PHASE 2

Washington State
School Seismic Safety Assessments Project

ILWACO HIGH SCHOOL
HIGH SCHOOL BUILDING
Ocean Beach School District

SEISMIC UPGRADES CONCEPT DESIGN REPORT

June 2021

PREPARED FOR

Washington Department of Natural Resources
Superintendent of Public Instruction, Washington

PREPARED BY

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WASHINGTON STATE SCHOOL SEISMIC SAFETY ASSESSMENTS PROJECT

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Ilwaco High School – Main Building

Ocean Beach School District

June 2021

Prepared for:

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EXECUTIVE SUMMARY

This report documents the findings of a seismic evaluation of the Ilwaco High School Main Building located in Ilwaco, Washington. This school building is a single-story, 89,250-square-foot, wood structure with a wood-framed roof. The school was constructed in 1971 on a sloping site and accommodates over 270 students. The building features classrooms, a cafeteria, a library, a gymnasium, and various administrative spaces.

The roof framing is constructed with plywood sheathing over wood joists supported by wood stud walls, beams, columns, and steel columns. The floor system varies with a concrete slab on grade in the northern areas and a structural slab on grade spanning to grade beams and footings in the southern areas. The walls are supported by continuous wall footings and grade beams. Columns are supported by spread footings. At the gymnasium, the columns, walls, and structural slab on grade are supported by pile caps and timber piling. The gymnasium consists of a partially exposed basement with an elevated floor of post-tensioned concrete joists with a 3-inch concrete slab supported by concrete beams, columns, and walls founded on timber piles. The lateral system consists of flexible plywood roof diaphragms spanning between interior and exterior gypsum shear walls and plywood shear walls. The lateral system at the gymnasium also has a rigid diaphragm elevated floor supported by concrete shear walls and retaining walls.

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; the most susceptible ones being lateral shear capacity and vertical irregularities. Geotechnical investigation is recommended due to the likelihood that this building is on liquefiable soils; foundation mitigation and ground improvement may be required.

Conceptual seismic upgrade recommendations for the structural systems are provided to improve the performance of the building to meet the Life Safety structural performance objective criteria of ASCE 41-17. Sketches for the concept-level seismic upgrades are provided in Appendix B. The structural upgrades include adding plywood sheathing to existing walls, adding fiber-reinforced plastic (FRP) to strengthen existing concrete walls, and providing blocking and strapping to the existing diaphragm. The recommendations for nonstructural upgrades are to add strongbacks to existing unreinforced masonry partition walls, anchor mechanical equipment and furniture to the existing structure, and add bracing to overhead equipment.

An opinion of probable construction costs is provided in Appendix C. It is our opinion that the total cost (construction costs plus soft costs) to upgrade the structure would range between \$12.2M and \$22.9M, with the baseline estimated total cost being \$15.3M. Note however that this estimated cost and cost range could be significantly higher if the presence of liquefiable soils is discovered and requires ground improvements on the Ilwaco High School campus to mitigate post-earthquake liquefaction settlement. A detailed geotechnical investigation is also recommended prior to doing a seismic upgrade design project.

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Table of Contents

Appendix List

Figure List

Table List

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Acronyms

AACE	Association for the Advancement of Cost Engineering
ADA	Americans with Disabilities Act
ASCE	American Society of Civil Engineers
A-E	Architects-Engineers
BPOE	Basic Performance Objective for Existing Buildings
BSE	Basic Safety Earthquake
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
FRP	Fiber-reinforced Plastic
GC/CM	General Contractor / Construction Manager
GWB	Gypsum Wallboard
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 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
URM	Unreinforced Masonry
USGS	United States Geological Survey
WF	Wide Flange
WGS	Washington Geological Survey
WSSSSAP	Washington State School Seismic Safety Assessments Project

Reference List

Codes and References

2018 IBC, *2018 International Building Code,* prepared by the International Code Council, Washington, D.C.

AACE International Recommended Practice No. 56R-08, 2020, *Cost Estimate Classification System*, prepared by the Association for the Advancement of Cost Engineering International, Fairmont, West Virginia.

ASCE 7-16, 2017, *Minimum Design Loads for Buildings and Other Structures*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

ASCE 41-17, 2017, *Seismic Evaluation and Retrofit of Existing Buildings*, prepared by the Structural Engineering Institute of the American Society of Civil Engineers, Reston, Virginia.

