Washington State School Seismic Safety Assessments Project

SEISMIC UPGRADES CONCEPT DESIGN REPORT

Boistfort Elementary School – Gym

Boistfort School District 234

June 2019

PREPARED FOR

PREPARED BY

DYKEMAN · rolluda architects architecture planning interiordesign · PRODIMS · BergerABAM · DCI ENGINEERS · wrk engineers STRUCTURAL & EARTHQUAKE ENGINEERING · ReidMiddleton

This page intentionally left blank.

WASHINGTON STATE SCHOOL SEISMIC SAFETY ASSESSMENTS PROJECT

SEISMIC UPGRADES CONCEPT DESIGN REPORT

Boistfort Elementary School – Gym

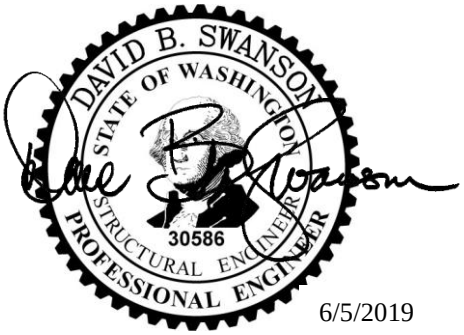
Boistfort School District 234

June 2019

Prepared for:

State of Washington
Department of Natural Resources and Office of Superintendent of Public Instruction

6/5/2019



6/5/2019

Prepared by:

wrk engineers
STRUCTURAL & EARTHQUAKE ENGINEERING
215 W 12th Street, Suite 202
Vancouver, WA 98660
360-695-9731
File No. 18104.00

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

Copyright© 2019 by Reid Middleton, Inc. All rights reserved.

This page intentionally left blank.

EXECUTIVE SUMMARY

This report documents the findings of a preliminary seismic evaluation of the Boistfort Elementary School Gym building in Curtis, Washington. The school is a PK-8 school for more than 90 students. The gymnasium building is a 14,530-square-foot, one-story building. The building has a gymnasium, a multipurpose room, locker rooms, storage, a mechanical room, and a kitchen. The building was originally constructed in 1963. The Boistfort Elementary School Gym is a reinforced concrete masonry and wood-framed structure. The roof system consists of wood-framed stress-skin panels spanning between wood beams. The stress-skin panels consist of plywood sheathing over 2x dimensional lumber framing. The glulam beams span east to west and are supported on steel columns. The foundation system for the building consists of shallow continuous wall footings under exterior and interior masonry walls and wood-stud bearing walls and shallow spread footings below steel columns.

WRK 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 multiple seismic deficiencies, including overstressed wood shear walls and inadequate reinforcement in the masonry shear walls. Other deficient items include insufficient exterior wall anchorage to transfer out-of-plane loading, inadequate load path at the clerestory windows, lack of continuous cross ties, and unblocked roof diaphragms.

Conceptual seismic upgrade recommendations for structural systems are provided to improve the performance of the building to meet the Immediate Occupancy structural performance objective criteria of ASCE 41-17. Sketches for the concept-level seismic upgrades are provided in Appendix B. The structural upgrades include replacing wood shear walls in the gymnasium with new concrete masonry shear walls; replacing gypsum board sheathing with plywood sheathing; providing foundation upgrades at locations of new shear walls and shear wall strengthening; adding additional out-of-plane wall anchors; and strengthening the roof diaphragm with additional blocking, strapping, and nailing. The recommendations for nonstructural upgrades include bracing unreinforced masonry partitions, anchoring fall-prone contents to adjacent floors or walls, and providing seismic bracing for mechanical equipment.

This page intentionally left blank.

Table of Contents

Page No.

EXECUTIVE SUMMARY

1.0 INTRODUCTION.....1

1.1 BACKGROUND.....1
1.2 SCOPE OF SERVICES.....1

2.0 SEISMIC EVALUATION PROCEDURES AND CRITERIA.....5

2.1 ASCE 41 SEISMIC EVALUATION AND RETROFIT OVERVIEW.....5
2.2 SEISMIC EVALUATION AND RETROFIT CRITERIA.....6
2.3 REPORT LIMITATIONS.....8

3.0 BUILDING DESCRIPTION & SEISMIC EVALUATION FINDINGS.....9

3.1 BUILDING OVERVIEW.....9
3.2 SEISMIC EVALUATION FINDINGS.....11

4.0 CONCLUSION AND RECOMMENDATIONS.....15

4.1 SEISMIC-STRUCTURAL UPGRADE RECOMMENDATIONS.....15
4.2 NONSTRUCTURAL UPGRADE RECOMMENDATIONS.....16
4.3 OPINION OF CONCEPTUAL CONSTRUCTION COSTS.....19

Appendix List

APPENDIX A: FIELD INVESTIGATION REPORT AND TIER 1 CHECKLISTS
APPENDIX B: CONCEPT-LEVEL SEISMIC UPGRADE FIGURES
APPENDIX C: OPINION OF PROBABLE CONSTRUCTION COSTS
APPENDIX D: EARTHQUAKE PERFORMANCE ASSESSMENT TOOL (EPAT) WORKSHEET
APPENDIX E: BOISTFORT ELEMENTARY SCHOOL EXISTING DRAWINGS
APPENDIX F: FEMA E-74 NONSTRUCTURAL SEISMIC BRACING EXCERPTS

Figure List

FIGURE 2-1. FLOW CHART AND DESCRIPTION OF ASCE 41 SEISMIC EVALUATION PROCEDURE. 5

Table List

TABLE 2.2.1-1 SPECTRAL ACCELERATION PARAMETERS (NOT SITE-MODIFIED). 7
TABLE 3.1.3-1. STRUCTURAL SYSTEM DESCRIPTIONS. 10
TABLE 3.1.4-1. STRUCTURAL SYSTEM CONDITION DESCRIPTIONS. 10
TABLE 3.2.1-1. IDENTIFIED STRUCTURAL SEISMIC DEFICIENCIES BASED ON TIER 1 CHECKLISTS. 11
TABLE 3.2.2-1. IDENTIFIED STRUCTURAL CHECKLIST ITEMS MARKED AS UNKNOWN. 12
TABLE 3.2.3-1. IDENTIFIED NONSTRUCTURAL SEISMIC DEFICIENCIES BASED ON TIER 1 CHECKLISTS. 13
TABLE 3.2.4-1. IDENTIFIED NONSTRUCTURAL CHECKLIST ITEMS MARKED AS UNKNOWN. 14
TABLE 4.3.1. SEISMIC UPGRADES OPINION OF PROBABLE CONSTRUCTION COSTS. 21

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

Reference List

Codes and References

2015 IBC, *2015 International Building Code,* prepared by the International Code Council, Washington, D.C.

ASCE 7-10, 2010, *Minimum Design Loads for Buildings and Other Structures*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 31-03, 2003, *Seismic Evaluation of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 41-06, 2007, *Seismic Rehabilitation of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 41-13, 2014, *Seismic Evaluation and Retrofit of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 41-17, 2018, *Seismic Evaluation and Retrofit of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ATC-14, *Evaluating the Seismic Resistance of Existing Buildings,* prepared for Applied Technology Council by H.J. Degenkolb Associates, San Francisco, California.

FEMA E-74, 1994, *Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide*, prepared by Wiss, Janney, Elstner Associates, Inc., under contract from the Federal Emergency Management Agency (FEMA), Washington, D.C.

FEMA E-74-FM, 2005, *Earthquake Hazard Mitigation for Nonstructural Elements, Field Manual*, prepared by Wiss, Janney, Elstner Associates, Inc., under contract with URS Corporation for the Federal Emergency Management Agency (FEMA), Washington, D.C.

FEMA 310, 1998, *Handbook for Seismic Evaluations of Buildings – A Prestandard*, prepared by America Society of Civil Engineers, Reston, Virginia.

FEMA 547, 2006, *Techniques for the Seismic Rehabilitation of Existing Buildings*, prepared by Rutherford & Chekene Consulting Engineers under contract with the National Institute of Standards and Technology (NIST), funded by the Federal Emergency Management Agency (FEMA).

NFPA 13, 2019, *Standard for the Installation of Sprinkler Systems*, prepared by National Fire Protection Association.

FEMA P-1000, *Safer, Stronger, Smarter: A Guide to Improving School Natural Hazard Safety*. Prepared by www.fema.gov/media-library/assets/documents/132592

Case Studies of Successful U.S. School Seismic Screening Programs. Prepared by EERI Staff, Members and Volunteers. https://www.eeri.org/wp-content/uploads/SESI_Screening_BestPractices_Version1_Dec2016.pdf

Incremental Seismic Rehabilitation of School Buildings (K-12): Providing Protection to People and Buildings (2003). Prepared by https://www.fema.gov/media-library/assets/documents/5154

FEMA E-74, *Reducing the Risks of Nonstructural Earthquake Damage.* Prepared by https://www.fema.gov/fema-e-74-reducing-risks-nonstructural-earthquake-damage

FEMA Earthquake School Hazard Hunt Game and Poster. Prepared by https://www.fema.gov/media-library/assets/documents/90409

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

Drawings

Oliver W. Olson & Associates A.I.A Architects, May 1964, existing drawings titled "Physical Education – Multi-Purpose," (Sheets 3 – 5) Boistfort Consolidated School District No. 234, Curtis, Lewis County, Washington.

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, etc.) 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.

This page intentionally left blank.

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

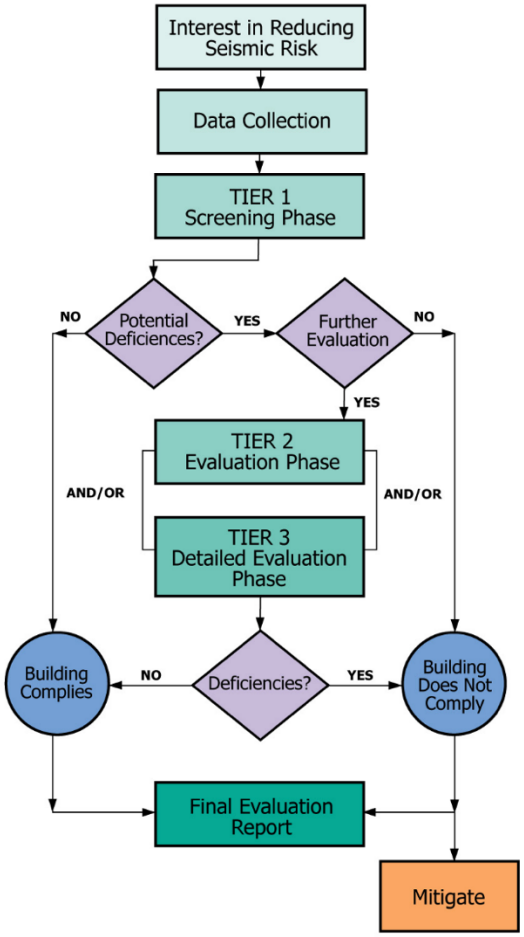


Figure 2-1. Flow Chart and Description of ASCE 41 Seismic Evaluation Procedure.

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 shear walls and wall 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 Boistfort Elementary 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 0.786 g, and the design 1-second period spectral acceleration, S_{D1} is 0.512 g. Based on ASCE 41 Table 2-4, the Level of Seismicity for this building is classified as **High**.

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 Boistfort Elementary 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	0.36 g	0.2 Seconds	0.75 g	0.2 Seconds	0.81 g	0.2 Seconds	1.12 g
1.0 Seconds	0.14 g	1.0 Seconds	0.34 g	1.0 Seconds	0.37 g	1.0 Seconds	0.51 g

2.2.2 Boistfort Elementary School Structural Performance Objective

The school building is an Assembly Group A-4 (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 Limited 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 **Immediate Occupancy** structural performance level at the **BSE-2E s**eismic hazard level in accordance with DNR direction, the project scope of work, and the project legislative language.

At the Immediate Occupancy performance level, the structure remains safe to occupy and essentially retains its pre-earthquake strength and stiffness. Nonstructural components might be damaged to the extent that they cannot immediately function but are secured in place so that damage caused by falling, toppling, or breaking of utility connections is avoided. Life safety systems, including doors, stairways, emergency lighting, and fire alarms, generally remain available and operable, provided that power and utility services are available.

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 school is classified in ASCE 41 Table 3-1 as a Reinforced Masonry Wall Building with Flexible Diaphragms, **RM1**. Reinforced Masonry Wall (RM1) Buildings include those that have bearing walls constructed out of reinforced brick or concrete masonry. The floor and roof framing consists of plywood sheathing, wood beams and girders supported by steel, and wood or masonry columns.

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: 1963
Building Code: Unknown

Number of Stories: 1
Floor Area: 14,530 SF

FEMA Building Type: RM1
ASCE 41 Level of Seismicity: High
Site Class: D

The building is a one-story, 1960s-era gymnasium building. The building has a mostly rectangular floor plan, 170 feet by 100 feet in plan, with a maximum roof height of around 25 feet. The building has a 3-foot-high elevated floor in the multipurpose room.

The structural system consists of a reinforced concrete masonry and wood-framed structure constructed on level ground. The roof system consists of wood-framed stress-skin panels spanning between glulam beams. The stress-skin panels consists of plywood over 2x6 dimensional lumber framing. The glulam beams span east to west and are supported on steel wide-flange columns and steel pipe columns. The lateral-force-resisting system of the building is a mixture of reinforced masonry shear walls and wood-stud shear walls, with either plywood or gypsum board sheathing and a flexible wood-framed roof diaphragm.

The foundation system for the building consists of shallow continuous wall footings under exterior and interior masonry walls and wood-stud bearing walls and shallow spread footings below steel columns.

3.1.2 Building Use

The building is a gymnasium for the Boistfort Elementary school. The school is a PK-8 elementary school for more than 90 students. The building consists of a gymnasium, a multipurpose room, locker rooms, storage, mechanical rooms, and a kitchen.

3.1.3 Structural System

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
Main Roof	The roof system consists of wood-framed stress-skin panels spanning between glulam beams. The stress-skin panels consist of plywood top skin over 2x6 dimensional lumber framing. The glulam beams are spaced at 16 feet on center above the gymnasium and at 20 feet on center above the multipurpose room.
First Floor	The main floor consists of a concrete slab on grade. The elevated floor at the multipurpose room consists of tongue and groove decking over wood framing.
Foundation	Foundations consist of cast-in-place, reinforced concrete, shallow spread footings supporting wall piers and columns and concrete strip footings supporting reinforced masonry and wood-stud bearing walls.
Gravity System	The gravity system consists of a wood-framed roof supported by glulam and solid-sawn beams, supported by reinforced masonry bearing walls, wood-stud bearing walls, and steel columns. The bearing walls and columns are supported on shallow concrete footings.
Lateral System	The lateral system consists of a flexible plywood roof diaphragm laterally supported by a mixture of reinforced masonry shear walls and wood shear walls.

3.1.4 Structural System Visual Condition

Table 3.1.4-1. Structural System Condition Descriptions.

Structural System	Description
Roof	The roof appeared to be in good condition.
Foundations Condition	The foundation was not observable.
Gravity System Condition	The condition of the gravity system appears to be functional and intact.
Lateral System Condition	The condition of the lateral system appeared to be intact. However, considering the building's age and lack of as-built information, there are concerns about the lateral system performance.

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
Load Path	The windows along the east and west side of the gymnasium create a break in the load path from the roof diaphragm to the masonry shear walls.
Shear Stress Check	Shear stresses in the wood shear walls are greater than 1,000 pounds per lineal foot.
Liquefaction and Slope Failure	Geotechnical investigation should be performed to determine the geological hazard to the building during an earthquake.
Reinforcing Steel	The reinforcing steel size and spacing for the CMU walls is unknown in both the vertical and horizontal directions based on the available as-built information and is assumed to be insufficient. Tier 1 requirements indicate that CMU walls, such as these, will behave as unreinforced masonry walls. Non-destructive testing should be performed to determine the size and spacing of the reinforcing steel.
Wall Anchorage at Flexible Diaphragms	Roof to exterior CMU wall connection types and extent are unknown. Based on the age of the building, it is assumed that the wall anchorage is insufficient.
Transfer to Shear Walls	There is no connection between the gymnasium roof diaphragm and the east/west CMU walls through the clerestory windows. Existing wall anchorage elsewhere is likely insufficient to transfer roof diaphragm loads to the shear walls.
Cross Ties	There are no continuous cross ties between diaphragm chords.
Unblocked Diaphragms	Roof diaphragm is assumed to be unblocked and has horizontal spans greater than 40 feet.

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
Liquefaction	The liquefaction potential of site soils is unknown at this time given available information. Moderate to high 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.
Ties Between Foundation Elements	No structural drawings are available. This evaluation item is unknown and cannot be visually verified. This item requires further investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Reinforcing Steel	The reinforcing steel size and spacing for the masonry walls is unknown based on the available as-built information. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Wood Ledgers	This evaluation item is unknown and likely noncompliant due to the building's age. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Girder-Column Connection	No structural drawings are available. This evaluation item is unknown and cannot be visually verified. This item requires further investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Stiffness of Wall Anchors	This evaluation item is unknown and could not be visually verified. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.

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
LSS-3 Emergency Power	Available record drawings do not have information on anchorage or bracing for emergency power equipment, and it was not able to be verified during the site investigation. Based on the age of the building, emergency power equipment is either nonexistent or noncompliant. Emergency power is critical to post-earthquake recovery; therefore, proper mounting of the components of the emergency power system is required for reliable performance.
CF-2 Tall Narrow Contents	Tall bookshelves and kitchen equipment do not appear to be anchored to floors or adjacent walls. Content more than 6 feet high with height-to-depth or height-to width ratio greater than 3-to-1 should be anchored to prevent from overturning and falling during an earthquake.
CF-3 Fall-Prone Contents	Basketball hoops in gymnasium and lockers that may weigh more than 20 pounds do not appear to be seismically braced or restrained.
P-1 Unreinforced Masonry Partitions	Partition wall at entrance to boys' locker room is likely unbraced based on the age of the building.
ME-2 In-Line Equipment	Mechanical equipment in-line with the duct or piping system weighing more than 75 pounds does not appear to be braced or restrained.

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 Checklist Items Marked as Unknown.

Deficiency	Description
LSS-3 Emergency Power	Emergency power equipment was not observed. Based on the age of the building, emergency power is likely nonexistent or noncompliant. Further investigation is required to review the life safety system anchorage and bracing.
C-2 Suspended Gypsum Board	This evaluation item is unknown and likely noncompliant due to the building's age. This item requires further field investigation to review suspended ceiling attachments.
LF-1 Independent Support	This item requires further investigation to review the support system for light fixtures and to make a final determination on its compliance.
CF-2 Tall Narrow Contents	Tall narrow contents do not appear to be anchored to the structure or to each other. Contents more than six feet high should be anchored to provide overturning base restraint.
ME-2 In-Line Equipment	Mechanical equipment in-line with the duct or piping system weighing more than 75 pounds does not appear to be braced or restrained, but cannot be visually verified. This item requires further investigation to review vertical support and lateral bracing of equipment.
ME-3 Tall Narrow Equipment	Further investigation required to review anchorage of tall narrow equipment.

4.0 Conclusion and Recommendations

4.1 Seismic-Structural Upgrade Recommendations

Concept-level seismic upgrade recommendations to improve the lateral-force-resisting system were developed. The sketches in Appendix B depict the concept-level structural upgrade recommendations outlined in this section. The following concept recommendations are intended to address the structural deficiencies noted in Table 3.2.1-1. This concept-level seismic upgrade design represents just one of several alternative seismic upgrade design solutions and is based on preliminary seismic evaluation and analysis results. Final analysis and design for seismic upgrades must include a more detailed seismic evaluation of the building in its present or future configuration and investigation into the existing reinforcing steel in the concrete masonry unit (CMU) walls and the foundation configuration and condition. Proposed seismic upgrades are described below.

4.1.1 New Concrete Masonry Shear Walls

The building has wood shear walls at the north and south ends of the gymnasium to resist the seismic forces in the east-west direction. The wood shear walls have insufficient lateral capacity to resist the seismic force demand. The lateral-force-resisting system of the building can be improved by adding new CMU shear walls at the north and south ends of the gymnasium to replace the wood shear walls. The new CMU shear walls should extend from the foundation to the roof diaphragm.

4.1.2 New Concrete Masonry Infill

The building has clerestory windows running the length of the east and west walls in the gymnasium, separating the CMU walls below from the roof diaphragm. It is recommended to infill the end windows on each wall with fully grouted, reinforced CMU to provide a transfer between the roof diaphragm and the CMU wall below.

4.1.3 Wood Shear Wall Strengthening

The gypsum board shear walls at the multipurpose room should be strengthened by removing the existing gypsum board sheathing and replacing it with plywood sheathing and hold-downs to resist overturning. Add supplemental sill plates to footing connections to strengthen the in-plane shear transfer between the walls and the foundation.

4.1.4 Foundation Systems

At the supplemental CMU shear wall locations and plywood shear wall strengthening locations, foundations should be upgraded to support the lateral load-carrying capacity of the new shear walls. The existing foundation system consists of shallow continuous wall footings. The upgrades should be shallow concrete continuous wall footings and spread footings to match the existing system.

4.1.5 Roof Diaphragm Blocking and Nailing

The plywood stress-skin panel diaphragm at the roof appears to be unblocked. The diaphragm seismic strength and stiffness capacity can be enhanced by adding blocking at the panel edges at locations of high diaphragm shear. Blocked diaphragms at panel edges have more strength to transfer lateral forces than those that are unblocked. Added blocking should be nailed through the existing diaphragm. This may necessitate the installation of a new roof membrane. Additionally, diaphragm nailing should be increased along all supported panel edges to increase the lateral strength of the diaphragm.

4.1.6 Wall Anchorage at Roof

Exterior concrete masonry wall-to-roof diaphragm anchors, with blocking and coil straps, should be added. These out-of-plane wall anchors can be from Simpson Strong-Tie, with post-installed embedded concrete masonry anchors or a similar product. Additionally, in-plane shear transfer between the roof diaphragm and shear walls should be strengthened by adding post-installed anchors.

4.1.7 HSS Strongbacks

The CMU walls should be strengthened for out-of-plane forces by adding vertical HSS strongbacks at 8 feet on center maximum. The east and west CMU walls in the gymnasium should be strengthened for out-of-plane forces by adding horizontal HSS strongbacks below the clerestory windows and at 8 feet above the floor level.

4.2 Nonstructural Upgrade Recommendations

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.

Interior Shear Walls

Existing interior wood-framed shear walls are to be replaced with CMU shear walls.

Existing shear wall thickness may differ from proposed CMU shear wall thickness, depending on finishes proposed. The Women's room and Janitor room interior walls will be removed and replaced. If the new shear wall is thicker than existing, the additional width should be added to the Gym side of the new CMU wall, as the existing restroom width appears to be minimal.

The Multipurpose room may be impacted by any additional wall width. The wall and door to Gymnasium Equip room will need to be removed and replaced, and if the new wall is thicker than existing, the door location could be impacted.

The soundproof folding partition will need to be removed and replaced; CMU anchorage will be required.

Openings in the new CMU shear walls for electrical outlets, switches, etc., will need to be coordinated with existing conditions.

Gypsum board shear walls are to be strengthened by replacing gypsum board with plywood panels, with supplemental sill plate to foundation connections. Floor, wall finishes, and ceiling will be affected.

HSS Strongbacks over existing CMU Walls

To strengthen existing CMU walls, vertical HSS strongbacks are to be added at 8 feet on center maximum. The impact on existing finishes will need to be addressed on a case-by-case basis, depending on location of the proposed work.

Foundation Work

The proposed CMU shear walls will require 24-inch-wide footings. The existing concrete slab on grade and floor finishes would be removed. After the floor slab is replaced, new flooring must be installed in affected areas. Care must be taken to integrate new with existing finishes; in some cases, this may require replacing the floor finish throughout the room. Foundation work will require removal of and installation of new wood flooring at the perimeter of gym. The flooring will need to be stitched into the existing flooring in order to eliminate continuous seams.

Exterior Clerestory Window Infill for Load Transfer

Select clerestory windows in existing CMU walls are to be replaced with CMU infill. The existing interior and exterior finishes need to continue over new CMU seamlessly, as do existing

insulation and vapor barrier. The impact of reduced window area on lighting and ventilation needs to be considered.

Roof Diaphragm Blocking/Nailing, and Wall-Roof Anchorage

Roof diaphragm upgrades require the removal of finishes above and below the roof deck for access to install new work. If existing insulation is above the roof deck, it will need to be replaced with additional insulation to meet current energy code requirements (R-38). Existing plywood ceilings will need to be removed and replaced to allow access to the underside of the deck, in order to install blocking and perimeter roof and wall connections.

This work takes place mainly above the Gym and Multipurpose rooms, with generally unhindered access to the underside of the roof deck. Access may be complicated above perimeter spaces, such as Gymnasium Equip, Boys and Girls lavatories, and parts of the kitchen. These rooms may need to be completely demolished and rebuilt with all new finishes. If that is the case, current ADA requirements may require relocation of plumbing fixtures and waste and water lines.

Ceilings

Removal of the existing plaster and acoustic ceiling tiles at the Gymnasium Equip room, Boys and Girls lavatories, and parts of the kitchen will be required to gain access to the underside of the roof deck for installation of blocking. Another option would be to replace the plaster and acoustic tiles with Tectum acoustic panels suspended below the existing structure. Fire ratings, if present, must be retained.

Tectum acoustic panels can also be attached to the underside of the gym roof decking, both over existing plywood to remain and in areas where plywood is removed for structural access. Existing suspended T-bar ceilings will need to be removed and reinstalled with new seismically braced T-bar in order to gain access to the underside of the roof diaphragm for blocking installation.

The existing ceiling-mounted light fixtures in the gym and elsewhere appear to be substandard and could become dangerous in an earthquake. Lighting should be updated to current lightweight LED fixtures with seismic bracing.

Exterior Shear Walls

To install new wood shear wall panels at the kitchen and storage room exterior, the existing exterior siding and sheathing will need to be removed down to the studs to install the shear panel blocking and anchors at the roof, floor, and foundations. Recommend installing new exterior skin consisting of a weather barrier, rainscreen capillary break material, and wood panel and batten siding. Since no mention of any existing insulation, recommend fiberglass batt insulation be installed in exterior walls to the full depth of the wood studs. New siding should match the look of the existing siding to retain building character.

Partitions

The building contains an unreinforced masonry partition at the exterior entrance to the boys' locker room. Partitions that are unbraced, or inadequately braced, are highly susceptible to dislodging or separating from the structure and can become a life-safety hazard. The recommended seismic mitigation for the unreinforced masonry partition is:

- Provide partition bracing at a maximum spacing of 6 feet or remove the partition.

Contents and Furnishings

The building contains freestanding tall and narrow furniture, such as bookshelves and kitchen equipment. This furniture is highly susceptible to toppling if it is not anchored properly and it can become a life-safety hazard or adversely affect post-earthquake operations. The recommended seismic mitigation for tall and narrow furniture is:

- Anchor contents and furnishings that are more than 6 feet high and have 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 Boistfort Elementary School Gym Building ranges between approximately $910,000 and $1.7M (-20 percent/+50 percent). The estimated construction cost to seismically upgrade this building is approximately $1.2M. On a per-square-foot basis, the seismic upgrade construction cost is estimated to be approximately $75 per square foot in 2019 dollars, with a variance range between $60 per square foot and $113 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)
Boistfort Elementary Gym	RM1	High / D	**Structural**			
			Immediate Occupancy	14,530 SF	$45 - $85 ($687K) ($1.29M)	$57 ($859K)
			Nonstructural			
			Life Safety	14,530 SF	$15 - $28 ($223K) ($418K)	$18 ($278K)
			Total			
				14,530 SF	$60 - $113 ($910K) ($1.71M)	$75 ($1.14M)

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

This page intentionally left blank.

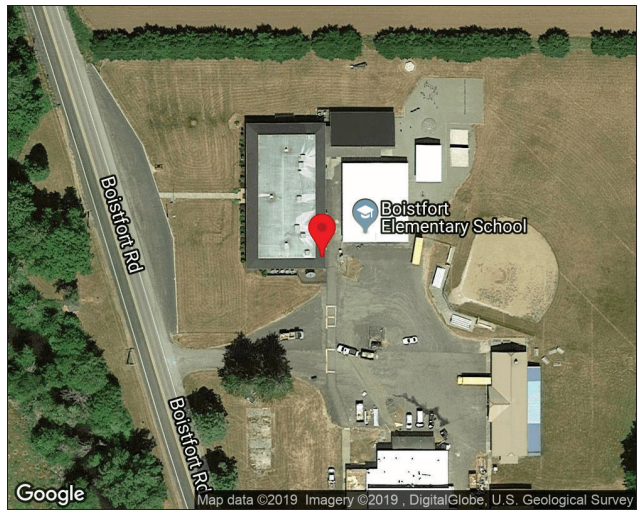
Appendix A: Field Investigation Report and Tier 1 Checklists

This page intentionally left blank.

1. Boistfort, Boistfort Elementary, Gymnasium Building

1.1 Building Description

Building Name:	Gymnasium Building
Facility Name:	Boistfort Elementary
District Name:	Boistfort
ICOS Latitude:	46.55
ICOS Longitude:	-123.133
ICOS County/District ID:	21234
ICOS Building ID:	16933
ASCE 41 Bldg Type:	RM1
Enrollment:	99
Gross Sq. Ft. :	14,530
Year Built:	1963
Number of Stories:	1
$S_{XS\ BSE\text{-}2E}$:	0.948
$S_{X1\ BSE\text{-}2E}$:	0.610
ASCE 41 Level of Seismicity:	High
Site Class:	D
V_{S30}(m/s):	320
Liquefaction Potential:	Moderate to High
Tsunami Risk:	None
Structural Drawings Available:	No
Evaluating Firm:	WRK Engineers



The Boistfort Elementary School gymnasium building is a one-story reinforced masonry and wood-framed structure. The building is constructed on level ground and is located in Curtis, Washington. The 1963 building is 170 feet by 100 feet with a maximum roof height of 25 feet. Building construction consists of reinforced masonry walls and wood-stud walls. The floor system is concrete slab-on-grade at the gym and a wood-framed elevated floor at the multi-purpose room. The roof system is wood-framed stress-skin panels over glulam beams. The building shares a site with the main building, a play shed, and various outbuildings.

1.1.1 Building Use

The building is a gymnasium for the Boistfort Elementary School and includes the gymnasium, a multipurpose room, locker rooms, storage, mechanical rooms, and a kitchen. The PK-8 elementary school has over 90 student occupants.

1.1.2 Structural System

Table 1.1-1. Structural System Description of Boistfort Elementary

Structural System	Description
Structural Roof	The roof system is composed of stress-skin wood panels over glulam beams. The stress-skin panels consist of plywood sheathing over 2x dimensional lumber framing.
Structural Floor(s)	The main floor consists of a concrete slab-on-grade. The elevated floor at the multipurpose room consists of T&G decking over wood framing.
Foundations	The foundation consists of cast-in-place reinforced concrete shallow spread footings supporting wall piers and columns, as well as concrete strip footings supporting reinforced masonry and wood stud bearing walls.
Gravity System	The gravity system consists of a wood-framed roof supported by glulam and solid-sawn beams supported by reinforced masonry bearing walls, wood stud bearing walls, and steel columns.
Lateral System	A mixture of wood shear walls and reinforced masonry walls with a structural diaphragm resists the forces in the longitudinal and transverse directions.

1.1.3 Structural System Visual Condition

Table 1.1-2. Structural System Condition Description of Boistfort Elementary

Structural System	Description
Structural Roof	No visible signs of corrosion, damage, or deterioration.
Structural Floor(s)	No visible signs of corrosion, damage, or deterioration.
Foundations	Unknown.
Gravity System	No visible signs of corrosion, damage, or deterioration.
Lateral System	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 Boistfort Boistfort Elementary Gymnasium Building

Deficiency	Description
Load Path	The windows along the east and west sides of the gymnasium create a break in the load path from the roof diaphragm to the masonry shear walls. In-plane strengthening is recommended, such as infilling windows with CMU or adding new shear walls or braced frames along the east and west sides.
Shear Stress Check	Shear stress for CMU walls is compliant. However, corresponding check for W2 system is non-compliant. The building likely requires lateral strengthening through the addition of new masonry shear walls. Further investigation is required.
Wall Anchorage	Roof exterior CMU wall connection types and extent are unknown. This evaluation item is likely non-compliant due to the building's age, but could not be visually verified. This item requires further field investigation to make a final determination on its compliance. The addition of out-of-plane wall anchors, blocking, and strapping is likely required.
Transfer to Shear Walls	There is no connection between the gymnasium roof diaphragm and the east/west masonry walls. Existing wall anchorage elsewhere is likely insufficient to transfer roof diaphragm loads to the shear walls. Post-installed anchors should be installed between the roof diaphragm and the existing masonry walls.
Cross Ties	There are no continuous cross ties between diaphragm chords. Diaphragm strengthening may be appropriate to mitigate seismic risk through the addition of new cross ties between diaphragm chords or adding strap plates to connect the existing framing members together.
Diagonally Sheathed and Unblocked Diaphragms	This evaluation cannot be visually verified, but is likely non-compliant. This item requires further investigation to make a final determination on its compliance. Diaphragm strengthening may be appropriate to mitigate seismic risk through the addition of diaphragm blocking and increased nailing.

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 Boistfort Boistfort Elementary Gymnasium Building

Unknown Item	Description
Liquefaction	The liquefaction potential of site soils is unknown at this time given available information. \moderate to high\ 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.
Ties Between Foundation Elements	No structural drawings are available. This evaluation item is unknown and cannot be visually verified. This item requires further investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Reinforcing Steel	The reinforcing steel size and spacing for the masonry walls is unknown based on the available as-built information. This item requires further field investigation to make a final determination on its compliance. The addition of FRP or vertical HSS strongbacks may be appropriate.
Wood Ledgers	This evaluation item is unknown and likely non-compliant due to the building's age. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Girder-Column Connection	No structural drawings are available. This evaluation item is unknown and cannot be visually verified. This item requires further investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Stiffness of Wall Anchors	This evaluation item is unknown and could not be visually verified. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.

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 Boistfort Boistfort Elementary Gymnasium Building

Deficiency	Description
P-1 Unreinforced Masonry. HR-LMH; LS-LMH; PR-LMH.	Partition wall at entrance to boys' locker room is likely unbraced based on the age of the building. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary. Unreinforced masonry partition walls should be braced at spacing of six feet or demolished.

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 Boistfort Boistfort Elementary Gymnasium Building

Unknown Item	Description
LSS-3 Emergency Power. HR-not required; LS-LMH; PR-LMH.	Emergency power equipment was not observed. Based on the age of the building, emergency power is likely non-existent or non-compliant. Further investigation is required to review the life-safety system anchorage and bracing.
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	This evaluation item is unknown and likely non-compliant due to the building's age. This item requires further field investigation to review suspended ceiling attachments.
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	This item requires further investigation to review the support system for light fixtures and to make a final determination on its compliance. Light fixture bracing is likely inadequate and the addition of bracing may be appropriate to mitigate seismic risk.
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Tall narrow contents do not appear to be anchored to the structure or to each other. Contents more than six feet high should be anchored to provide overturning base restraint.
ME-2 In-Line Equipment. HR-not required; LS-H; PR-H.	Mechanical equipment in-line with the duct or piping system weighing more than 75 pounds does not appear to be braced or restrained, but cannot be visually verified. This item requires further investigation to review vertical support and lateral bracing of equipment.
ME-3 Tall Narrow Equipment. HR-not required; LS-H; PR-MH.	Further investigation required to review anchorage of tall narrow equipment. All tall narrow mechanical equipment should be braced or anchored to the structure.

Photos:

Figure 1-1. Boistfort Gym - West Exterior

Figure 1-2. Boistfort Gym - South Exterior

Figure 1-3. Boistfort Gym - East Exterior

Figure 1-4. Boistfort Gym - North Exterior

Figure 1-5. Unbraced Nonstructural Partition Wall at Entry

Figure 1-6. Locker Room with Unbraced Half-Height Partition Walls

Figure 1-7. Gymnasium - North Interior

Figure 1-8. Mechanical Room

Figure 1-9. Multipurpose Room with Unknown Light Fixture Bracing, Typical Throughout

Figure 1-10. Kitchen - Large Nonstructural Components Unbraced

Boistfort, Boistfort Elementary, Gymnasium 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 windows along the east and west sides of the gymnasium create a break in the load path from the roof diaphragm to the masonry shear walls. In-plane strengthening is recommended, such as infilling windows with CMU or adding new shear walls or braced frames along the east and west sides.
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. Moderate to high 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	No structural drawings are available. This evaluation item is unknown and cannot be visually verified. This item requires further investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.

17-34 Collapse Prevention Structural Checklist for Building Types RM1 and RM2

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
Redundancy	The number of lines of shear walls in each principal direction is greater than or equal to 2. (Tier 2: Sec. 5.5.1.1; Commentary: Sec. A.3.2.1.1)	X				
Shear Stress Check	The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.2 (0.48 MPa). (Tier 2: Sec. 5.5.3.1.1; Commentary: Sec. A.3.2.4.1)		X			Shear stress for CMU walls is compliant. However, corresponding check for W2 system is non-compliant. The building likely requires lateral strengthening through the addition of new masonry shear walls. Further investigation is required.
Reinforcing Steel	The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls. (Tier 2: Sec. 5.5.3.1.3; Commentary: Sec. A.3.2.4.2)				X	The reinforcing steel size and spacing for the masonry walls is unknown based on the available as-built information. This item requires further field investigation to make a final determination on its compliance. The addition of FRP or vertical HSS strongbacks may be appropriate.

Stiff Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Topping Slab	Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab. (Tier 2: Sec. 5.6.4; Commentary: Sec. A.4.5.1)			X		

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT

Wall Anchorage	Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7. (Tier 2: Sec. 5.7.1.1; Commentary: Sec. A.5.1.1)		X			Roof exterior CMU wall connection types and extent are unknown. This evaluation item is likely non-compliant due to the building's age, but could not be visually verified. This item requires further field investigation to make a final determination on its compliance. The addition of out-of-plane wall anchors, blocking, and strapping is likely required.
Wood Ledgers	The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers. (Tier 2: Sec. 5.7.1.3; Commentary: Sec. A.5.1.2)				X	This evaluation item is unknown and likely non-compliant due to the building's age. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.
Transfer to Shear Walls	Diaphragms are connected for transfer of seismic forces to the shear walls. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.1)		X			There is no connection between the gymnasium roof diaphragm and the east/west masonry walls. Existing wall anchorage elsewhere is likely insufficient to transfer roof diaphragm loads to the shear walls. Post-installed anchors should be installed between the roof diaphragm and the existing masonry walls.
Topping Slab to Walls or Frames	Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements. (Tier 2: Sec. 5.7.2; Commentary: Sec. A.5.2.)			X		
Foundation Dowels	Wall reinforcement is doweled into the foundation. (Tier 2: Sec. 5.7.3.4; Commentary: Sec. A.5.3.5)	X				

Girder-Column Connection	There is a positive connection using plates, connection hardware, or straps between the girder and the column support. (Tier 2: Sec. 5.7.4.1; Commentary: Sec. A.5.4.1)				X	No structural drawings are available. This evaluation item is unknown and cannot be visually verified. This item requires further investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.

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

Stiff Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Openings at Shear Walls	Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.4)			X		
Openings at Exterior Masonry Shear Walls	Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.6)			X		

Flexible Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Cross Ties	There are continuous cross ties between diaphragm chords. (Tier 2: Sec. 5.6.1.2; Commentary: Sec. A.4.1.2)		X			There are no continuous cross ties between diaphragm chords. Diaphragm strengthening may be appropriate to mitigate seismic risk through the addition of new cross ties between diaphragm chords or adding strap plates to connect the existing framing members together.
Openings at Shear Walls	Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.4)			X		
Openings at Exterior Masonry Shear Walls	Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long. (Tier 2: Sec. 5.6.1.3; Commentary: Sec. A.4.1.6)			X		
Straight Sheathing	All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.1)			X		
Spans	All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.2)	X				

Diagonally Sheathed and Unblocked Diaphragms	All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4 to-1. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.3)		X			This evaluation cannot be visually verified, but is likely non-compliant. This item requires further investigation to make a final determination on its compliance. Diaphragm strengthening may be appropriate to mitigate seismic risk through the addition of diaphragm blocking and increased nailing.
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				

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Stiffness of Wall Anchors	Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors. (Tier 2: Sec. 5.7.1.2; Commentary: Sec. A.5.1.4)				X	This evaluation item is unknown and could not be visually verified. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary.

Boistfort, Boistfort Elementary, Gymnasium 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		No fire sprinklers
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		
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	Emergency power equipment was not observed. Based on the age of the building, emergency power is likely non-existent or non-compliant. Further investigation is required to review the life-safety system anchorage and bracing.
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		
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		
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		

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		
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		
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		
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		
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		

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			Partition wall at entrance to boys' locker room is likely unbraced based on the age of the building. This item requires further field investigation to make a final determination on its compliance and to develop a mitigation recommendation, if necessary. Unreinforced masonry partition walls should be braced at spacing of six feet or demolished.
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		

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		
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		Non-applicable due to ASCE 41 Performance Level: "Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance Level: "Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance Level: "Life Safety (LS)"

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		
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	This evaluation item is unknown and likely non-compliant due to the building's age. This item requires further field investigation to review suspended ceiling attachments.
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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	This item requires further investigation to review the support system for light fixtures and to make a final determination on its compliance. Light fixture bracing is likely inadequate and the addition of bracing may be appropriate to mitigate seismic risk.
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		
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		
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		
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		
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		

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		
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		
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		

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		
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		
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		
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		
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		
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		

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		
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		
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		
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		

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		

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		

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		
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		

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		
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	Tall narrow contents do not appear to be anchored to the structure or to each other. Contents more than six feet high should be anchored to provide overturning base restraint.
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		
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		
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	Mechanical equipment in-line with the duct or piping system weighing more than 75 pounds does not appear to be braced or restrained, but cannot be visually verified. This item requires further investigation to review vertical support and lateral bracing of equipment.
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	Further investigation required to review anchorage of tall narrow equipment. All tall narrow mechanical equipment should be braced or anchored to the structure.
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"
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		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

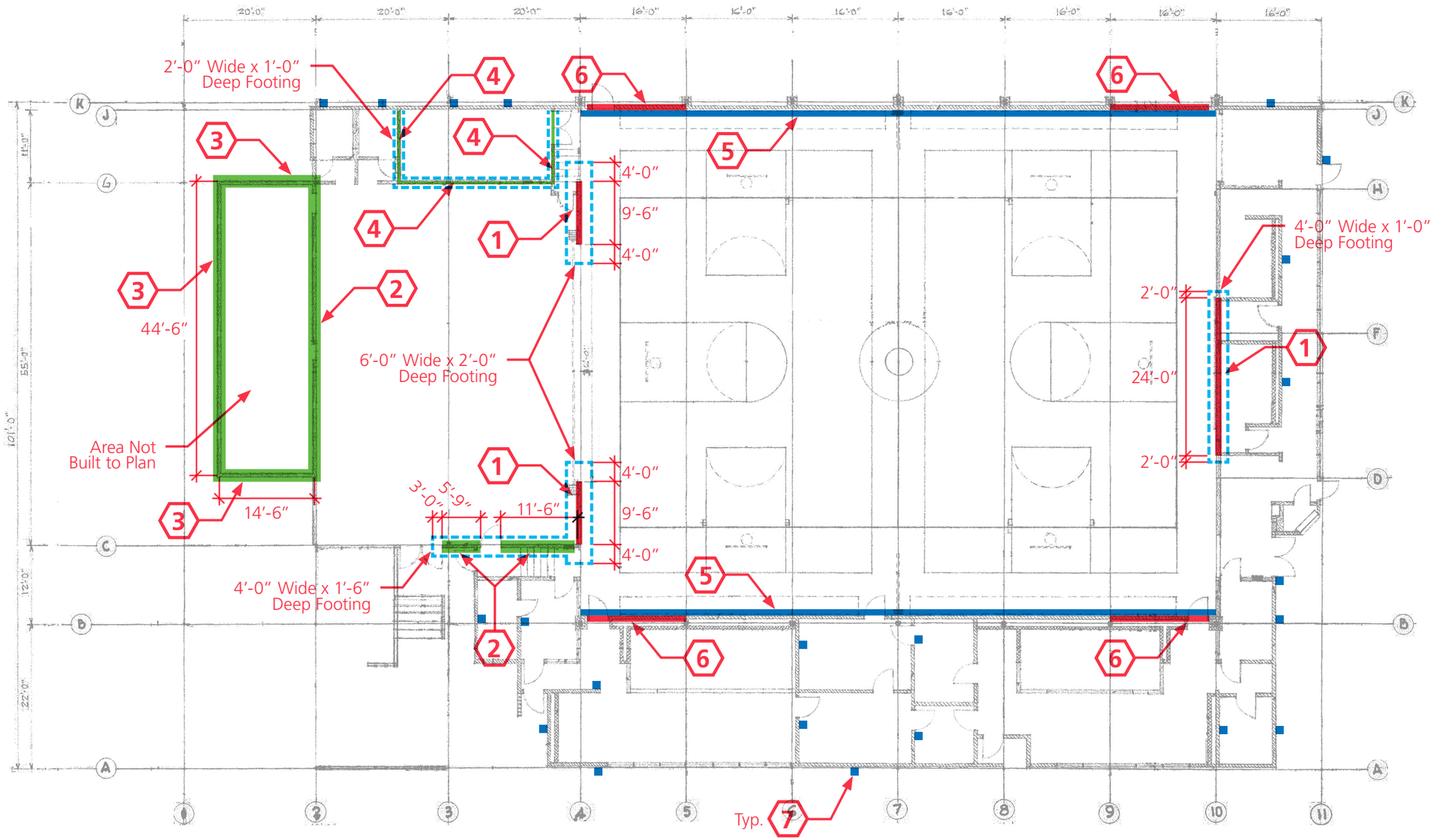
D-3 Ducts Crossing Seismic Joints. HR-not required; LS-not required; PR-H.	Ducts that cross seismic joints or isolation planes or are connected to independent structures have couplings or other details to accommodate the relative seismic displacements. (Tier 2: Sec. 13.7.6; Commentary: Sec. A.7.14.4)			X		N/A due to ASCE 41 Performance Level: "Life Safety (LS)"

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		Non-applicable due to ASCE 41 Seismicity Level: "Moderate"
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		Non-applicable due to ASCE 41 Seismicity Level: "Moderate"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"
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		Non-applicable due to ASCE 41 Performance "Level: Life Safety (LS)"

Appendix B: Concept-Level Seismic Upgrade Figures

This page intentionally left blank.



