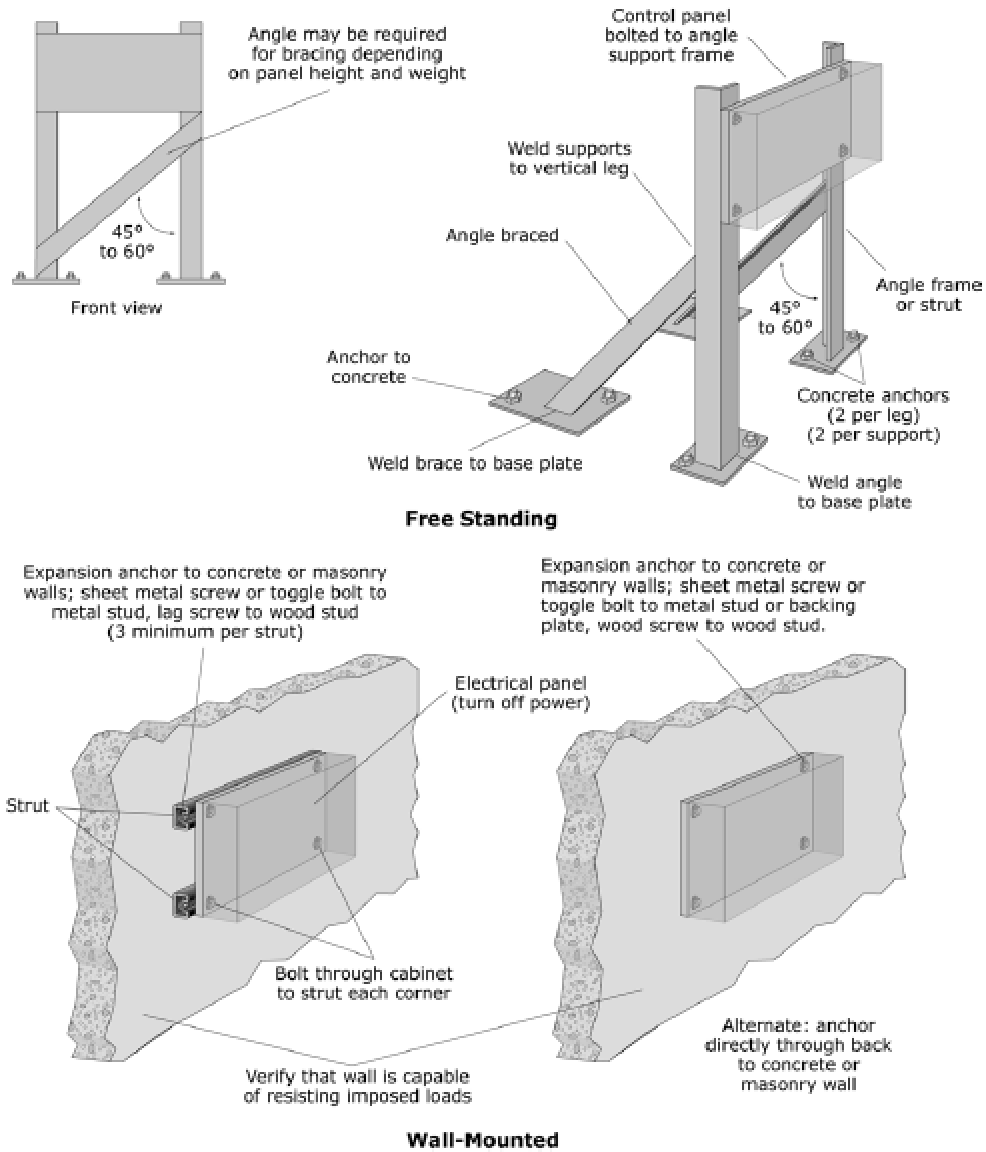


Figure G-39. Freestanding and Wall-mounted Electrical Control Panels, Motor Controls Centers, or Switchgear.