FEMA E-74, 2011, *Reducing the Risks of Nonstructural Earthquake Damage: A Practical Guide*, prepared by Applied Technology Council, Redwood City, California.

Structural Engineers of Northern California, 2017, Earthquake Performance Rating System ASCE 41-13 Translation Procedure: The Buildings Ratings Committee, a sub-committee of the Existing Buildings Committee of The Structural Engineers Association of Northern California.

Structural Engineers of Northern California, 2015, Earthquake Performance Rating System User's Guide: The Buildings Ratings Committee, a sub-committee of the Existing Buildings Committee of The Structural Engineers Association of Northern California.

Drawings

G. W. Norris and Associates May, 1970, existing drawings titled "Junior Senior High School Ocean Beach School District No. 101" Pacific County, Washington.

1.0 Introduction

1.1 Background

In 2018-2019, the Washington Geological Survey (WGS), a division of the Department of Natural Resources (DNR), led a Washington State School Seismic Safety Assessments Project (WSSSSAP) that seismically and geologically screened 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. This first phase of the WSSSSAP was executed with the help of Washington State's Office of Superintendent of Public Instruction (OSPI) and Reid Middleton, along with their team of structural engineers, architects, and cost estimators.

Building upon the success of Phase 1, WGS, OSPI, and Reid Middleton's team embarked on Phase 2 of this project to seismically and geologically screen another 339 school buildings and 2 fire stations, mostly located in the high-seismic risk regions of Washington State. Similar to Phase 1, the two main components of Phase 2 of this seismic safety assessments 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.

Seventeen school buildings were selected in consultation with WGS and OSPI 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 17 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, 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: Field 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, lath and plaster, brick veneer, roofing materials) for access to concealed conditions or to expose elements that could not otherwise be visually observed and assessed was not performed. Material testing or sampling was not performed. The ASCE 41 checklist items that were not documented due to access limitations are noted.

1.2.3 Seismic Evaluations and Conceptual Upgrades Design

1. Seismic Evaluations: Limited 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. Conceptual Upgrades Design: 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. Architectural Review: The seismic upgrade concept developed by the structural engineers was reviewed by Rolluda Architects, Inc., for general guidance and consideration of the architectural aspects of the seismic upgrade. The architects discussed the seismic upgrade concepts with the structural engineer and reviewed existing drawings that were available, pictures taken during the engineer's field investigations, and the ASCE 41 Tier 1 Screening reports. However, field visits by the architect and meetings with the school district and facilities personnel to discuss phasing and programming requirements were not included in the project scope of work. The architectural considerations are discussed in Section 4.4 Nonstructural Recommendations and Considerations. These conceptual designs were reviewed with high-level recommendations. Future planning for seismic improvements should include further review with a design team.

4. Cost Estimating: Through the concept-level seismic upgrades report process, ProDims, LLC, 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. Conceptual Upgrade Design Reports: Buildings that were selected to receive a conceptual upgrade design will have a report prepared that will include an introduction summarizing the overall findings and recommendations, along with individual sections documenting each building's seismic evaluation, list of deficiencies, conceptual seismic upgrade sketches and opinions of probable construction costs.

2. Building Photography: Photos were taken of each building during on-site walkthroughs to document the existing building configurations, conditions, and structural systems. These are available upon request through DNR/WGS.

3. Existing Drawings: Select and available existing drawings and other information were collected during the evaluation process. These are available upon request through DNR/WGS.

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2.0 Seismic Evaluation Procedures and Criteria