1. Demo (E) 22 Ft Tall Wood Stud Wall & Rebuild As 8" CMU Wall w/ 2'-0" Deep Concrete Footing
2. Remove (E) Gypboard Each Side Of Wall, Provide 15/32" Plywood Shthg w/ 8D @ 4" OC @ Panel Edges & 12" OC in the Field, Provide Simpson Hdu4 Each End, Fasten Sill Plate To Footing w/ 3/4" Adh Anchors @ 2'-0" OC
3. Demo (E) Siding & Sheathing, Provide 15/32" Plywood Sheathing w/ 8D @ 6" OC @ Panel Edges & 12" OC in the Field, Fasten Sill Plate To (E) Concrete Footing w/ 5/8" Adh Anchors @ 4'-0" OC, Provide Simpson HDU4 Each End
4. Demo (E) Wall Finishes, Provide 15/32" Plywood Sheathing With 8D @ 6" OC @ Panel Edges & 12" OC in the Field, Fasten Sill Plate To Footing w/ 5/8" Anchor Bolts @ 4'-0" OC, Provide Simpson HDU2 Each End
5. Provide HSS 4x4x3/8 Horizontal Strongback w/ 5/8" Dia Adh Anchors @ 4'-0" OC, Strongbacks To Be Placed @ 8'-0" Above Floor Level & Below Windows
6. Infill 6'X14' Window Above With 8" CMU
7. HSS 4x4x3/8 Vertical Strongback w/ 5/8" Dia Adh Anchors @ 4'-0" OC, Typical @ 22 Locations

Notes:

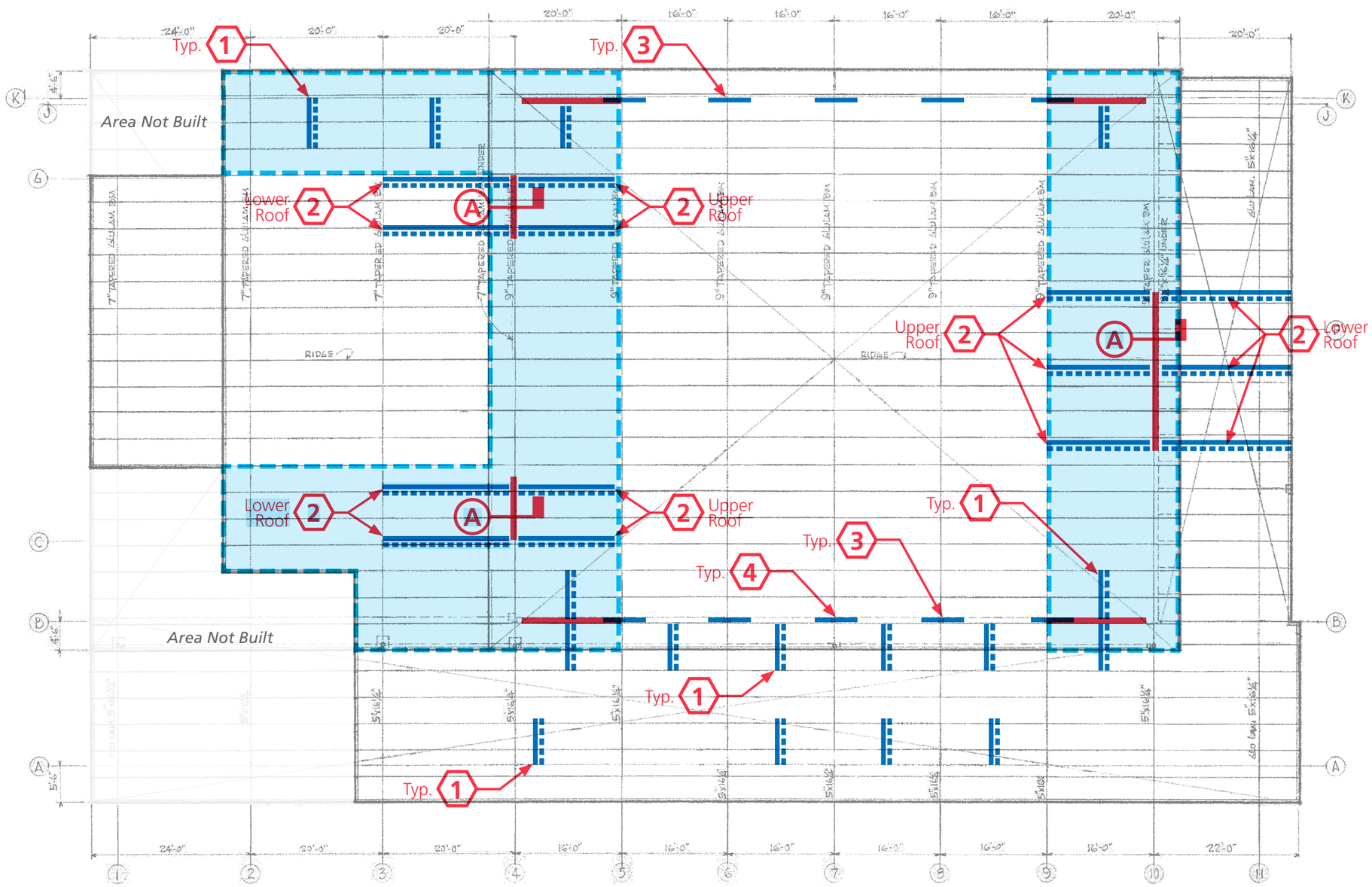
1. Repair & Replace Wall & Floor Finishes In Kind As Required

ReidMiddleton wrk engineers

Boistfort Elementary School Seismic Upgrades – Gym Building

Washington State School Seismic Safety Assessments Project – Boistfort School District – June 2019

Figure 1 - Main Floor Strengthening Plan



1 Simpson Cmst 14x12'-0" Over Full Depth 4X Blkg, Provide Simpson HDU4 Out-Of-Plane Wall Anchor W/ 5/8" Adh Anchor

2 Sister (E) Roof Framing With 2X Df-L #2 Member, Depth to Match. Attach With (2) Rows 10D @ 6" OC Staggered, Provide Simpson HDU-4 Out-Of-Plane Wall Anchor

3 Provide Simpson HDU-4 Out-Of-Plane Wall Anchor @ Underside Of Each Glulam/Wood Beam @ Masonry Walls, (24 Locations).

4 Simpson Cmst 14x8'-0" @ 10 Locations

Add 2X Blocking to All Unsupported Panel Edges, Remove & Replace Ceiling Finishes & Sheathing As Required, Replace In Kind

CMU Wall Below. Provide 4X Ledger W/ 3/4" Dia Ab @ 16" OC, @ Lower Roof Along Gridlines 4 & 10

Notes:

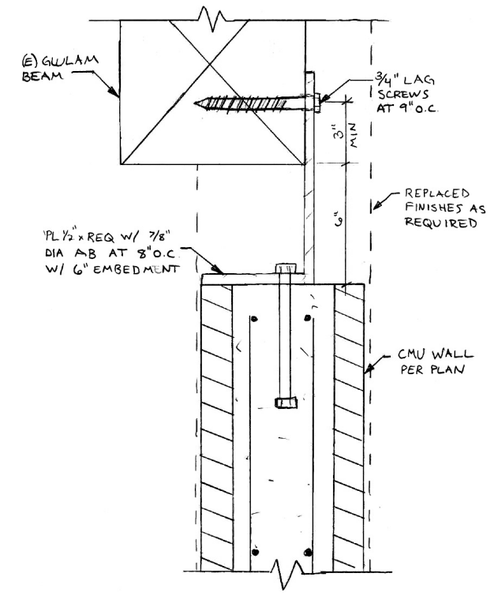
1. Provide 8D @ 6" OC, @ All Supported Panel Edges Entire Roof Area, Remove & Replace Roofing to Match Existing as Required

ReidMiddleton wrk engineers

Boistfort Elementary School Seismic Upgrades – Gym Building

Washington State School Seismic Safety Assessments Project – Boistfort School District – June 2019

Figure 2 - Roof Strengthening Plan



SECTION A

Top of CMU Wall at Glulam

Figure 3 - Conceptual Sections

This page intentionally left blank.

Appendix C: Opinion of Probable Construction Costs

This page intentionally left blank.

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:	**Boistfort Elem School Gym**
Location:	**State of Washington**
Design Phase:	**ROM Cost Estimates**
Date of Estimate:	**April 2, 2019**
Date of Revision:	
Month of Cost Basis:	**1Q, 2019**

Boistfort Elem School Gym

Master Estimate Summary

Project Name		Total Estimated Construction Cost
Boistfort Elem School Gym	**Structural Costs**	**$858,663**
Boistfort Elem School Gym	**Non-Structural Costs**	**$278,409**
TOTAL ESTIMATED CONSTRUCTION COST		**$1,137,071**

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:	Boistfort Elem School Gym	Building Area	15,129
Location:	Curtis, WA		
Design Phase:	ROM Cost Estimates		
Date of Estimate:	April 2, 2019		
Date of Revision:			
Month of Cost Basis:	4Q, 2018, 1Q, 2019	Total Areas	15,129

Boistfort Elem School Gym

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 655,468

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 65,547	$ 721,014
General Conditions	10.0%	$ 65,547	$ 786,561
Home Office Overhead	5.0%	$ 32,773	$ 819,335
Profit	6.0%	$ 39,328	$ 858,663
Escalation Not Included-Costs in 1Q, 2019 Dollars	0.0%	$ -	$ 858,663
Washington State Sales Tax	0.0%	$ -	$ 858,663

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

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--	**$ 858,663**	**$ 56.76**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 686,930**	**$ 45.40**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 1,287,994**	**$ 85.13**

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											

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
Foundations											
	Notes 1, 2 and 4:										
	Spread Footings System- Excavation, Backfill, Formwork, Concrete, Reinforcing and detailing. Inside Existing Building.	27.6	cuyd	$ 499.20	$ 13,792.71	$ 280.80	$ 7,758.40	$ 46.80	$ 1,293.07	$ 826.80	$ 22,844.18
Substructure											
	Notes 1, 2 and 4:										
	Remove and Reinstall Slab on Grade System with Reinforcing, New Flooring System at New Footings	556.0	sqft	$ 13.20	$ 7,339.20	$ 10.80	$ 6,004.80	$ 1.44	$ 800.64	$ 25.44	$ 14,144.64
Superstructure											
Upper Floor Systems											
	Note 1:										
	Remove Wood Stud Wall System	946	sqft	$ 4.28	$ 4,044.15	$ 0.23	$ 212.85	$ 0.27	$ 255.42	$ 4.77	$ 4,512.42
	New 8" Reinforced CMU Wall System	946	sqft	$ 9.90	$ 9,365.40	$ 8.10	$ 7,662.60	$ 1.08	$ 1,021.68	$ 19.08	$ 18,049.68
	Temporary Shoring of Roof Structure	1	set	$ 4,125.00	$ 4,125.00	$ 1,375.00	$ 1,375.00	$ 330.00	$ 330.00	$ 5,830.00	$ 5,830.00
	Note 2:										
	Remove GWB Both Sides, Add 15/32" Sheathing and Install new GWB/Finishes - Adjust Devices	777	sqft	$ 8.80	$ 6,837.60	$ 7.20	$ 5,594.40	$ 0.96	$ 745.92	$ 16.96	$ 13,177.92
	Fasten Sill Plate to Footing with 3/4" Adhesive Anchor Bolts at 24" o.c.	35	each	$ 68.75	$ 2,406.25	$ 56.25	$ 1,968.75	$ 7.50	$ 262.50	$ 132.50	$ 4,637.50
	Holdown - Simpson HDU4 Assembly	6	each	$ 146.25	$ 877.50	$ 78.75	$ 472.50	$ 13.50	$ 81.00	$ 238.50	$ 1,431.00
	Note 3:										
	Remove Siding and Sheathing, Add 15/32" Sheathing and Install new Exterior Siding System	874	sqft	$ 12.10	$ 10,575.40	$ 9.90	$ 8,652.60	$ 1.32	$ 1,153.68	$ 23.32	$ 20,381.68
	Fasten Sill Plate to Footing with 3/4" Adhesive Anchor Bolts at 48" o.c.	21	each	$ 68.75	$ 1,443.75	$ 56.25	$ 1,181.25	$ 7.50	$ 157.50	$ 132.50	$ 2,782.50
	Holdown - Simpson HDU4 Assembly	6	each	$ 146.25	$ 877.50	$ 78.75	$ 472.50	$ 13.50	$ 81.00	$ 238.50	$ 1,431.00
	Note 4:										
	Remove GWB Both Sides, Add 15/32" Sheathing and Install new GWB/Finishes - Adjust Devices	525	sqft	$ 8.80	$ 4,620.00	$ 7.20	$ 3,780.00	$ 0.96	$ 504.00	$ 16.96	$ 8,904.00
	Fasten Sill Plate to Footing with 3/4" Adhesive Anchor Bolts at 48" o.c.	14	each	$ 68.75	$ 962.50	$ 56.25	$ 787.50	$ 7.50	$ 105.00	$ 132.50	$ 1,855.00
	Holdown - Simpson HDU4 Assembly	6	each	$ 146.25	$ 877.50	$ 78.75	$ 472.50	$ 13.50	$ 81.00	$ 238.50	$ 1,431.00

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	Note 5:										
	4x4x3/8 Horizontal Strongback, Painted with 5/8" Adhesive Anchor Bolts at 48" o.c.	390	lnft	$ 77.63	$ 30,274.74	$ 41.80	$ 16,301.79	$ 7.17	$ 2,794.59	$ 126.59	$ 49,371.12
	Holdown - Simpson HDU4 Assembly	6	each	$ 81.25	$ 487.50	$ 43.75	$ 262.50	$ 7.50	$ 45.00	$ 132.50	$ 795.00
	Note 6:										
	Remove Window- 6' x 14'	4	each	$ 319.20	$ 1,276.80	$ 16.80	$ 67.20	$ 20.16	$ 80.64	$ 356.16	$ 1,424.64
	New 8" Reinforced CMU Wall System - Infill Windows	336	sqft	$ 15.21	$ 5,110.56	$ 8.19	$ 2,751.84	$ 1.40	$ 471.74	$ 24.80	$ 8,334.14
	Note 7:										
	4x4x3/8 Vertical Strongback, Painted with 5/8" Adhesive Anchor Bolts at 48" o.c.	264	lnft	$ 77.63	$ 20,493.67	$ 41.80	$ 11,035.05	$ 7.17	$ 1,891.72	$ 126.59	$ 33,420.45
	New 8" Reinforced CMU Wall System - Infill Windows	119	sqft	$ 13.52	$ 1,614.65	$ 7.28	$ 869.43	$ 1.25	$ 149.04	$ 22.05	$ 2,633.13
Roofing Systems											
	Remove Existing Roofing System- Including Overhangs	16,579	sqft	$ 2.02	$ 33,423.26	$ 0.08	$ 1,392.64	$ 0.13	$ 2,088.95	$ 2.23	$ 36,904.85
	Nail Existing Roof Deck at Panel Edges to Members with 8d @ 6" o.c.	16,579	sqft	$ 1.12	$ 18,510.45	$ 0.33	$ 5,529.10	$ 0.09	$ 1,442.37	$ 1.54	$ 25,481.92
	Add 2x Blocking at Unsupported Panel Edges including removing and replacing Ceiling Finishes	5,100	sqft	$ 3.33	$ 16,983.00	$ 1.17	$ 5,967.00	$ 0.27	$ 1,377.00	$ 4.77	$ 24,327.00
	Figure A Detail - 1/2" Plate by 18" wide with 7/8" x 8" Dia Anchor Bolt at 8" o.c. into CMU and 3/4" x 8" Lag Screw @ 9" o.c. into the Glulam	41	lnft	$ 67.32	$ 2,760.12	$ 31.68	$ 1,298.88	$ 5.94	$ 243.54	$ 104.94	$ 4,302.54
	Note 1:										
	SIMPSON CMST14x12'-0" OVER FULL DEPTH 4x BLKG. PROVIDE SIMPSON HDU4 OUT-OF-PLANE WALL ANCHOR W/ 5/8" ADH ANCHOR.	15	each	$ 275.40	$ 4,131.00	$ 129.60	$ 1,944.00	$ 24.30	$ 364.50	$ 429.30	$ 6,439.50
	Note 2:										
	SISTER (E) ROOF FRAMING WITH 2x DF-L#2 MEMBER, DEPTH TO MATCH. ATTACH WITH (2) ROWS 10d AT 6" OC STAGGERED. PROVIDE SIMPSON HDU-4OUT-OF-PLANE WALL ANCHOR.	280	lnft	$ 9.69	$ 2,713.20	$ 4.56	$ 1,276.80	$ 0.86	$ 239.40	$ 15.11	$ 4,229.40

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	Note 3:										
	PROVIDE SIMPSON HDU-4OUT-OF-PLANE WALL ANCHOR AT UNDERSIDE OF EACH GLULAM/WOOD BEAM AT MASONRY WALLS	24	each	$ 214.20	$ 5,140.80	$ 100.80	$ 2,419.20	$ 18.90	$ 453.60	$ 333.90	$ 8,013.60
	Note 4:										
	SIMPSON CMST14x8'-0"	10	each	$ 153.00	$ 1,530.00	$ 72.00	$ 720.00	$ 13.50	$ 135.00	$ 238.50	$ 2,385.00
	Install New Roofing System - Including Roof Membrane, New Insulation, Coverboard and Flashing and Trim for a Complete System	16,579	sqft	$ 10.02	$ 166,071.84	$ 8.53	$ 141,468.61	$ 1.11	$ 18,452.43	$ 19.66	$ 325,992.88
Subtotal of the Direct Cost of Construction				**Boistfort Elem School Gym**							**$ 655,468**

PRODIMS

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

Non-Structural Costs

Name:	Wa State School Seismic Safety Assessment	Areas	sqft
Second Name:	Boistfort Elem School Gym	Building Area	15,129
Location:	Curtis, WA		
Design Phase:	ROM Cost Estimates		
Date of Estimate:	April 2, 2019		
Date of Revision:			
Month of Cost Basis:	4Q, 2018, 1Q, 2019	Total Areas	15,129

Boistfort Elem School Gym

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 212,526

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 21,253	$ 233,778
General Conditions	10.0%	$ 21,253	$ 255,031
Home Office Overhead	5.0%	$ 10,626	$ 265,657
Profit	6.0%	$ 12,752	$ 278,409
Escalation Not Included-Costs in 1Q, 2019 Dollars	0.0%	$ -	$ 278,409
Washington State Sales Tax	0.0%	$ -	$ 278,409

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

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--	**$ 278,409**	**$ 18.40**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 222,727**	**$ 14.72**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 417,613**	**$ 27.60**

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											
	Ceilings and Finishes and Gym Equipment temporary relocation for Installation of Seismic Work	15,129	sqft	$ 0.54	$ 8,242.45	$ 0.45	$ 6,743.82	$ 0.06	$ 899.18	$ 1.05	$ 15,885.45

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
	Mechanical/Electrical/Fire Protection Systems	15,129	sqft	$ 6.74	$ 102,030.35	$ 5.52	$ 83,479.38	$ 0.74	$ 11,130.58	$ 13.00	$ 196,640.31

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

Subtotal of the Direct Cost of Construction				**Boistfort Elem School Gym**							**$ 212,526**

This page intentionally left blank.

Appendix D: Earthquake Performance Assessment Tool (EPAT) Worksheet

This page intentionally left blank.

Washington Schools Earthquake Performance Assessment Tool (EPAT)
MAIN PAGE

Full District Name	Boistfort		
Point of Contact	Shannon Criss (principal)		
Telephone	360-245-3343		
E-Mail	scriss@boistfort.k12.wa.us		
File Name	Boistfort, Boistfort Elementary, Gymnasium EPAT	**File Date:**	7/5/2018

District	Boistfort
Facility Name	Boistfort Elementary
Building Part Name	Gymnasium

Earthquake Ground Motion (% g)		**Earthquake Hazards**	
20% in 50 year PGA	21.4%	**Site Class**	D
10% in 50 year PGA	30.2%	**Ground Shaking Hazard**	High
2% in 50 year PGA	52.5%	**Liquefaction Potential**	Moderate to High
Percentile S_s *Among all WA Campuses*	46%	**Combined Earthquake Hazard Level**	Very High

Total Building Part Area (Square Feet)	**Building Evaluated By**	**Input Data by Person(s)**
14,530	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	Boistfort Elementary
Building Name	Gymnasium
Building Use	Assembly

Data Entry Item	User Entered Values	Default Values	Used for BCA
Seismic Data			
Decimal Latitude	46.550176	46.550176	46.550176
Decimal Longitude	-123.133102	-123.133102	-123.133102
Site Class (Soil/Rock Type)	D	D-E	D
Liquefaction Potential	Moderate to High	Moderate to High	Moderate to High
Geographic Region for Seismic Zones	Coastal	Coastal	Coastal
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***	1963		1963
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***	Yes		Yes
Moderate Vertical Irregularity***	No		No
Plan (Horizontal) Irregularity***	No		No

*** **Mandatory Data Entry**

Washington Schools Earthquake Performance Assessment Tool (EPAT)
RESULTS SUMMARY

District Name	Boistfort	**Existing Building Life Safety Risk & Priority for Retrofit or Replacement**
School Name	Boistfort Elementary	
Building Name	Gymnasium	Very High

Building Data

HAZUS Building Type	RM1	Reinforced Masonry Bearing Walls w/ Wood or Metal Diaphragms
Year Built	1963	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	Coastal	
Severe Vertical Irregularity	Yes	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	High	Frequency and severity of earthquakes at this site
Percentile S_s Among WA K-12 Campuses	46%	Earthquake ground shaking hazard is higher than 46% of WA campuses.
Site Class (Soil or Rock Type)	D	Stiff Soil
Liquefaction Potential	Moderate to High	Liquefaction increases the risk of major damage to a building
Combined Earthquake Hazard Level	Very High	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	79%	79%	Very High	Red
Life Safety Retrofit Building	16%	8.8%	Very Low	Green/Yellow
Current Code Building	13%	5.8%	Very Low	Green

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.

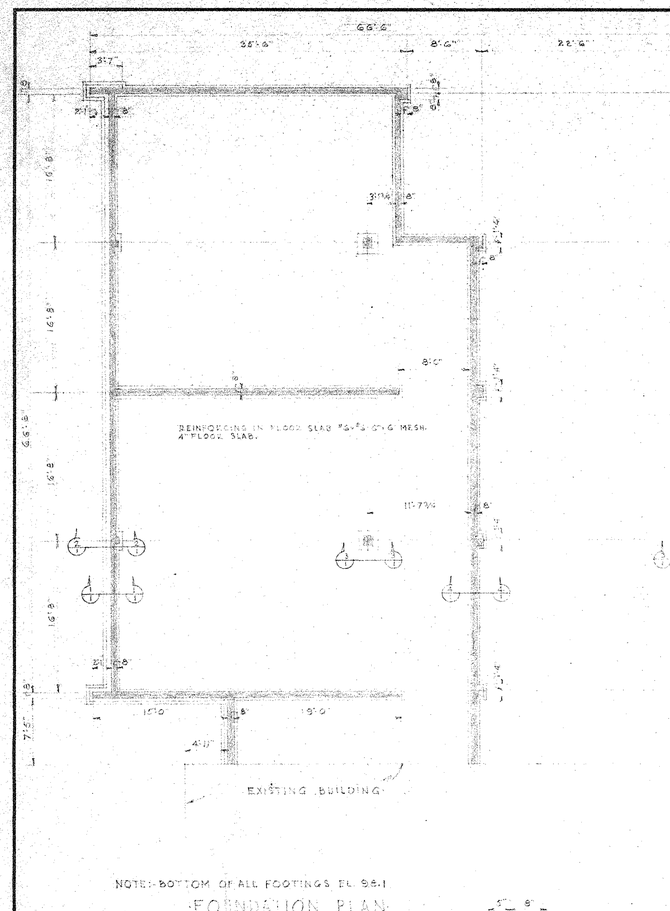
Source for the Data Entered into the Tool

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

This page intentionally left blank.

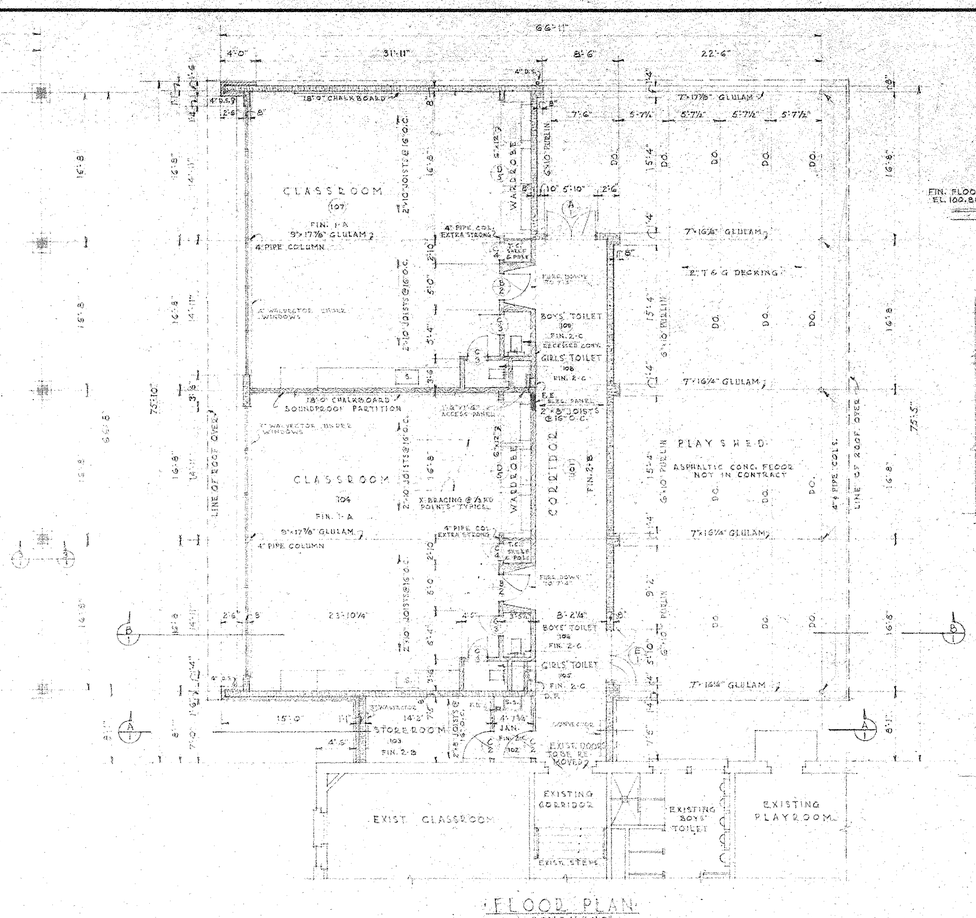
Appendix E: Boistfort Elementary School Existing Drawings

This page intentionally left blank.

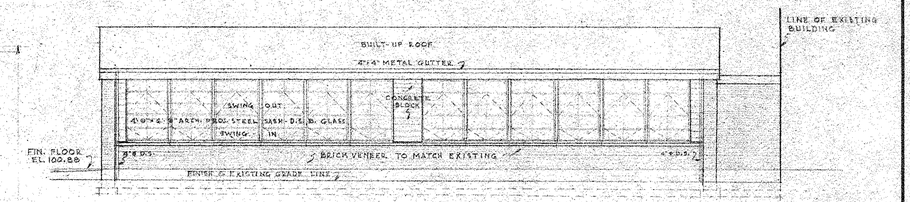


NOTE:- BOTTOM OF ALL FOOTINGS EL. 98.1

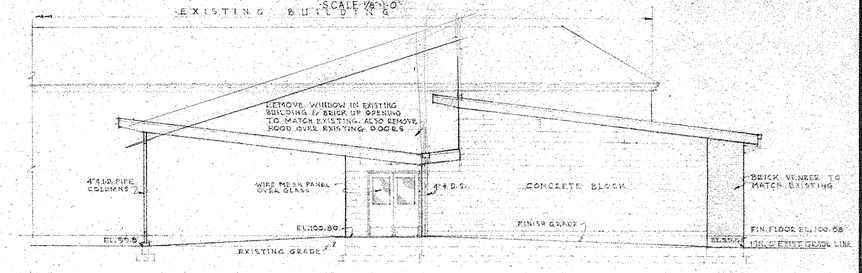
FOUNDATION PLAN
SCALE: 1/8"=1'0"



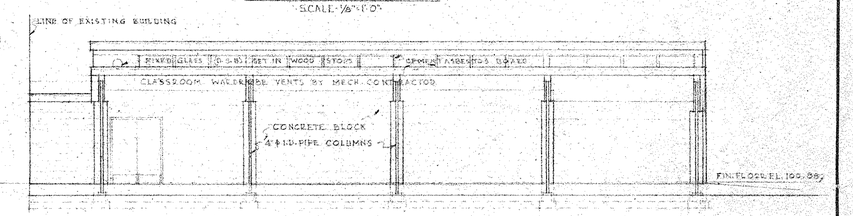
FLOOR PLAN
SCALE: 1/8"=1'0"
FIN. FLOOR EL. 100.88



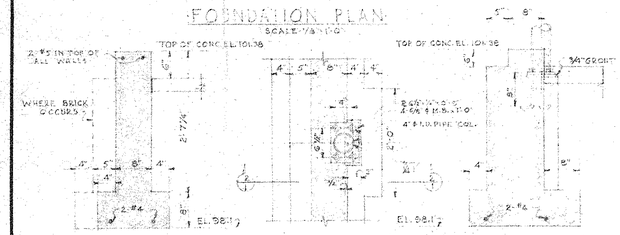
NORTH ELEVATION
SCALE: 1/8"=1'0"



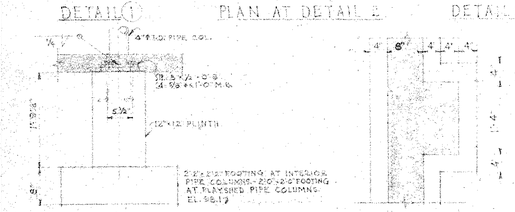
EAST ELEVATION
SCALE: 1/8"=1'0"



SOUTH ELEVATION
SCALE: 1/8"=1'0"

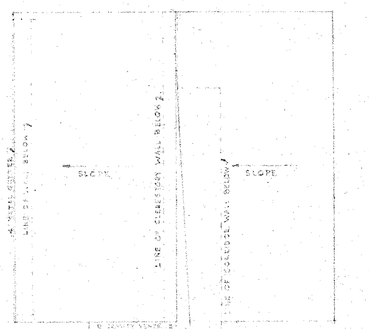


DETAIL (1) PLAN AT DETAIL 2 DETAIL (2)

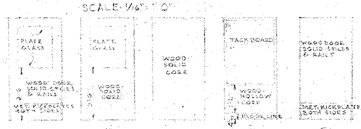


DETAIL (3) DETAIL (4)

FOOTING DETAILS
SCALE: 3/4"=1'0"



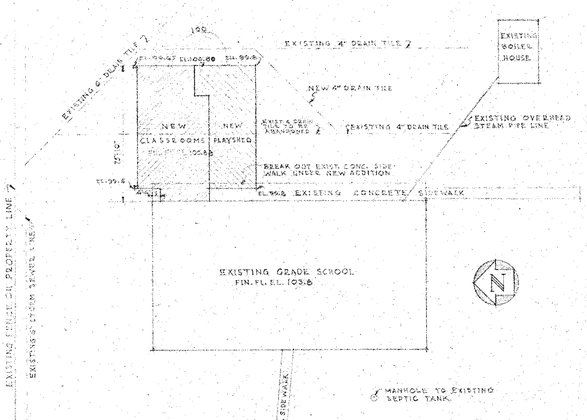
ROOF PLAN
SCALE: 1/8"=1'0"



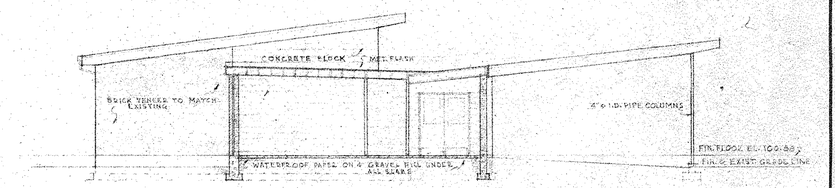
DOOR TYPES
NOT TO SCALE

DOOR SCHEDULE

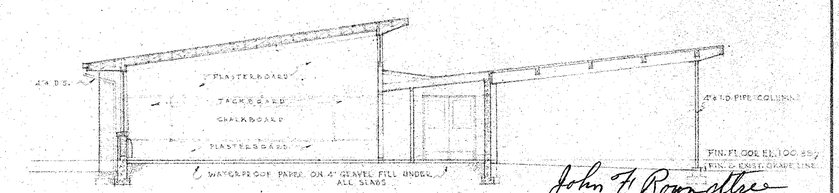
MARK	WIDTH	HEIGHT	THICK	REMARKS
1	2'-8	7'-0	2 1/4	PAIR DOORS
2	3'-0	7'-0	1 3/4	
3	2'-4	7'-0	1 3/4	UNDERCUT 1"
4	2'-0	7'-0	1 3/4	
5	2'-6	6'-0	1 3/4	6 DOORS PER UNIT - UNDERCUT 4"



PLOT PLAN
SCALE: 1"=40'-0"



SECTION A-A
SCALE: 1/8"=1'0"



SECTION B-B
SCALE: 1/8"=1'0"

John H. Ropnellee
Board Chairman
School Dist. #234

Irvin C. Eggimann

STRUCTURAL GENERAL NOTES:

STRUCTURAL DESIGN IN ACCORD WITH PACIFIC COAST UNIFORM BUILDING CODE.

LIVE LOADS			
ROOFS	20 P.S.F.	CONC. COVER-REINFORCING STEEL	
WIND	15	BEAMS	1 1/2"
FLOORS	40	FOOTINGS	3"

DESIGN STRESSES:- fc = 20,000 P.S.I.
fc = 3000 @ 28 DAYS FOR STRUCT. CONC. MIN. 6 SACKS CEMENT/C.Y.
fc = 2500 FOR SLABS ON GRADE ONLY MIN. 5 SACKS CEMENT/C.Y.
STRUCTURAL STEEL:- fs = 20,000 P.S.I.
WELDING IN ACCORD WITH A.W.S.
TIMBER:- DIMENSION & SOLID BEAMS - 1450 f
POSTS - 1200 f
GLUED LAMINATED BEAMS - 2475 f
SOIL BEARING - 3000 P.S.F. MAXIMUM.
CONTRACTOR TO VERIFY ALL DIMENSIONS ON JOB.
MASONRY WALLS TO BE REINFORCED WITH K-WEB AS SPECIFIED.
LINTELS:- SHOWN LINTELS IN CONC. BLOCK WALLS TO BE 8"x8"
2 - REBARS BELOW 2" ⅝" — BOTTOM

SYMBOLS:

EARTH — WOOD STUDS
GRAVEL — METAL
CONCRETE — WOOD-FINISH
BRICK — PLYWOOD
CONCRETE BLOCK — INSULATION
EXISTING WORK TO REMAIN
EXISTING WORK TO BE REMOVED
DOOR TYPE / DOOR SIZE — SECTION NUMBER / SHEET NUMBER
(101) ROOM NUMBER — (2) DETAIL NUMBER / SHEET NUMBER

FINISH SCHEDULE

MARK	FLOOR	BASE	WAINSCOT MATERIAL	WAINSCOT HEIGHT	WALLS	CEILING	TRIM	REMARKS
1	A.T.	WOOD	—	—	PLASTERBOARD	A.C.T.	WOOD	CONC. BLOCK WALLS EXPOSED
2	A.T.	WOOD	—	—	PLASTERBOARD	PLASTERBOARD	WOOD	CONC. BLOCK WALLS EXPOSED

PAINT SCHEDULE

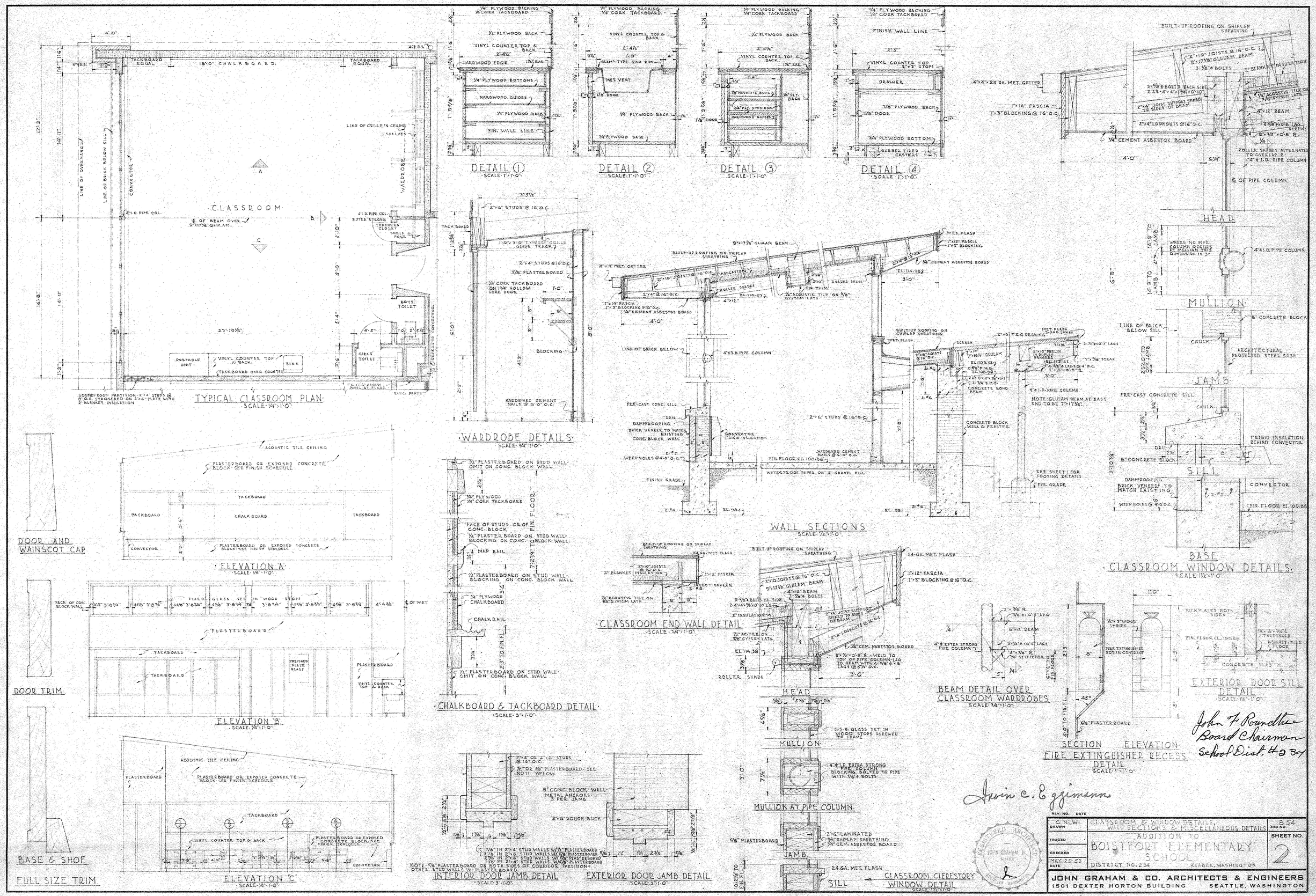
MARK	FLOOR	BASE	WAINSCOT MATERIAL	WAINSCOT HEIGHT	WALLS	CEILING	TRIM	REMARKS
A	—	ST. & V.	—	—	PAINT	—	ST. & V.	
B	—	ST. & V.	—	—	PAINT	PAINT	ST. & V.	
C	—	ENAMEL	—	—	ENAMEL	ENAMEL	ENAMEL	

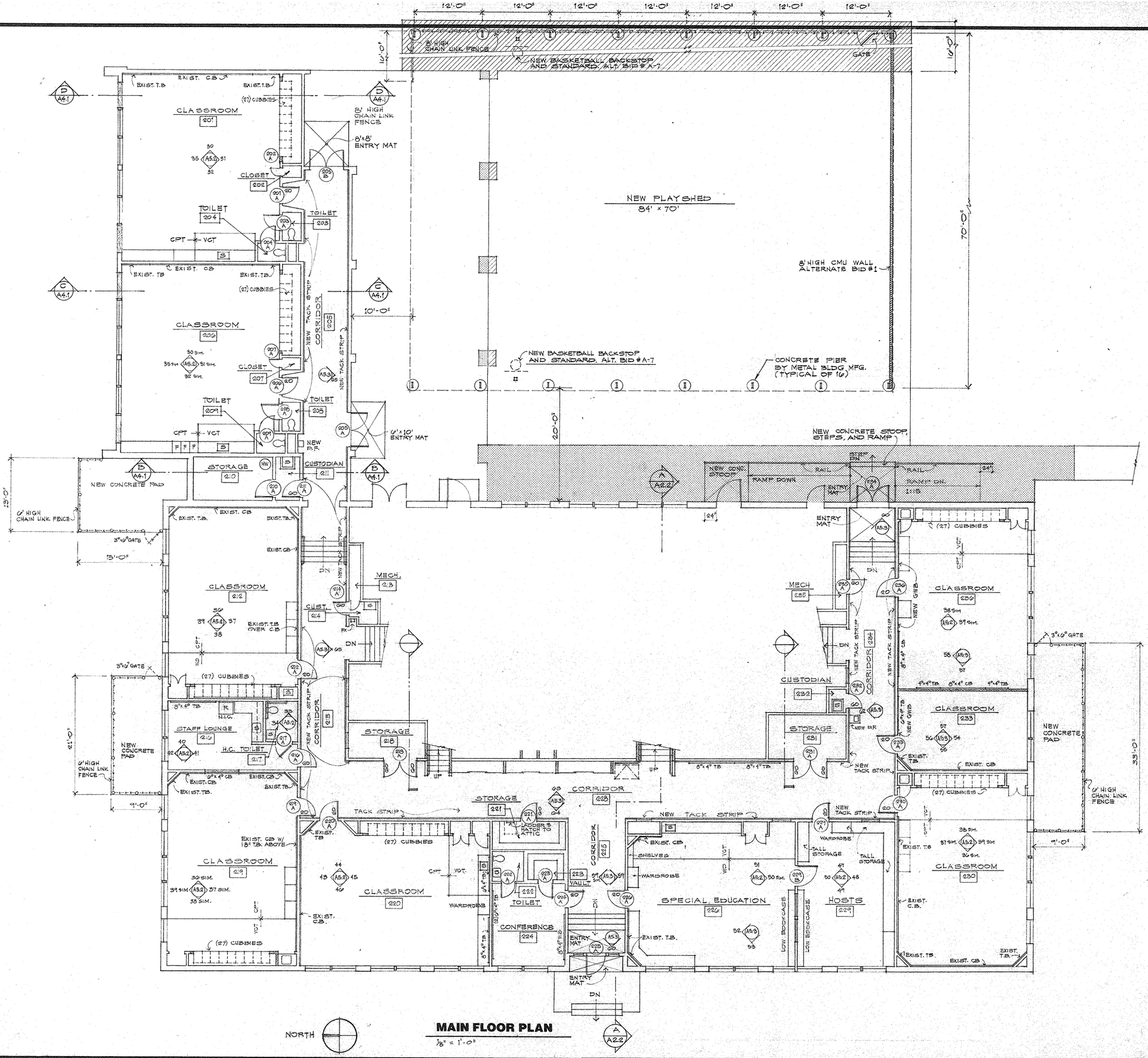
GENERAL NOTES:

1.- ALL DIMENSIONS ARE TAKEN TO FACE OF CONCRETE OR MASONRY WALLS OR CENTERLINE OF STUD WALLS UNLESS OTHERWISE NOTED.
2.- FIN. 1-A - WHERE THIS OR SIMILARS NUMBER-LETTER COMBINATION APPEARS ON DRAWINGS, THE NUMBER INDICATES THE FINISH MATERIALS USED & THE LETTER INDICATES THE PAINT FINISH USED.
3.- WOOD PARTITIONS SHALL BE OF 2"x4" STUDS @ 16" O.C. UNLESS OTHERWISE NOTED. ANCHOR PARTITIONS TO CONCRETE FLOOR SLABS WITH HARDENED CEMENT NAILS @ 16" O.C. & DOUBLED AT DOORS.