(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

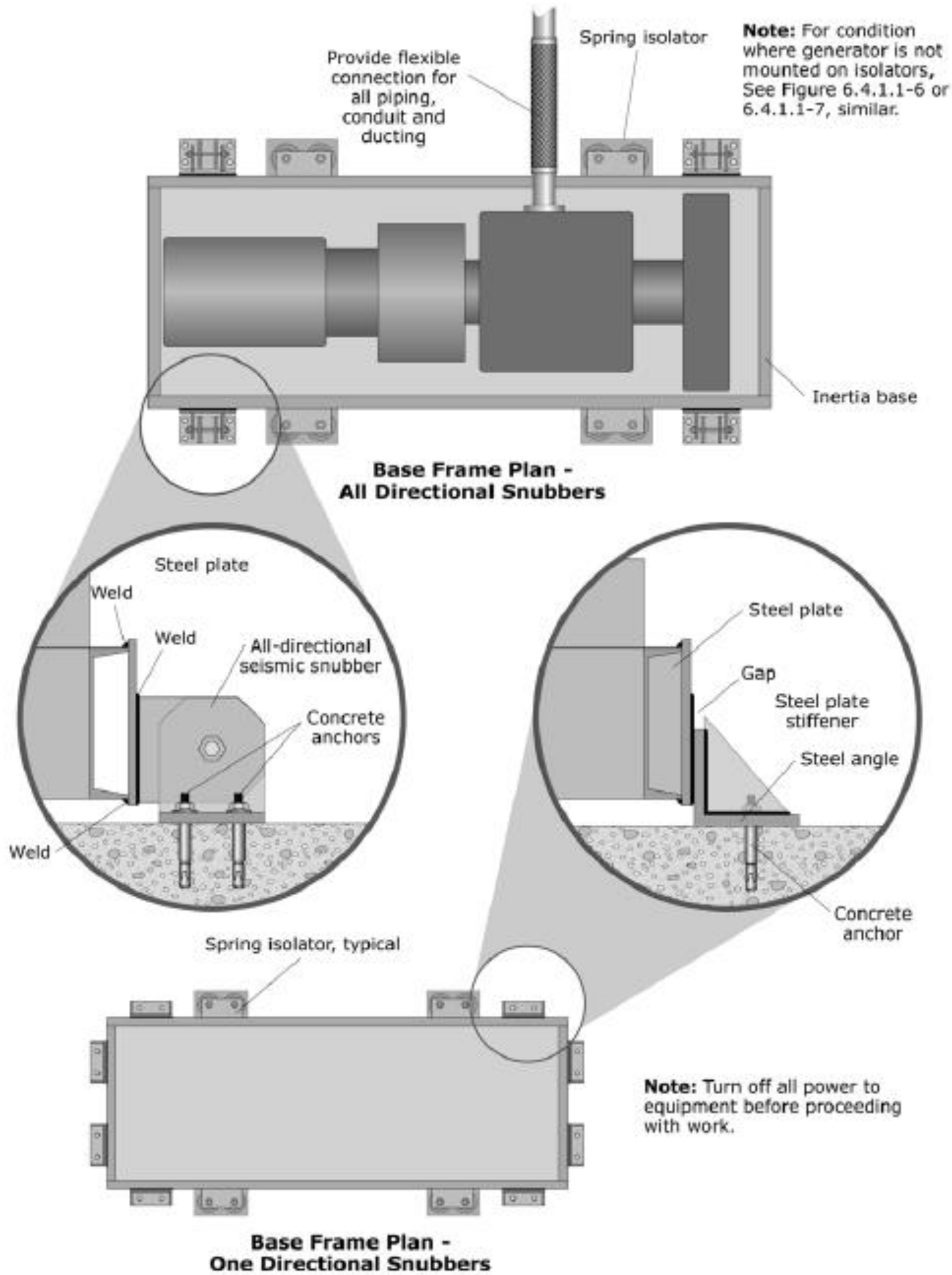


Figure G-40. Emergency Generator.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

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ReidMiddleton

728 – 134th St SW
Suite 200
Everett, WA 98204

Tel 425-741-3800
Fax 425-741-3900

www.reidmiddleton.com
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