2.1 ASCE 41 Seismic Evaluation and Retrofit Overview

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

TIER 1 – Screening Phase

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

TIER 2 – Evaluation Phase

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

TIER 3 – Detailed Evaluation Phase

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

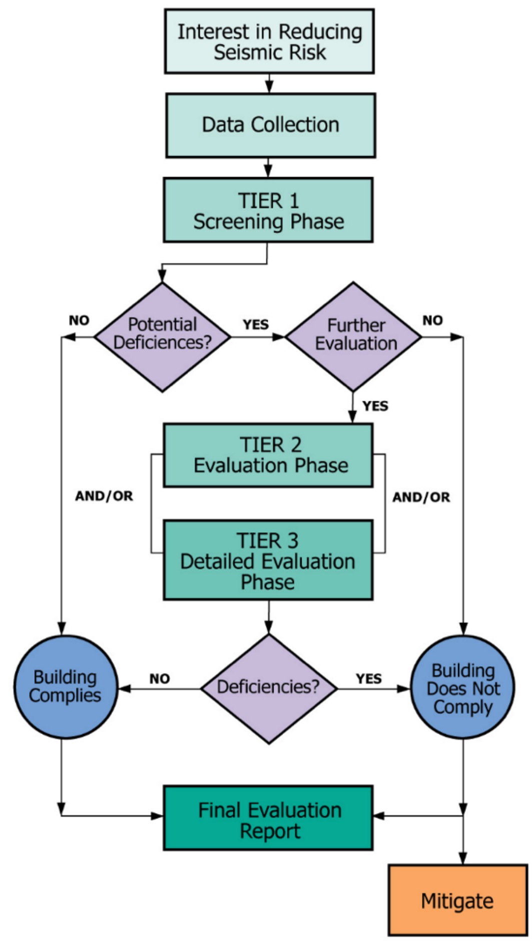

Figure 2-1. Flow Chart and Description of ASCE 41 Seismic Evaluation Procedure.

The Tier 1 checklists in ASCE 41 are specific to each common building type and contain seismic evaluation statements based on observed structural damage in past earthquakes. These checklists screen for potential seismic deficiencies by examining the lateral-force-resisting systems and details of construction that have historically caused poor seismic performance in similar buildings. Tier 1 screenings include basic "Quick Check" analyses for primary components of the lateral system. 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 Site Class Definition

The building site class definition quantifies the site soil's propensity to amplify or attenuate earthquake ground motion propagating from underlying rock. Site class has a direct impact on the seismic design forces utilized to design and evaluate a structure. There are six distinct site classes defined in ASCE 7-16, Site Class A through Site Class F, that range from hard rock to soils that fail such as liquefiable soils. Buildings located on soft or loose soils will typically sustain more damage than similar buildings located on stiff soils or rock, all other things being equal. The Washington State Department of Natural Resources measured the time-averaged shear-wave velocity at each site to 30 meters (100 feet) below the ground surface, Vs30. This measured shear-wave velocity was used to determine the site class. The site class for this building was determined to be **Site Class D**.

2.2.2 Ilwaco High 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 0.951 g, and the design 1-second period spectral acceleration, S_{D1}, is 0.836 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 Ilwaco High School that are considered in this study.

Table 2.2.1-1. Spectral Acceleration Parameters (Site Class D).

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	0.344 g	0.2 Seconds	0.951 g	0.2 Seconds	1.044 g	0.2 Seconds	1.427 g
1.0 Seconds	0.178 g	1.0 Seconds	0.836 g	1.0 Seconds	0.859 g	1.0 Seconds	1.254 g

2.2.3 Ilwaco High School Structural Performance Objective

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

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

Knowledge Factor

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

ASCE 41 Classified Building Type

Use of ASCE 41 for seismic evaluations requires buildings to be classified from a group of common building types historically defined in previous seismic evaluation standards (ATC-14, FEMA 310, and ASCE 31-03). The school is primarily classified in ASCE 41 Table 3-1 as a wood frame, commercial and industrial building, **W2**. The gymnasium portion of the building is a 2-story structure with an elevated concrete floor and a wood roof. The concrete portion of the gymnasium is classified as a concrete shear walls with stiff diaphragms building, **C2**.

Wood frame, commercial and industrial buildings (W2) include those that consist of few interior walls with flexible diaphragms and exterior walls sheathed with plywood. Concrete shear wall buildings (C2) include those that consist of concrete slabs supported by concrete columns and concrete shear walls.

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: 1971
Building Code: 1967 UBC

Number of Stories: 1
Floor Area: 89,250 SF

FEMA Building Type: W2, C2
ASCE 41 Level of Seismicity: High
Site Class: D

Ilwaco High School Main Building is located in Ilwaco, Washington. This school building is a single-story, 89,250-square-foot, wood structure with a wood-framed roof. The school was constructed in 1971on a sloping site and accommodates over 270 students. The building contains unreinforced partition walls in the gymnasium and wood partition walls throughout the remaining structure. The building features classrooms, a cafeteria, a library, a gymnasium, and various administrative spaces.

The roof diaphragm is constructed with plywood sheathing over wood joists supported by wood stud walls, beams, columns, and steel columns. The ground floor is slab on grade with pile footings, spread footings, grade beams, and wall footings.