REV. NO.	DATE		
DRAWN: E.N.W.	FOUNDATION & FLOOR PLANS, ELEVATIONS & SECTIONS		JOB NO. 654
TRACED	ADDITION TO BOISTFORT ELEMENTARY SCHOOL		SHEET NO. 1
CHECKED			
DATE: MAY 25 '65	DISTRICT NO. 234	KLABER, WASHINGTON	

JOHN GRAHAM & CO. ARCHITECTS & ENGINEERS
1501 DEXTER HORTON BUILDING — SEATTLE, WASHINGTON


TYPICAL CLASSROOM PLAN
SCALE 1/4" = 1'-0"
CLASSROOM
TACKBOARD EQUAL
18'-0" CHALKBOARD
LINE OF GRILLE IN CEILING
SHELVES
WARDROBE
CONVECTOR
LINE OF BRICK BELOW SILL
4" I.D. PIPE COL.
℄ OF BEAM OVER 9"x17 7/8" GLULAM.
TRACHEE CLOSET
SHELF & POLE
BOYS' TOILET
GIRLS' TOILET
PORTABLE UNIT
VINYL COUNTER TOP & BACK
SINK
TACKBOARD OVER COUNTER
SOUNDPROOF PARTITION-2"x4" STUDS @ 8'-0" O.C. STAGGERED ON 2"x6" PLATE WITH 2" BLANKET INSULATION
DETAIL 1
SCALE 1" = 1'-0"
DETAIL 2
SCALE 1" = 1'-0"
DETAIL 3
SCALE 1" = 1'-0"
DETAIL 4
SCALE 1" = 1'-0"
1/4" PLYWOOD BACKING
1/4" CORK TACKBOARD
1/2" PLYWOOD BACK
VINYL COUNTER TOP & BACK
HARDWOOD EDGE
1/4" PLYWOOD BOTTOMS
HARDWOOD GUIDES
1/4" PLYWOOD BACK
FIN. WALL LINE
CLAMP-TYPE SINK RIM
MET. VENT
1/8" DOOR
1/4" PLYWOOD BASE
1/8" MASONITE BOTT.
3/4" PLY DIVISION
1/4" PLY. BACK
FINISH WALL LINE
VINYL COUNTER TOP 2"x3" STOPS
DRAWER
3/8" PLYWOOD BACK
1/8" DOOR
3/4" PLYWOOD BOTTOM
RUBBER TIRED CASTERS
WARDROBE DETAILS
SCALE 3/4" = 1'-0"
2"x6" STUDS @ 16" O.C.
TACK BOARD
1'-0"x3'-0" EXHAUST GRILLE
GUIDE TRACK
2"x4" STUDS @ 16" O.C.
5/8" PLASTERBOARD
1/4" CORK TACKBOARD ON 1 3/4" HOLLOW CORE DOOR
BLOCKING
HARDENED CEMENT NAILS @ 6'-0" O.C.
1/2" PLYWOOD BACKING
1/4" CORK TACKBOARD
1/2" PLASTERBOARD ON STUD WALL-OMIT ON CONC. BLOCK WALL
FACE OF STUDS OR ON CONC. BLOCK
1/2" PLASTER BOARD ON STUD WALL-BLOCKING ON CONC. BLOCK WALL
FIN. FLOOR
1 MAP RAIL
1/2" PLASTERBOARD ON STUD WALL-BLOCKING ON CONC. BLOCK WALL
1/4" PLYWOOD CHALKBOARD
CHALK RAIL
23" TO FIN. FL.
1/2" PLASTERBOARD ON STUD WALL-OMIT ON CONC. BLOCK WALL
CHALKBOARD & TACKBOARD DETAIL
SCALE 3" = 1'-0"
WALL SECTIONS
SCALE 1/2" = 1'-0"
9"x17 7/8" GLULAM BEAM
BUILT-UP ROOFING ON SHIPLAP SHEATHING
2"x10" JOISTS @ 16" O.C.
INSULATION
2"x4" @ 16" O.C.
ROLLER SHADES
EL. 110.67
4"x12"
1"x14" FASCIA
1"x3" BLOCKING @ 16" O.C.
1/4" CEMENT ASBESTOS BOARD
4"x4" MET. GUTTER
FIR TRIM
1/4" ACOUSTIC TILE ON 3/8" GYPSUM LATH
ROLLER SHADE
MET. FLASH
EL. 114.362
4'-0"
3'-0"
LINE OF BRICK BELOW
4" I.D. PIPE COLUMN
PRE-CAST CONC. SILL
DRIP
DAMPPROOFING
BRICK VENEER TO MATCH EXISTING CONC. BLOCK WALL
CONVECTOR
1" RIGID INSULATION
WEEP HOLES @ 4'-0" O.C.
FIN. FLOOR EL. 100.88
HARDENED CEMENT NAILS @ 6'-0" O.C.
WATERPROOF PAPER ON 4" GRAVEL FILL
FINISH GRADE
EL. 98.1
2"x6" STUDS @ 16" O.C.
EL. 98.1
BUILT-UP ROOFING ON SHIPLAP SHEATHING
SCREEN
2"x6" T&G DECKING
MET. FLASH 3-8d. SPIKES
2"x10" JOISTS @ 16" O.C.
9"x17 7/8" GLULAM
EL. 105.34
4"x6" NLBL
EL. 108.59
2.25 0'-4 1/2" x 0'-10 1/2"
2 3/8" x 10 1/2"
CONCRETE BOND BEAM
2"x10" PURLIN IN BOLTED HANGERS
3/4"x10"
EL. 117.21
4 5/8" x 11 1/2" @ 4'-0" O.C.
7 7/8" x 10'-0" L
2 7/8" x 10'-0" LAGS
7 7/8" STRAP
4" x 1" D. PIPE COLUMN
NOTE-GLULAM BEAM AT EAST END TO BE 7"x17 7/8"
CONCRETE BLOCK WALL & PILASTER
SEE SHEET 1 FOR FOOTING DETAILS
FIN. GRADE
EL. 98.1
BUILT-UP ROOFING ON SHIPLAP SHEATHING
4"x4" 24 GA. MET. GUTTER
1"x14" FASCIA
1"x3" BLOCKING @ 16" O.C.
2"x10" JOISTS @ 16" O.C.
9"x17 7/8" GLULAM BEAM
2"x12" BEAM
2-7/8" x 8 BOLTS
3-5/8" x 8 BOLTS
2"x4" JOIST SUPPORT SPIKED TO SIDES OF BEAM
2"x4" LOOKOUTS @ 16" O.C.
1/4" CEMENT ASBESTOS BOARD
2" BLANKET INSULATION
1/4" ACOUSTIC TILE ON 3/8" GYPSUM LATH
CLASSROOM END WALL DETAIL
SCALE 3/4" = 1'-0"
24 GA. MET. FLASH
1"x12" FASCIA
1"x3" BLOCKING @ 16" O.C.
2"x10" JOISTS @ 16" O.C.
9"x17 7/8" GLULAM BEAM
2"x12" BEAM
2-7/8" x 8 BOLTS
2"x4" JOIST SUPPORT SPIKED TO SIDES OF BEAM
2"x4" LOOKOUTS @ 16" O.C.
1/4" CEM. ASBESTOS BOARD
8"x7/8"x0'-8" L WELD TO TOP OF PIPE COLUMN-LAG TO BEAM WITH 6"x7/8" & 3 LAGS @ 5 1/4" O.C.
EL. 114.38
ROLLER SHADE
HEAD
MULLION
4" x 4" I.D. EXTRA STRONG PIPE COLUMN BLOCKING, BOLTED TO PIPE WITH 7/8" x 8 BOLTS
MULLION AT PIPE COLUMN
2"x6" LAMINATED
3/4" SHIPLAP SHEATHING
1/4" CEM. ASBESTOS BOARD
1/2" PLASTERBOARD
JAMB
24 GA. MET. FLASH
SILL
CLASSROOM CLERESTORY WINDOW DETAIL
SCALE 1" = 1'-0"
BUILT-UP ROOFING ON SHIPLAP SHEATHING
2"x10" JOISTS @ 16" O.C.
9"x17 7/8" GLULAM BEAM
3-7/8" x 8" BOLTS
2" BLANKET INSULATION
1/4" CEMENT ASBESTOS BOARD
2"x4" JOIST SUPPORT SPIKED TO SIDES OF BEAM
2"x4" LOOKOUTS @ 16" O.C.
3-5/8" x 8" BOLTS BACK SIDE
2"x4" JOIST SUPPORT SPIKED TO SIDES OF BEAM
1/4" ACOUSTIC TILE ON 3/8" GYPSUM LATH
4"x12" BEAM
2-7/8" x 8" LAG SCREWS
5"x3/4"x0'-8" R.
ROLLER SHADES ALTERNATE TO OVERLAP 2"
4" x 1" D. PIPE COLUMN
℄ OF PIPE COLUMN
HEAD
WHERE NO PIPE COLUMN OCCURS AT MULLION, THIS DIMENSION IS 3"
4" x 1" D. PIPE COLUMN
MULLION
8" CONCRETE BLOCK
CAULK
ARCHITECTURAL PROJECTED STEEL SASH
JAMB
PRE-CAST CONCRETE SILL
CAULK
RIGID INSULATION BEHIND CONVECTOR
8" CONCRETE BLOCK
SILL
DAMPPROOFING
BRICK VENEER TO MATCH EXISTING
WEEP HOLES @ 4'-0" O.C.
CONVECTOR
FIN. FLOOR EL. 100.88
BASE
CLASSROOM WINDOW DETAILS
SCALE 1 1/2" = 1'-0"
ACOUSTIC TILE CEILING
PLASTERBOARD OR EXPOSED CONCRETE BLOCK-SEE FINISH SCHEDULE
TACKBOARD
CHALKBOARD
CONVECTOR
PLASTERBOARD OR EXPOSED CONCRETE BLOCK-SEE FINISH SCHEDULE
ELEVATION A
SCALE 1/4" = 1'-0"
FACE OF CONC. BLOCK WALL
FIXED GLASS SET IN WOOD STOPS
℄ OF PART
PLASTERBOARD
TACKBOARD
POLISHED PLATE GLASS
VINYL COUNTER TOP & BACK
ELEVATION B
SCALE 1/4" = 1'-0"
ACOUSTIC TILE CEILING
PLASTERBOARD
PLASTERBOARD OR EXPOSED CONCRETE BLOCK-SEE FINISH SCHEDULE
TACKBOARD
VINYL COUNTER TOP & BACK
PLASTERBOARD OR EXPOSED CONCRETE BLOCK-SEE FINISH SCHEDULE
CONVECTOR
ELEVATION C
SCALE 3/8" = 1'-0"
DOOR AND WAINSCOT CAP
DOOR TRIM
BASE & SHOE
FULL SIZE TRIM
2"x4" OR 2"x6" STUDS @ 16" O.C.
7/8" OR 5/8" PLASTERBOARD-SEE NOTE BELOW
8" CONC. BLOCK WALL METAL ANCHORS 3 PER JAMB
2"x6" ROUGH BLOCK
7/8" IN 2"x4" STUD WALLS W/ 1/2" PLASTERBOARD
1 3/8" IN 2"x6" STUD WALLS W/ 5/8" PLASTERBOARD
2 7/8" IN 2"x6" STUD WALLS W/ 7/8" PLASTERBOARD
2"x4" STUD WALLS W/ 7/8" PLASTERBOARD
NOTE: 5/8" PLASTERBOARD ON BOTH SIDES OF CORRIDOR PARTITION-OTHER STUD WALLS 1/2" PLASTERBOARD.
INTERIOR DOOR JAMB DETAIL
SCALE 3" = 1'-0"
EXTERIOR DOOR JAMB DETAIL
SCALE 3" = 1'-0"
1"x6" SOLID BEAM OVER WARDROBES
1/4" R
1/8"x1"x0'-8" LAG
6"x12" BEAM
2-1/4"x4"x0'-6" LAGS
1"x3/8" R
7/8" STIFFENER
4" 8 EXTRA STRONG PIPE COLUMN
BEAM DETAIL OVER CLASSROOM WARDROBES
SCALE 3/4" = 1'-0"
1"x3" WOOD STRIPS
FIRE EXTINGUISHER NOT IN CONTRACT
5/8" PLASTERBOARD
SECTION
FIRE EXTINGUISHER RECESS DETAIL
SCALE 1" = 1'-0"
KICKPLATES BOTH SIDES
FIN. FLOOR EL. 100.88
1"x1"x1/4" TREADGOLD
ASPHALT TILE FLOOR
CONCRETE SLAB
ELEVATION
EXTERIOR DOOR SILL DETAIL
SCALE 1 1/2" = 1'-0"
John F. Roundtree
Board Chairman
School Dist. #234
Irvin C. Eggimann
REV. NO. DATE
REGISTERED ARCHITECT
JOHN GRAHAM JR.
STATE OF WASHINGTON
C.N.W. DRAWN
TRACED
CHECKED
MAY 25 53 DATE
CLASSROOM & WINDOW DETAILS, WALL SECTIONS & MISCELLANEOUS DETAILS
ADDITION TO
BOISTFORT ELEMENTARY SCHOOL
DISTRICT NO. 234
KIAMER, WASHINGTON
JOB NO. 3-54
SHEET NO. 2
JOHN GRAHAM & CO. ARCHITECTS & ENGINEERS
1501 DEXTER HORTON BUILDING SEATTLE, WASHINGTON



MAIN FLOOR PLAN

1/8" = 1'-0"

REGISTERED ARCHITECT
RICKY J. McGOVERN
STATE OF WASHINGTON

MAIN FLOOR PLAN

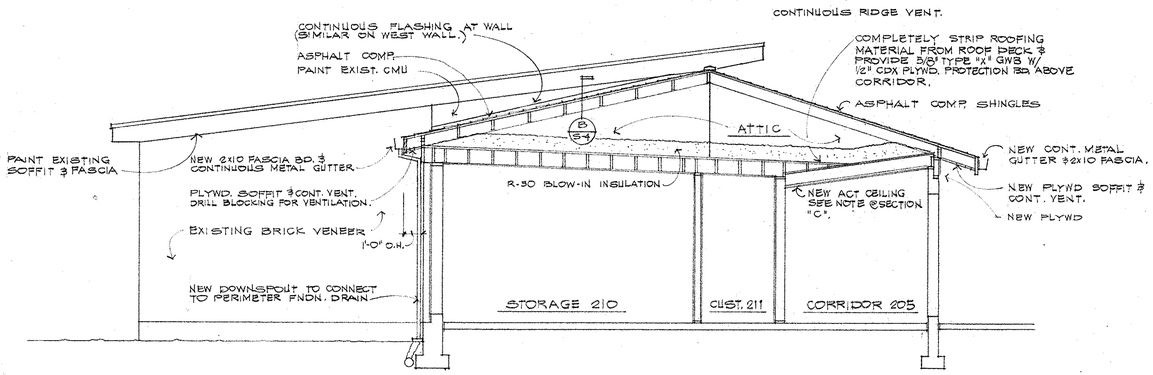
BOISTFORT K-8 SCHOOL
MODERNIZATION/COVERED PLAYSHED ADDITION

ERICKSON McGOVERN ARCHITECTS
130 SO. 131 ST., TACOMA WA. 98444 (206) 531-0206

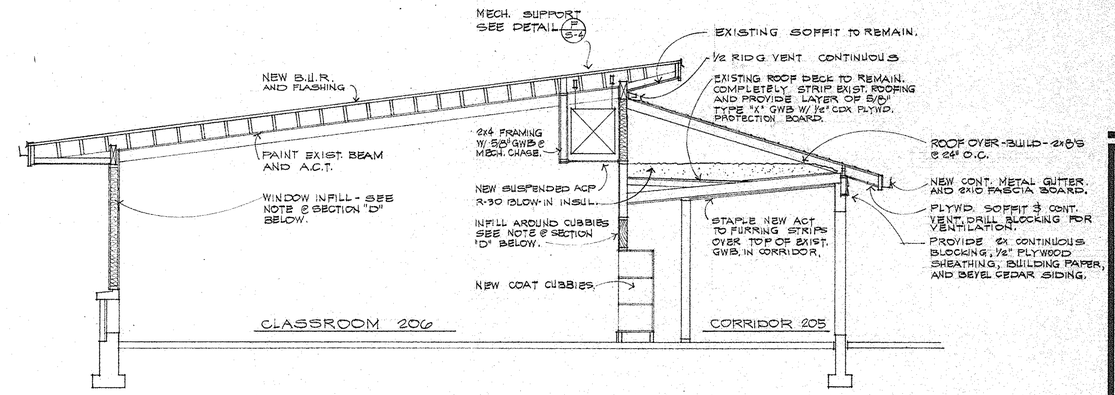
COMM.
REV.

DRAWN
DATE 4/13/90

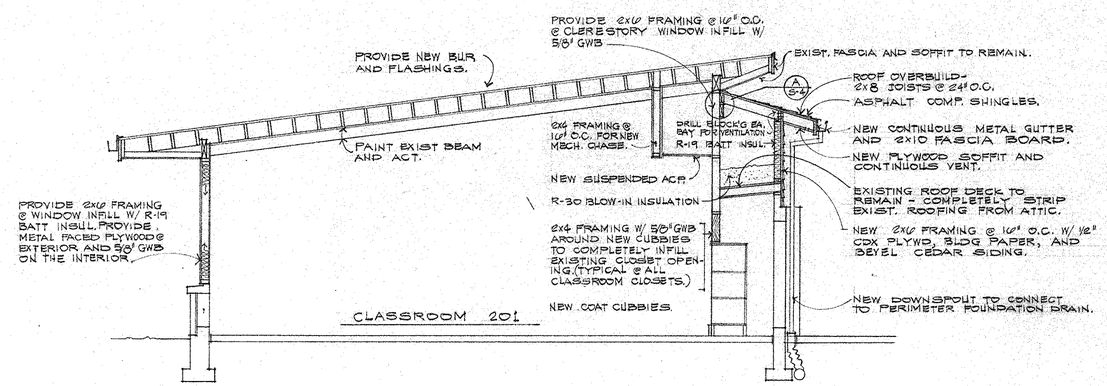
SHT
A2.1
OF 14



B BUILDING SECTION
1/4" = 1'-0"



C BUILDING SECTION
1/4" = 1'-0"



D BUILDING SECTION
1/4" = 1'-0"

3029 REGISTERED ARCHITECT RICKY J. McGOVERN STATE OF WASHINGTON

BUILDING SECTIONS
MISCELLANEOUS DETAILS

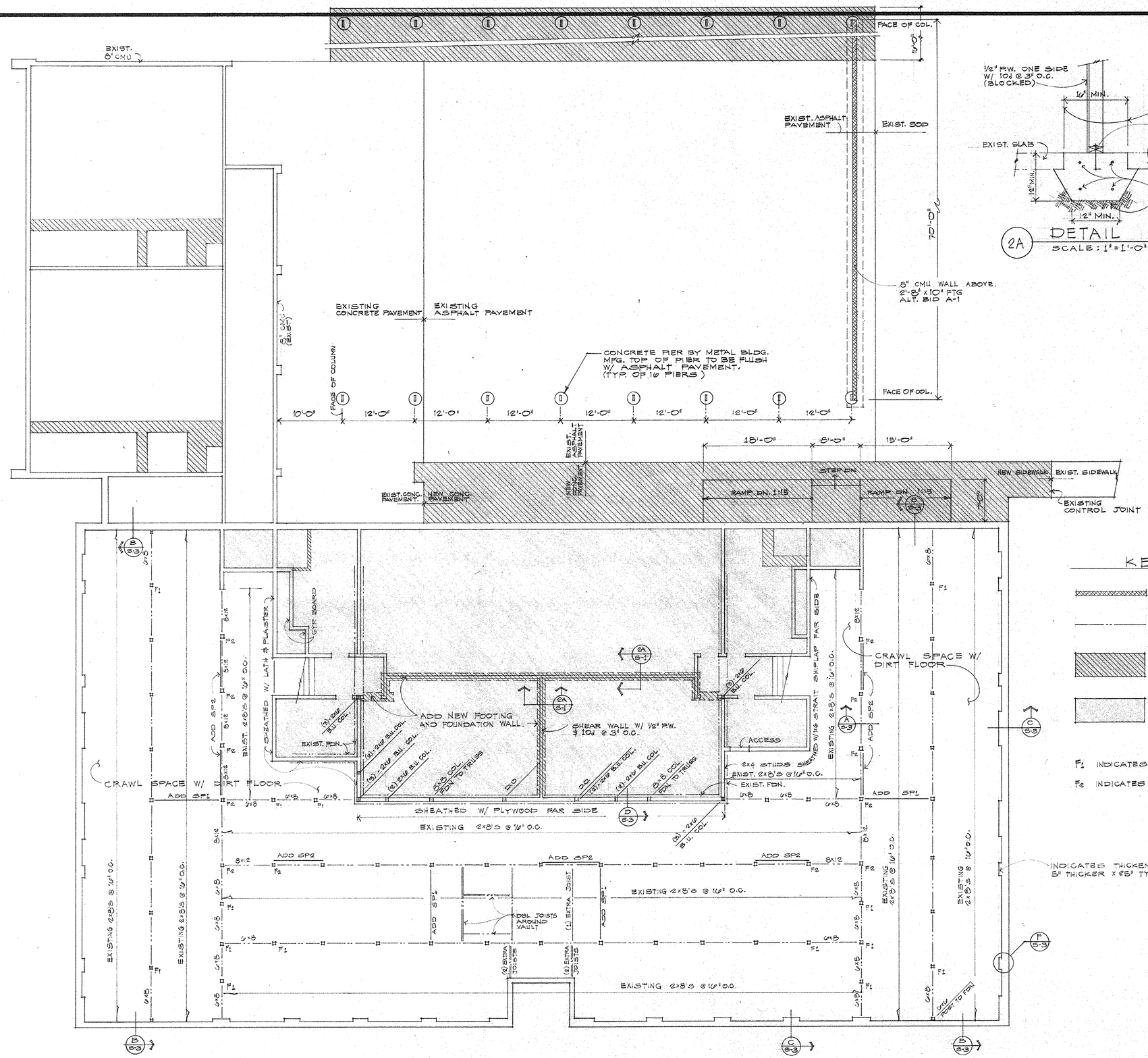
BOISTFORT K-8 SCHOOL
MODERNIZATION / COVERED PLAYSHED ADDITION

ERICKSON McGOVERN ARCHITECTS 130 SO. 131 ST., TACOMA WA. 98444 (206) 531-0206

COMM.
REV.

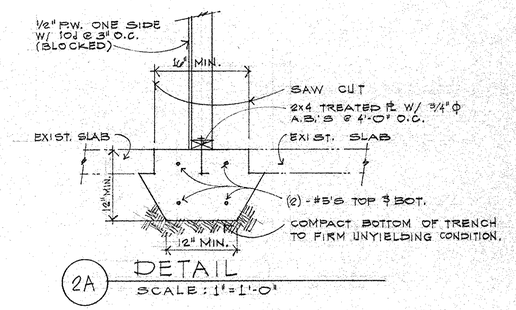
DRAWN
DATE 4/13/90

SHT
A4.1
OF 14



MAIN FLOOR FRAMING AND FOUNDATION PLAN

1/8" = 1'-0"



2A DETAIL

SCALE: 1" = 1'-0"

KEY

- INDICATES NEW CMU WALL
- INDICATES EXISTING STRUCTURE
- INDICATES NEW CONCRETE SLAB ON GRADE. (OR NEW ASPHALT PAVEMENT AT EAST SIDE OF NEW PLAYSHED.
- INDICATES EXISTING CONCRETE SLAB ON GRADE.

F1 INDICATES 2' SQUARE x 12" FTG.

F2 INDICATES 3'-3" SQUARE x 12" FTG.

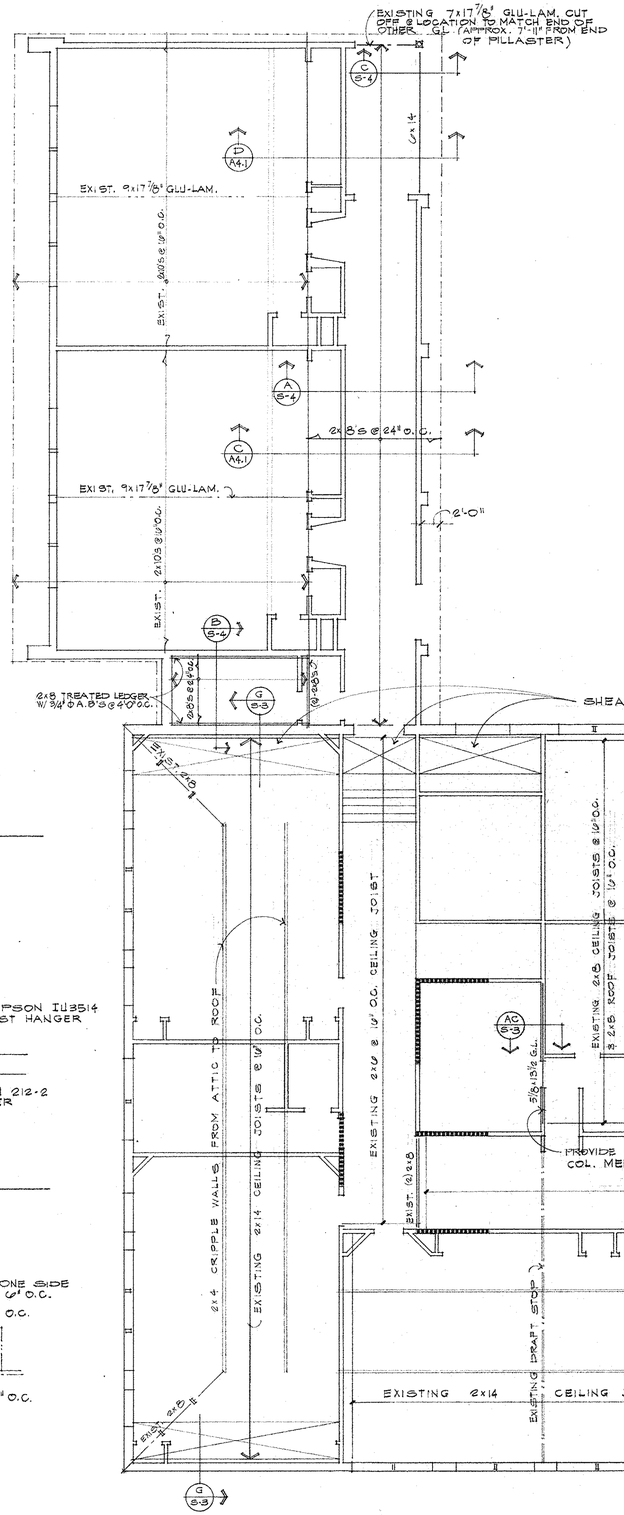
MAIN FLOOR FRAMING & FOUNDATION PLAN

BOISTFORT K-8 SCHOOL
MODERNIZATION / COVERED PLAYSHED ADDITION

ERICKSON McGOVERN ARCHITECTS
130 SO. 131 ST., TACOMA WA. 98444 (206) 531-0206

COMM.
REV.
DRAWN
DATE 4/13/90

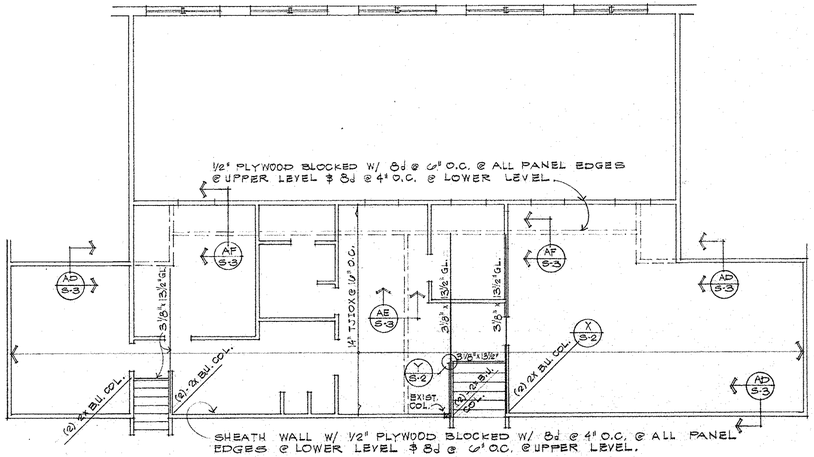
SHT
S-1
OF 4



FRAMING PLAN

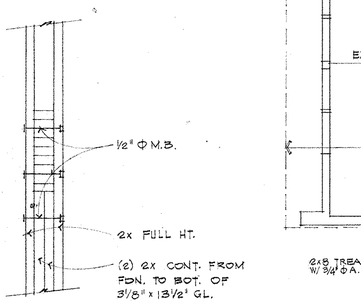
ALL ROOF JOISTS ARE 2x8 @ 24" EXCEPT AS NOTED. CEILING JOISTS NOT SHOWN ARE 2x6 @ 16" O.C.

INDICATES LOCATION OF NEW SHEAR WALL BETWEEN ATTIC FLOOR & ROOF. ALL SHEAR WALLS ARE 8'-0" IN LENGTH. SEE TYPICAL SHEAR WALL DETAIL (L) S-3



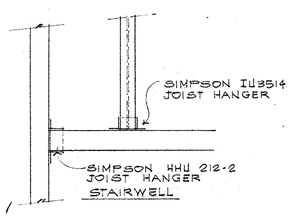
MEZZANINE FLOOR FRAMING PLAN

1/8" = 1'-0"



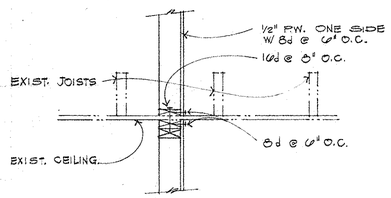
(X) DETAIL

SCALE 1" = 1'-0"



(Y) DETAIL

SCALE 1" = 1'-0"



(Z) DETAIL

SCALE: 1" = 1'-0"

BOISFORT K-8 SCHOOL

MODERNIZATION / COVERED PLAYSHED ADDITION

FRAMING PLAN

ERICKSON McGOVERN ARCHITECTS 130 SO. 131 ST., TACOMA WA. 98444 (206) 531-0206

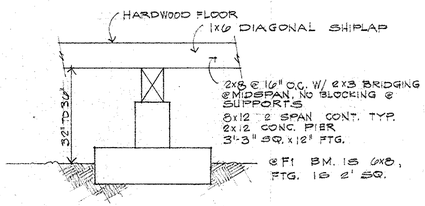
COMM.

REV.

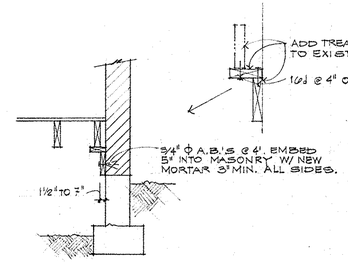
DRAWN

DATE 4/13/00

SHT S-2 OF 4

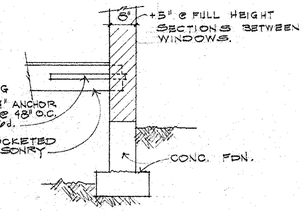


A DETAIL



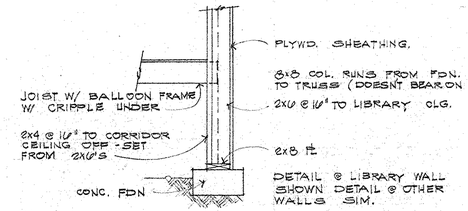
TYPICAL FDN. WALL W/ JOIST PARALLEL TO WALL

B DETAIL

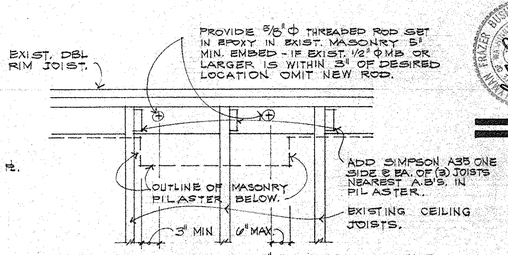


TYP. EXT. FDN. WALL W/ JOIST PERPENDICULAR TO WALL.

C DETAIL C



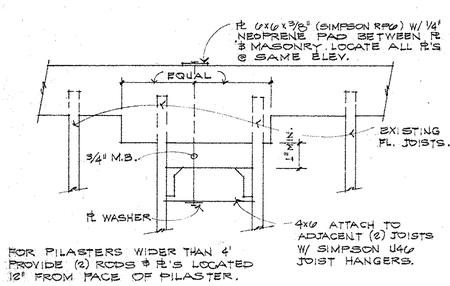
D DETAIL



DETAIL SHOWN IS FOR TYP. 25" WIDE PILLASTER FOR WIDER PILASTERS ADD (1) ROD & (2) - A35'S FOR EA. 2' OF ADDITIONAL WIDTH.

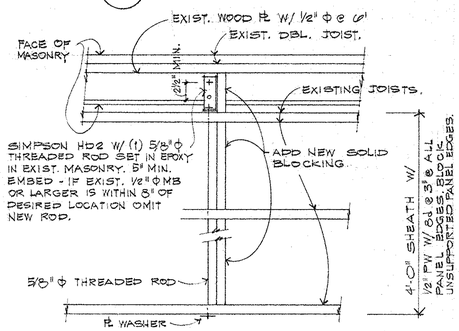
TYP. @ TOP OF MASONRY PILASTERS EXCEPT @ LIBRARY.

E DETAIL



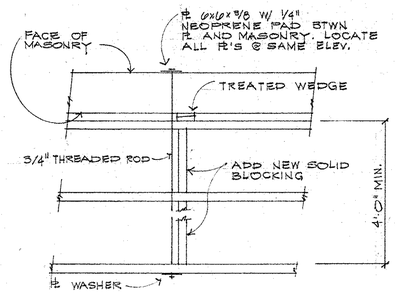
TYP. @ BOT. OF MASONRY PILASTERS EXCEPT @ LIBRARY

F DETAIL



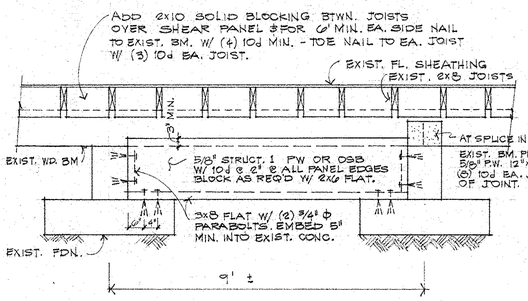
LOCATE ASSEMBLY @ 6' O.C. MAX.
TYP. @ TOP OF 8" MASONRY WALL.

G DETAIL



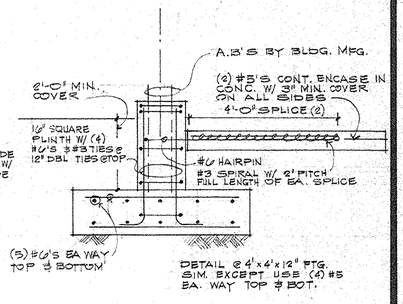
LOCATE ASSEMBLY 6' O.C. MAX.
TYPICAL @ BOTTOM OF 8" MASONRY WALL.

H DETAIL

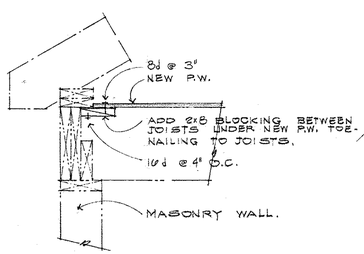


TYPICAL SHEAR PANEL W/ EXIST BEAMS PARALLEL TO SHEAR PANEL.

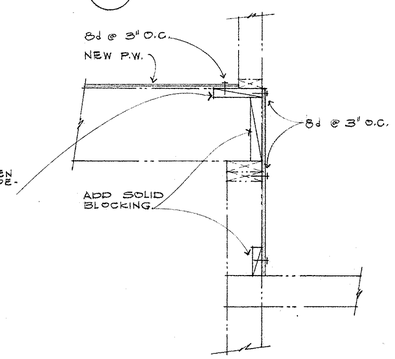
SP2 DETAIL



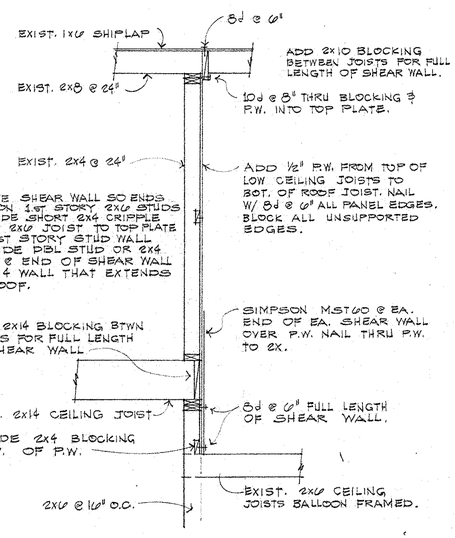
J TYPICAL INTERIOR PLAYSHED FTG
1/2" = 1'-0"



AA DETAIL

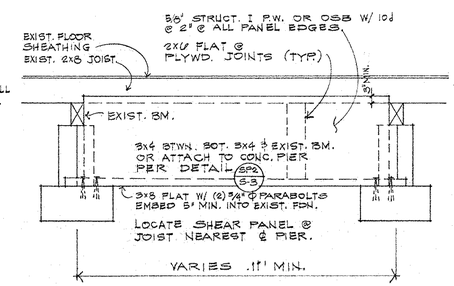


AB DETAIL

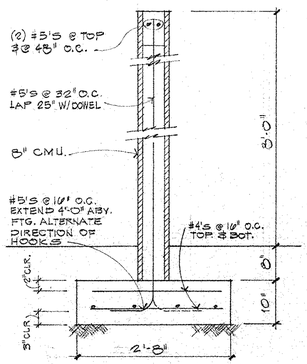


TYPICAL SHEAR WALL IN ATTIC ALONG CORRIDOR

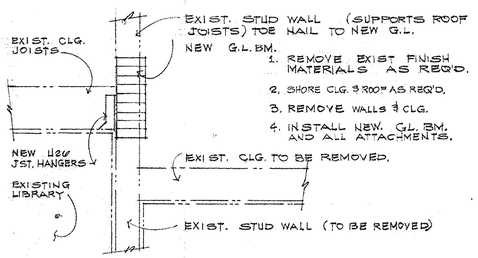
L



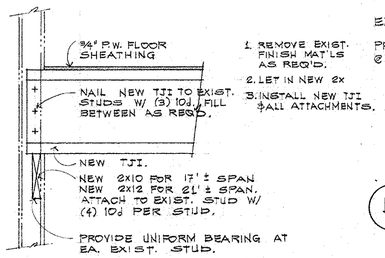
SP1 DETAIL



K PLAYSHED MASONRY WALL
3/4" = 1'-0"



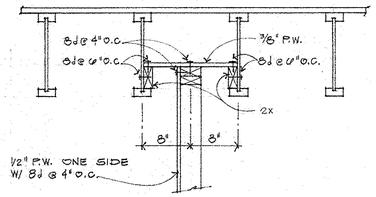
AC DETAIL



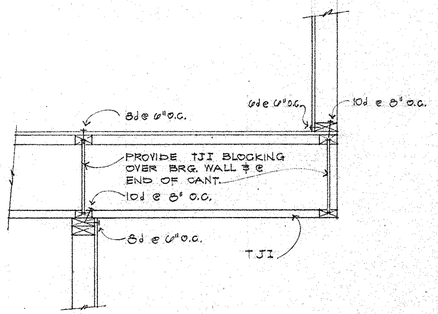
1. REMOVE EXIST. FINISH MAT'LS AS REQ'D.
2. LET IN NEW 2x
3. INSTALL NEW TJI & ALL ATTACHMENTS.

ALTERNATE DETAIL:
OMIT LET IN LEDGER & PROVIDE 2x4 UNDER EA. TJI FULL HT. FROM PLATE @ FDN. TO BOT. OF TJI. NAIL TO EXIST STUD.

AD DETAIL



AE DETAIL



AF DETAIL

STRUCTURAL DETAILS

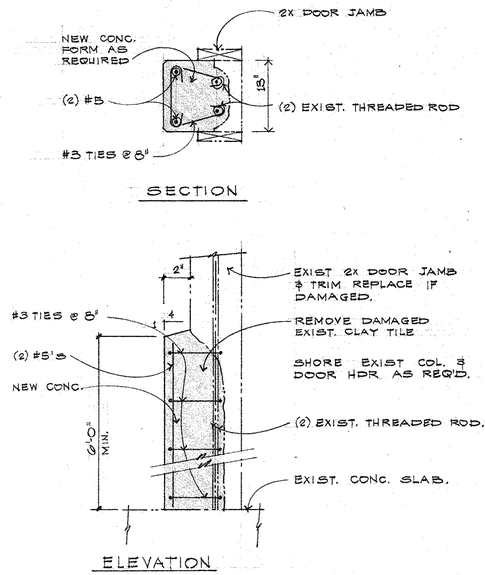
BOISTFORT K-8 SCHOOL
MODERNIZATION / COVERED PLAYSHED ADDITION

130 SO. 131 ST., TACOMA WA. 98444 (206) 531-0206

ERICKSON McGOVERN ARCHITECTS

COMM.
REV.
DRAWN
DATE 4/13/10

SHT
S-3
OF 4



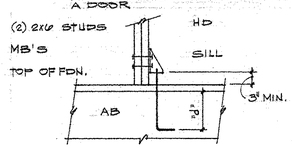
D DETAIL - REPAIR TO CLAY TILE PIER BETWEEN GARAGE DOORS

ALL INTERMEDIATE PIERS - (4) TOTAL

TYP. "HD" HOLDOWNS			
SIZE	MB	AB	"J"
HD-2A	(2) 5/8"Φ	5/8"Φ	12"
HD-5	(2) 3/4"Φ	3/4"Φ	11"
HD-6	(2) 3/4"Φ	1"Φ	15"

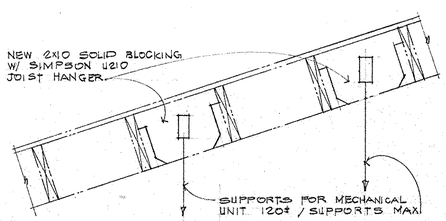
NOTES:

1) SEE FDN PLANS FOR HOLDOWN LOCATIONS.
2) ALL HOLDOWNS NOT OCCURING AT A WALL CORNER SHALL BE LOCATED AT THE EDGE OF A WINDOW OR A DOOR.



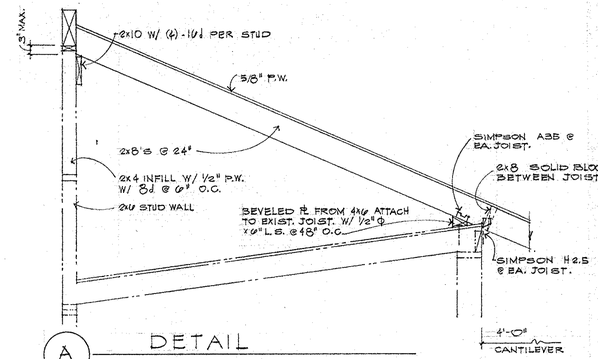
E DETAIL

TYP. "HD" HOLDOWNS AT FDN.

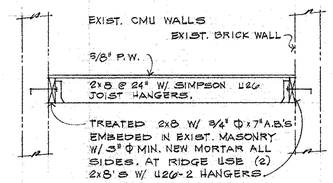


F DETAIL

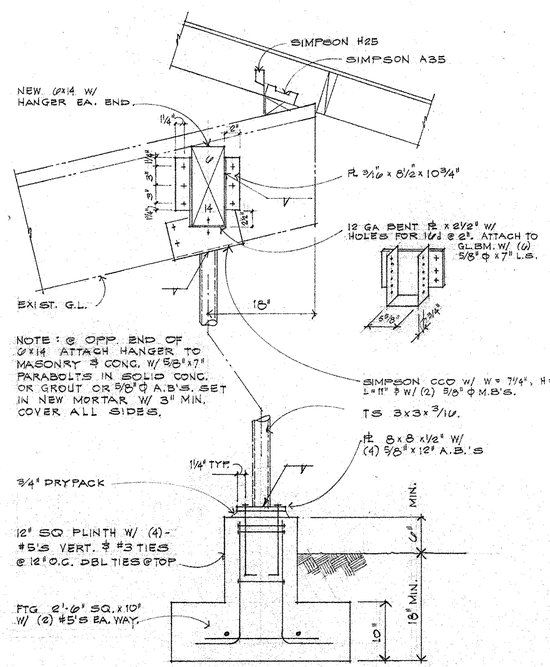
SUPPORT FOR MECH. UNITS RMS 201 & 206



A DETAIL



B DETAIL



C DETAIL

GENERAL NOTES March 15, 1990

These General Notes are to be used as a supplement to the Specifications. Any discrepancies found among the Drawings, the Specifications, these General Notes and the site conditions shall be reported to the Architect, who shall correct such discrepancy in writing. Any work done by the Contractor after discovery of such discrepancy shall be done at the Contractor's risk. The Contractor shall verify and coordinate dimensions among all drawings prior to proceeding with any work or fabrication. The Contractor is responsible for all bracing and shoring during construction.

Standards
All methods, materials and workmanship shall conform to the 1985 Uniform Building Code (UBC) as amended and adopted by the local building official or applicable jurisdiction.

DESIGN CRITERIA

		Roof	Floor
Vertical Loads:	Dead Load	Actual	Actual
	Live Load	25 PSF	50 PSF

Lateral Forces

1. Lateral forces are transmitted by diaphragm action of roof and floors to shear walls.
2. Wind: P=CeCqQsI, Basic Wind Speed = 80 MPH
   Exposure Classification B, Importance Coefficient 1.0
   Uplift - Enclosed Roof Areas: Cq = -1.1. Net pressure = P-2/3 (Design Dead Load).
   Overhangs and Partly Enclosed Areas: Cq = -1.6. Net pressure = P-2/3 (Design Dead Load).
3. Seismic: Zone 3 per 1985 UBC. V=ZIKCSW, V=Base Shear, Z=.75, I=1.00, K=1.33, CS=.14, W=Dead Load of Portion of Building.

Soil Bearing Pressure: 2000 PSF (Assumed)
All footings shall bear on firm, undisturbed earth.

CONCRETE

Concrete: Shall be made with Portland Cement ASTM C-150 Type II or Type I-II, and shall be ready-mixed per ASTM C-94. f'c=2000 PSI, maximum slump 5". Minimum cement content 5 sacks per yard.

Metal Reinforcement: All reinforcing shall conform to ASTM A-615, Grade 60 (Grade 40 for welded bars unless otherwise noted). Detail, fabricate and place per ACI 315 and ACI 318. Splices shall be 24 bar diameters or 18" minimum.

STRUCTURAL STEEL

Detailing, Fabrication and Erection: Conform to AISC "Manual of Steel Construction", 8th Edition.

Steel Shapes and Plates: ASTM A-36 (fy=36 ksi).

Structural Steel Pipes: ASTM A-53 (fy=35 ksi).

Steel Structural Tubing: ASTM A-500 (fy=46 ksi).

Machine Bolts (M.B.) and Anchor Bolts (A.B.): ASTM A-307.

Drilled-In Anchors: "Parabolt" by USM, Inc., Molly Fastener Division, or approved equal. Embed bolt into concrete or masonry 7 diameters minimum, except as shown.

Finish: Shop paint after fabrication with an approved primer (see Specifications). Galvanize after fabrication all miscellaneous steel specifically called to be galvanized in plans, specifications or details.

CARPENTRY

Wood Sheathing (Structural): Shall be plywood or Oriented Strand Board. Plywood shall be Group 1 or Group 2 species, C-D grade Exposure 1 conforming to PS 1-83. Each piece shall bear the grade trademark of the American Plywood Association. Oriented Strand Board (OSB) shall be "sturdi-wood" by Pelican Spruce Mills, Ltd. Each panel shall be classified as Exposure 1 and shall bear the grade trademark of the American Plywood Association (APA). Roof sheathing shall have a span rating of 32/16. Nailing shall be with "galvanized box" or "common" size. All shear walls shall be blocked at all panel edges unless otherwise noted.

Glue-Laminated Members: Conform to ANSI/AITC A190.1-1983. Members shall be combination 24F-V4 Douglas Fir for simple spans (24F-V8 Douglas Fir for cantilevered spans) with exterior glue. Architectural Appearance Grade where exposed to view, Industrial Appearance where not exposed to view. All members to have AITC stamp. Camber 1 X dead load deflection minimum, or as shown on drawings.

Framing Lumber

Standards: Conform to West Coast Lumber Inspection Bureau (WCLIB), or Western Wood Products Association (WWPA). Each piece shall bear the WCLIB or WWPA grade trademark.

Species and Grade
-Beams and Headers: "Doug Fir-Larch" No. 1
-Joists and Purlins: "Doug Fir-Larch" No. 2, or "Hem-Fir" No. 1
-Blocking: "Doug Fir-Larch" No. 3, or "Hem-Fir" No. 2
-Exterior Stud Wall: "Doug Fir-Larch" No. 2, or "Hem-Fir" No. 2
-Interior Stud Wall, Blocking, and Miscellaneous Framing: "Hem-Fir" No. 3, or better
-The Minimum Grade of All Other Structural Framing: "Doug Fir-Larch" No. 2, or "Hem-Fir" No. 2

General Requirements: Provide minimum nailing per 1985 UBC Table 25-Q or more as otherwise shown. Pressure treat all wood in contact with concrete. Provide cut washers where bolt heads, nuts and lag screw heads bear on wood. Do not notch or drill structural members, except as allowed by UBC or as approved prior to installation.

Framing Connectors: Shall have ICBO approval and be manufactured by P. H. Bowman Company, Inc., Seattle, WA; Simpson Company, San Leandro, CA; or approved equal. Provide maximum size and quantity of nails or bolts per manufacturer, except as noted otherwise.

Trus-Joists: Shall be manufactured only in a Trus-Joist Corporation plant under the direction of the licensed Professional Engineer resident at the plant in accordance with approved shop drawings. The entire truss assembly, including bearing clips, anchoring nails or lags, and bridging clips shall be as approved by current ICBO report. Trus-Joists shall be designed to carry the loads listed in the design criterion and any additional loads indicated on the framing plan. Provide shop and installation drawings produced under the supervision of and bearing the stamp of a structural engineer registered in the State of Washington. Detail drawings to indicate types, size, spacing, bridging, connections, anchoring, bearing plate and other pertinent details. Sprinkler line attachments shall conform to NFPA pamphlet 13A and Trus-Joist publication "Guidelines for Sprinkler System Installation with Trus-Joist". Loads hung from Trus-Joist shall not exceed 30 pounds at any one point, nor shall total loads in pounds on any one joist exceed 6 times the span in feet, unless detailed otherwise on the drawings. Attachment of loads exceeding 100 pounds shall be approved prior to installation. Do not notch or drill thru truss members.

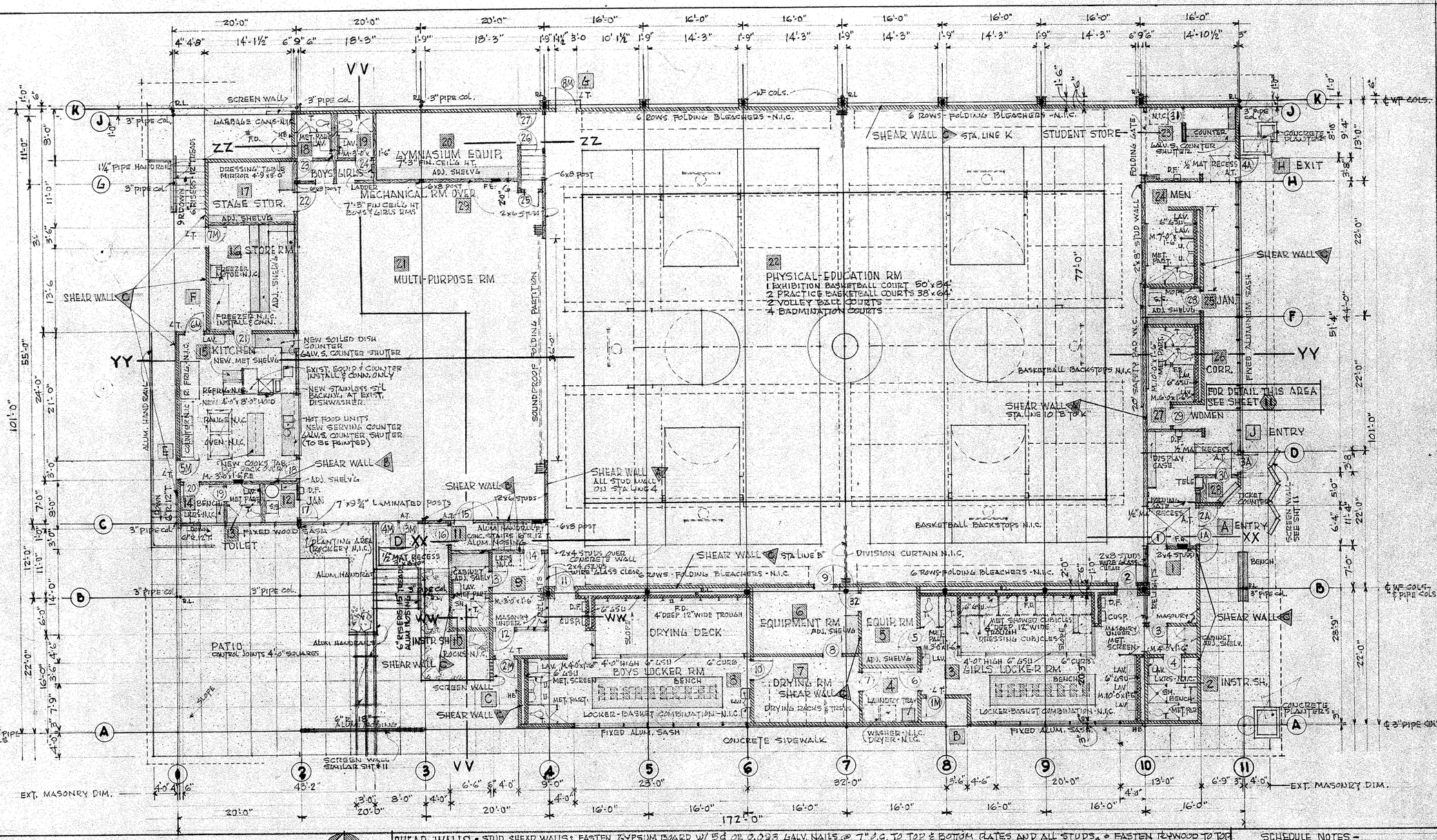
STRUCTURAL DETAILS / STRUCTURAL GENERAL NOTES

ERICKSON McGOVERN ARCHITECTS 130 SO. 131 ST., TACOMA WA. 98444 (206) 531-0206

BOISTFORT K-8 SCHOOL
MODERNIZATION / COVERED PLAYSHED ADDITION

COMM.
REV.
DRAWN
DATE 4/13/90

SHT S-4 OF 4



FLOOR PLAN • SCALE 1/8"=1'-0" NORTH

SHEAR WALLS • STUD SHEAR WALLS: FASTEN GYPSUM BOARD W/ 5d OR 0.093 GALV. NAILS @ 7" O.C. TO TOP & BOTTOM PLATES AND ALL STUDS. • FASTEN PLYWOOD TO TOP & BOTTOM PLATES & STUDS W/ 6d NAILS AT 6" O.C. AT EDGES & 6d NAILS AT 12" O.C. INTERMEDIATE STUDS-BLOCK JOINTS. - FASTEN TOP PLATE TO ROOF BEAM & ROOF PANELS W/ 20d NAILS @ 16" O.C. - SEE DET. - FASTEN BOTTOM SILL TO CONCRETE W/ 1/2"ϕ BOLTS @ 4'-0" O.C. • REINF. MASONRY SHEAR WALLS R/F AS NOTED ON DWGS - FASTEN TOP PLATE TO MASONRY & ROOF PANELS - SEE DET. DOWEL VERT. R/F TO FOOTINGS. — SHEAR WALL "A" - GYPSUM BD ONE SIDE & 3/8" PLYWOOD ONE SIDE — SHEAR WALL "B" GYPSUM BD TWO SIDES — SHEAR WALL "C" R/F MASONRY WALL.

SEE SHT. 5 FOR DETS.

ROOM FINISH SCHEDULE

NUMBER	NAME	FLOOR	BASE	WALL NORTH	WALL EAST	WALL SOUTH	WALL WEST	WAINSCOT	CEILING	REMARKS
1-2	INSTRUCTOR-SHOWER	CONCRETE	QUARRY TILE	SEE PLAN	SEE PLAN	MASONRY	SEE PLAN	—	5/8" GYP BD	
3-8	GIRL-BOY LOCKERS	CONCRETE	*QUARRY TILE	SEE PLAN	G.S.U.	SEE PLAN	MASONRY	—	5/8" GYP BD	*MASONRY WALL
4-7	LAUNDRY & DRYING	CONCRETE	QUARRY TILE	MASONRY	MASONRY	MASONRY	MASONRY	—	5/8" GYP BD	
5-6	STORE RMS	CONCRETE	QUARRY TILE	MASONRY	MASONRY	MASONRY	MASONRY	—	5/8" GYP BD	
9-10	INSTRUCTOR-SHOWER	CONCRETE	QUARRY TILE	MASONRY	GYP. BD	MASONRY	MASONRY	—	5/8" GYP BD	
11	CORRIDOR	CONCRETE	WOOD	MASONRY	GYP BD	GYP BD	GYP BD	—	5/8" GYP BD	
12-13-14	JAN.-TOILET-DRESS'G	CONCRETE	QUARRY TILE	SEE PLAN	GYP BD	GYP BD	GYP BD	—	5/8" GYP BD	
15	KITCHEN	CONCRETE	QUARRY TILE	MASONRY	MASONRY	GYP BD	GYP BD	—	5/8" GYP BD	
16-17	STORE ROOMS	CONCRETE	WOOD	MASONRY	SEE PLAN	GYP BD	GYP BD	—	5/8 GYP BD	
18-19	BOYS-GIRLS	VINYL-ASB.T.	WOOD	SEE PLAN	MASONRY	GYP BD	GYP BD	—	5/8 GYP BD	
20	GYMNASIUM STOR.	CONCRETE	WOOD	GYP BD	MASONRY	GYP BD	GYP BD	—	5/8 GYP BD	
21	MULTI-PURPOSE	MAPLE 25/32	WOOD	GYP BD	GYP BD	GYP BD	GYP BD	*BIRCH PLYWOOD	5/8 GYP BD	*4'-0" HIGH
22	PHYSICAL-EDUCATION	MAPLE 33/32	ALUMINUM L	*SAFETY PAD	MASONRY	*SAFETY PAD	MASONRY	*6'-0" HIGH	PERF. PLYWOOD	*SEE PLANS.
23	STUDENT STORE	CONCRETE	QUARRY TILE	GYP BD	MASONRY	MASONRY	*GYP. BD	*BIRCH 4'-0" HIGH	5/8 GYP BD	
24-27	MEN-WOMEN	CONCRETE	*QUARRY TILE	GYP BD	MASONRY	G.S.U.	MASONRY	—	5/8 GYP BD	*EXCEPT G.S.U.
25	JANITOR	CONCRETE	—	GYP BD	MASONRY	MASONRY	MASONRY	—	5/8 GYP BD	
26	CORRIDOR	CONCRETE	QUARRY TILE	MASONRY	GYP BD	ALUM. SASH	*GYP BD	*BIRCH 4'-0" HIGH	5/8 GYP BD	
28	TICKET COUNTER	CONCRETE	QUARRY TILE	GYP BD	GYP BD	MASONRY	MASONRY	—	5/8 GYP BD	
29	MECHANICAL RM	2x6 T&G	—	*GYP BD	MASONRY	*GYP BD	*GYP BD	—	5/8 GYP BD	*1/2" FIBERGLAS TO BE COVERED

PAINTING SCHEDULE

NUMBER	NAME	FLOOR	BASE	NORTH	EAST	SOUTH	WEST	WAINSCOT	CEILING
1-2	INSTRUCTOR-SHOWER	SEALER	—	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
3-8	GIRL-BOY LOCKERS	SEALER	—	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
4-7	LAUNDRY & DRYING	SEALER	—	—	—	—	—	—	F.W.P.
5-6	STORE RMS	SEALER	—	—	—	—	—	—	F.W.P.
9-10	INSTRUCTOR-SHOWER	SEALER	—	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
11	CORRIDOR	SEALER	W.P.	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
12-13-14	JAN.-TOILET-DRESS'G	SEALER	—	ENAMEL ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
15	KITCHEN	SEALER	—	ENAMEL ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
16-17	STORE ROOMS	SEALER	W.P.	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
18-19	BOYS-GIRLS	WAX	W.P.	ENAMEL ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
20	GYMNASIUM STOR.	SEALER	W.P.	S.G.W.P.	—	S.G.W.P.	S.G.W.P.	—	F.W.P.
21	MULTI-PURPOSE	GYM FINISH	S.&V.	S.G.W.P.	S.G.W.P.	S.G.W.P.	S.G.W.P.	S.&V.	F.W.P.
22	PHYSICAL-EDUCATION	GYM. FINISH	—	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				S.&V.	F.W.P.
23	STUDENT STORE	SEALER	—	S.G.W.P.	—	—	S.G.W.P.	S.&V.	F.W.P.
24-27	MEN-WOMEN	SEALER	—	ENAMEL ON GYPSUM BD WALL FINISH ONLY				—	F.W.P.
25	JANITOR	SEALER	—	ENAMEL	—	—	—	—	F.W.P.
26	CORRIDOR	SEALER	—	S.G.W.P. ON GYPSUM BD WALL FINISH ONLY				S.&V.	F.W.P.
28	TICKET COUNTER	SEALER	—	S.G.W.P.	S.G.W.P.	—	—	—	F.W.P.
29	MECHANICAL RM.	—	—	—	—	—	—	—	—

SCHEDULE NOTES -

1. CABINET TRIM, MOULDINGS, DOORS ALL PUBLIC AREAS - BIRCH - OTHERS - FIR.
2. ALUM. SASH - QUARRY TILE STOOLS
3. WOOD SASH - WOOD STOOLS & SILLS.
4. F.W.P. - FLAT WALL PAINT.
5. S.G.W.P. - SEMI-GLOSS WALL PAINT.
6. S.&V. - STAIN & VARNISH
7. GYP. BD - GYPSUM WALLBOARD TYPE "X" (SPECIAL FIRE RETARDANT)
8. SAFETY PAD - PLASTIC FOAM CUSHION CEMENTED TO PLYWOOD BACK.
9. PERF. PLYWOOD & PLYWOOD CEILING PART OF STRESSED SKIN PLYWOOD PANEL ASSEMBLY.
10. G.S.U. - GLAZED STRUCTURAL UNITS.
11. SEALER - LIQUID FLOOR HARDNER.

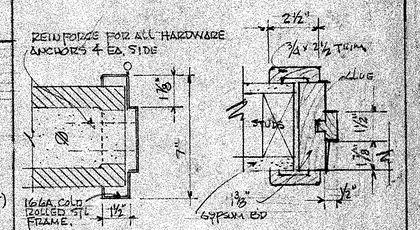
EQUIPMENT SCHEDULE NOTES

1. SINGLE TIER LOCKERS 18"x21"x60" IN ROOMS 2-9-14 N.I.C. (NOT IN CONTRACT)
2. LOCKER-BASKET COMBINATIONS IN ROOMS 3-8 N.I.C. (BENCH IN CONTRACT)
3. SHOWER-DRESSING CUBICLES IN ROOM 3 ALTERNATE 7
4. WASHER & DRYER UNITS IN RM 4-N.I.C.-PROVIDE ELEC. & PLUMBING CONN. AS REQ'D.
5. FOLDING BLEACHERS IN RM 22-N.I.C.
6. BASKETBALL BACKSTOPS IN RM 22-N.I.C.
7. RANGE & OVEN IN RM 15-N.I.C. PROVIDE ELEC. CONN. AS REQ'D.
8. SINK-DISHWASHER & COUNTER IN RM 15-N.I.C. INSTALL & PROVIDE ELEC. & PLUMBING CONN. AS REQ'D.
9. 3 COMPARTMENT SINK COUNTER IN RM 15-N.I.C. INSTALL & PROVIDE PLUMBING CONN. AS REQ'D.
10. 2 REFRIGERATORS IN RM 15-N.I.C.-INSTALL & PROVIDE ELEC. CONN. AS REQ'D.
11. FREEZER & FREEZER MOTOR IN RM 16-N.I.C.-INSTALL & PROVIDE ELEC. CONN. AS REQ'D.
12. DIVISION CURTAIN IN RM 22 N.I.C.
13. ROCKS IN PLANTING AREAS ETC.-N.I.C.
14. SOUNDPROOF FOLDING PARTITION IN RM 21 ALTERNATE. 5
15. SEE PROPOSAL FOR ALTERNATES 1-2-3-4 AND 6

DOOR SCHEDULE

No.	SIZE	MATERIAL	GLASS	REMARKS
1A-2A-3A				
4A	3'-0"x7'-0"x1 3/4"	ALUMINUM	SAFETY	ALUM. FRAME
1M-2M				
5M-8M	3'-0"x7'-0"x1 3/4"	HOLLOW METAL	—	H.M. FRAME
3M-4M	3'-2"x7'-0"x1 3/4"	HOLLOW METAL	—	WOOD FRAME
5M-6M	3'-6"x7'-0"x1 3/4"	HOLLOW METAL	—	H.M. FRAME
1-14				
19-20-23				
24-25-26	2'-6"x7'-0"x1 3/4"	WOOD	—	WOOD
27-30				
2-5-6-7				
8-9-10-11	3'-0"x7'-0"x1 3/4"	WOOD	—	H.M. FRAME
16-21-28				
32				
3-4-12-13	2'-6"x7'-0"x1 3/4"	WOOD	—	H.M. FRAME
15-17-18				
22-29	3'-0"x7'-0"x1 3/4"	WOOD	—	WOOD
31	2'-6"x6'-6"x	WOOD	—	SLIDING IN-WALL

NOTES DOORS
ALUMINUM DOORS - WIDE STILE (1A)
HOLLOW METAL DOORS - FLUSH TYPE - 18 GAGE STL (1M)
(4) DOORS 3M-4M - BOTH SIDES PAINTED VERTICAL STRIPS - 6" WIDE ALTERNATING SCHOOL COLORS.
WOOD DOORS - STANDARD FLUSH CONSTRUCTION, 5 PLY GLUED UP RANDOM-LENGTH VERT. STAVE CORE.



FLOOR PLAN • SCHEDULES

3

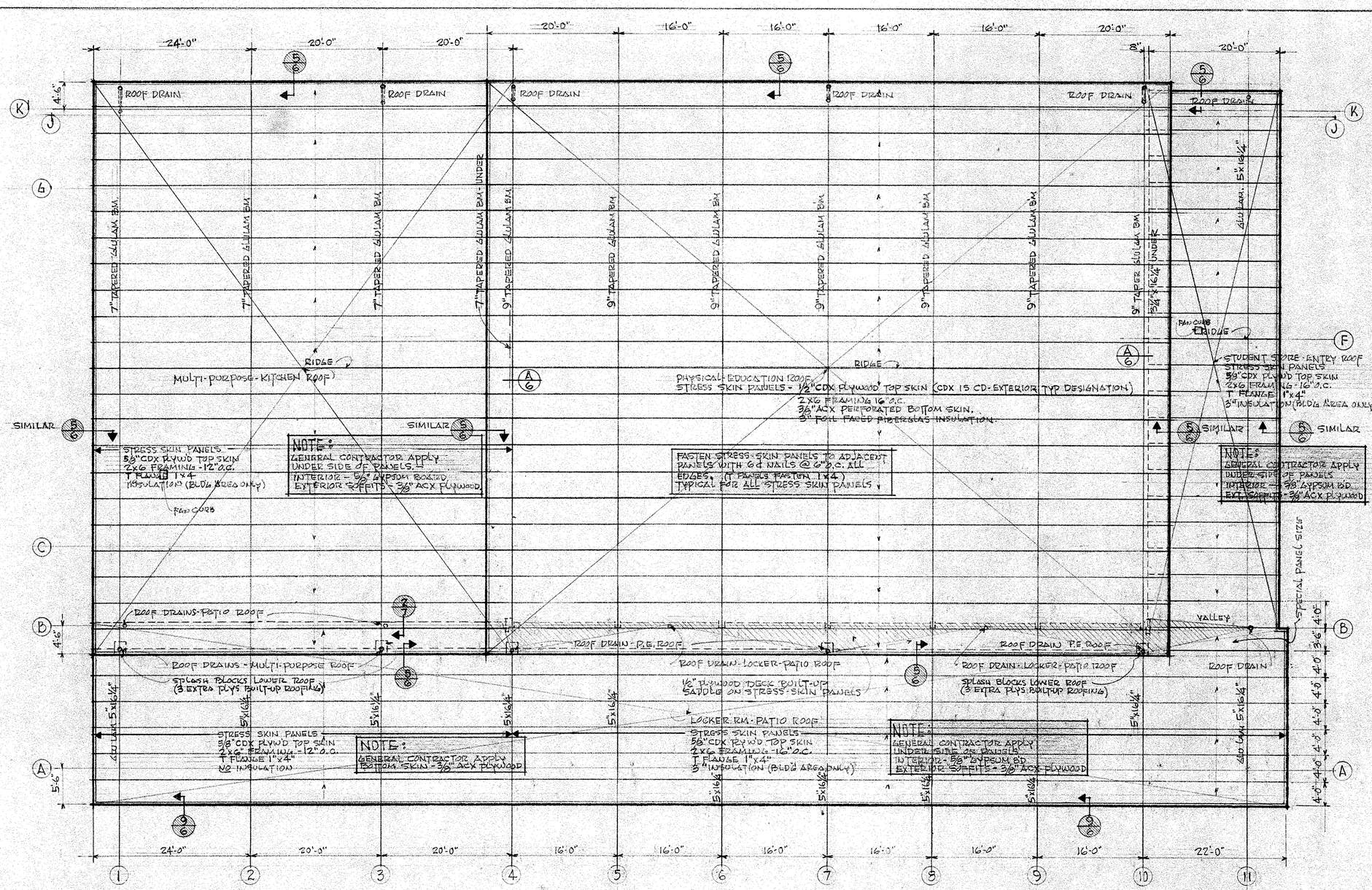
DETAIL DESIGNATION
DETAIL OR SECTION
NUMBER OR LETTER

SHEET LOCATION

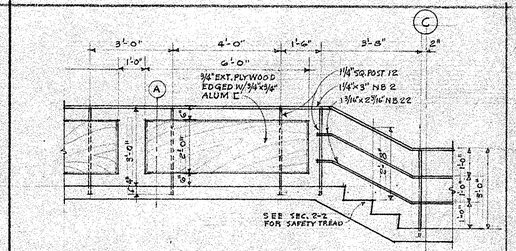
DATE • MAY 22, 1964

PHYSICAL EDUCATION • MULTI-PURPOSE BLD'G. ADDITION TO THE BOISTFORT CONSOLIDATED SCHOOL DISTRICT Nº 234 • CURTIS, LEWIS COUNTY, WASHINGTON

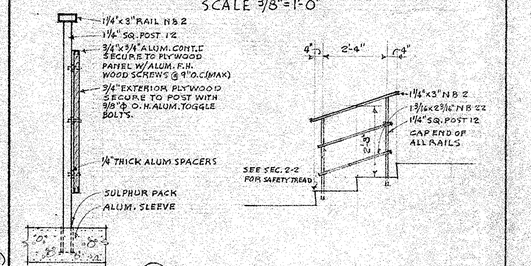
E. A. KENNEDY • DESIGNER • ASSOCIATE A.I.A.
OLIVER W. OLSON & ASSOCIATES A.I.A. ARCHITECTS
2437 N.W. MARKET ST. SEATTLE 7
8716 JONES AVE N.W. SEATTLE 7



ROOF PLAN ◦ SCALE 1/8" = 1'-0"

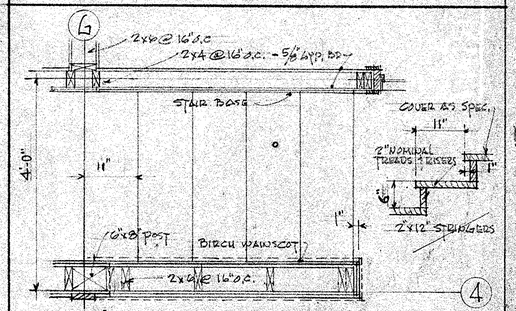


ALUM. RAILING-NORTH ELEV.
SCALE 3/8" = 1'-0"

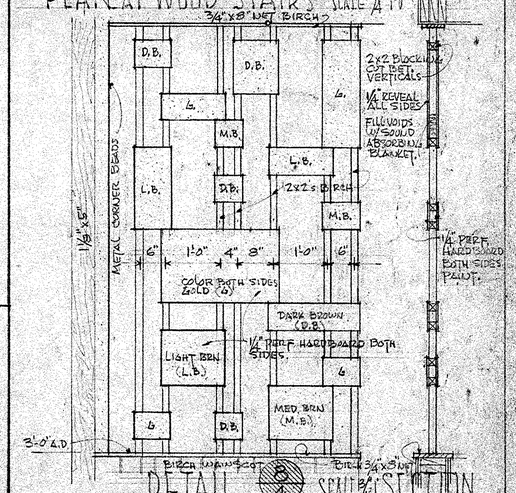


SECTION (A) ALUM. CENTER RAIL-WEST ELEV.
SCALE 1" = 1'-0" SCALE 3/8" = 1'-0"

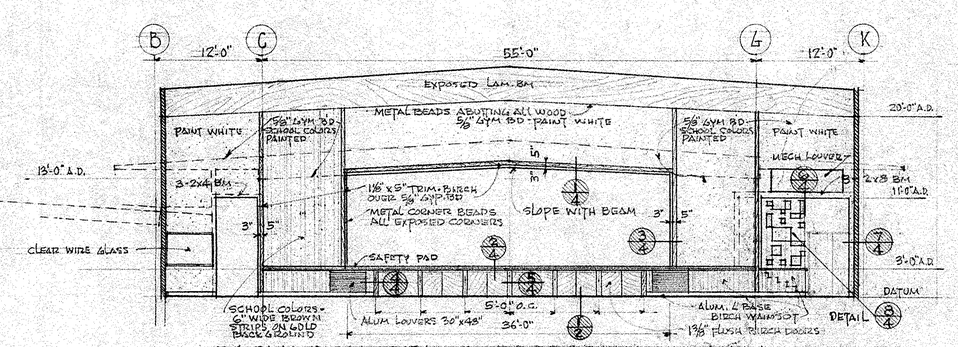
NOTE: ALL ALUMINUM SECTIONS BY "ECONORAIL" OR EQUAL.



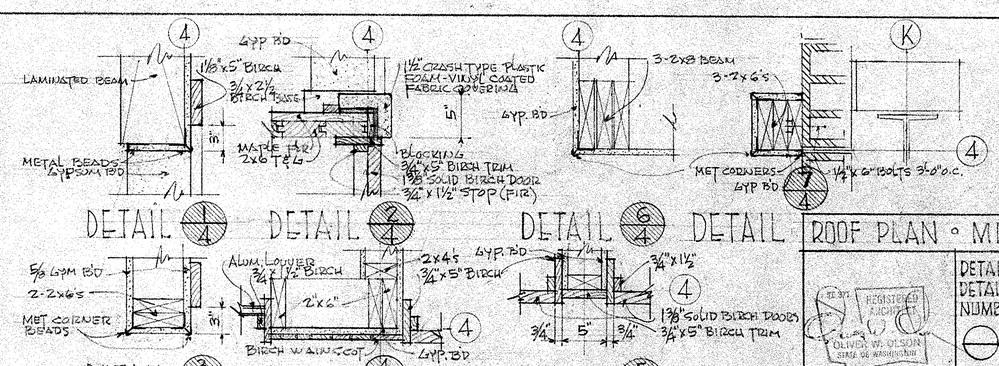
PLAN AT WOOD STAIRS ◦ SCALE 3/4" = 1'-0"



DETAIL (8/4) SCALE 3/4" = 1'-0" SECTION



ELEVATION STAGE PROSCENIUM WALL ◦ SCALE 1/4" = 1'-0"



DETAIL (1/4) DETAIL (2/4) DETAIL (6/4) DETAIL
DETAIL (3/4) DETAIL (4/4) DETAIL (5/4) ◦ SCALE 1½" = 1'-0"

ROOF PLAN ◦ MISC. DETAILS

4

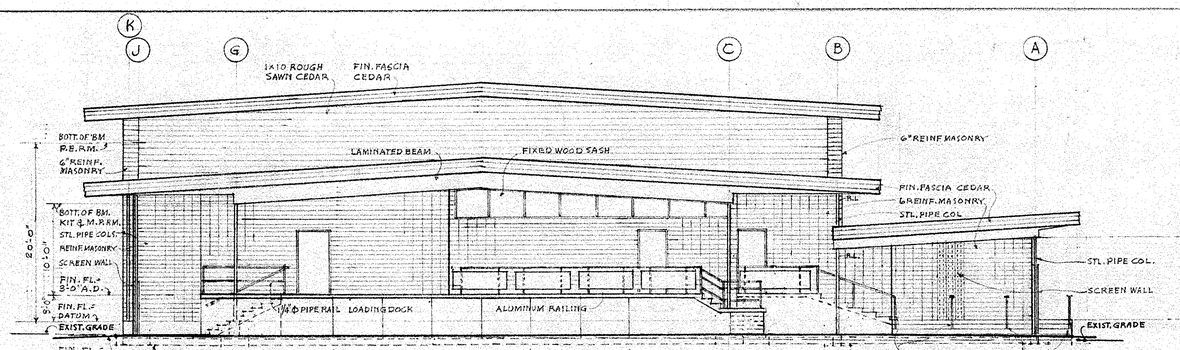
DETAIL DESIGNATION
DETAIL OR SECTION NUMBER OR LETTER

SHEET LOCATION
DATE - MAY 22, 1964

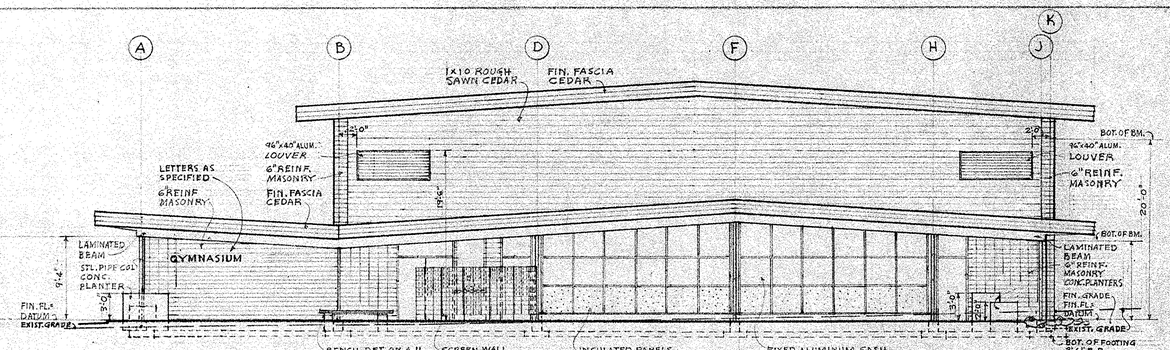
REGISTERED ARCHITECT OLIVER W. OLSON STATE OF WASHINGTON

PHYSICAL EDUCATION ◦ MULTI-PURPOSE BLDG
ADDITION TO THE BOISTFORT CONSOLIDATED SCHOOL DISTRICT No 234 - CURTIS, LEWIS COUNTY, WASHINGTON

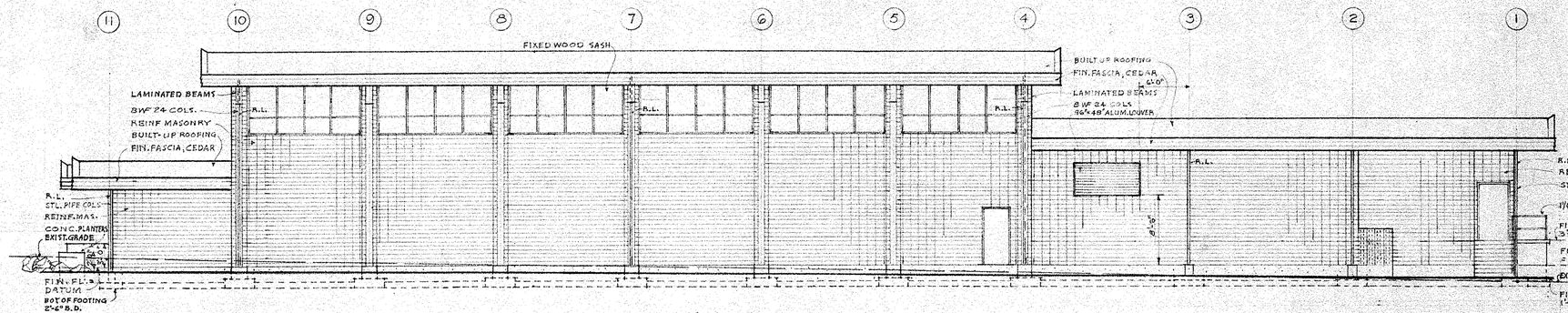
E. A. KENNEDY ◦ DESIGNER - ASSOCIATE
OLIVER W. OLSON & ASSOCIATES A.I.A. ARCHITECTS
2437 N.W. MARKET ST. SEATTLE 7.
8718 JONES AVE. N.W. SEATTLE 7.



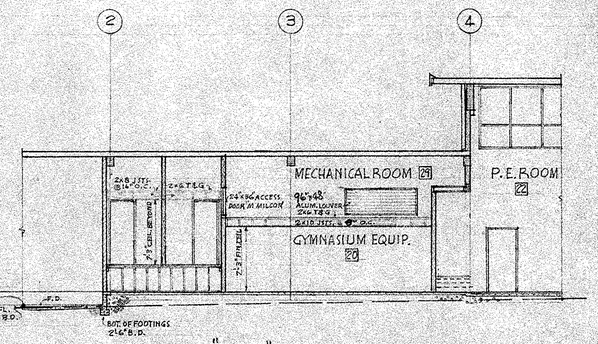
NORTH ELEVATION - SCALE 1/8" = 1'-0"



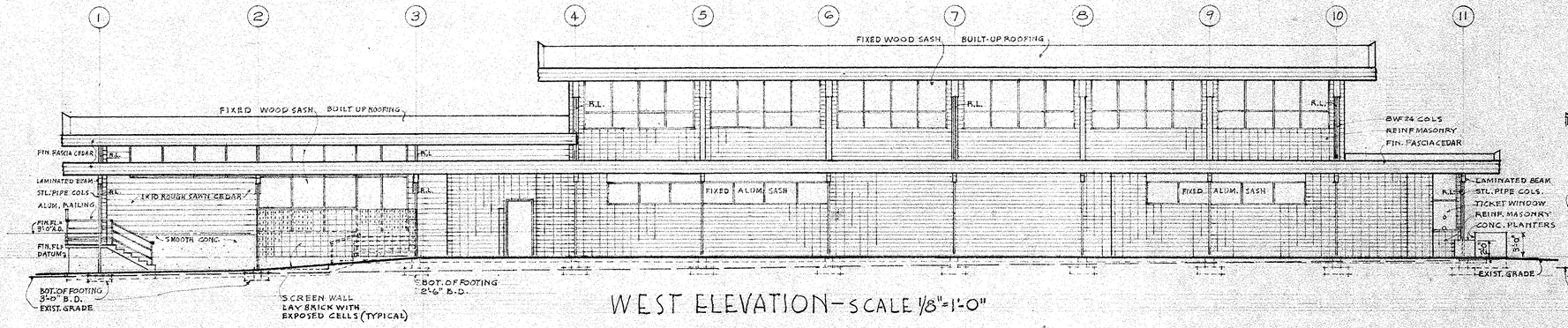
SOUTH ELEVATION - SCALE 1/8" = 1'-0"



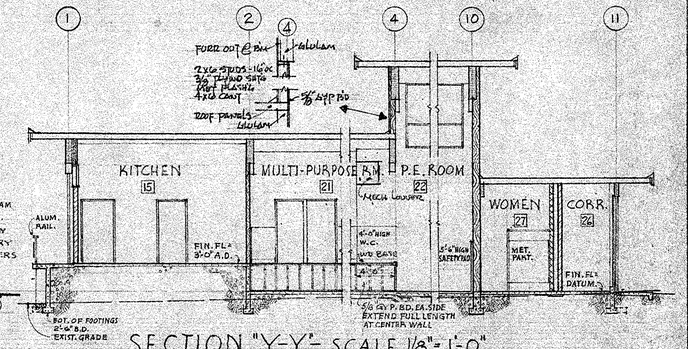
EAST ELEVATION - SCALE 1/8" = 1'-0"



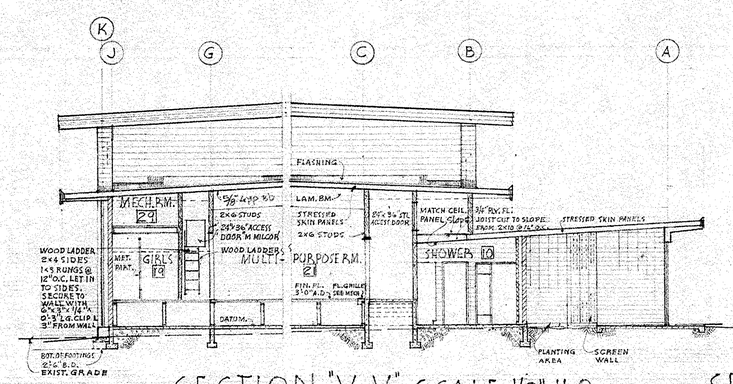
SECTION "Z-Z" - SCALE 1/8" = 1'-0"



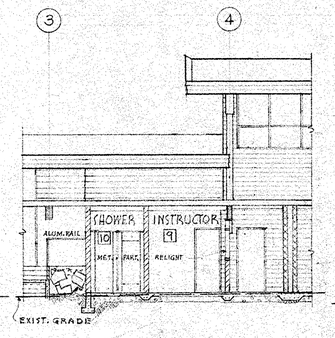
WEST ELEVATION - SCALE 1/8" = 1'-0"



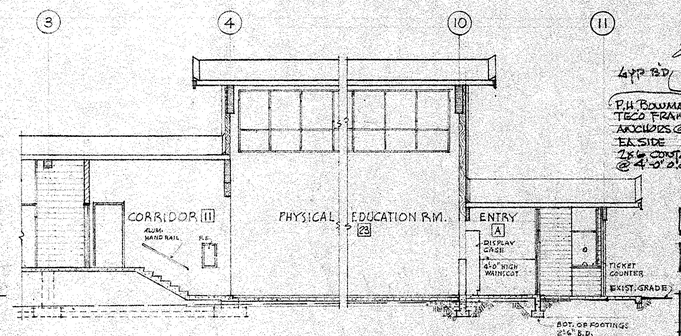
SECTION "Y-Y" - SCALE 1/8" = 1'-0"



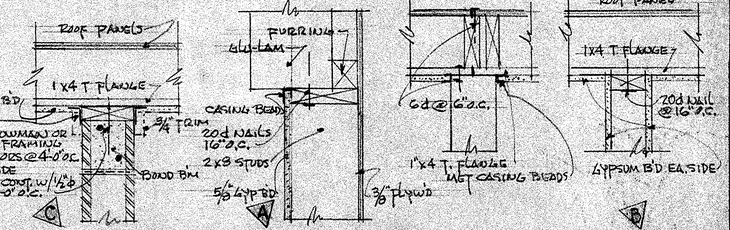
SECTION "V-V" - SCALE 1/8" = 1'-0



SECTION "W-W" - SCALE 1/8" = 1'-0"



SECTION "X-X" - SCALE 1/8" = 1'-0"



ROOF PANEL TO MAS. SHEAR WALL — SHEAR WALL • BEAM CONN. CONN. • STA. 10 (STA 4 SIM.) TO GLULAM — PANEL STUD SHEAR WALL TO PANEL