A rectangular gymnasium is located in the southeast corner of the building. It consists of a partially exposed basement with non-bearing masonry walls. The roof diaphragm is constructed with plywood sheathing over wood joists supported by wood stud walls, beams, and columns. The floor consists of post-tension concrete panels with a 3-inch topping slab supported by concrete columns, walls, and retaining walls. The ground floor is slab on grade with wall footings, pile footings, and grade beams.

The lateral system for the roof consists of flexible plywood roof diaphragms spanning between interior and exterior gypsum shear walls and plywood shear walls. Shear walls transfer load to the foundation or basement walls. The lateral system for the basement consists of a rigid diaphragm spanning between concrete shear walls and retaining walls. Concrete shear walls and retaining walls transfer the lateral load to the foundation.

3.1.2 Building Use

The building features multiple classrooms, a cafeteria, a library, a gymnasium, and various administrative spaces. The school accommodates serves over 270 students.

3.1.3 Structural System

Table 3.1.3-1. Structural System Descriptions.

Structural System	Description
Structural Roof	The roof system is composed of 1/2-inch plywood sheathing, blocking, wood joists, and glulam beams.
Structural Floor (Slab on Grade)	The floor system varies with a concrete slab on grade in the northern areas and a structural slab on grade spanning to grade beams and footings in the southern areas. See existing drawings.
Structural Floor (Elevated Floor Slab)	The gymnasium floor system consists of a 3-inch slab over post-tensioned joists at 3 feet on center supported by concrete girders and columns.
Foundations	The walls are supported by continuous wall footings and grade beams. Columns are supported by spread footings. At the gymnasium, the columns, walls, and structural slab on grade are supported by pile caps and timber piling.
Gravity System	The gravity system consists of glulam beam framing supported by wood stud walls, wood columns, and steel columns. The suspended slab is supported by concrete beams, bearing walls, and columns.
Lateral System	Lateral forces are resisted by the plywood roof diaphragm, which transfers the forces into wood shear walls in both the longitudinal and transverse directions. The wood shear walls are sheathed with gypsum, which transfer load to the foundation.
Lateral System (Gymnasium)	Lateral forces are resisted by the plywood roof diaphragm, which transfers the forces into wood shear walls in both the longitudinal and transverse directions. The wood shear walls and the concrete slab, which spans between concrete shear walls, transfer the lateral force to the foundation.

3.1.4 Structural System Visual Condition

Table 3.1.4-1. Structural System Condition Descriptions.

Structural System	Description
Structural Roof	No visible signs of corrosion, damage, or deterioration.
Structural Floor	No visible signs of corrosion, damage, or deterioration.
Foundations	Unknown, not visible.
Lateral System	No visible signs of corrosion, damage, or deterioration.
Gravity System	No visible signs of corrosion, damage, or deterioration.

3.2 Seismic Evaluation Findings

3.2.1 Structural Seismic Deficiencies

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

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

Deficiency	Description
Vertical Irregularities	Vertical elements resisting shear wall overturning are discontinuous at the west gymnasium wall. Wood shear wall and diaphragm strengthening or the addition of new shear walls may be appropriate to mitigate seismic risk.
Shear Stress Check	Pseudo shear stress is greater than 1,000 pounds per foot. The building likely requires wood shear wall strengthening.

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	"None" 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. The structure appears to be located on a relatively flat site.
Surface Fault Rupture	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.

3.2.3 Nonstructural Seismic Deficiencies

Table 3.2.3-1 summarizes the seismic deficiencies in the nonstructural systems. The Tier 1 screening checklists are provided in Appendix A.

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

Deficiency	Description
LSS-3 Emergency Power	Inadequate anchoring/bracing of life-safety equipment.
P-2 Heavy Partitions Supported by Ceilings.	The top of heavy masonry partition walls in the locker room below the gymnasium are supported by integrated ceiling systems. Bracing or strongbacking is recommended to mitigate seismic risk.
LF-1 Independent Support.	Inadequate independent attachments for light fixtures.
CF-2 Tall Narrow Contents.	Anchorage is required for tall narrow contents more than 6 feet high to provide overturning restraint.
CF-3 Fall-Prone Contents.	Anchorage is required for fall-prone contents. Heavy items on upper shelves should be restrained to avoid becoming falling hazards.
ME-1 Fall-Prone Equipment.	Anchorage is required for fall-prone equipment weighing more than 20 pounds.
ME-2 In-Line Equipment.	Independent vertical support and lateral bracing is required for in-line equipment.
ME-3 Tall Narrow Equipment.	Anchorage is required for tall narrow equipment.