ELEVATIONS • SECTIONS

5

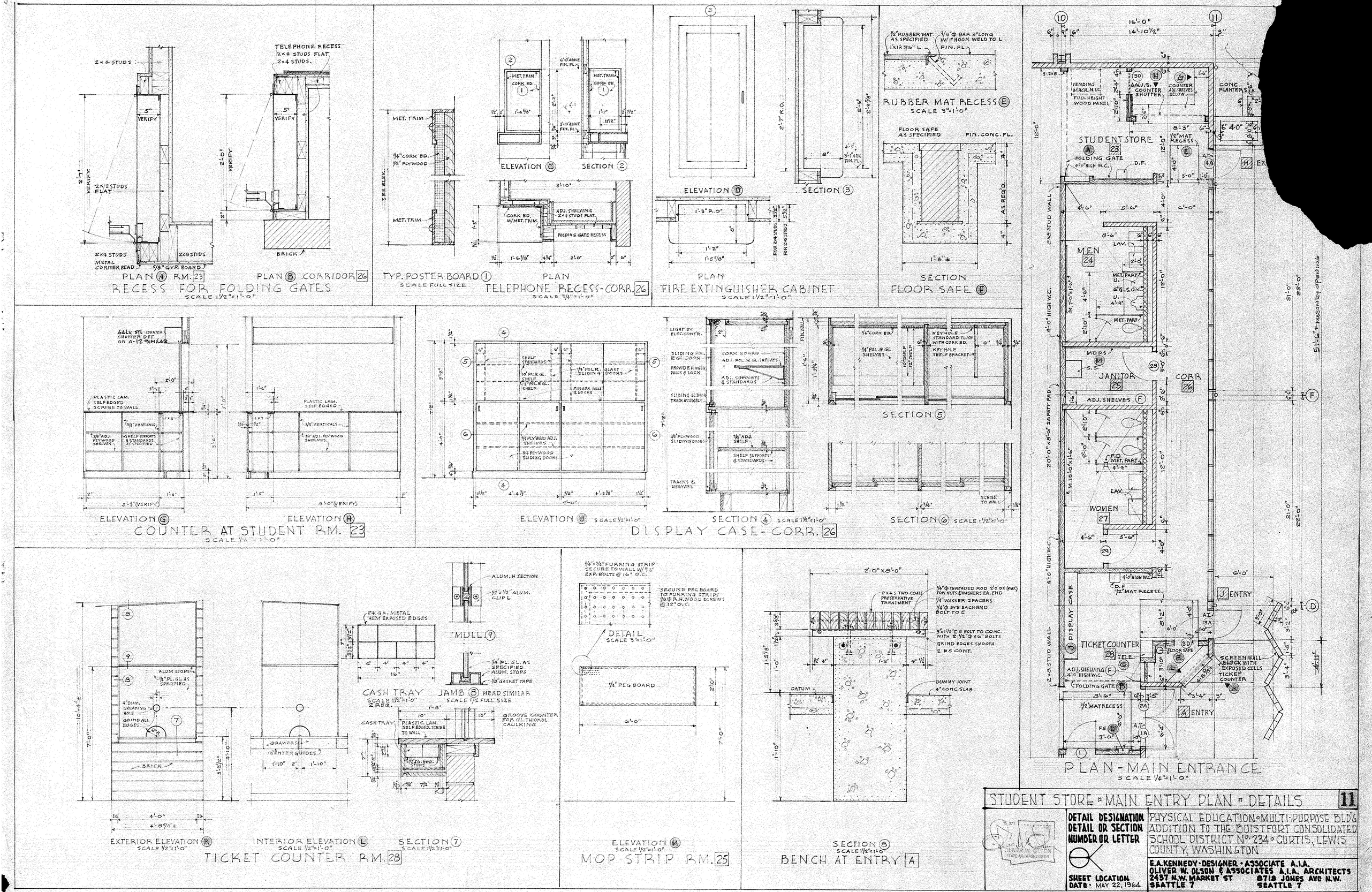
DETAIL DESIGNATION
DETAIL OR SECTION NUMBER OR LETTER

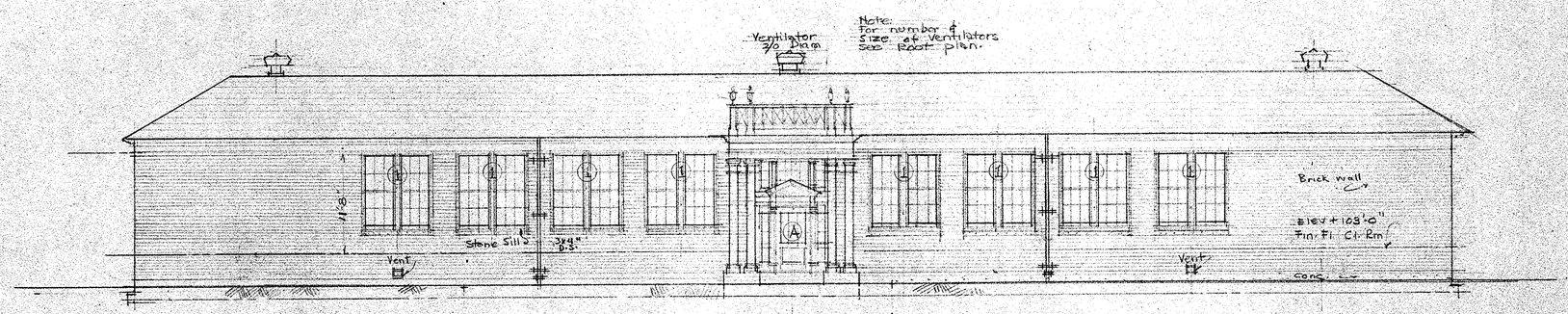
SHEET LOCATION

DATE: MAY 22 1964

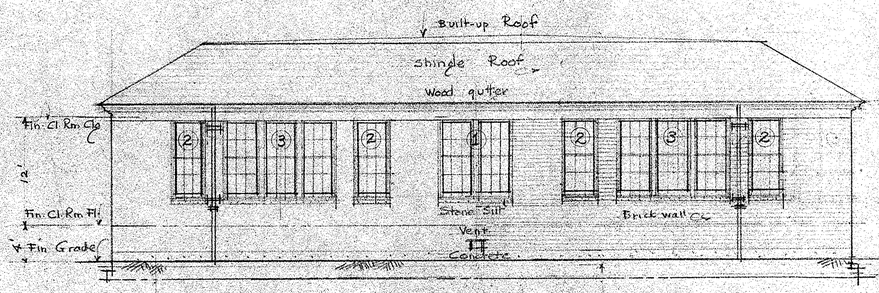
PHYSICAL EDUCATION • MULTI-PURPOSE BLDG. ADDITION TO THE BOISTFORT CONSOLIDATED SCHOOL DISTRICT No. 234 • CURTIS, LEWIS COUNTY, WASHINGTON

E.A. KENNEDY: DESIGNER ASSOCIATE
OLIVER W. OLSON & ASSOCIATES, A.I.A. ARCHITECTS
2437 N.W. MARKET ST. SEATTLE 7
8718 JONES AVE. N.W. SEATTLE 7

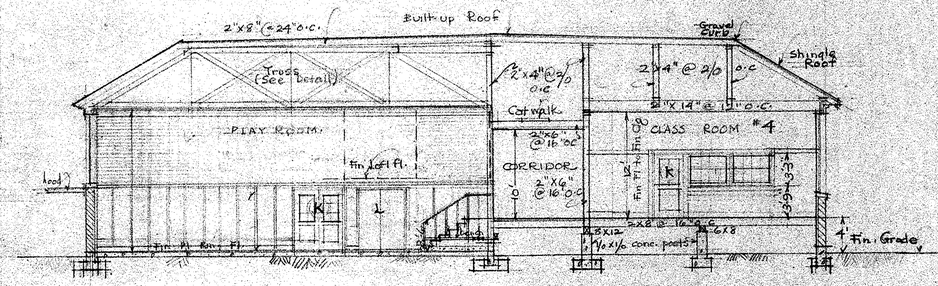

PLAN (A) RM. 23
PLAN (B) CORRIDOR 26
RECESS FOR FOLDING GATES
SCALE 1½"=1'-0"
TYP. POSTER BOARD (1)
SCALE FULL SIZE
PLAN
TELEPHONE RECESS-CORR. 26
SCALE ¾"=1'-0"
ELEVATION (D)
SECTION (3)
PLAN
FIRE EXTINGUISHER CABINET
SCALE 1½"=1'-0"
RUBBER MAT RECESS (E)
SCALE 3"=1'-0"
SECTION
FLOOR SAFE (F)
ELEVATION (G)
ELEVATION (H)
COUNTER AT STUDENT RM. 23
SCALE ½"=1'-0"
ELEVATION (J) SCALE ½"=1'-0"
SECTION (4) SCALE 1½"=1'-0"
SECTION (6) SCALE 1½"=1'-0"
DISPLAY CASE-CORR. 26
SECTION (5)
PLAN-MAIN ENTRANCE
SCALE ¼"=1'-0"
EXTERIOR ELEVATION (K)
SCALE ½"=1'-0"
INTERIOR ELEVATION (L)
SCALE ½"=1'-0"
SECTION (7)
SCALE 1½"=1'-0"
TICKET COUNTER RM. 28
MULL (9)
CASH TRAY
SCALE 1½"=1'-0"
2 REQ.
JAMB (8) HEAD SIMILAR
SCALE 1½ FULL SIZE
DETAIL
SCALE 3"=1'-0"
ELEVATION (M)
MOP STRIP RM. 25
SECTION (8)
SCALE 1½"=1'-0"
BENCH AT ENTRY (A)
STUDENT STORE • MAIN ENTRY PLAN • DETAILS
11
DETAIL DESIGNATION
DETAIL OR SECTION
NUMBER OR LETTER
SHEET LOCATION
DATE: MAY 22, 1964
PHYSICAL EDUCATION • MULTI-PURPOSE BLDG
ADDITION TO THE BOISTFORT CONSOLIDATED
SCHOOL DISTRICT No. 234 • CURTIS, LEWIS
COUNTY, WASHINGTON
E.A. KENNEDY • DESIGNER • ASSOCIATE A.I.A.
OLIVER W. OLSON & ASSOCIATES A.I.A. ARCHITECTS
2437 N.W. MARKET ST SEATTLE 7
8718 JONES AVE N.W. SEATTLE 7



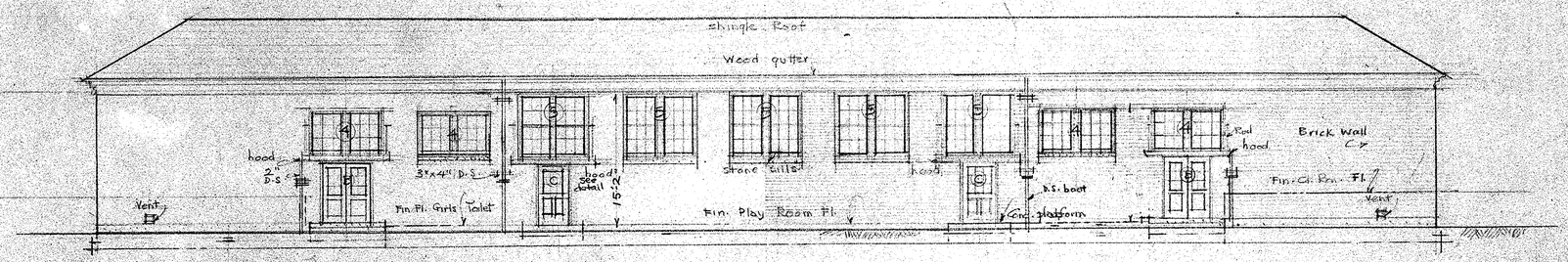
WEST ELEVATION
Scale 1/8" = 1'-0"



NORTH ELEVATION
Scale 1/8" = 1'-0"
SOUTH ELEVATION SIMILAR



CROSS SECTION
Scale 1/8" = 1'-0"



EAST ELEVATION
Scale 1/8" = 1'-0"

INTERIOR FINISH SCHEDULE

ABBREVIATIONS USED

A.T.	Asphalt Tile	K.	Keene's Cem. Pl.	S	Stain
Bd.	Blackboard	Kal.	Kalsomine	Tr.	Troweled fin. pl.
B	Brickwork	L	Linoleum	U	Unfinished
C	Cement	M	Metal Lath	V	Varnish
Con	Concrete	Mp	Maple	Vp	Veneer Panel
F	Fir	O	Oil	W	Wood lath
F.H.	Floor hardner	PB	Plaster Board	WC	Wood Ceiling
Flt.	Float finish	Pic	Picture Mold	Wx	Wax
G	Gypsum Plaster	Pt.	Paint	PW	Plywood

ROOM		FLOOR		DADO			WALL		TRIM			CEILING	
Number	Designation	Material	Finish	Height	Material	Cap	Material	Finish	Base	Door & Window	Other	Height	Material	Finish
1-6	Class Rooms	M	O	7'-0"	KWTr	F	KWFt	Kal	F	F	V	12'-0"	KWFt	Kal
7	Library	M	O	7'-0"	KWTr	F	KWFt	Kal	F	F	Pic V	12'-0"	KWFt	Kal
8 & 9	Sanitaries	C	FH	5'-6"	KMTr	F	Pt	GWFt	Pt	C	F	– Pt	12'-0"	GWFt	Pt
10	Main Entry	B	O	5'-6"	GWTr	F	Pt	GWFt	Kal	F	F	Pic V		GWFt	Kal
11	Corridors	M	O	5'-6"	GWTr	F	Pt	GWFt	Kal	F	F	Pic V	10'-0"	GWFt	Kal
12	Entries	C	H	5'-6"	GWTr	F	Pt	GWFt	Kal	C & F	F	Pic V	12'-0"	GWFt	Kal
17	Rest Room	M	O	5'-6"	GWTr	F	Pt	GWFt	Kal	F	F	Pic V	8'-0"	GWFt	Kal
18 & 19	Toilets	M	O	5'-6"	GWTr	F	Pt	GWFt	Pt	F	F	Pic V	8'-0"	GWFt	Pt
21	Teachers Rm.	M	O	5'-6"	GWTr	F	Pt	GWFt	Kal	F	F	Pic	12'-0"	GWFt	Kal
20	Vault	C	FH	–	–	–	–	GWFt	Kal				7'-6"	Con	Kal
25	Play Room	C	FH	7'-6"	PW	F	V	W.C.	V	C	F	– V	16'-0"	WC	V
22 & 23	Entries	C	FH	5'-6"	GWTr	F	Pt	GWFt	Kal	F	F	Pic V	10'-0"	GWFt	Kal
18A 23		F	O	–	–	–	–	W	V	F	F	– V	8'-0"	W	V
26	Jan. Clos.	M	O	7'-0"	GWTr	F	Pt	GWFt	Kal	F	F	– Pt	8'-0"	GWFt	Kal
16	Storage	C	FH	–	–	–	–	W	V	C	F	– V	8'-0"	W	V
24	Kitchen	C	FH	7'-0"	GWTr	F	Pt	GWFt	Kal	C	F	– Pt	8'-0"	GWFt	Pt

DOOR SCHEDULE

MARK	LOCATION	SIZE	DESCRIPTION	Where Shown
A	Main Entrance	4/0 x 7/0 x 2¼	Glazed Transom over	1 & 5
B	Corridors	2-2'6" x 7/0 x 2¼	Glazed	1
C	Play Room Ext.	¾ x 7/0 x 2¼	Glazed guards over	
D	Class Room	¾ x 7/0 x 1¾	Glazed guards over Cl. Gl.	
E	Sanitaries	2/6 x 7/6 x 1¾	6 panel	
F	Closets	2/8 x 7/0 x 1¾	6 panel	
G	San. & Teachers			
H	Loft	2-3/6 x 7/2 x 1⅜		
J	Loft	3/6 x 4/6 x 1⅜		
K	Play Room	2-2'6 x 7'-0 x 1¾	Similar to B doors guards one side	
L	Storage	2-2'6 x 7'-0 x 1¾	Similar to E doors	
M	Teachers Clos	2/6 x 7/6 x 1⅜	2 panel; 1 Cork carpet	

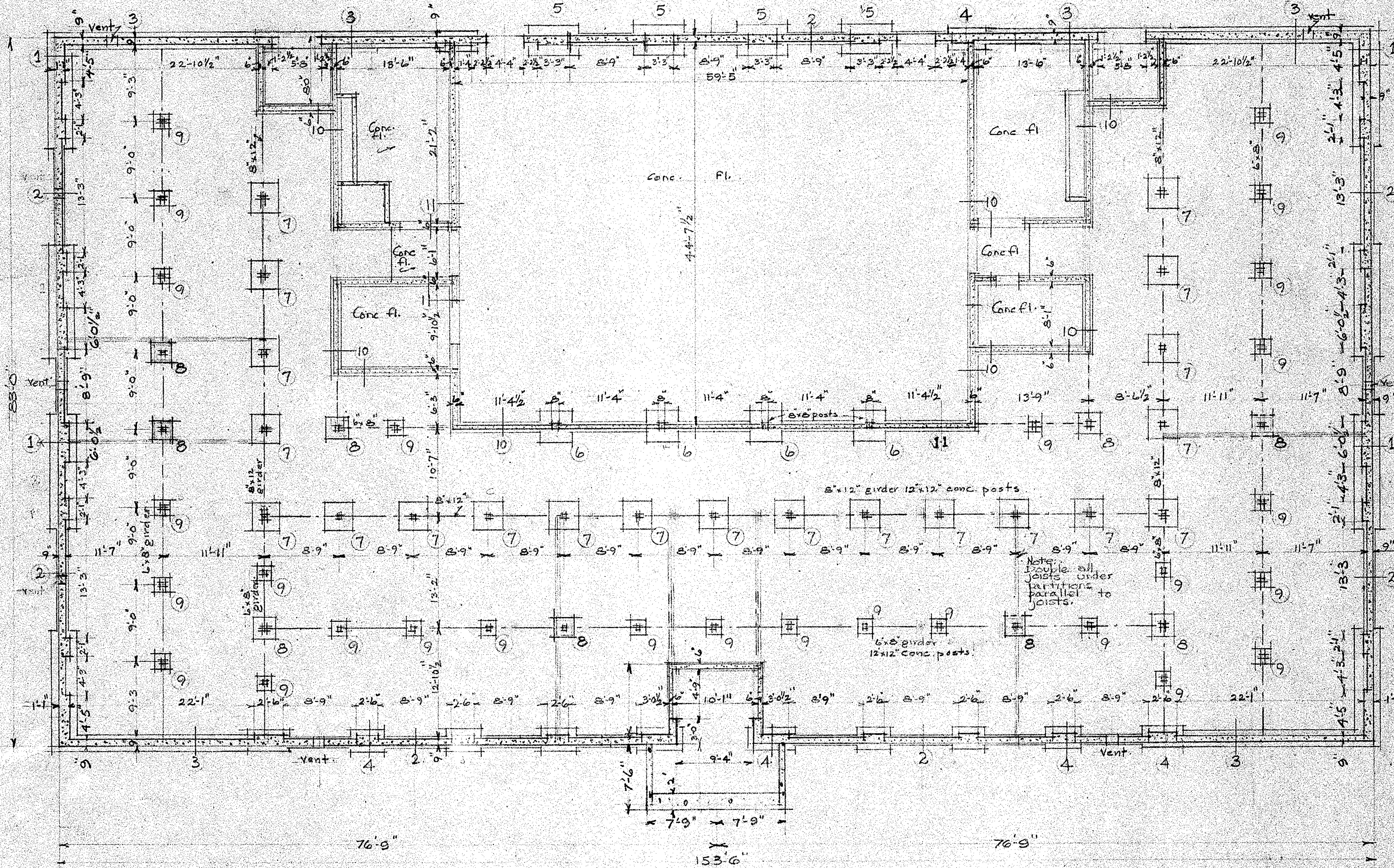
WINDOW SCHEDULE

MARK	No. lights	Size	REMARKS	Where Shown
1	24	14/54	Double-hung	1
2	12	14/54	" "	1
3	36	14/54	" "	1
4	18	14/16	Plank frame – open in at top.	1 & 5
5	24	14/20	Double-hung	1

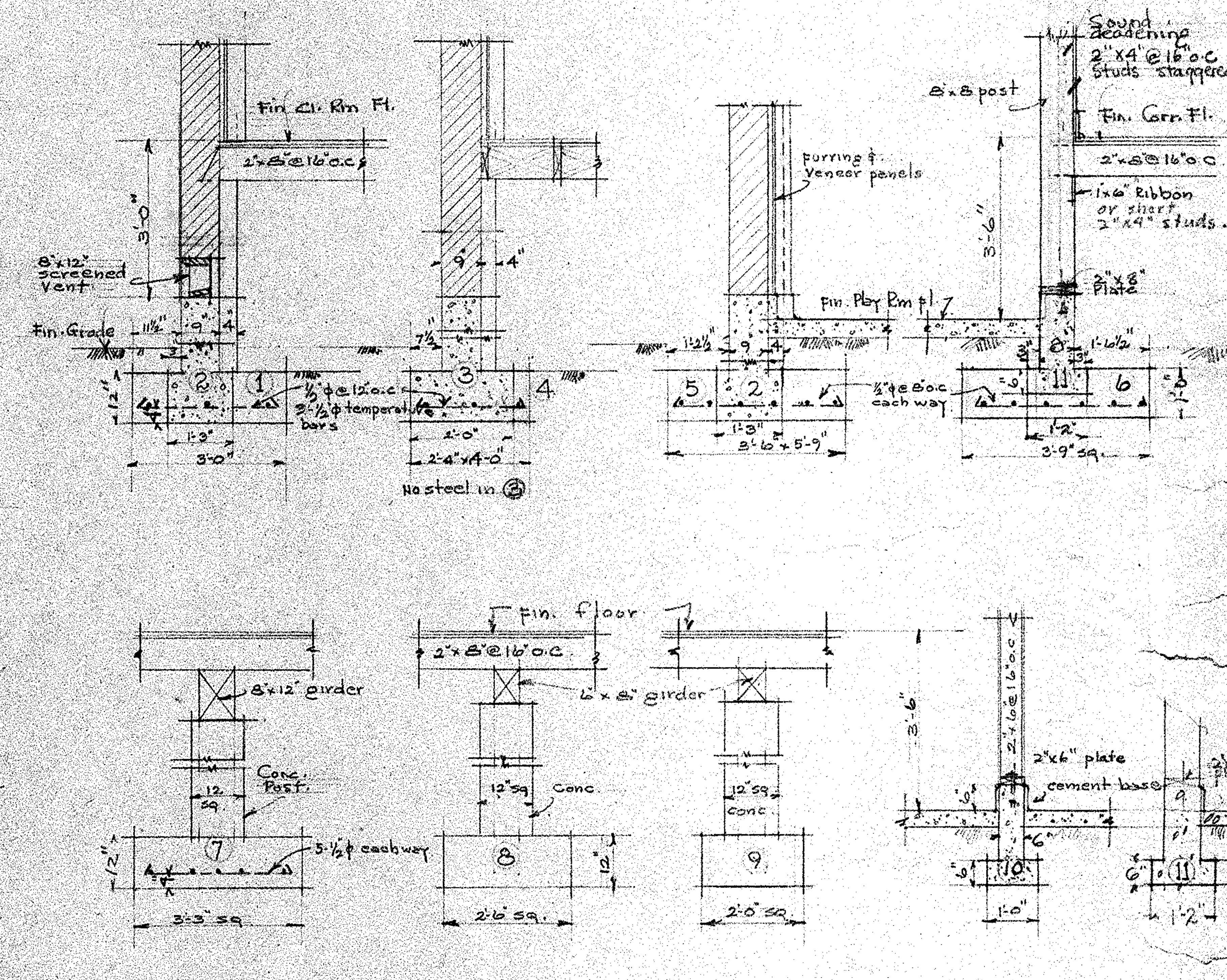
Note:
For Doors & Windows in Basement See Sheet #3.

ELEVATIONS

DRAWN BY ETM. NJM	BOISTFORT GRADE SCHOOL	289
TRACED BY H.J.M.	SCHOOL DISTRICT #234 LEWIS COUNTY	DATE 6/6/36
CHECKED BY ETM	KLABER WASHINGTON	PRINTED
SET	MOCK & MORRISON ARCHITECTS 228 PERKINS BLDG TACOMA WASHINGTON	SHEET 1

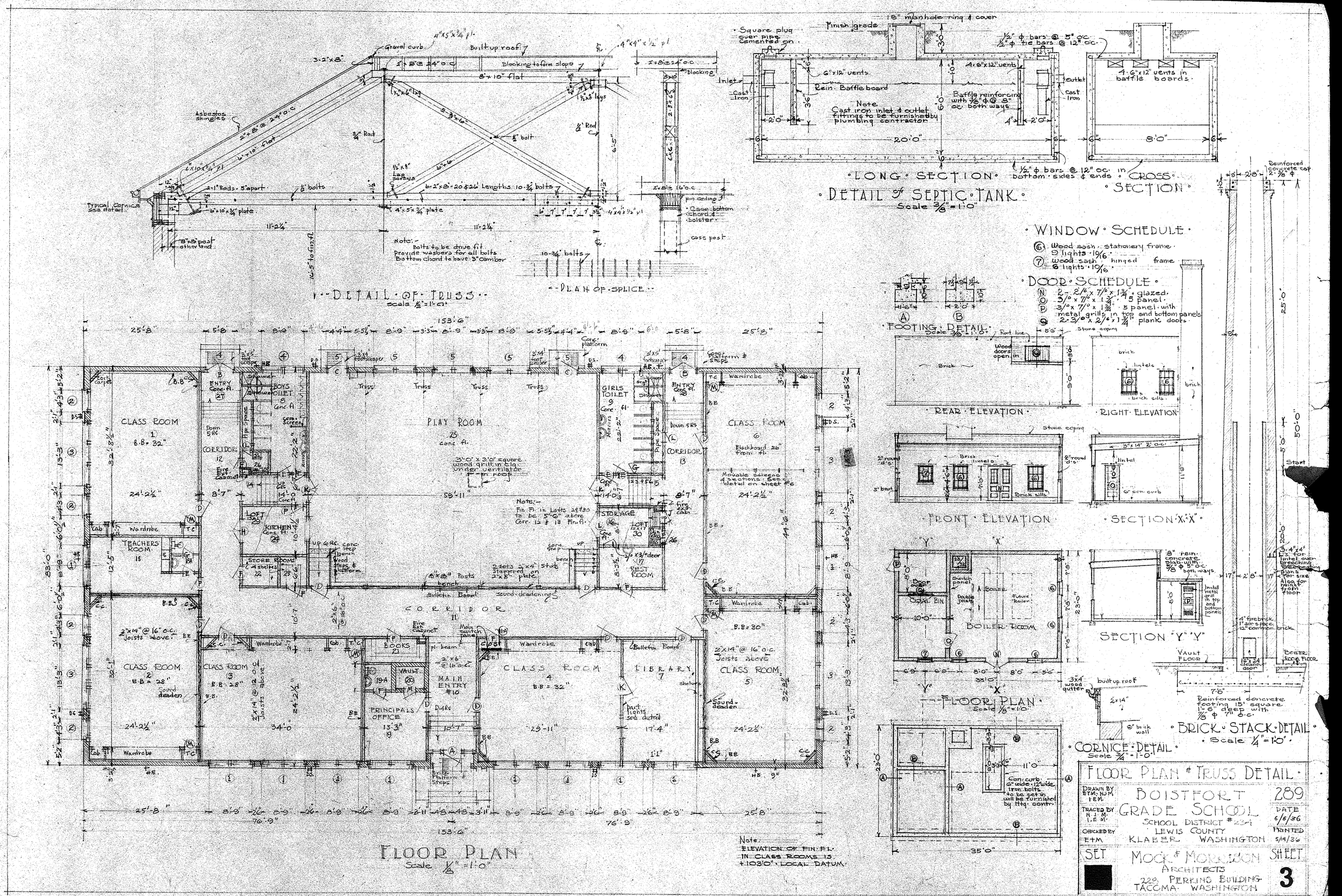


FOUNDATION PLAN
Scale 1/8"=1'-0"



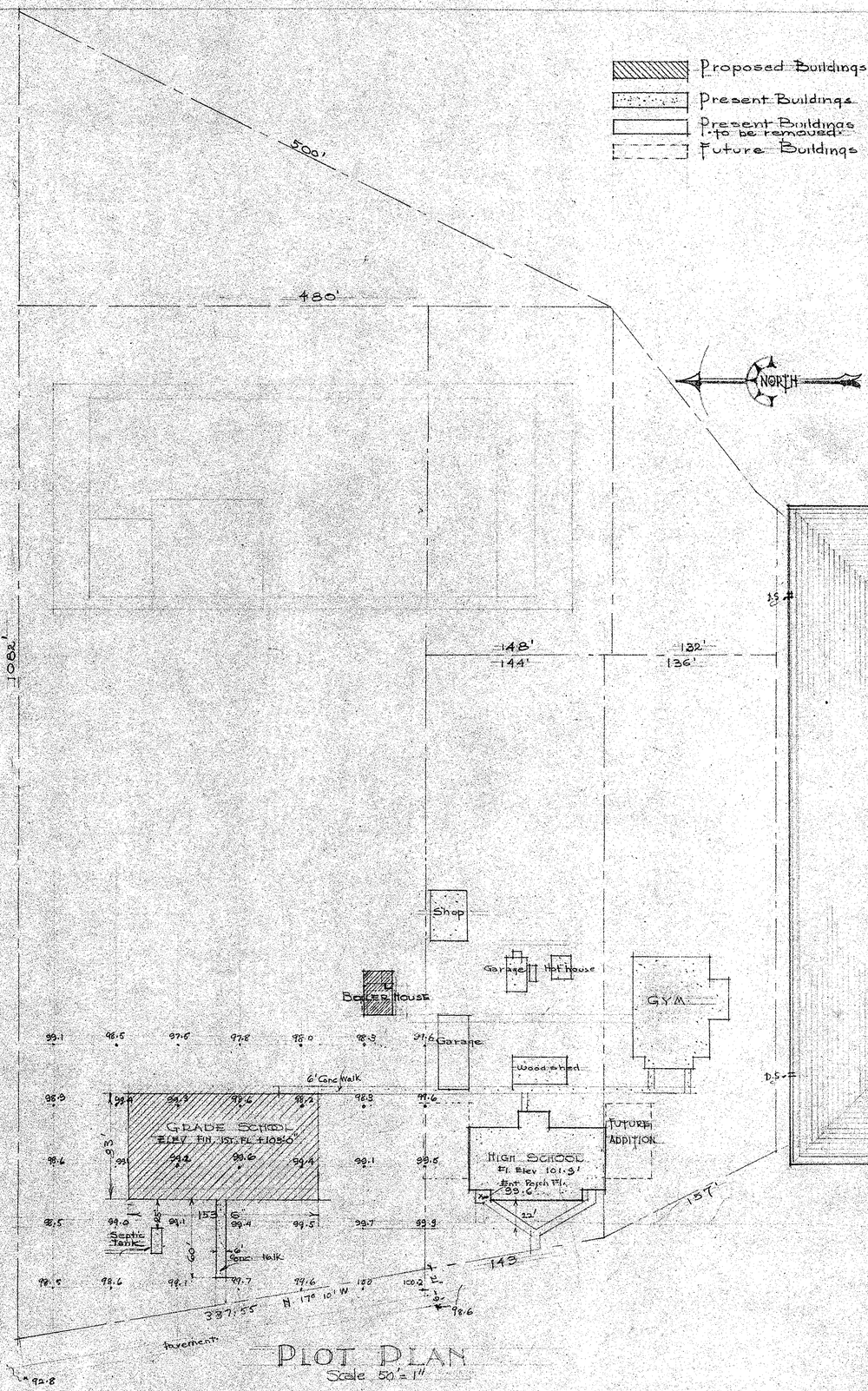
· · DETAIL · OF · FOOTINGS · ·
Scale ½"=1'-0"

· FOUNDATION · PLAN ·		
DRAWN BY NJM · IEM	· BOISTFORT ·	289
TRACED BY NJM · IEM	GRADE · SCHOOL · · SCHOOL DISTRICT #234 · · LEWIS COUNTY ·	DATE 6/6/36
CHECKED BY ETM	· KLABER · WASHINGTON ·	PRINTED
SET	· MOCK & MORRISON · · ARCHITECTS ·	SHEET
	· 228 · PERKINS · BUILDING · · TACOMA · WASHINGTON ·	2

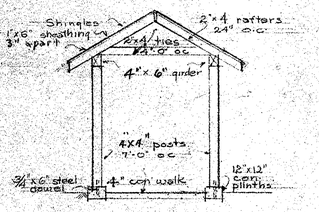


DETAIL OF TRUSS
Scale 1/2" = 1'-0"
PLAN OF SPLICE
Note:- Bolts to be drive fit. Provide washers for all bolts. Bottom chord to have 3" camber
LONG SECTION
DETAIL OF SEPTIC TANK
Scale 3/8" = 1'-0"
CROSS SECTION
WINDOW SCHEDULE
DOOR SCHEDULE
FOOTING DETAIL
REAR ELEVATION
RIGHT ELEVATION
FRONT ELEVATION
SECTION X-X
SECTION Y-Y
FLOOR PLAN
Scale 1/8" = 1'-0"
CORNICE DETAIL
Scale 3/4" = 1'-0"
BRICK STACK DETAIL
Scale 1/4" = 1'-0"
CLASS ROOM
PLAY ROOM
CORRIDOR
TEACHERS ROOM
BOYS TOILET
GIRLS TOILET
KITCHEN
STORE ROOMS
BEST ROOM
BOOKS
VAULT
MAIN ENTRY #10
PRINCIPALS OFFICE
LIBRARY
BOILER ROOM
Note: ELEVATION OF FIN. FL. IN CLASS ROOMS IS +103'0" LOCAL DATUM
FLOOR PLAN & TRUSS DETAIL
DRAWN BY ETM, NJM, LEM
TRACED BY N.J.M. LEM
CHECKED BY ETM
BOISTFORT GRADE SCHOOL
SCHOOL DISTRICT #234
LEWIS COUNTY
KLABER WASHINGTON
289
DATE 6/6/36
PRINTED 5/14/36
SET
MOCK & MORRISON ARCHITECTS
228 PERKINS BUILDING
TACOMA WASHINGTON
SHEET 3

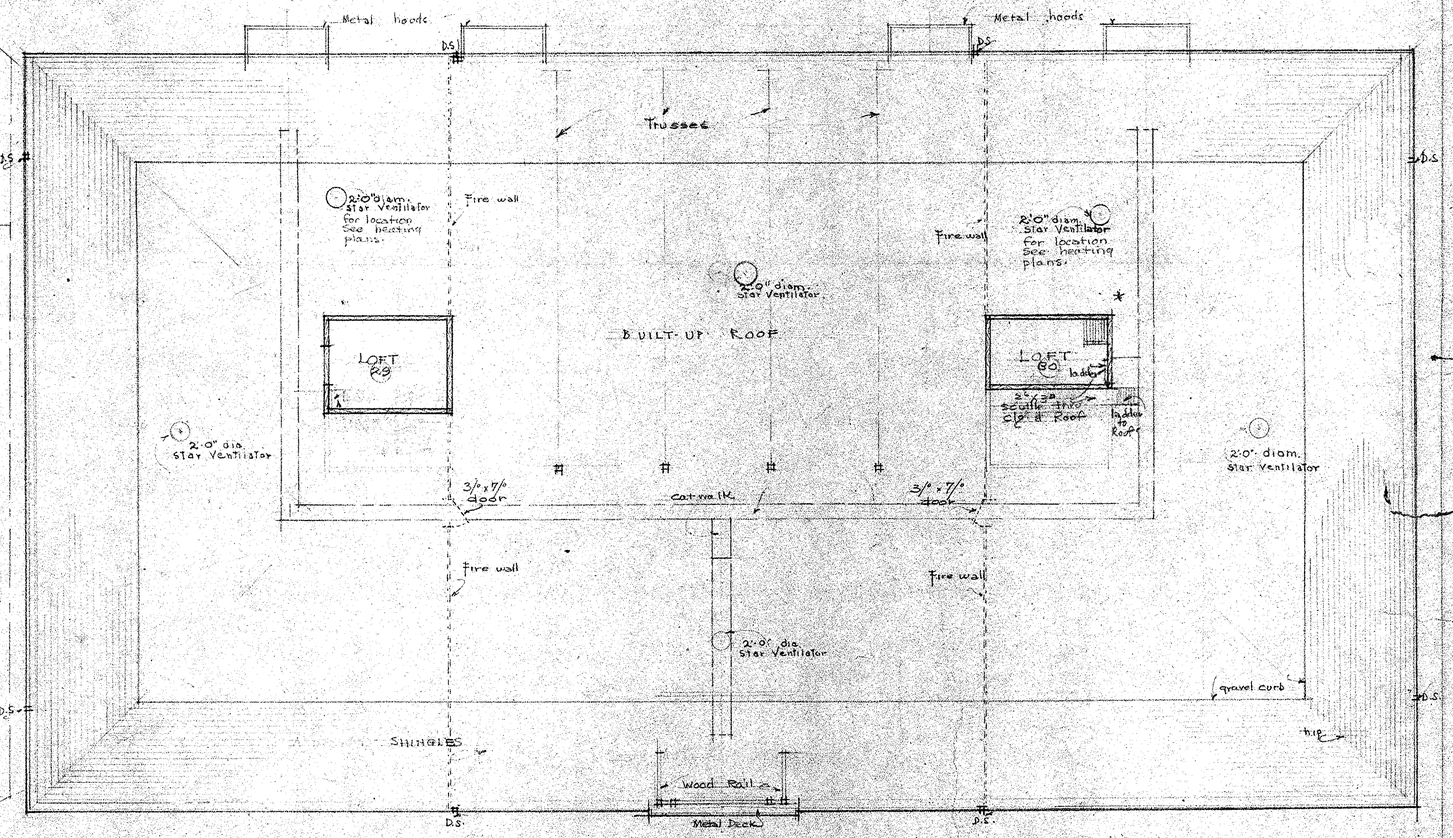
Proposed Buildings
Present Buildings
Present Buildings to be removed
Future Buildings



PLOT PLAN
Scale 50' = 1"



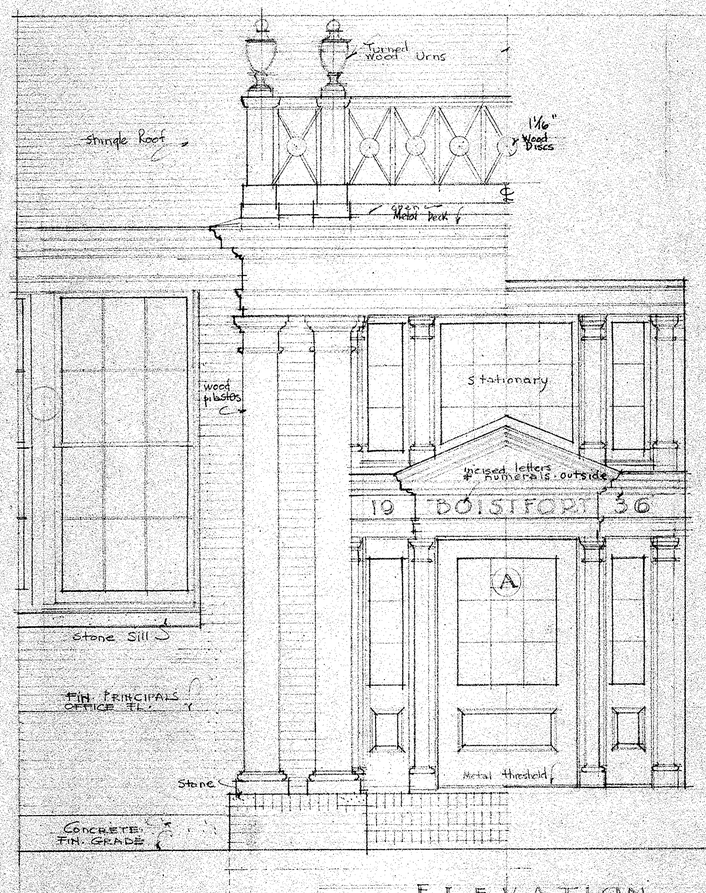
COVERED WALK DETAIL
Scale 1/4" = 1'-0"



ROOF PLAN
Scale 1/8" = 1'-0"

DRAWN BY N.J.M. MWP	DOISTFORT GRADE SCHOOL SCHOOL DISTRICT #234 LEWIS COUNTY KLABER WASHINGTON	289
TRACED BY N.J.M. MWP		DATE 6/6/36
CHECKED BY ETM		PRINTED
SET	MOCK & MORRISON ARCHITECTS 228 PERKINS BUILDING TACOMA WASHINGTON	SHEET 4

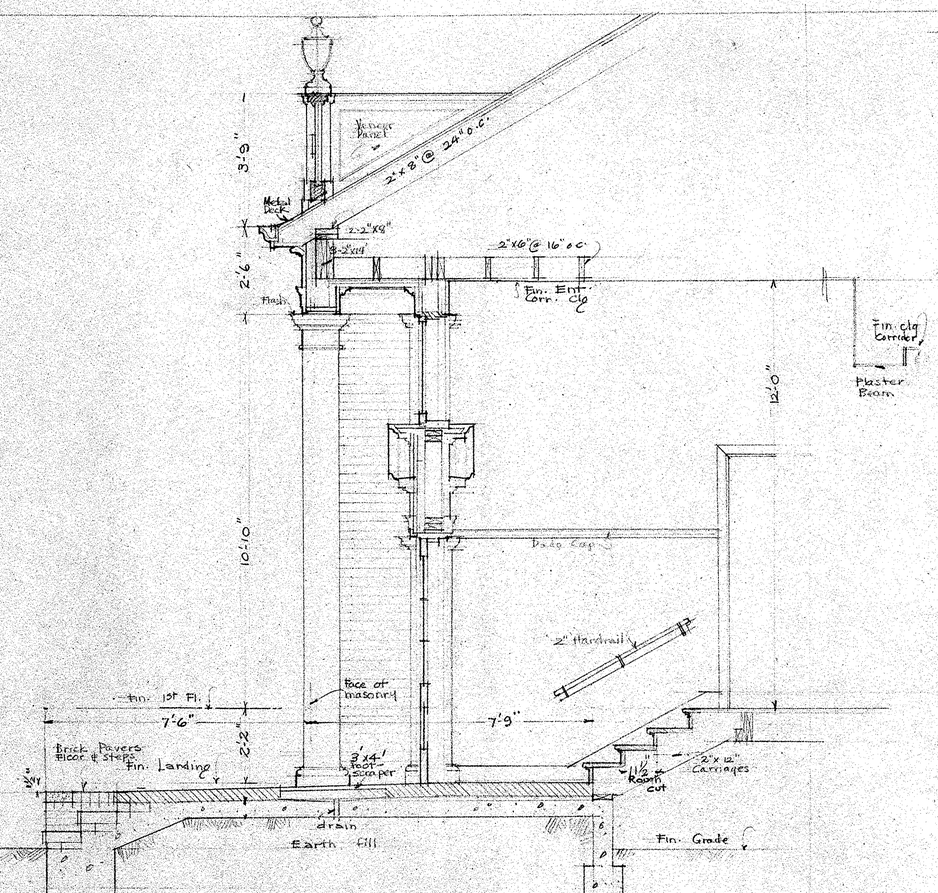
PLOT & ROOF PLAN



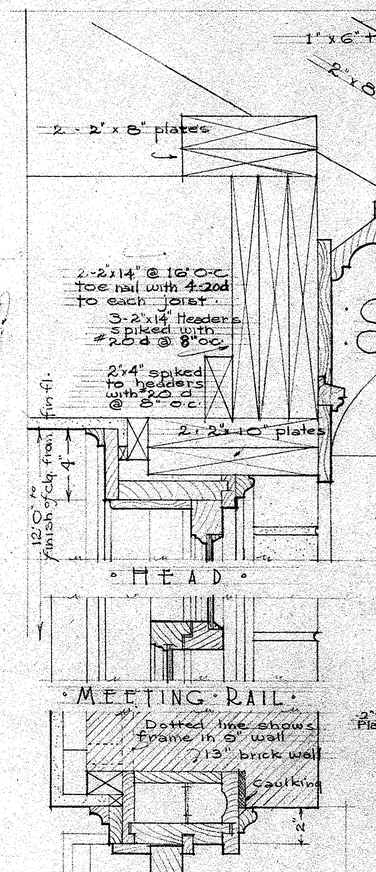
ELEVATION

½ EXTERIOR — ½ INTERIOR

Scale ½" = 1'-0"

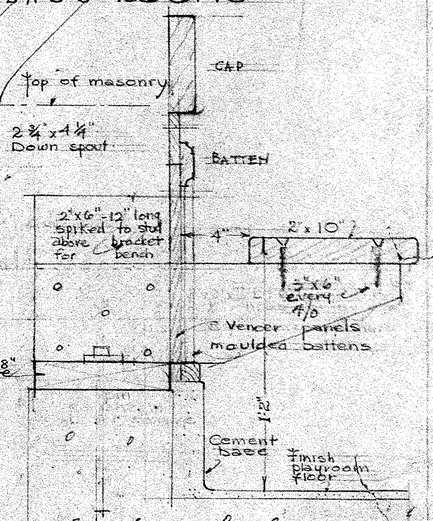


SECTION



CORNICE of CLASS ROOMS

HEAD

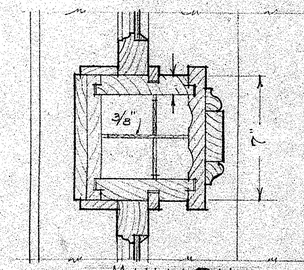


PLAY ROOM BENCH

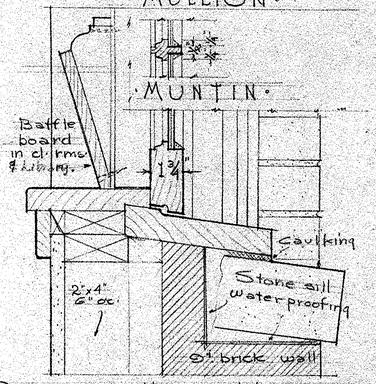
Scale 3" = 1'-0"

MEETING RAIL

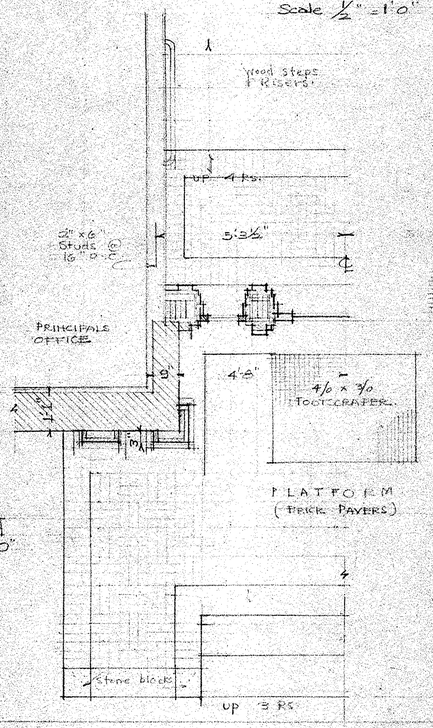
JAMB



MULLION

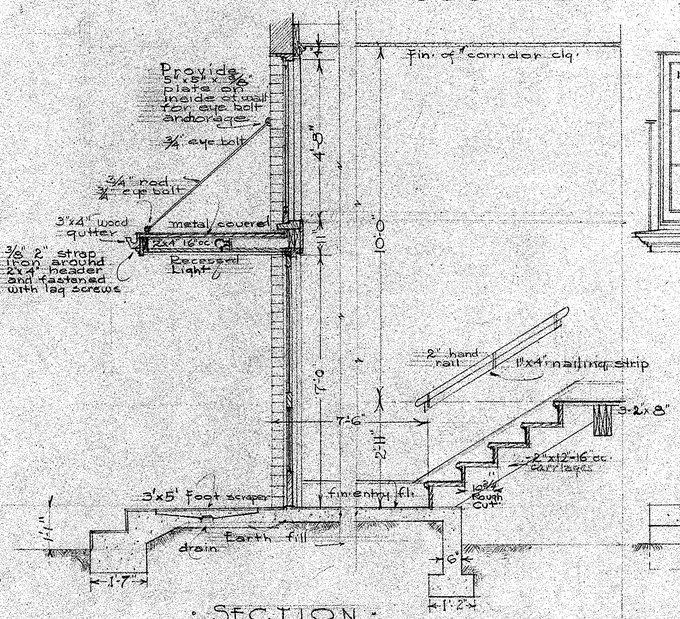


MUNTIN

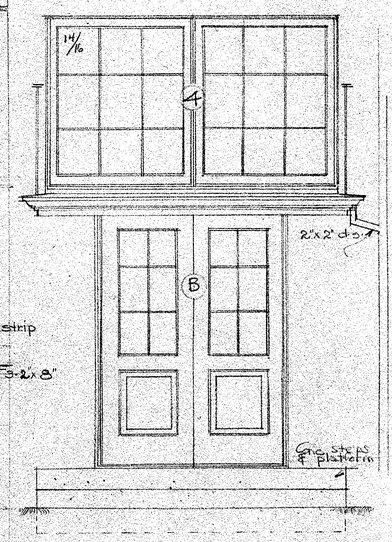


PLAN

Scale ½" = 1'-0"



SECTION



ELEVATION

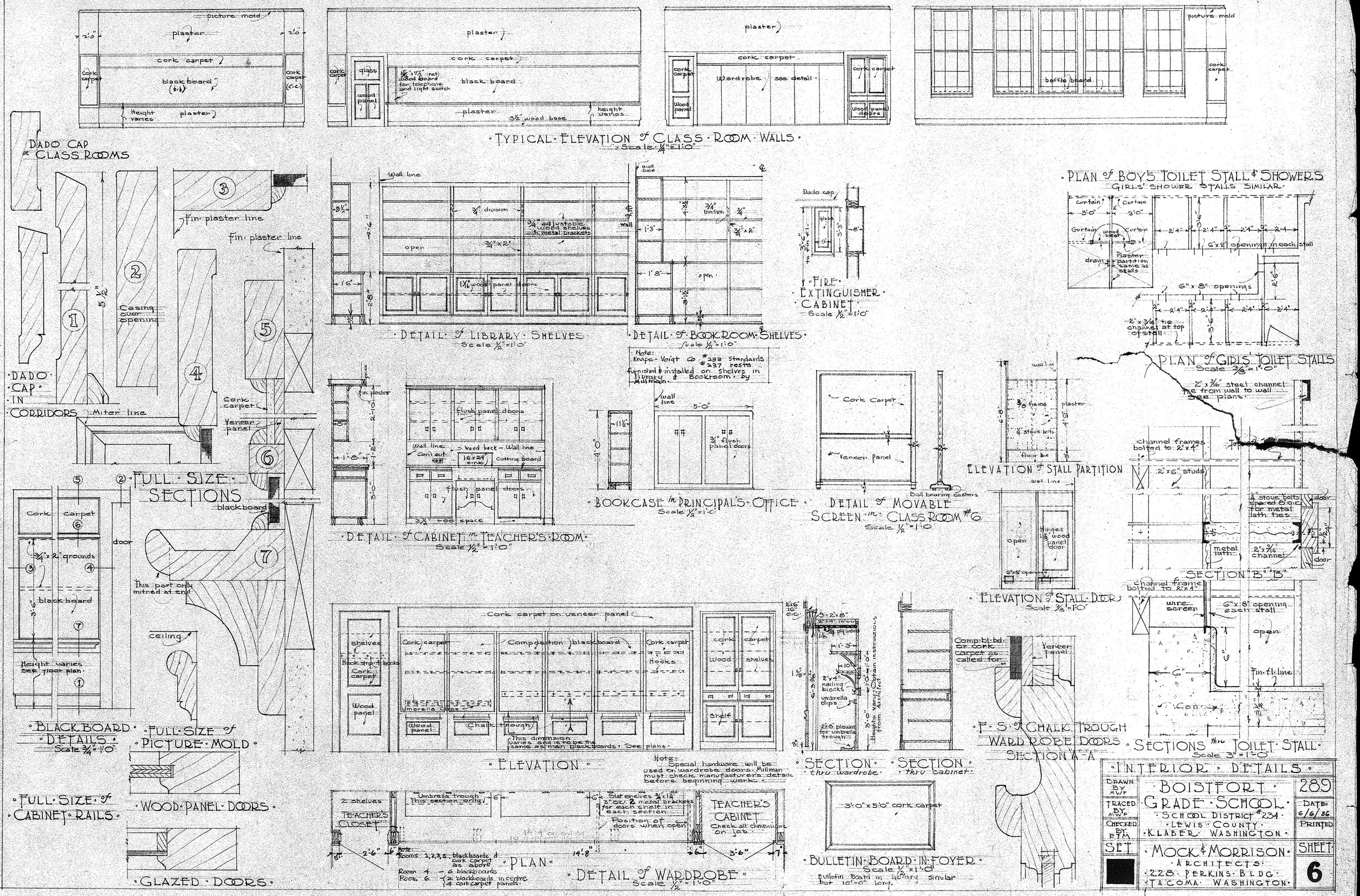
DETAIL of CORRIDOR ENTRANCES

Scale ½" = 1'-0"

DOUBLE HUNG WINDOWS

Scale 3" = 1'-0"

ENTRANCE & WINDOW DETAILS		
DRAWN BY N.J.M. M.W.P.	BOISTFORT GRADE SCHOOL	289
TRACED BY N.J.M. M.W.P.	SCHOOL DISTRICT #234	DATE 6/6/36
CHECKED BY E.J.M.	LEWIS COUNTY KLAPER WASHINGTON	PRINTED
SET	MOCK & MORRISON ARCHITECTS 228 PERKINS BUILDING TACOMA WASHINGTON	SHEET 5

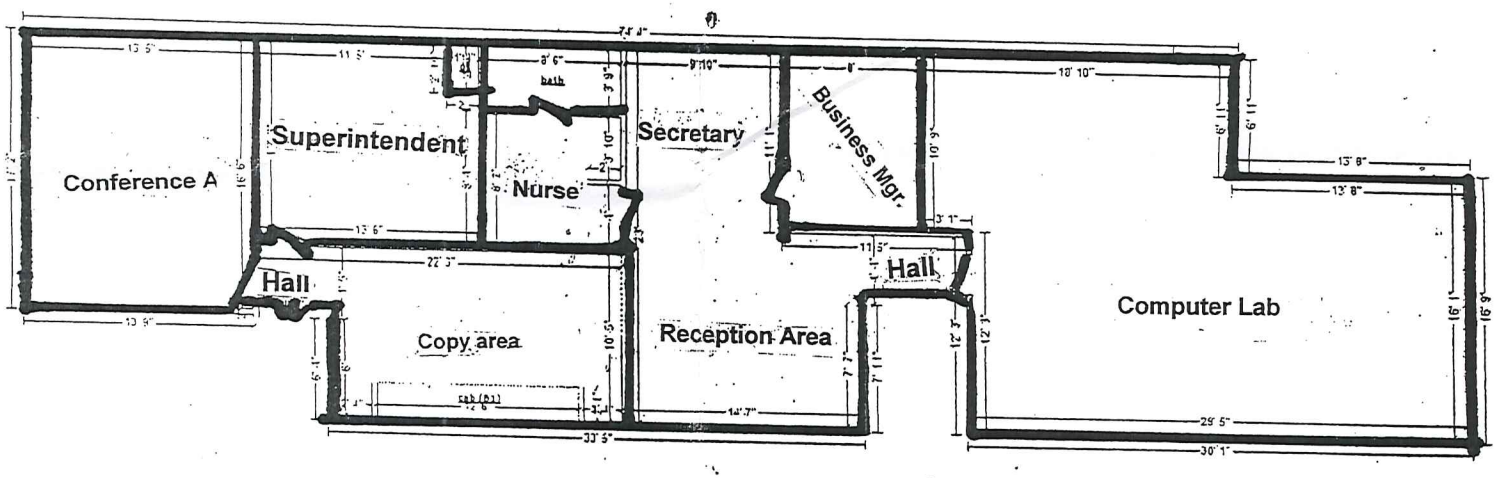


TYPICAL ELEVATION of CLASS ROOM WALLS
Scale 1/4"=1'0"
DADO CAP in CLASS ROOMS
DADO CAP IN CORRIDORS
FULL SIZE SECTIONS
BLACKBOARD DETAILS
Scale 3/4"=1'0"
FULL SIZE of PICTURE MOLD
FULL SIZE of CABINET RAILS
WOOD PANEL DOORS
GLAZED DOORS
DETAIL of LIBRARY SHELVES
Scale 1/2"=1'0"
DETAIL of BOOKROOM SHELVES
Scale 1/2"=1'0"
Note: Knape-Voigt Co #233 standards #237 rests furnished & installed on shelves in library & Bookroom by Millman.
FIRE EXTINGUISHER CABINET
Scale 1/2"=1'0"
DETAIL of CABINET in TEACHER'S ROOM
Scale 1/2"=1'0"
BOOKCASE in PRINCIPAL'S OFFICE
Scale 1/2"=1'0"
DETAIL of MOVABLE SCREEN in CLASS ROOM #6
Scale 1/2"=1'0"
PLAN of BOY'S TOILET STALL & SHOWERS
GIRLS' SHOWER STALLS SIMILAR
PLAN of GIRLS' TOILET STALLS
Scale 3/8"=1'0"
ELEVATION of STALL PARTITION
ELEVATION of STALL DOOR
Scale 3/8"=1'0"
SECTION "B" "B"
SECTIONS thru TOILET STALL
Scale 3"=1'0"
ELEVATION
Note: Special hardware will be used on wardrobe doors. Millman must check manufacturer's details before beginning work.
SECTION thru wardrobe
SECTION thru cabinet
F.S. of CHALK TROUGH WARDROBE DOORS SECTION "A"-"A"
PLAN
DETAIL of WARDROBE
Scale 1/2"=1'0"
BULLETIN BOARD IN FOYER
Scale 1/2"=1'0"
Bulletin Board in library similar but 10'-0" long.
INTERIOR DETAILS
BOISTFORT GRADE SCHOOL
SCHOOL DISTRICT #234
LEWIS COUNTY
KLABER WASHINGTON
MOCK & MORRISON
ARCHITECTS
228 PERKINS BLDG
TACOMA WASHINGTON
289
DATE 6/6/36
PRINTED
SHEET 6

Boistfort Elementary School
983 Boistfort Rd.
Curtis, WA 98538

Phone: 360-245-3343
Fax: 360-245-3451

upstairs



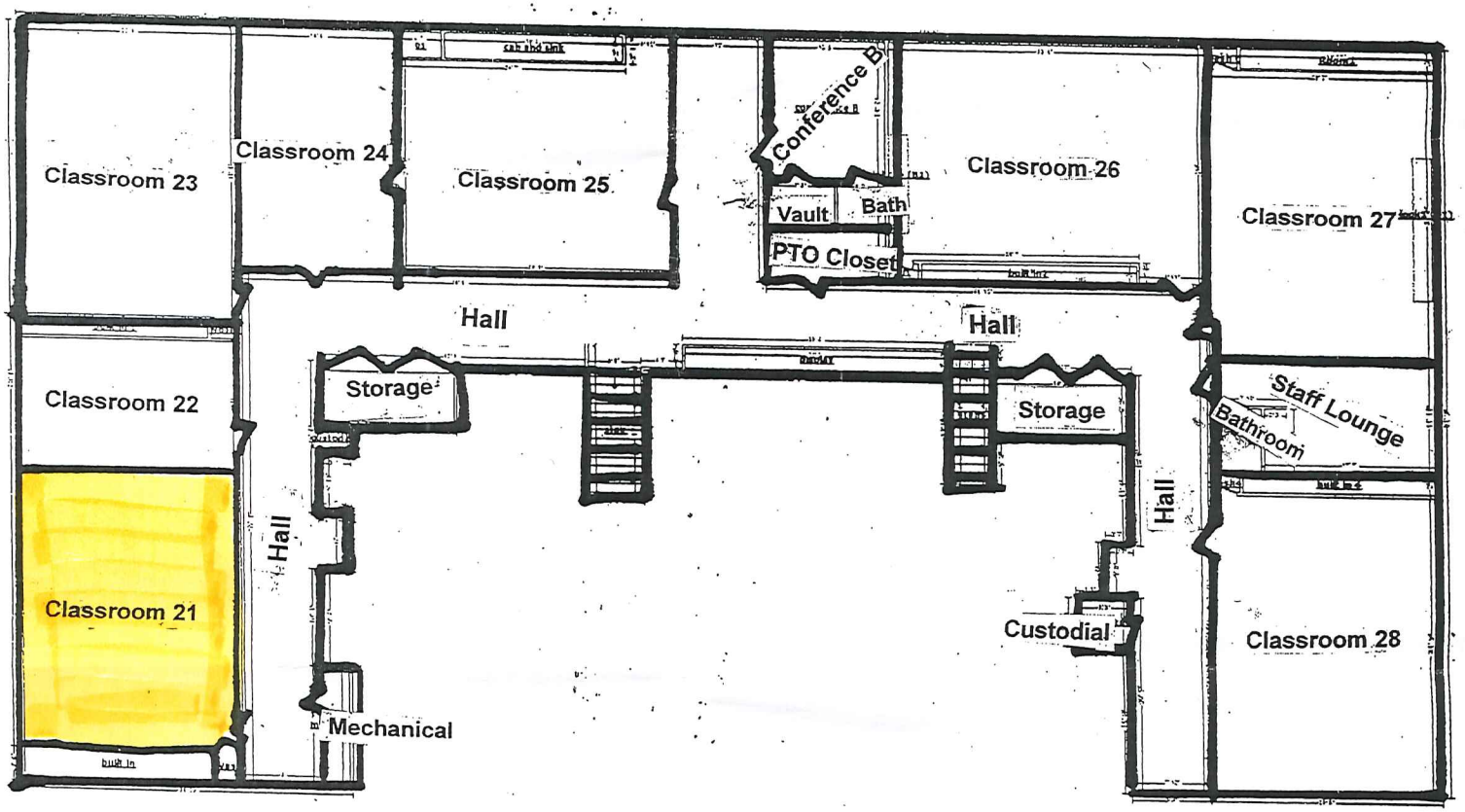
N
upstairs

S

Boistfort Elementary School
983 Boistfort Rd.
Curtis, WA 98538

Phone: 360-245-3343
Fax: 360-245-3451

Main Level

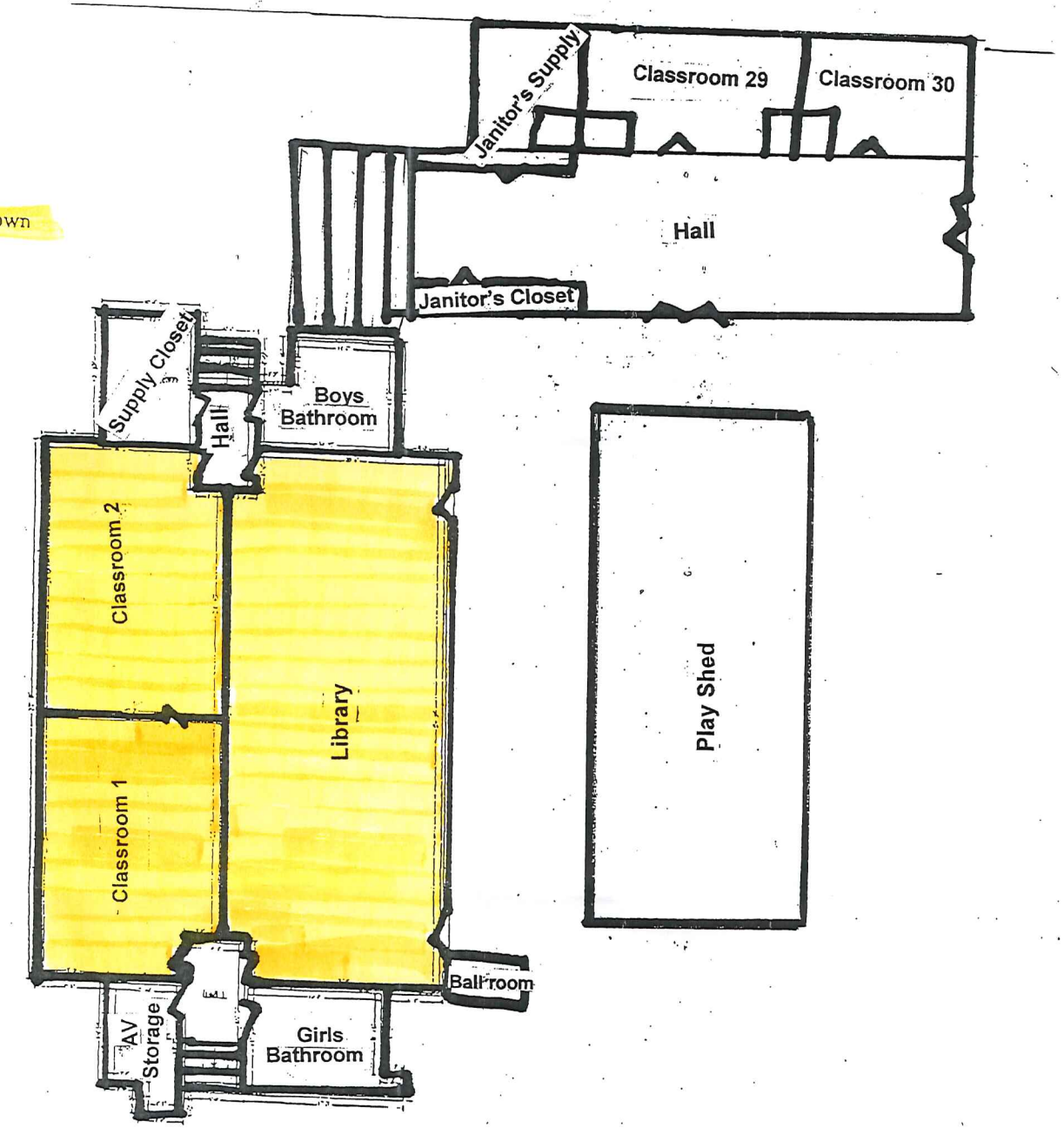


Main Level

Boistfort Elementary School
983 Boistfort Rd.
Curtis, WA 98538

Phone: 360-245-3343
Fax: 360-245-3451

down

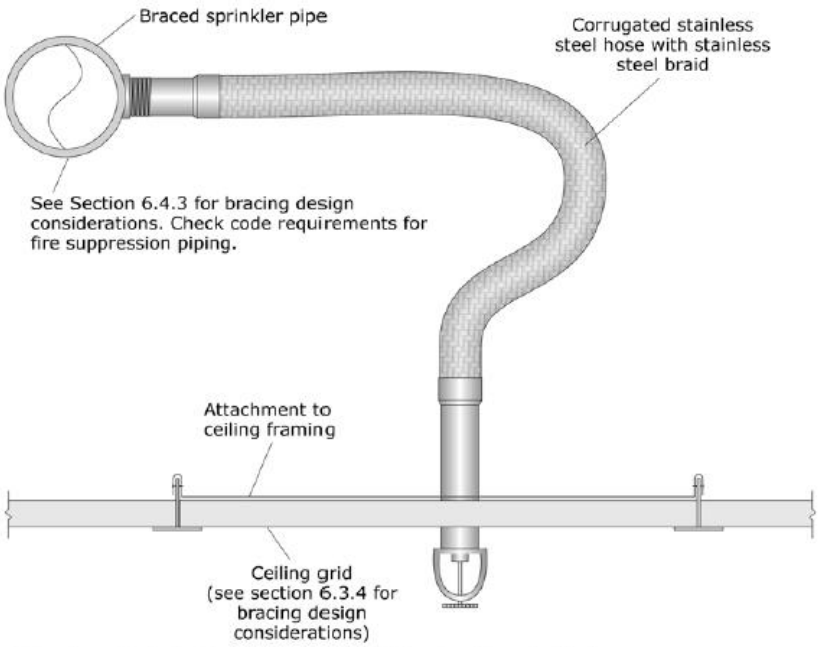


ELEMENTRY. SCHOOL

This page intentionally left blank.

Appendix F: FEMA E-74 Nonstructural Seismic Bracing Excerpts

This page intentionally left blank.



Note: for seismic design category D, E & F, the flexible sprinkler hose fitting must accommodate at least 1" of ceiling movement without use of an oversized opening. Alternatively, the sprinkler head must have a 2" oversize ring or adapter that allows 1" movement in all directions.

Figure G-1. Flexible Sprinkler Drop.

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

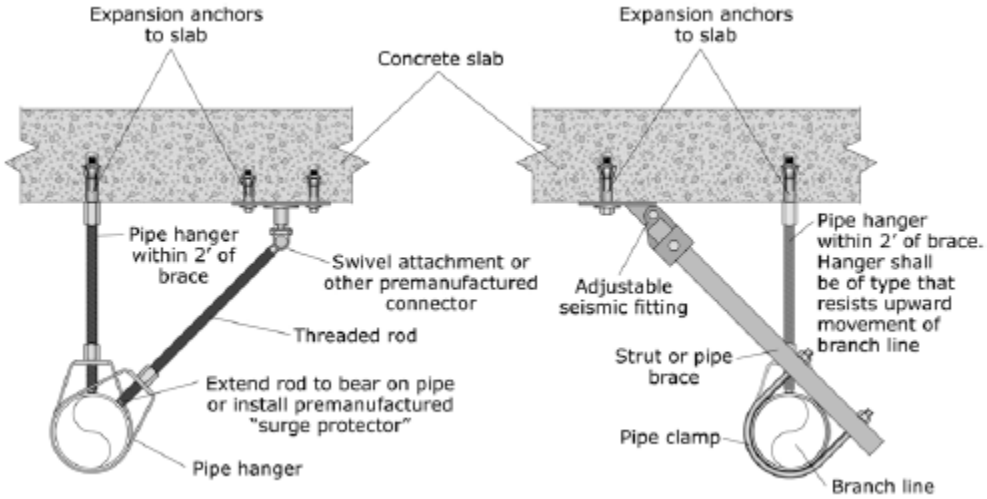


Figure G-2. End of Line Restraint.

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

Partitions

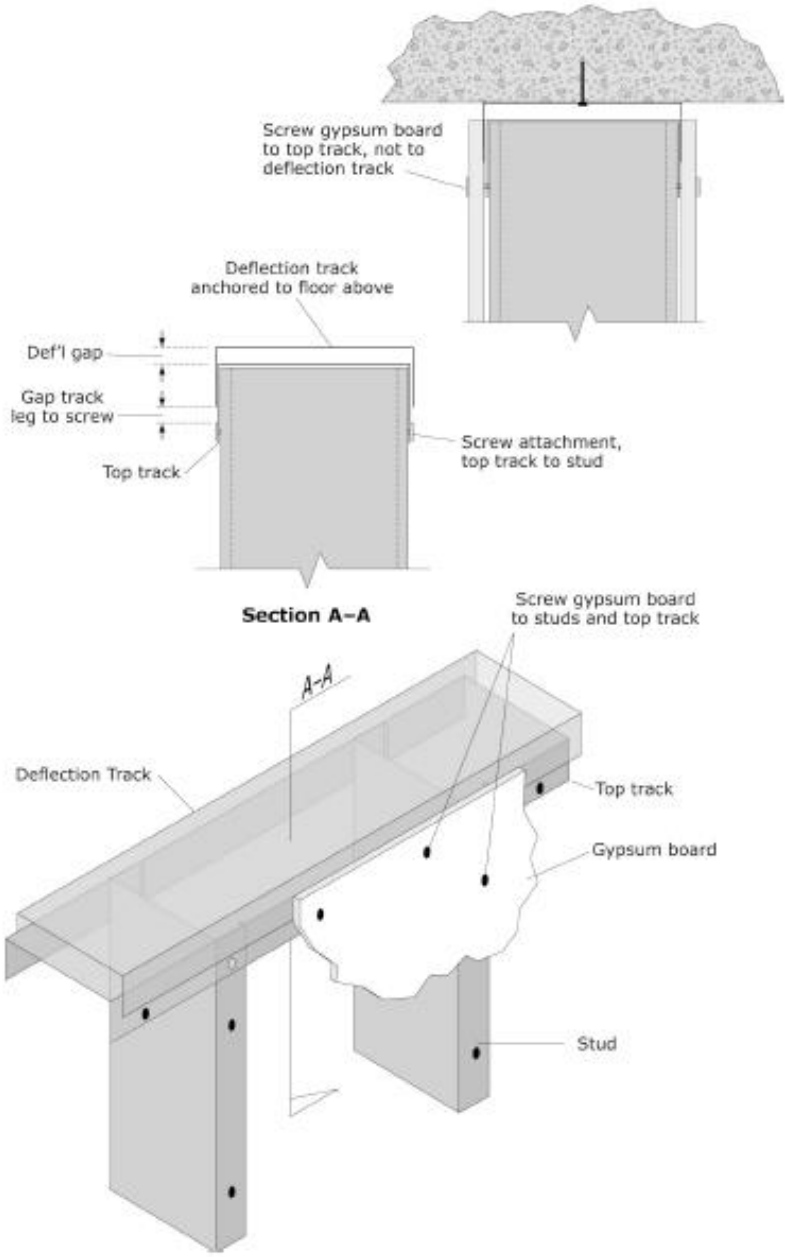


Figure G-3. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

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

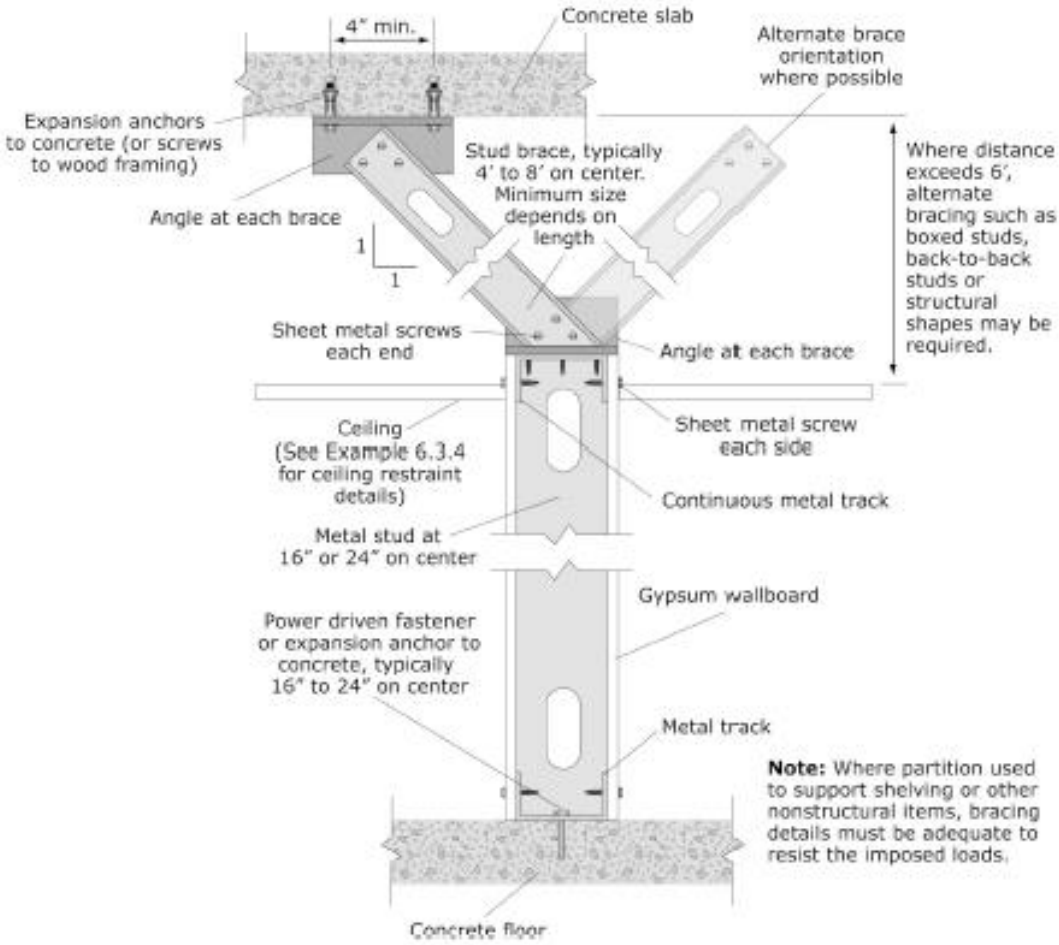
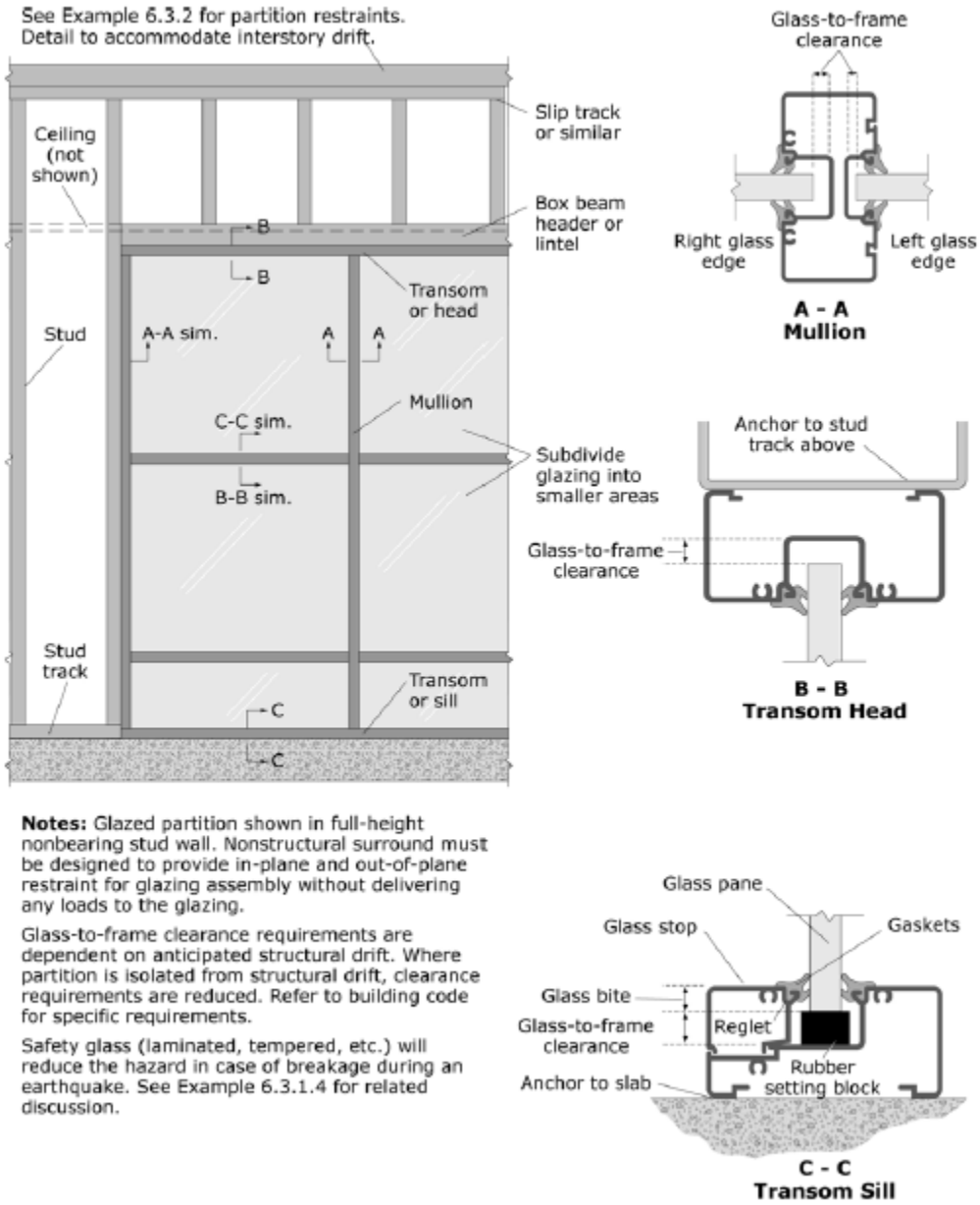


Figure G-4. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

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



Notes: Glazed partition shown in full-height nonbearing stud wall. Nonstructural surround must be designed to provide in-plane and out-of-plane restraint for glazing assembly without delivering any loads to the glazing.

Glass-to-frame clearance requirements are dependent on anticipated structural drift. Where partition is isolated from structural drift, clearance requirements are reduced. Refer to building code for specific requirements.

Safety glass (laminated, tempered, etc.) will reduce the hazard in case of breakage during an earthquake. See Example 6.3.1.4 for related discussion.

Figure G-5. Full-height Glazed Partition.

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

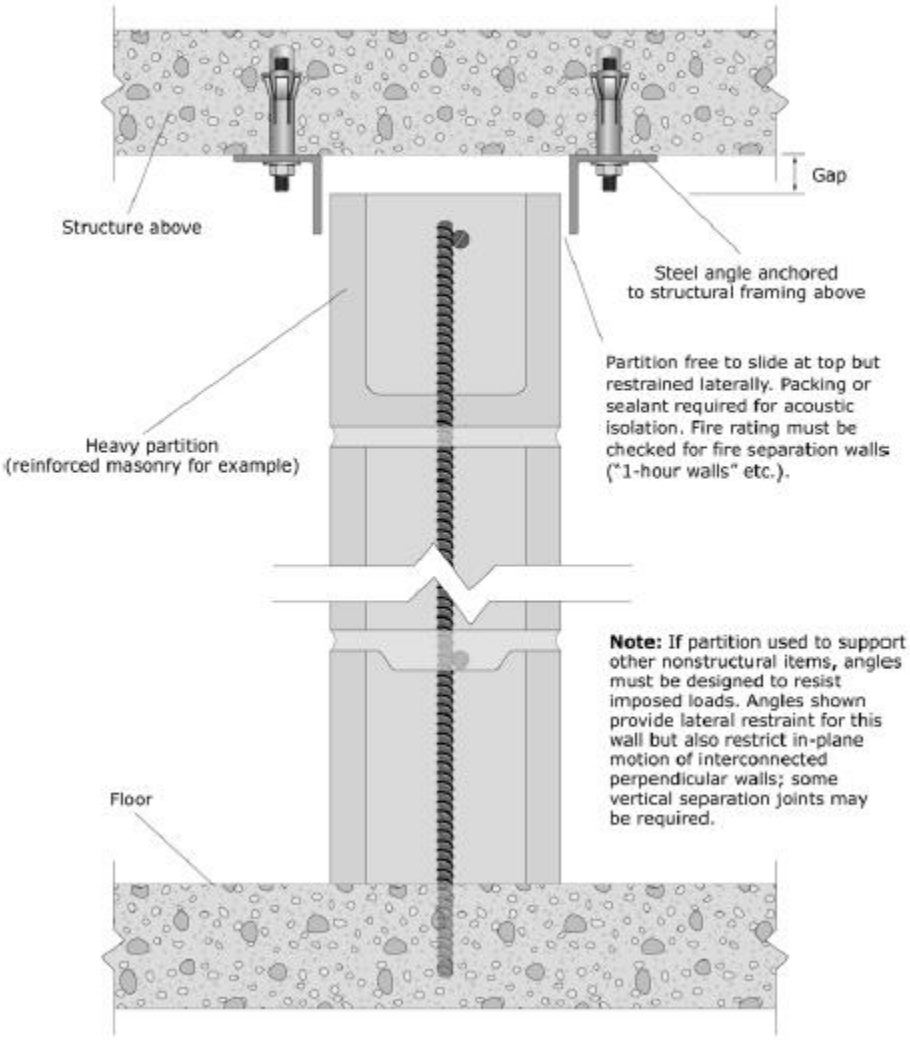


Figure G-6. Full-height Heavy Partition.

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

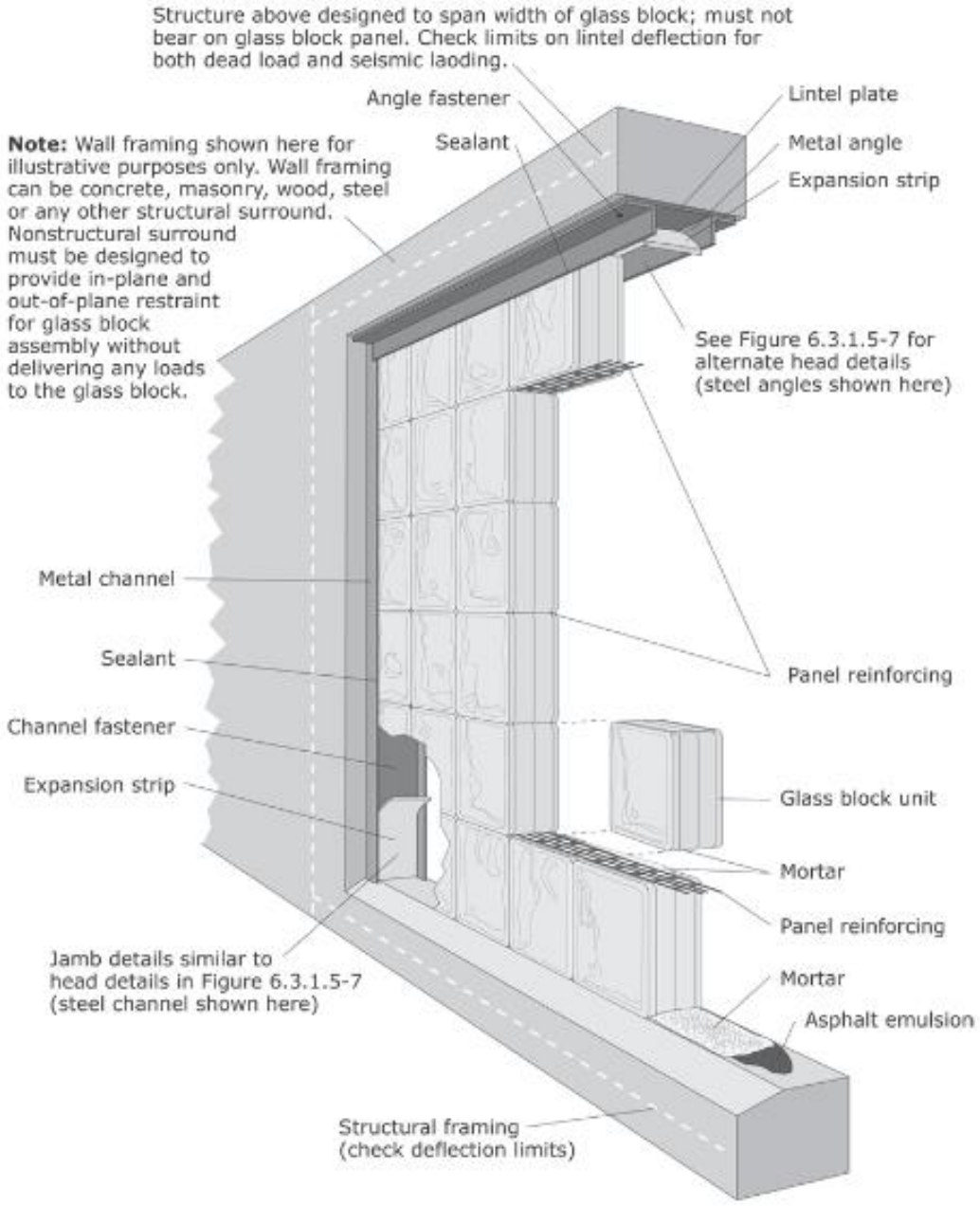


Figure G-7. Typical Glass Block Panel Details.

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

Ceilings

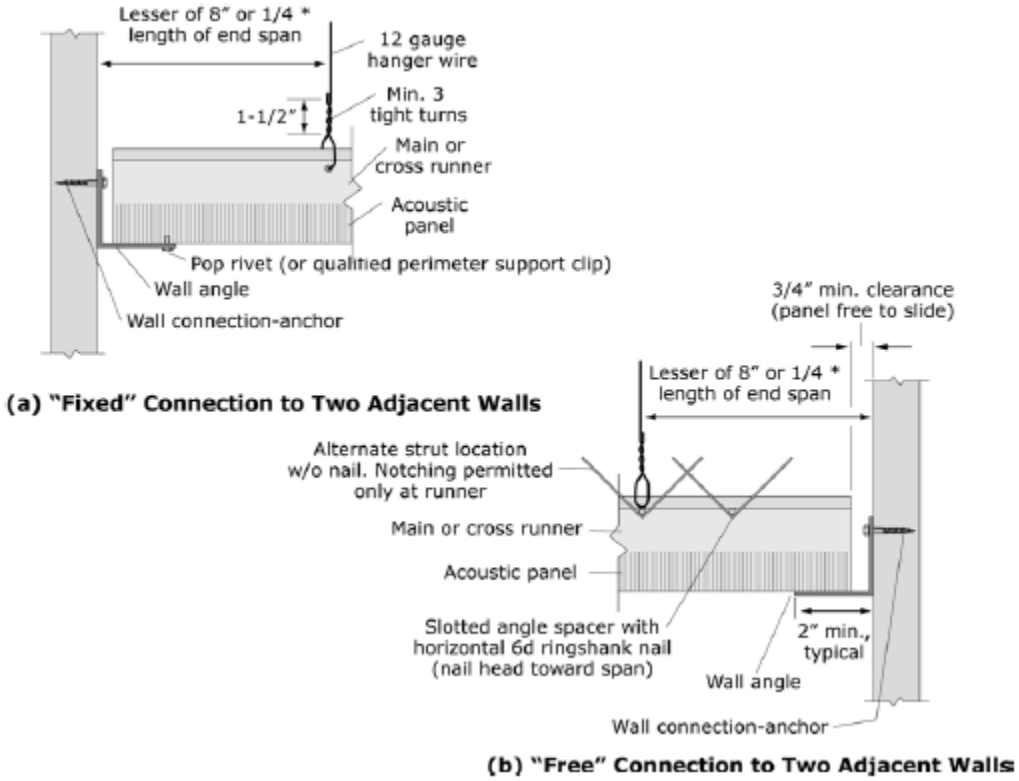
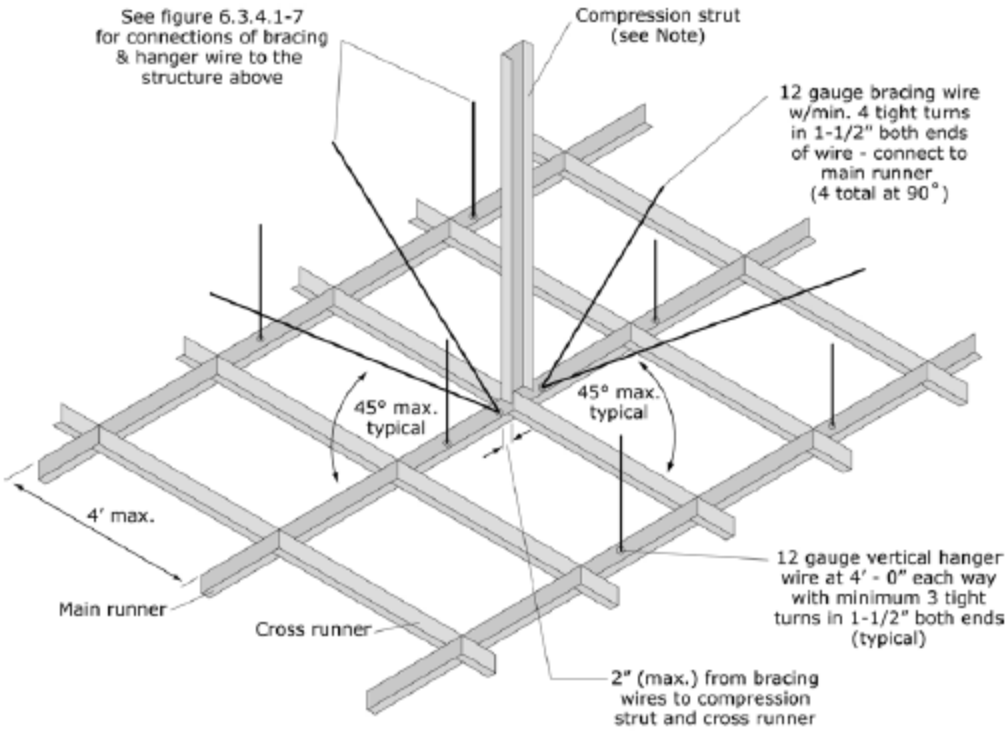


Figure G-8. Suspension System for Acoustic Lay-in Panel Ceilings – Edge Conditions.

(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)

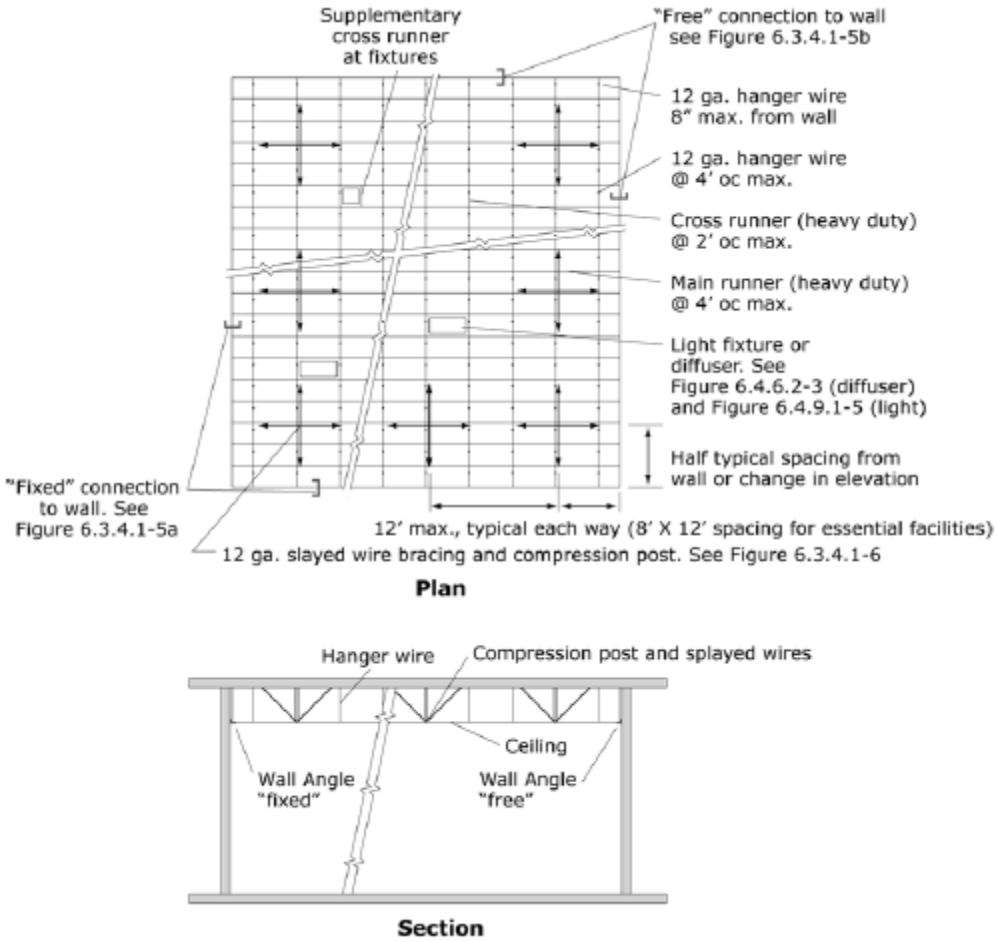


Figure G-10. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Layout.

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

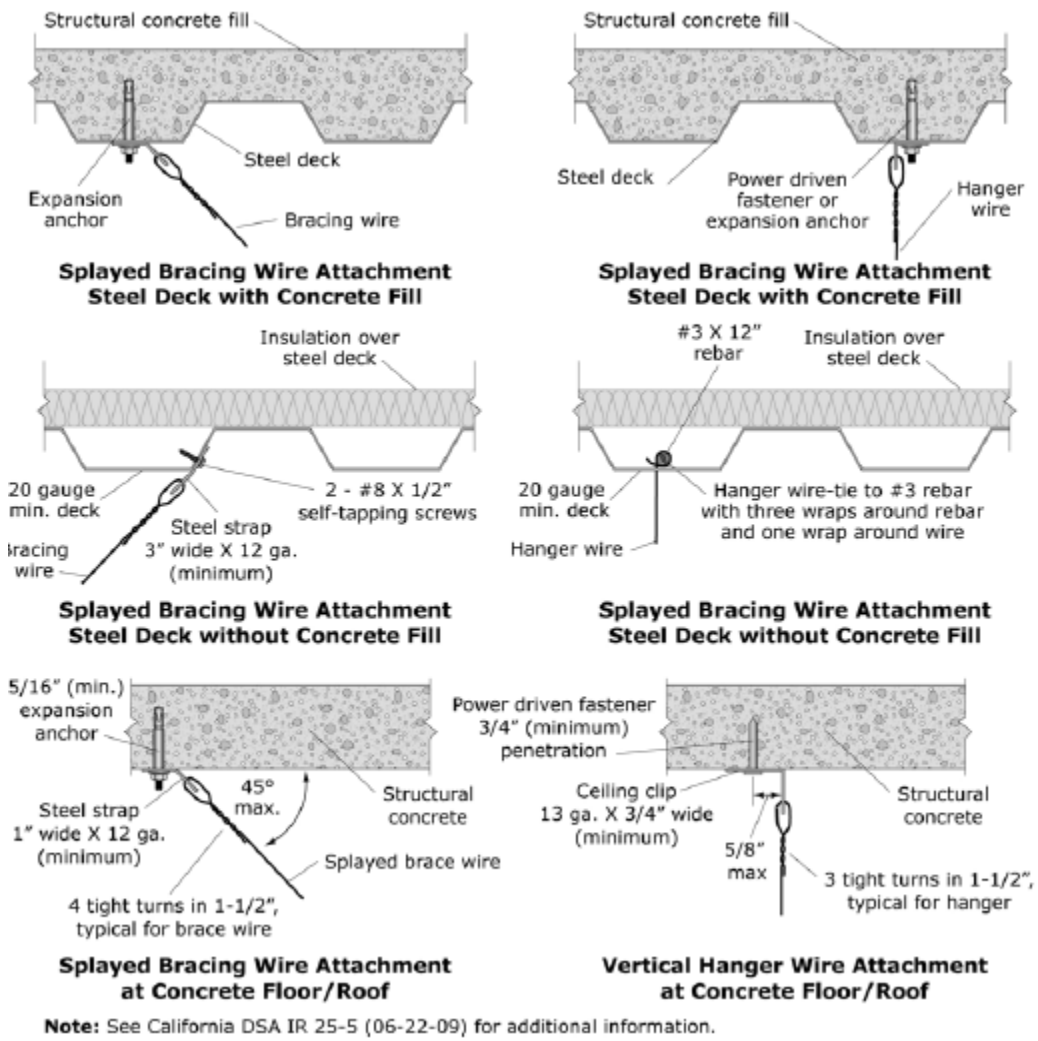
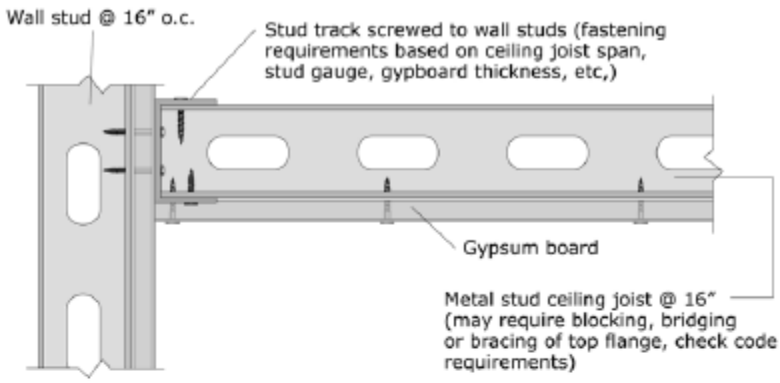
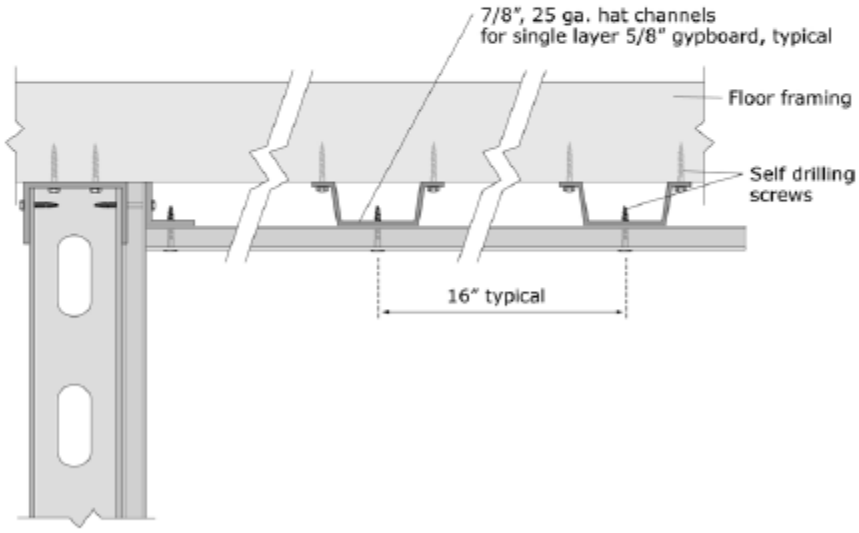


Figure G-11. Suspension System for Acoustic Lay-in Panel Ceilings – Overhead Attachment Details.

(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)

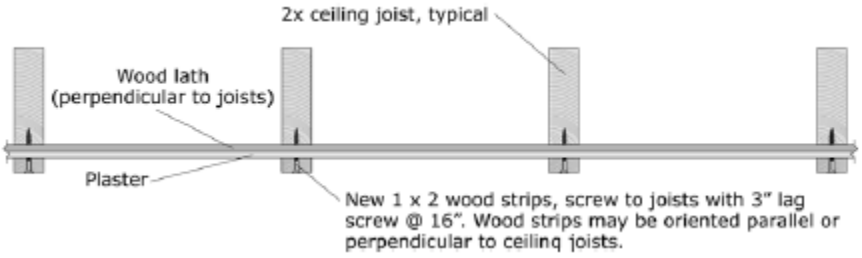


Figure G-13. Retrofit Detail for Existing Lath and Plaster.

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

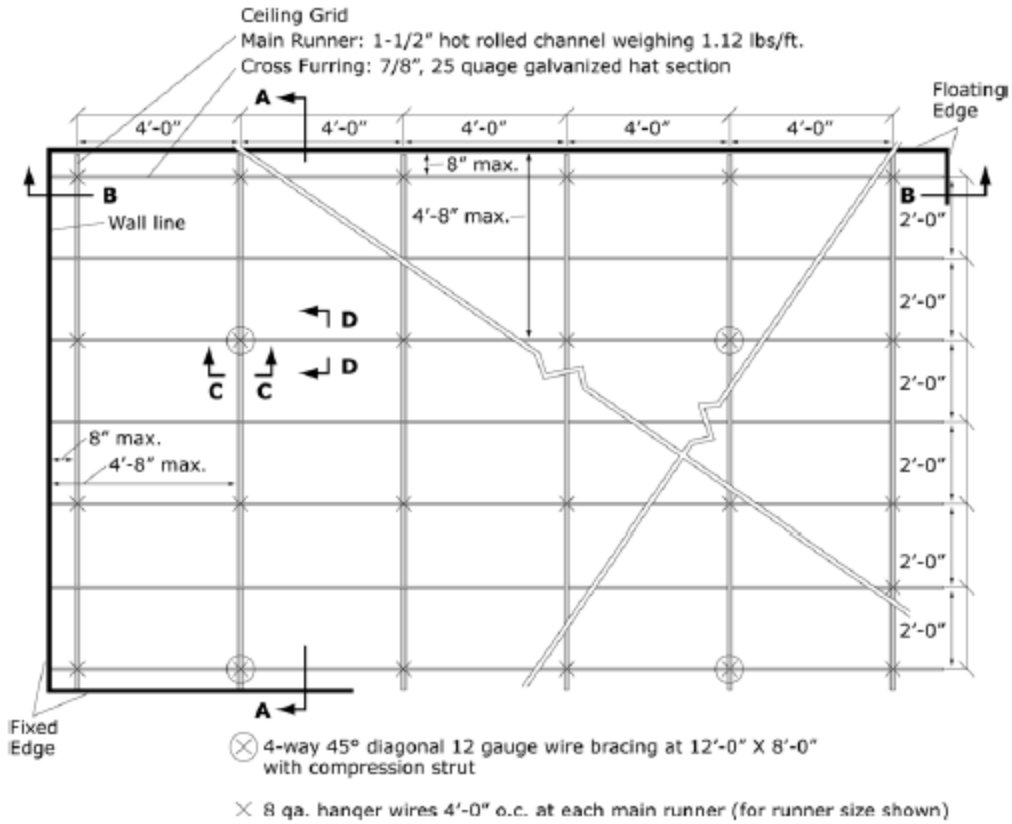


Figure G-14. Diagrammatic View of Suspended Heavy Ceiling Grid and Lateral Bracing.

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

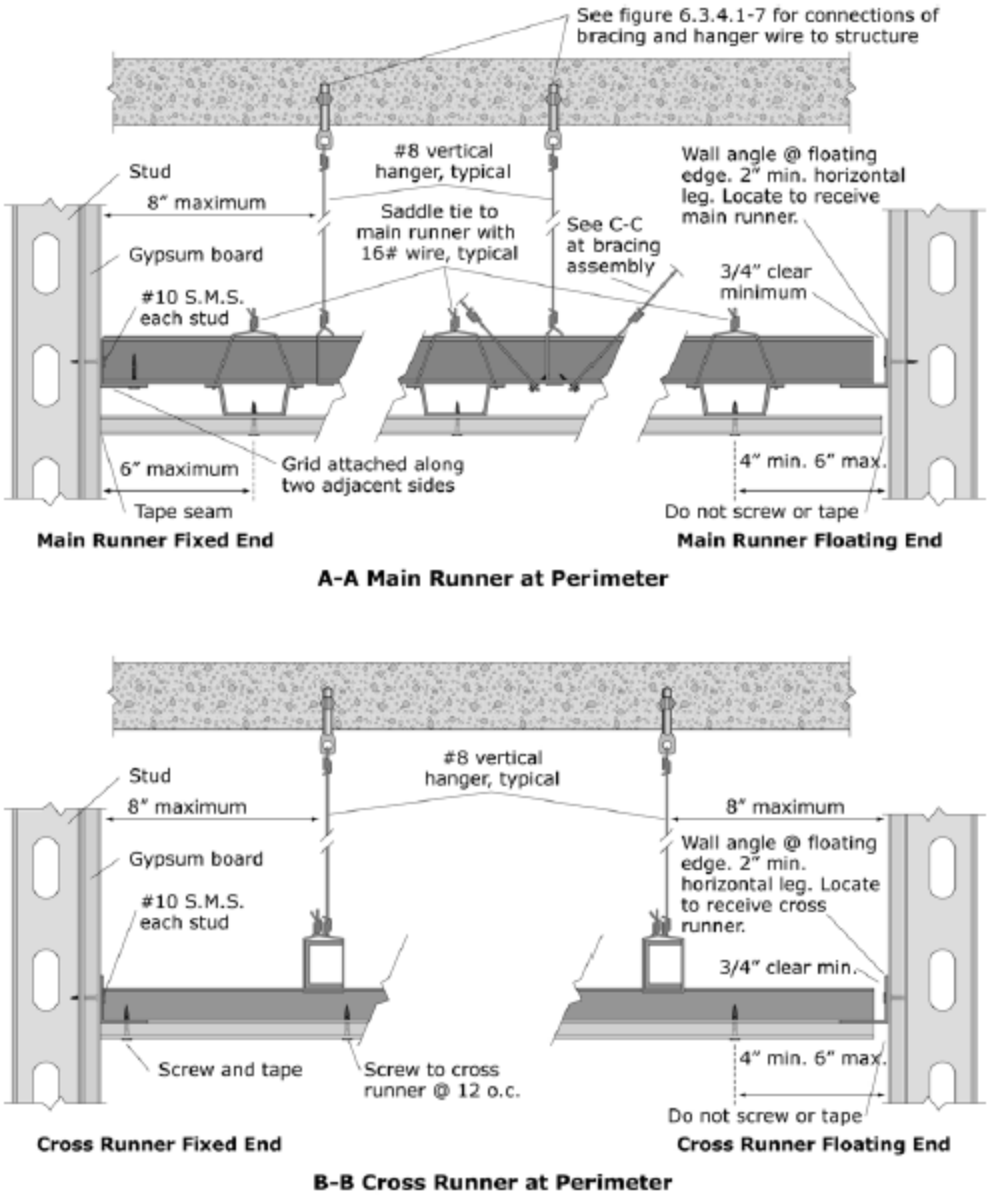
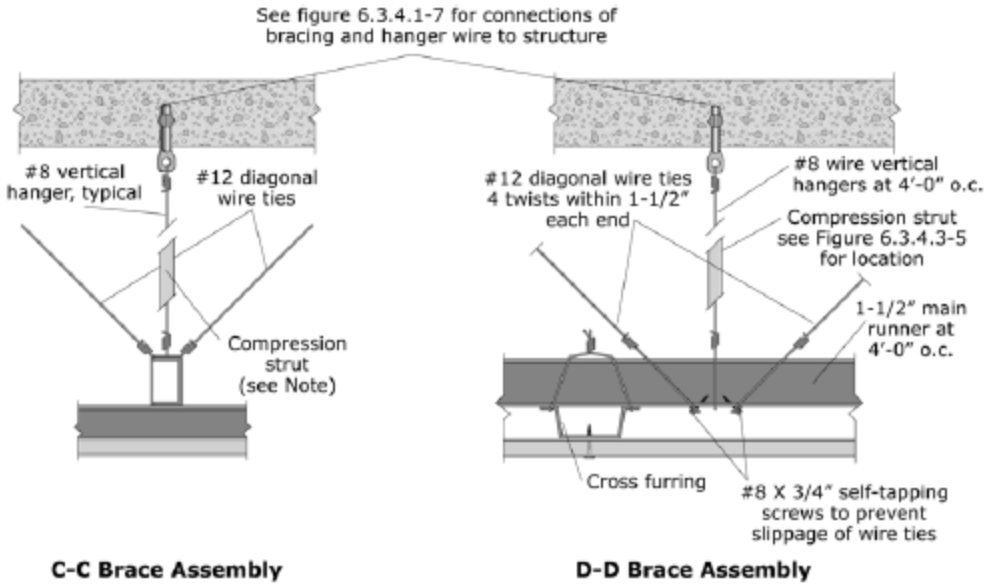


Figure G-15. Perimeter Details for Suspended Gypsum Board Ceiling.

(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

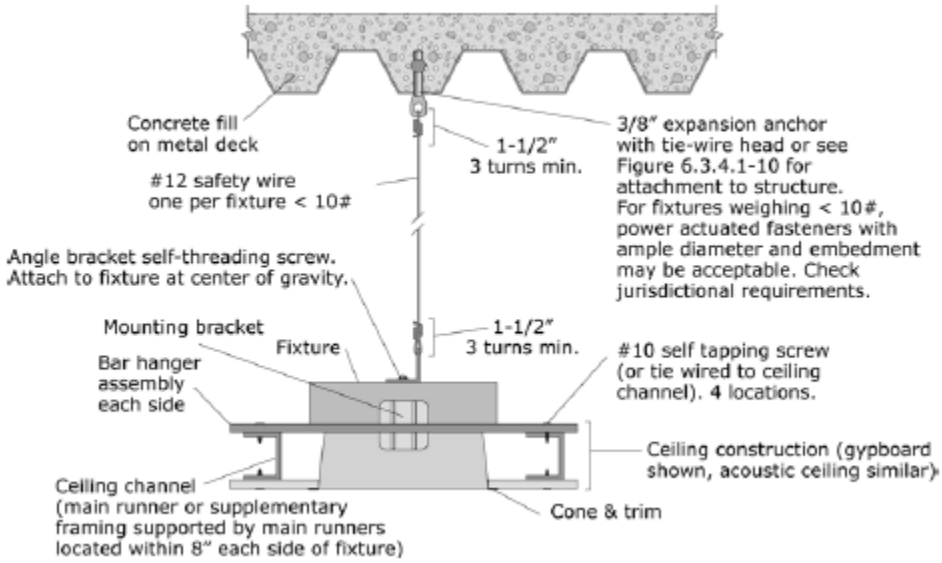


Figure G-17. Recessed Light Fixture in suspended Ceiling (Fixture Weight < 10 pounds).

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

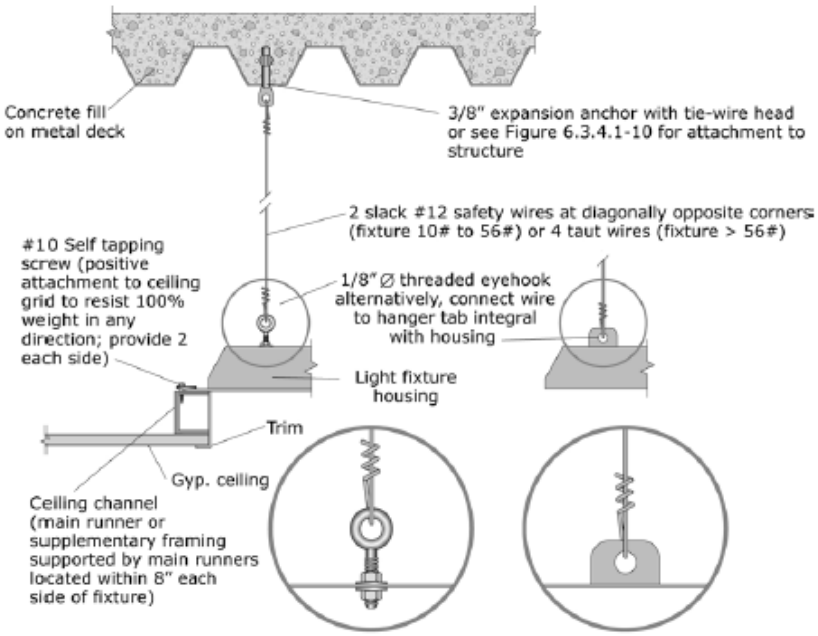


Figure G-18. Recessed Light Fixture in suspended Ceiling (Fixture Weight 10 to 56 pounds).

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

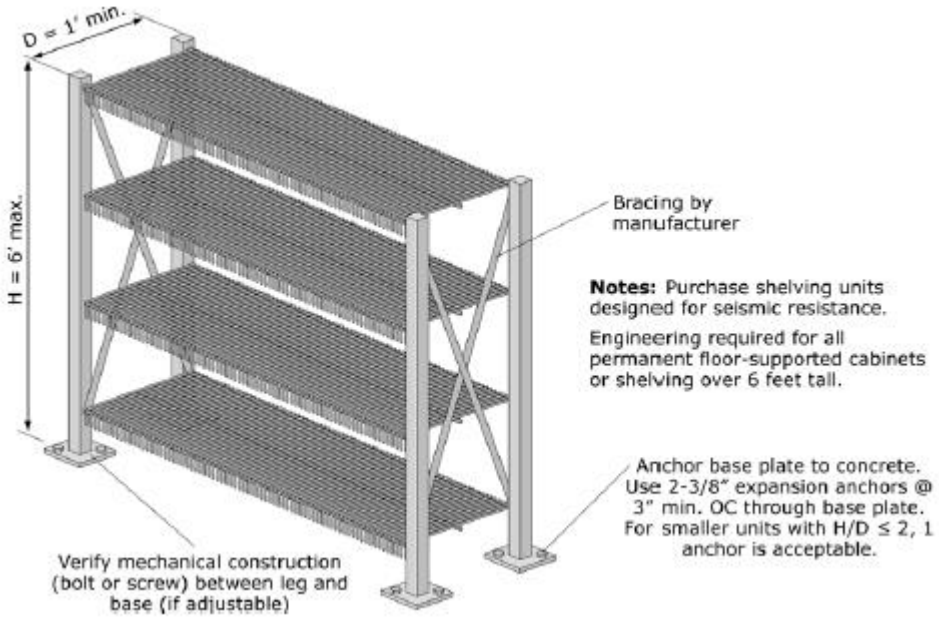
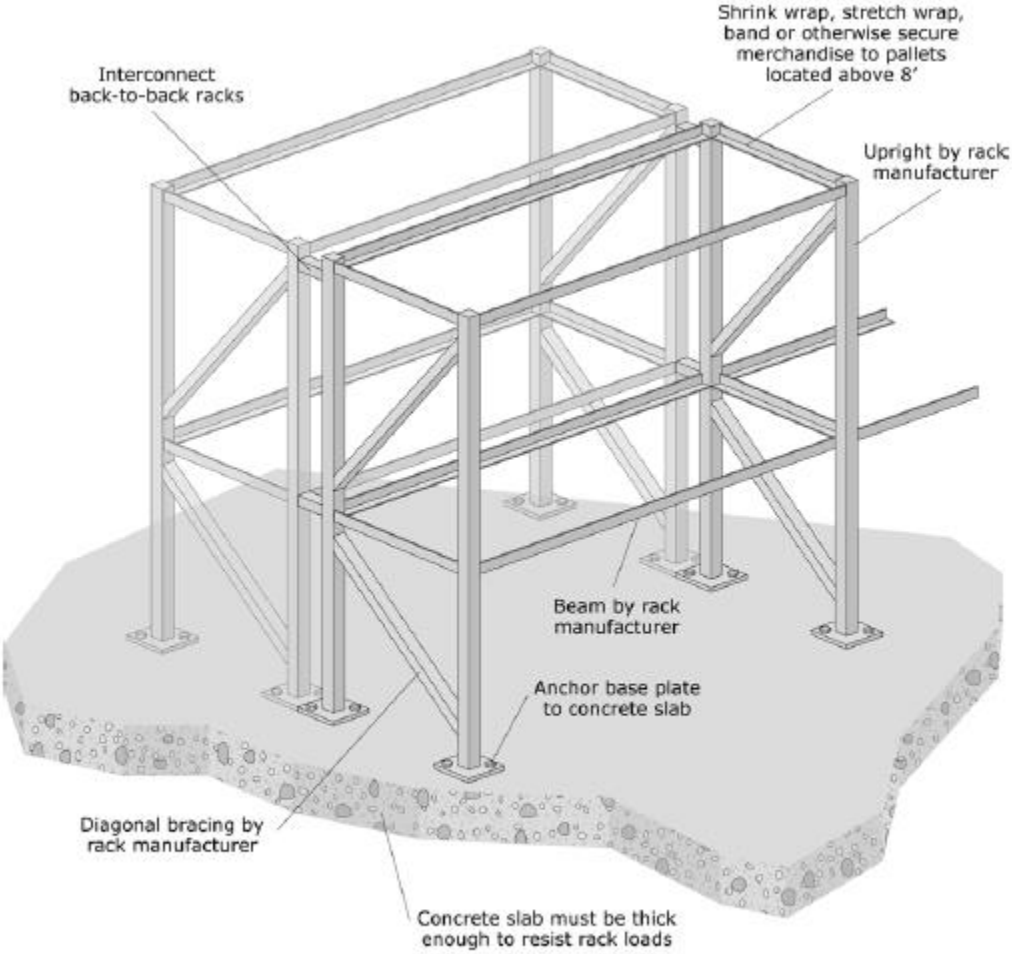


Figure G-19. Light Storage Racks.

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



Note: Purchase storage racks designed for seismic resistance. Storage racks may be classified as either nonstructural elements or nonbuilding structures depending upon their size and support conditions. Check the applicable code to see which provisions apply.

Figure G-20. Industrial Storage Racks.

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

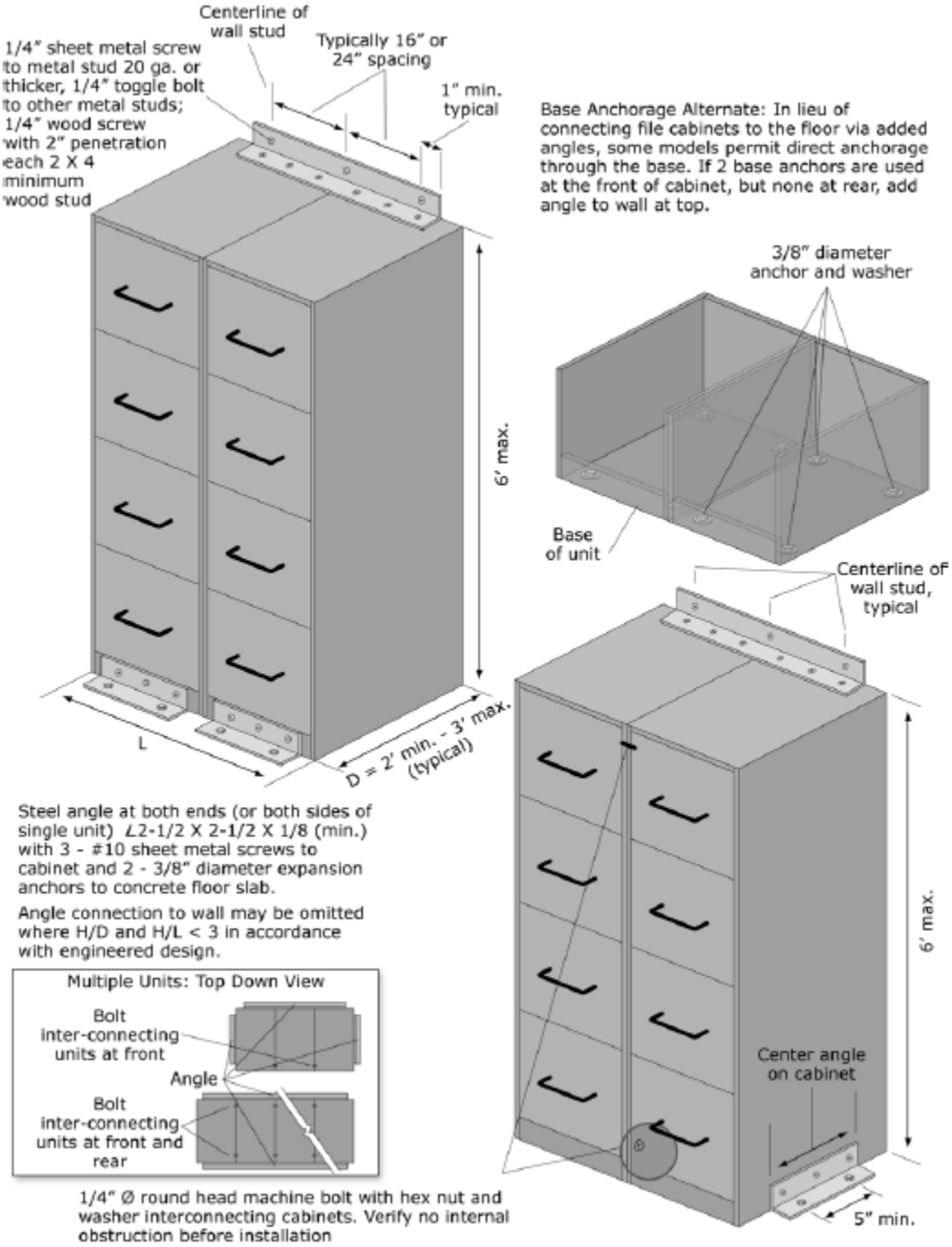


Figure G-21. Wall-mounted File Cabinets.

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

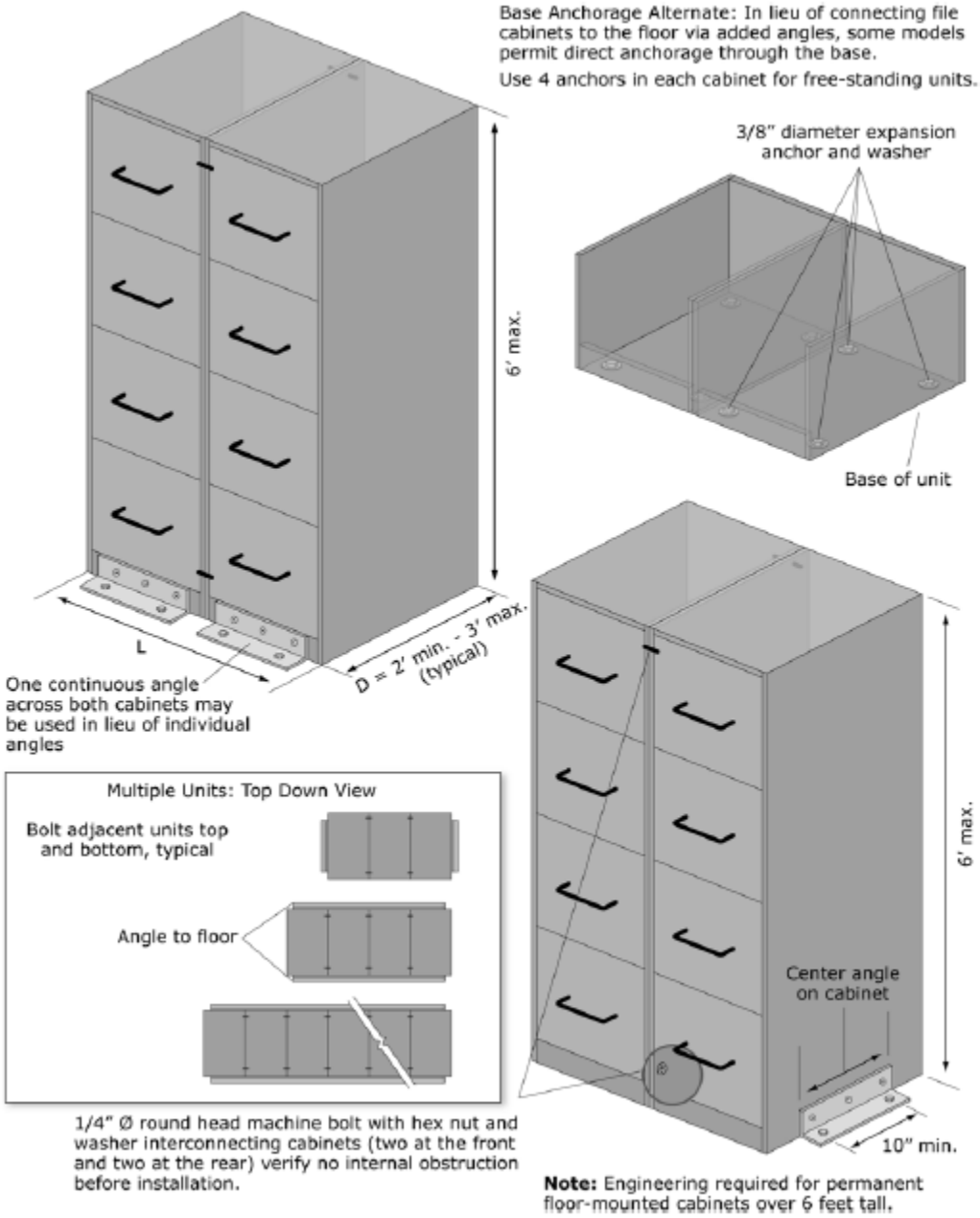


Figure G-22. Base Anchored File Cabinets.

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

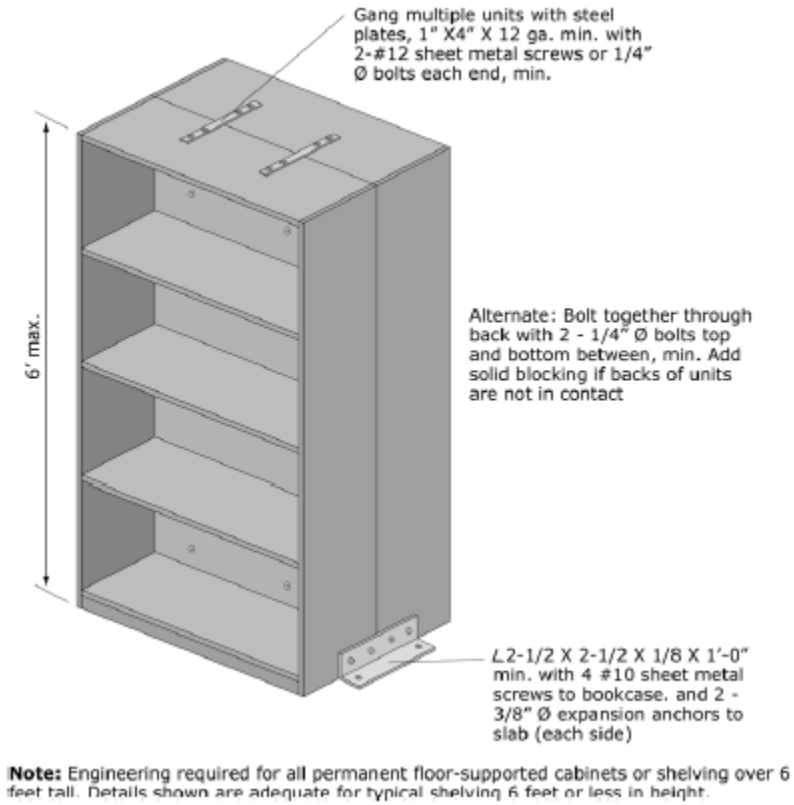


Figure G-23. Anchorage of Freestanding Book Cases Arranged Back to Back.

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

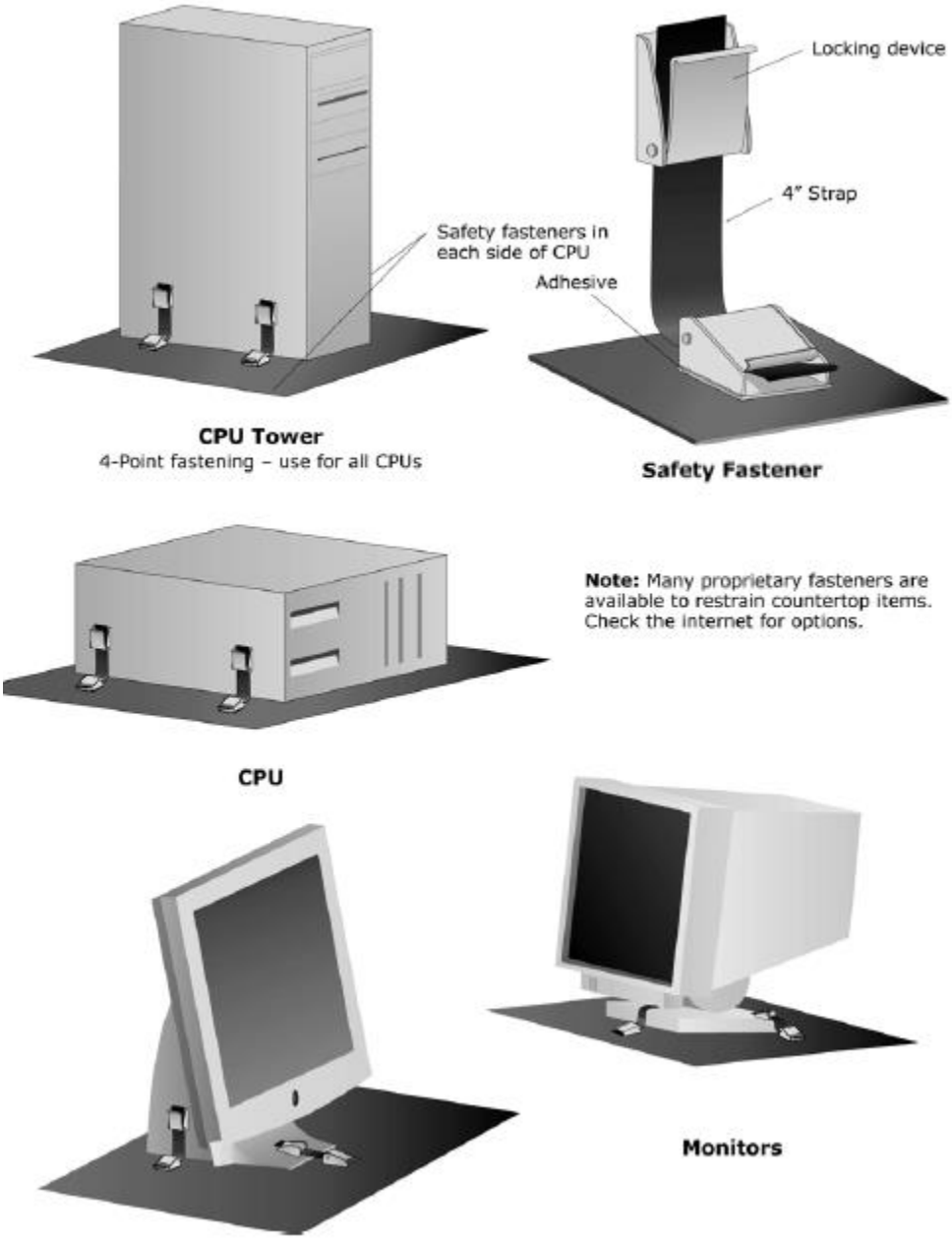
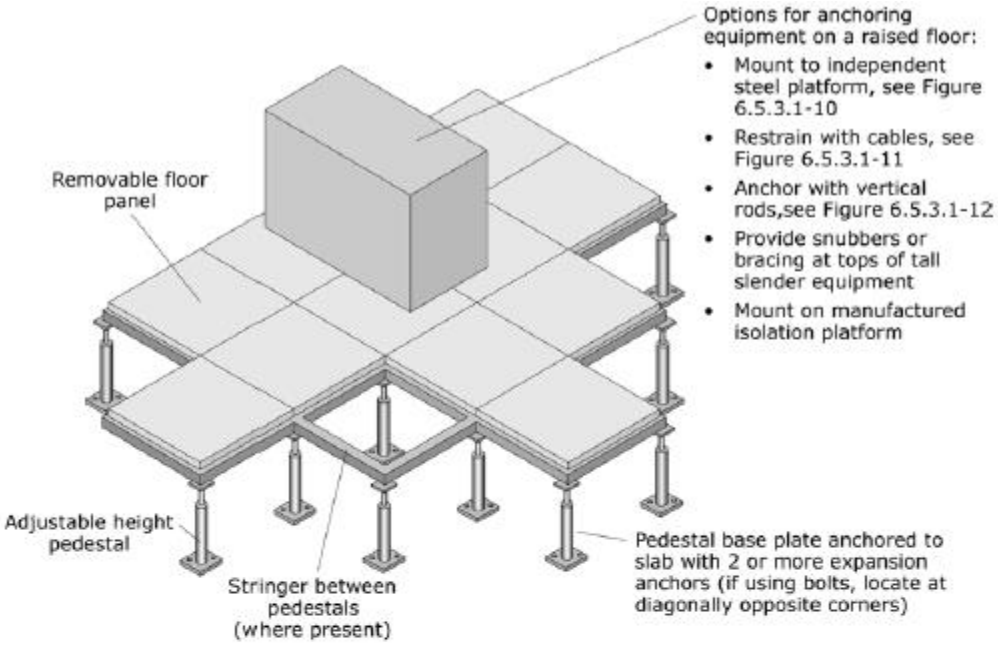
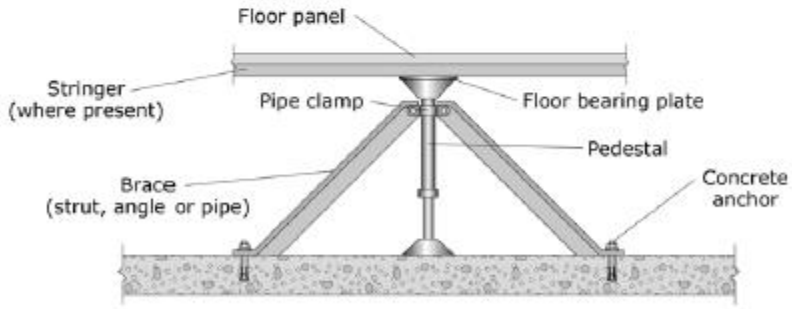


Figure G-24. Desktop Computers and Accessories.

(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)

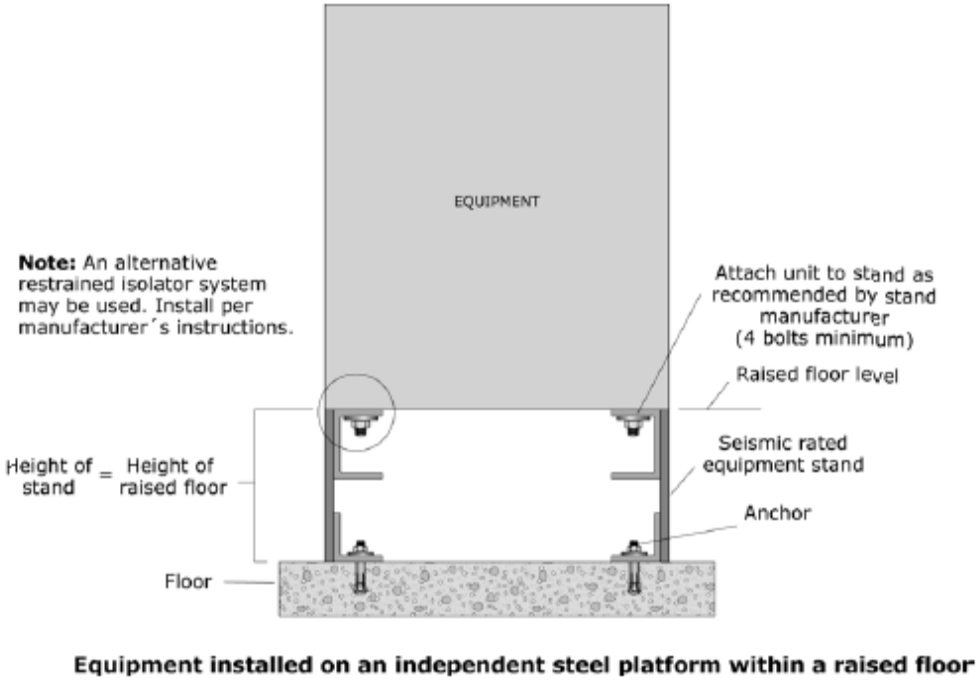


Figure G-26. Equipment Mounted on Access Floor – Independent Base.

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

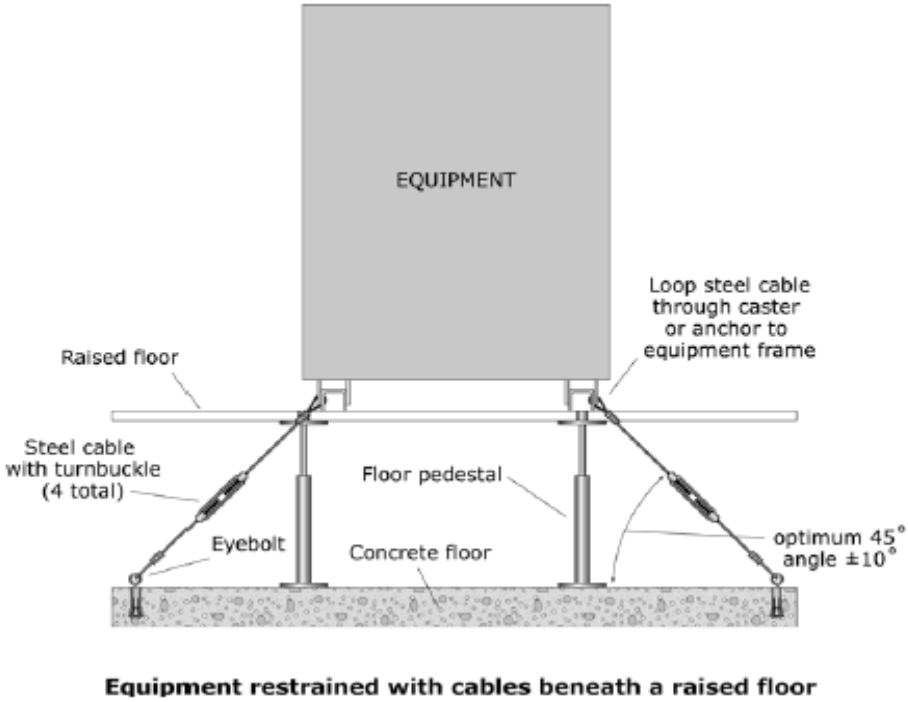
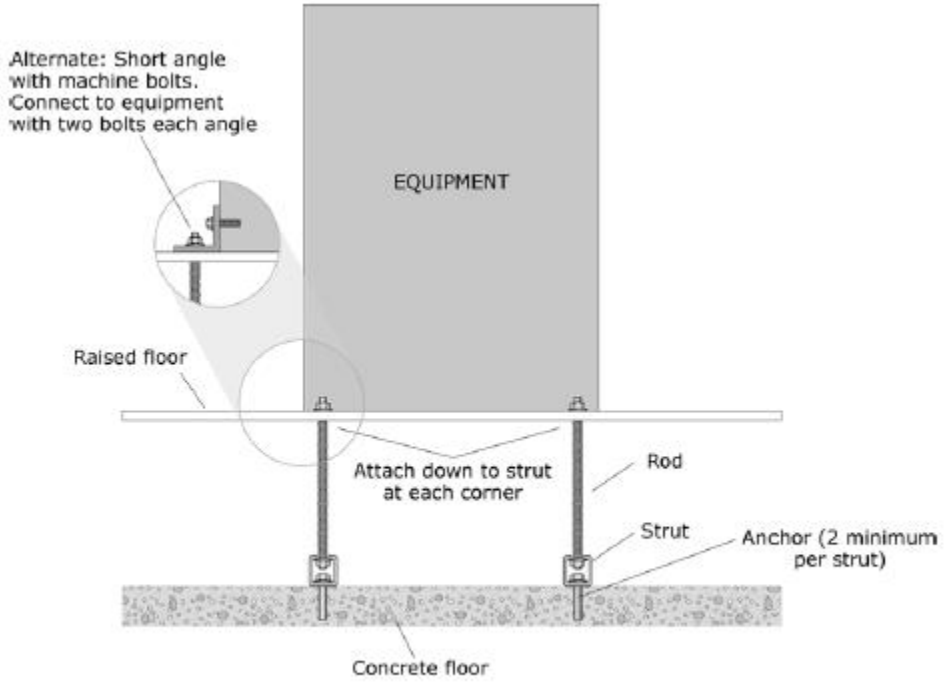


Figure G-27. Equipment Mounted on Access Floor – Cable Braced.

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

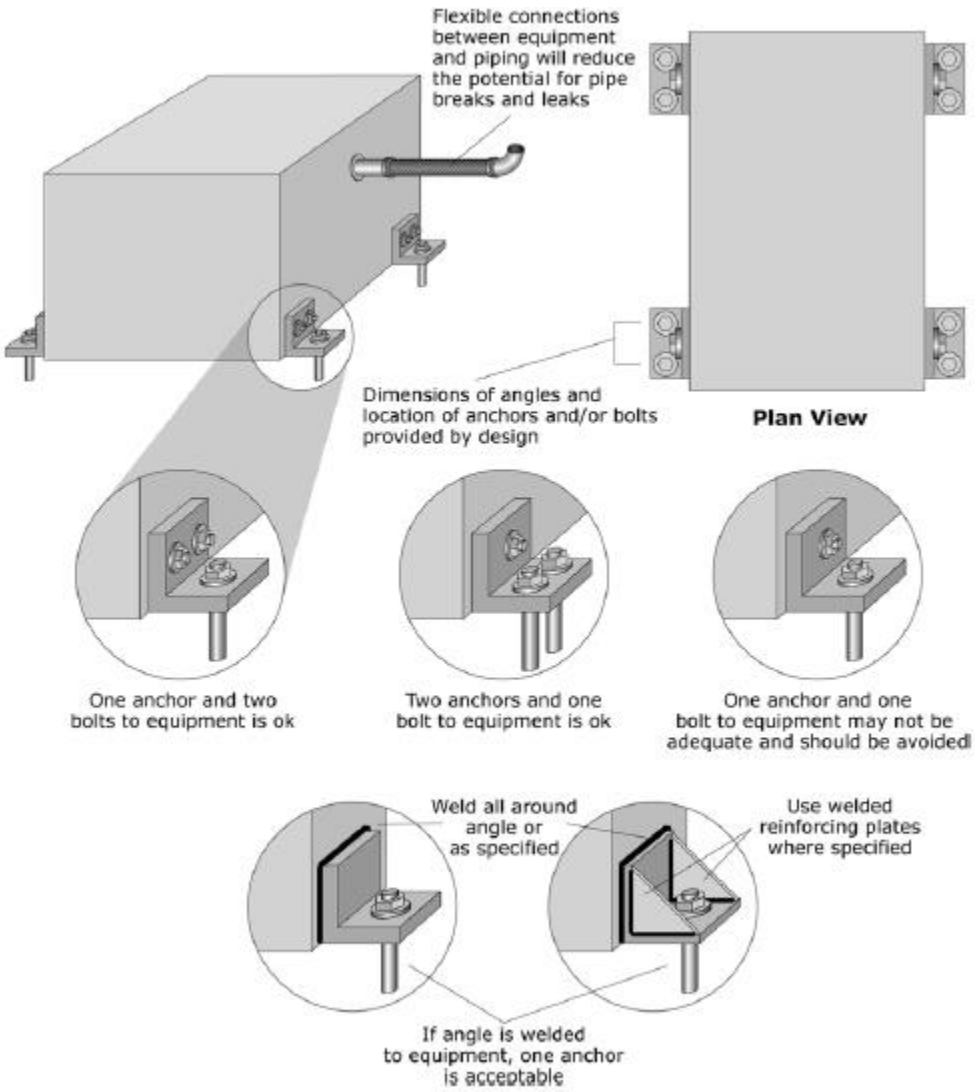


Equipment anchored with vertical rods beneath a raised floor

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)

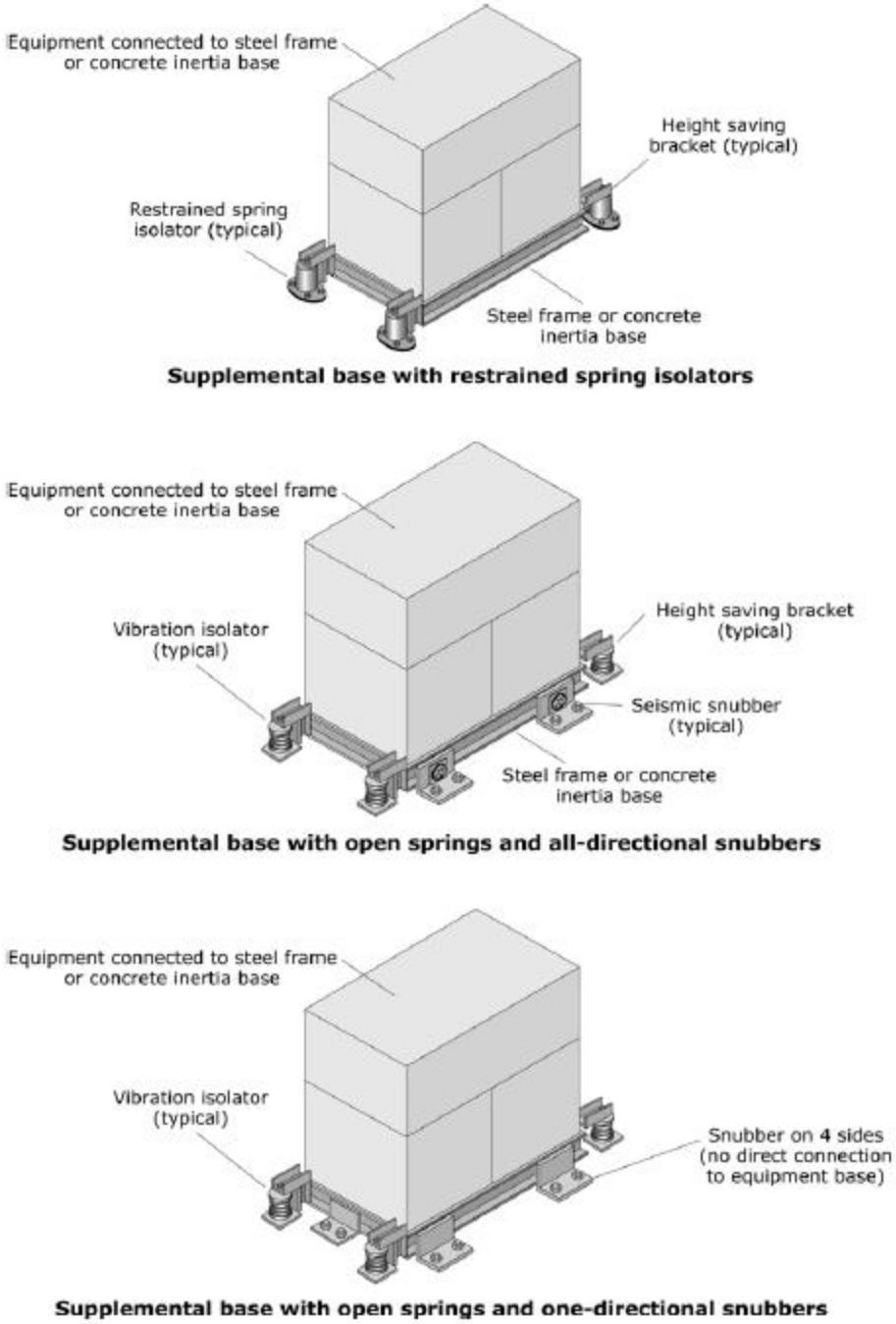


Figure G-30. HVAC Equipment with Vibration Isolation.

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

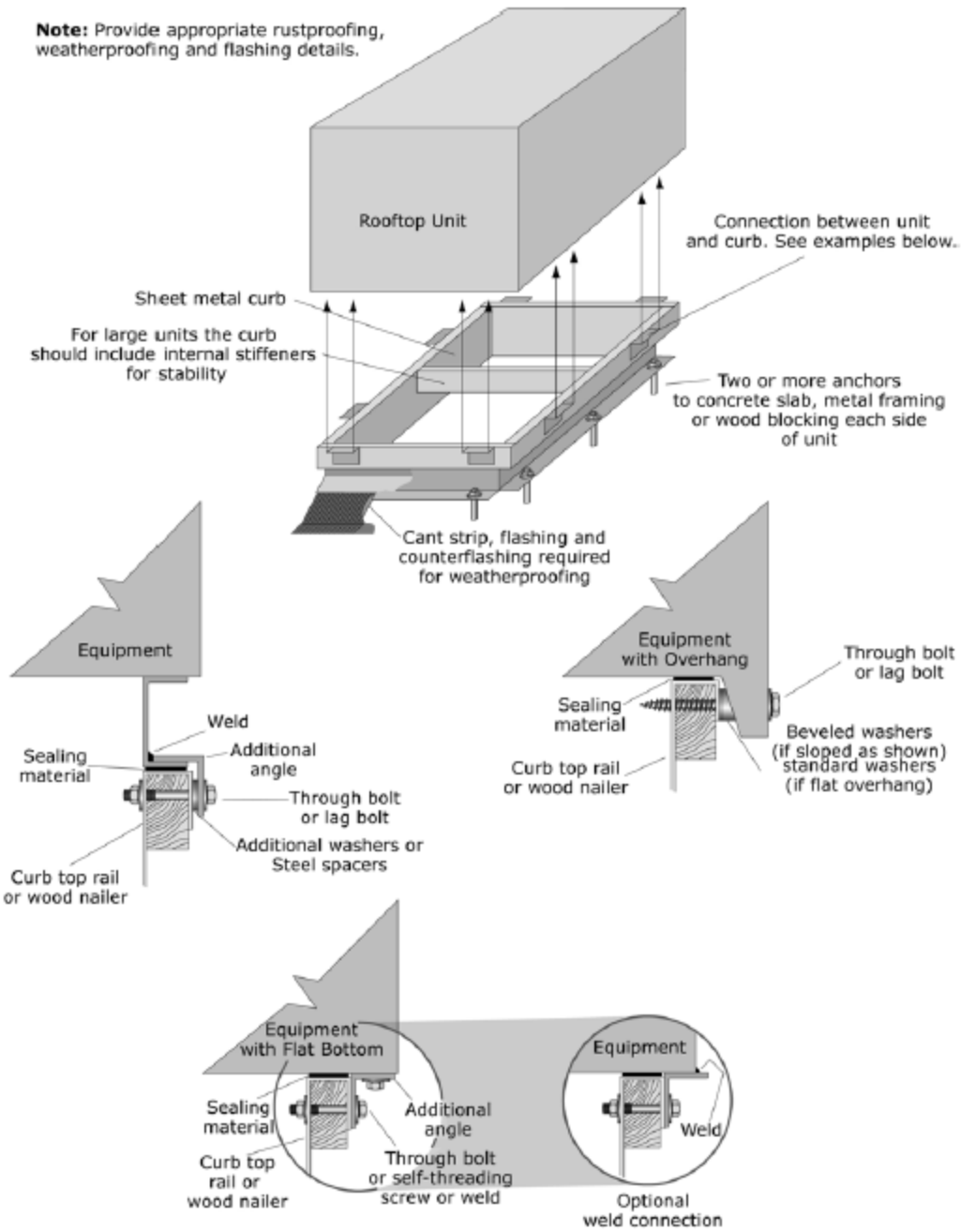


Figure G-31. Rooftop HVAC Equipment.

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

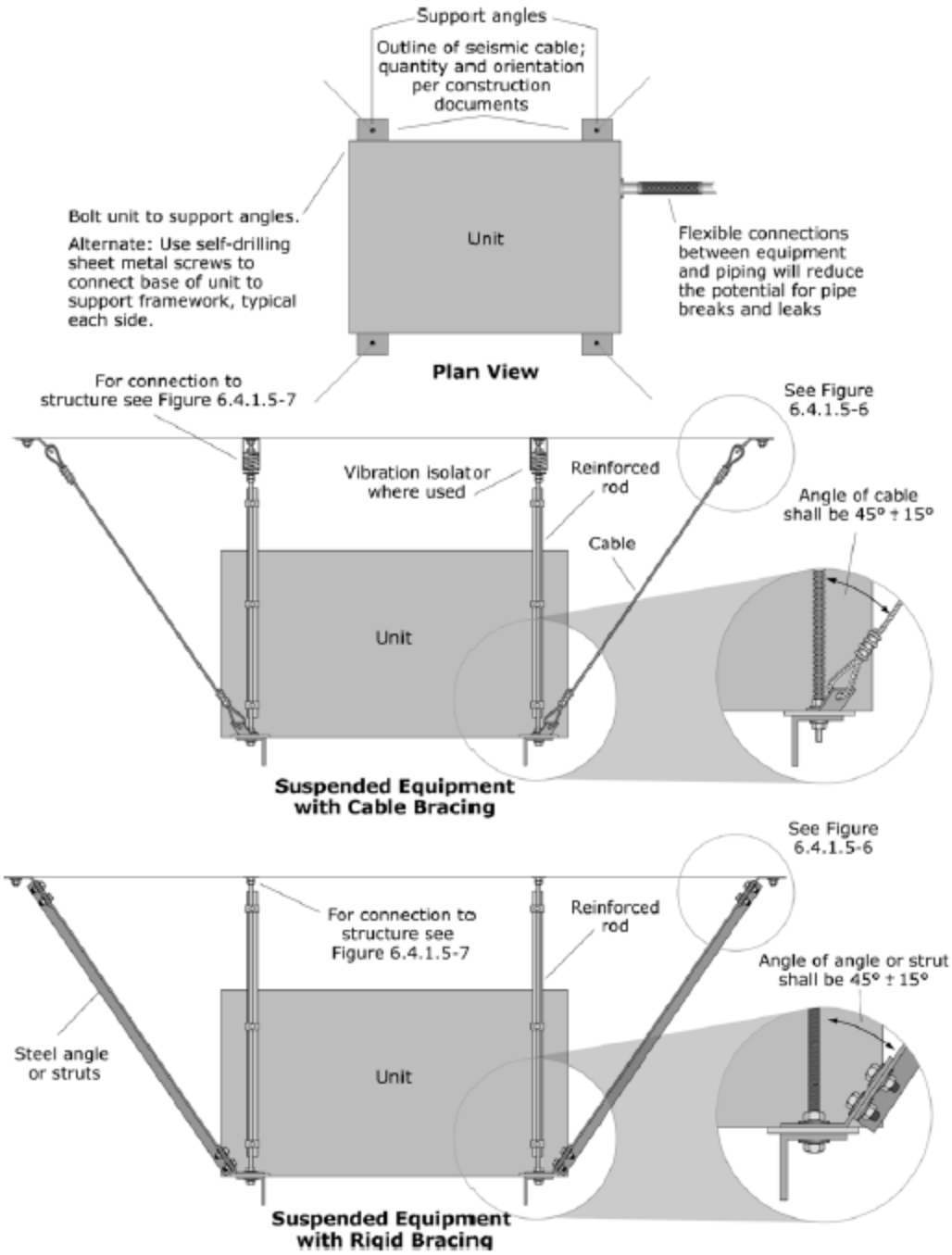


Figure G-32. Suspended Equipment.

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

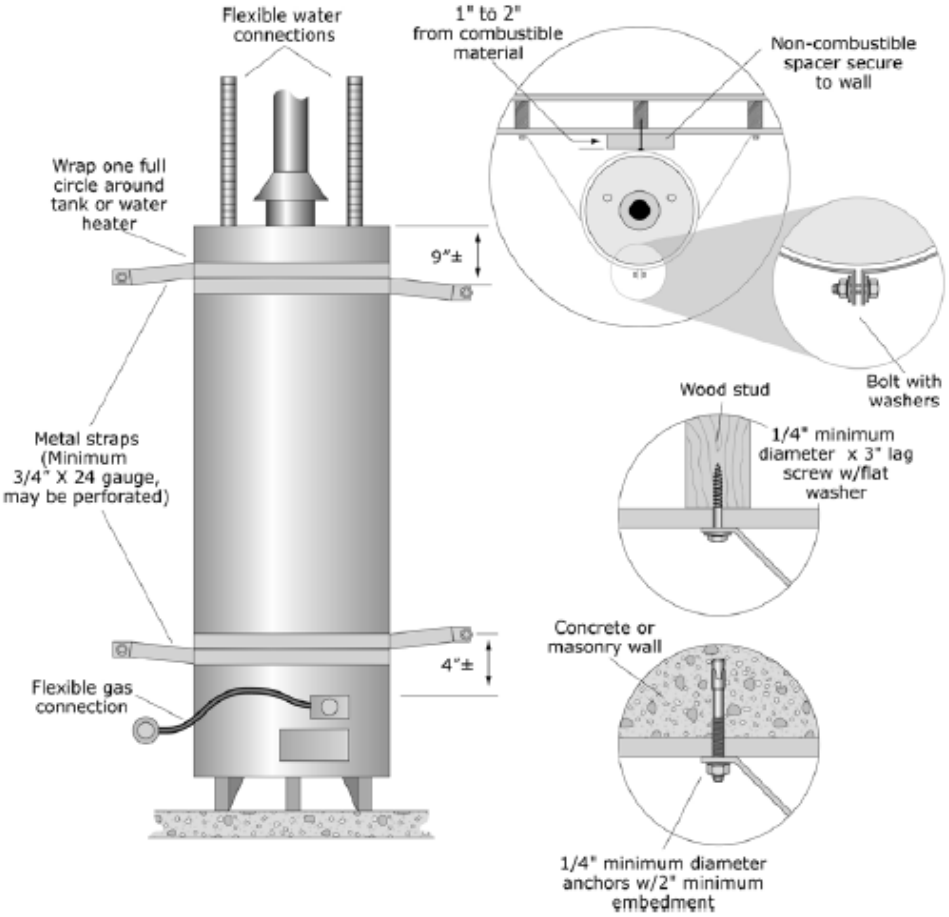


Figure G-33. Water Heater Strapping to Backing Wall.

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

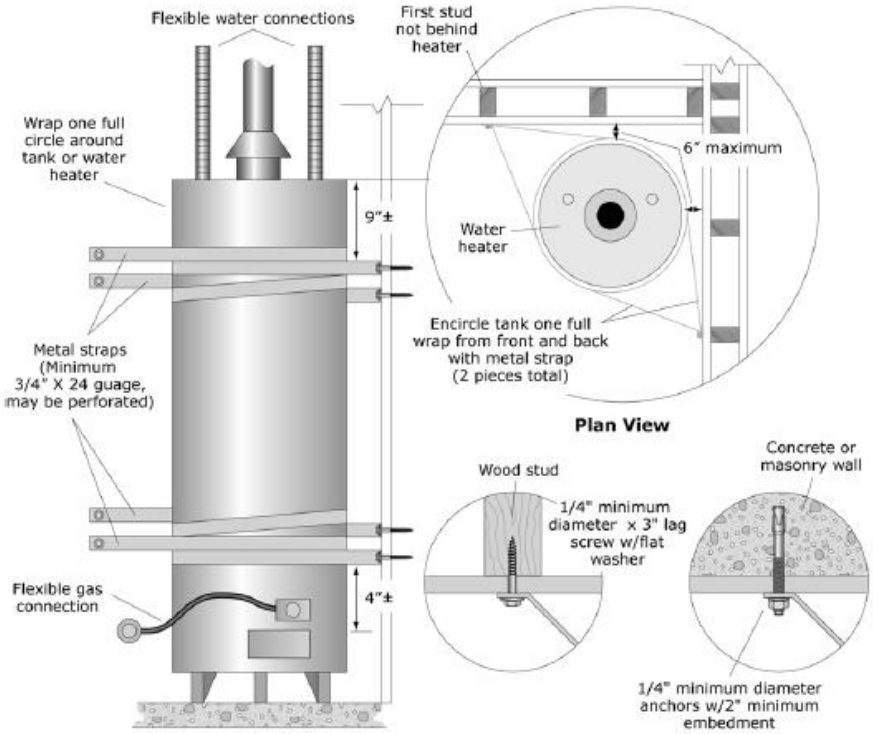


Figure G-34. Water Heater – Strapping at Corner Installation.

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

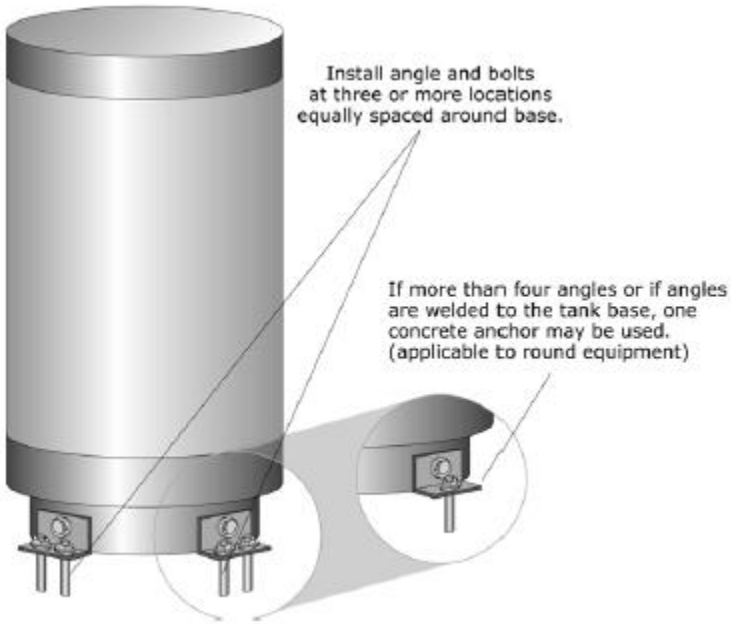


Figure G-35. Water Heater – Base Mounted.

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

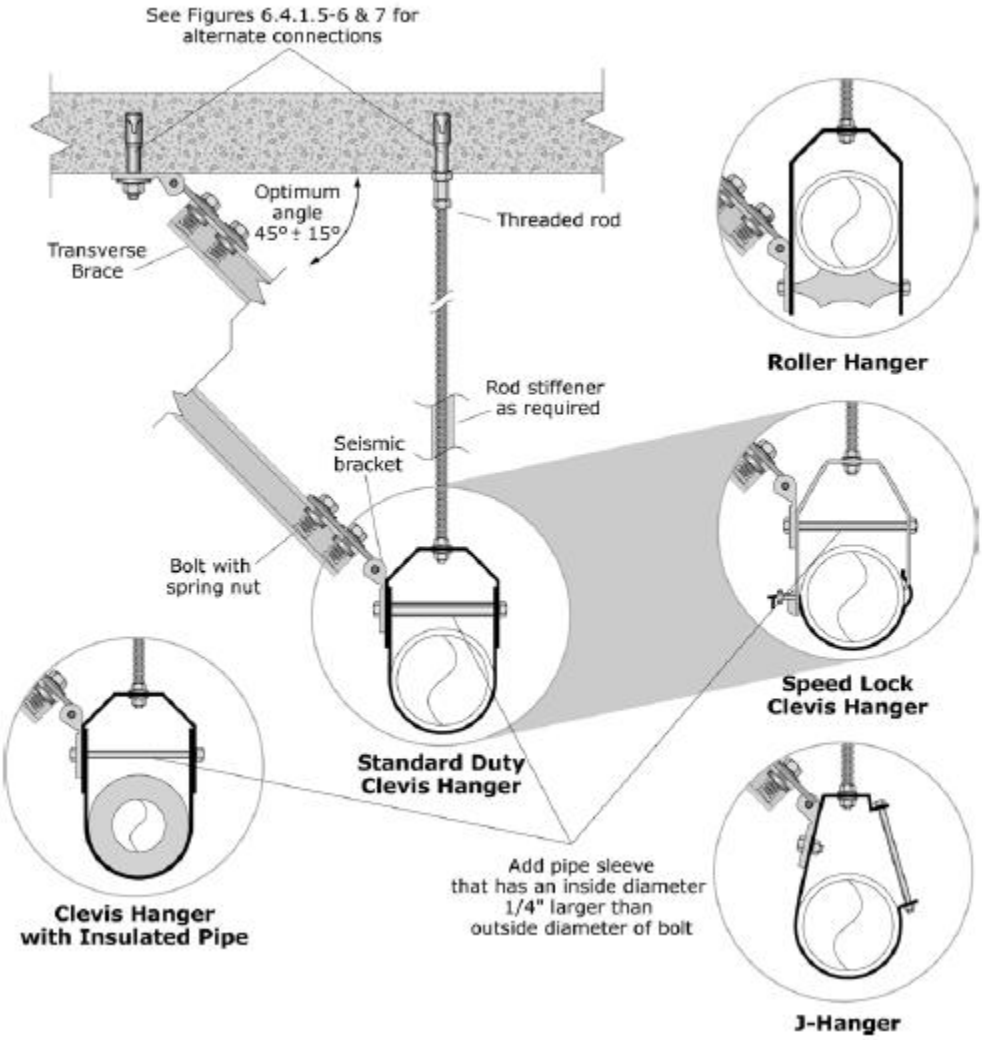


Figure G-36. Rigid Bracing – Single Pipe Transverse.

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

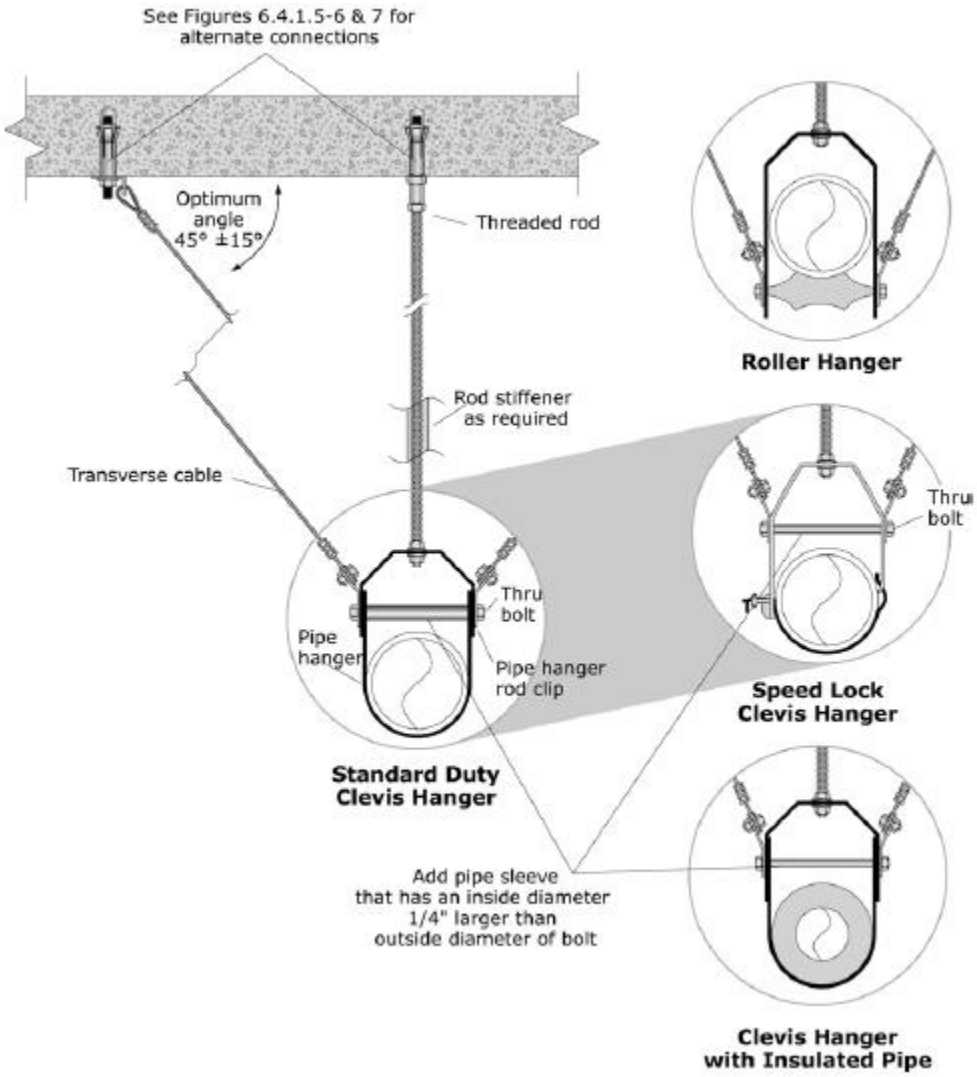


Figure G-37. Cable Bracing – Single Pipe Transverse.

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

Electrical and Communications

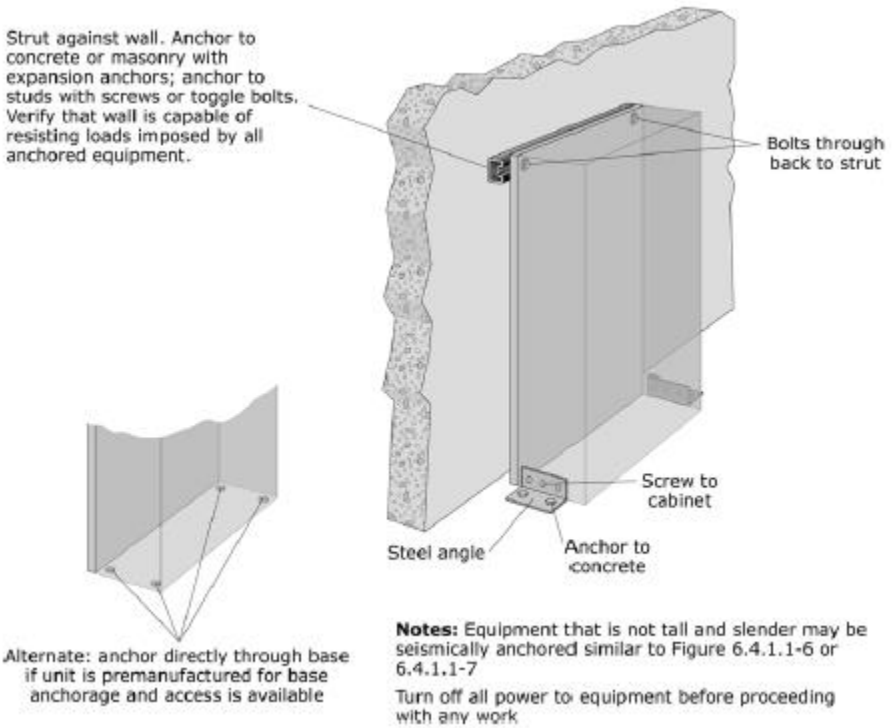


Figure G-38. Electrical Control Panels, Motor Controls Centers, or Switchgear.

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

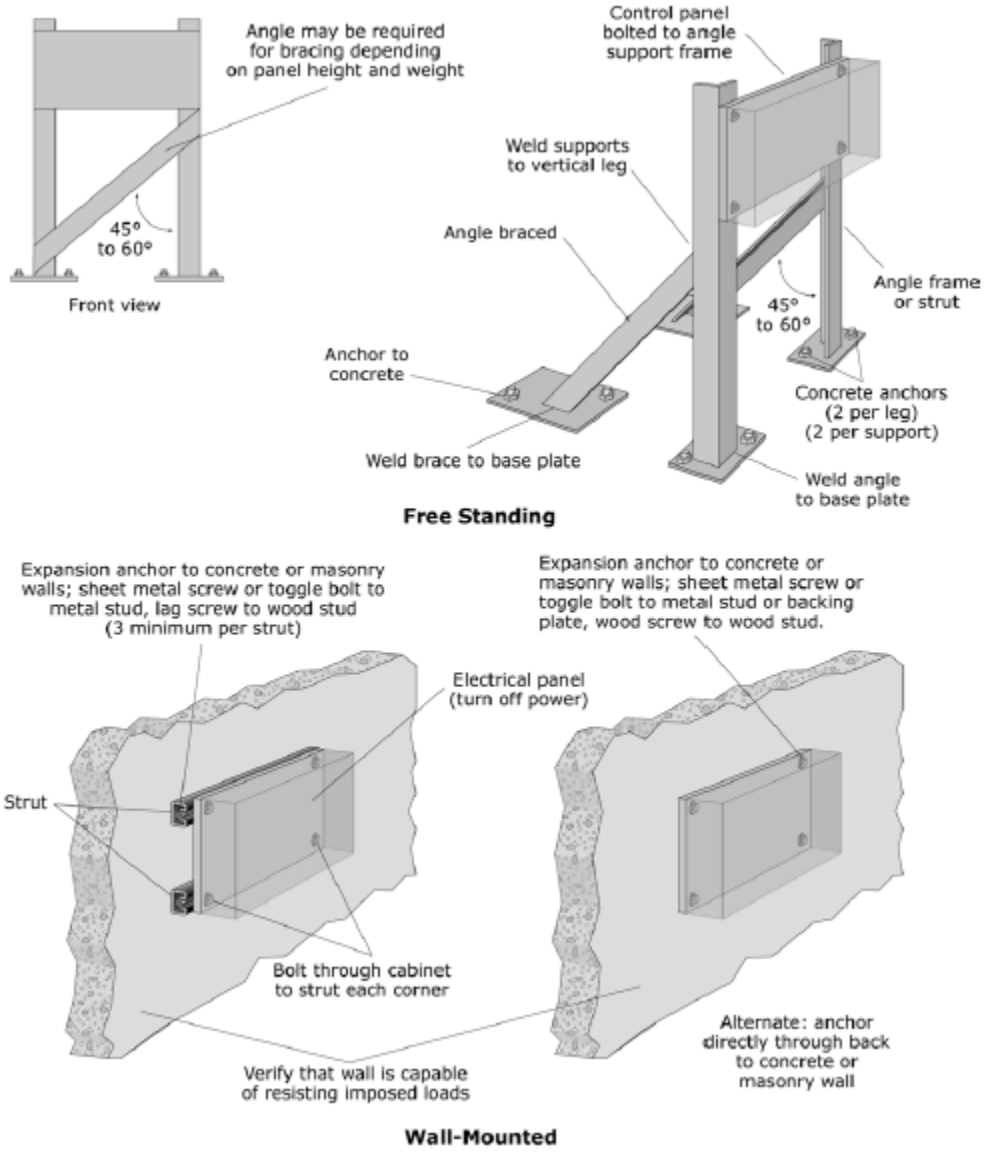


Figure G-39. Freestanding and Wall-mounted Electrical Control Panels, Motor Controls Centers, or Switchgear.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

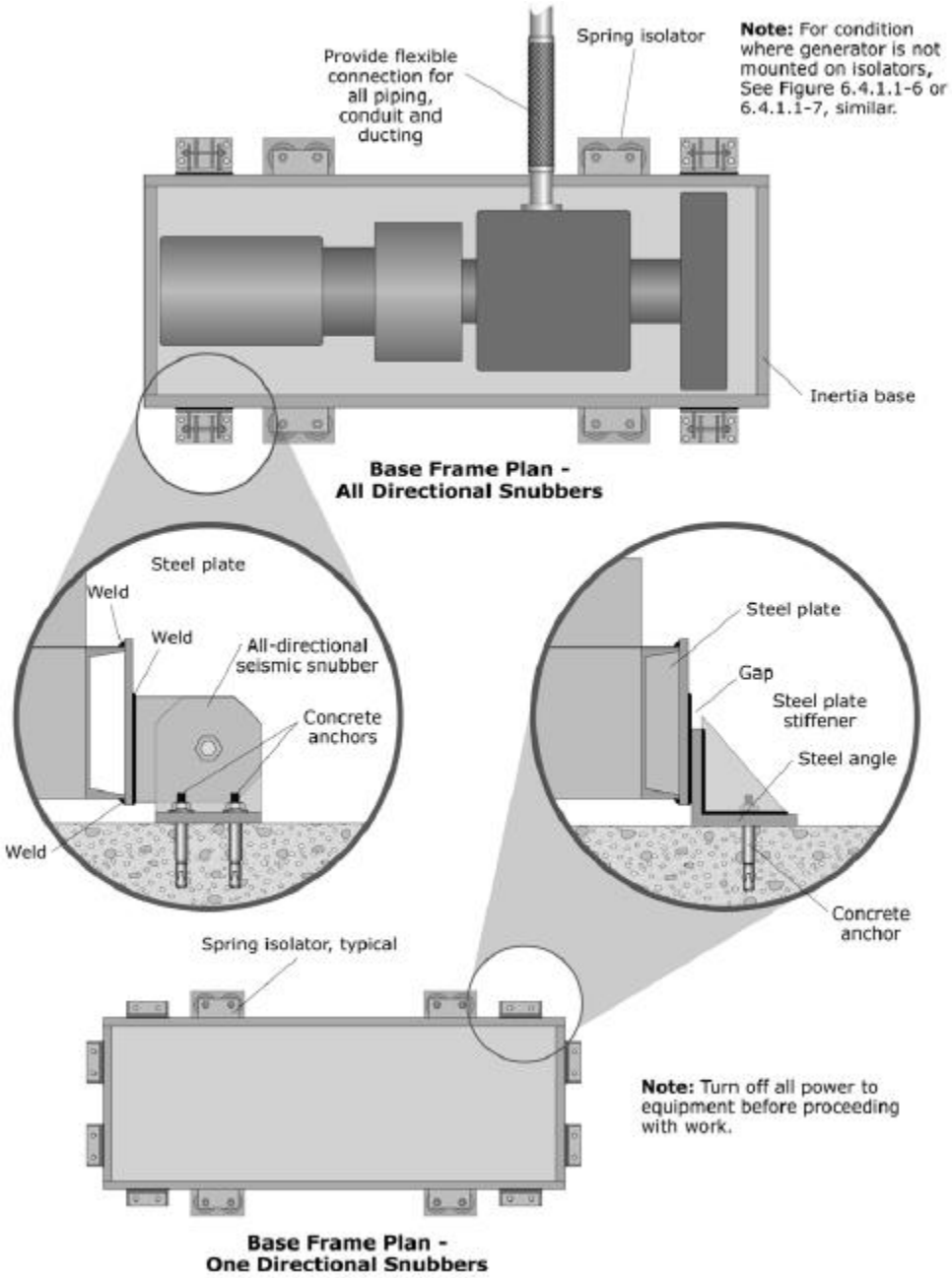


Figure G-40. Emergency Generator.
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)

ReidMiddleton

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

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

www.reidmiddleton.com
File No. 262018.063