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-1 Fire Suppression Piping.	Further investigation is required to review fire suppression anchorage and bracing.
LSS-2 Flexible Couplings.	Further investigation is required to review fire suppression for flexible couplings.
LSS-4 Stair and Smoke Ducts.	Further investigation is required to review stair and smoke ducts for bracing and flexible connections at seismic joints.
LSS-5 Sprinkler Ceiling Clearance.	Further investigation is required to review penetration clearances at panelized ceilings for fire suppression devices.
HM-2 Hazardous Material Storage.	Further investigation is required to review breakable containers storing hazardous material.
HM-4 Shutoff Valves.	Further investigation is required to locate shutoff valves or spill/leak protection for hazardous material piping.
HM-5 Flexible Couplings.	Further investigation is required to locate flexible couplings on hazardous material ductwork/piping.
P-3 Drift.	Further investigation is required to verify detailing of rigid cementitious partitions for drift.
C-1 Suspended Lath and Plaster.	Further investigation is required to review suspended ceiling attachments.
C-2 Suspended Gypsum Board.	Further investigation is required to review suspended ceiling attachments.
PCOA-2 Canopies.	Further investigation is required to verify anchorage of canopies at building exits to the main structure.

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4.0 Recommendations and Considerations

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. Proposed seismic upgrades include the following.

4.1.1 Diaphragm Strengthening

To reduce stress concentrations within the diaphragm, it is recommended to add plywood sheathing to existing walls to reduce diaphragm spans. These new shear walls will also require in-plane connections to the diaphragm and floor slab. It is also recommended to add blocking and strapping at select locations to reduce stress concentrations within the diaphragm.

4.1.2 Wood Shear Wall Strengthening

Typical existing shear walls depend on gypsum board and lack adequate shear capacity to withstand a seismic event. It is recommended to install plywood panels, hold-downs, and in-plane connections to adequately strengthen the shear capacity.

4.1.3 Vertical irregularities

The east and west side of the gymnasium and south side of the school contain vertical irregularities. It is recommended to add plywood, in-plane connections, and hold-downs to existing walls at the west side of the gymnasium and south side of the school. For the east side of the gym, adding fiber-reinforced plastic (FRP) to the existing concrete wall is recommended.

4.1.4 Bracing of Masonry Partitions in Locker Rooms

The non-load-bearing masonry partitions are not braced at the top to prevent toppling. It is recommended that vertical strongbacks be installed to support the walls out of plane. See Figure 4 in Appendix B. Removal of the masonry walls and replacement with a light-frame wood or metal-stud wall is also a mitigation strategy to consider.

4.2 Foundations and Geotechnical Considerations

A detailed geotechnical analysis of the site soils was not included in the scope of this study. As a result, the geotechnical seismic effects on the existing building and its foundations, such as the presence of liquefiable soils, allowable soil bearing pressures, and pile capacities are unknown at this time. Although the current state of Washington liquefaction mapping shows this building is located on soils classified with a low susceptibility of liquefaction, the Vs30 measurement of 184 m/s (603 ft/s) is on the borderline between Site Class D and Site Class E, where Site Class E is often associated with liquefiable soils.

Liquefaction is the tendency of certain soils to saturate and lose strength during strong earthquake shaking, causing it to flow and deform similar to a liquid. Liquefaction, when it occurs, drastically decreases the soil bearing capacity and tends to lead to large differential settlement of soil across a building's footprint. Liquefaction can also cause soils to spread laterally and can dramatically affect a building's response to earthquake motions, all of which can significantly compromise the overall stability of the building and possibly lead to isolated or widespread collapse in extreme cases. Existing foundations damaged as a result of liquefiable soils also make the building much more difficult to repair after an earthquake.

Buildings that are not founded on a raft foundation or deep foundation system (such as grade beams and piles), and those with conventional strip footings and isolated spread footings that are not interconnected well with tie beams, are especially vulnerable to liquefiable soils. Mitigation techniques used to improve structures in liquefiable soils vary based on the type and amount of liquefiable soils and may include ground improvements to densify the soil (aggregate piers, compaction piling, jet grouting), installation of additional deep foundations (pin piling, augercast piling, micro-piling), and installation of tie beams between existing footings.

The southern areas of the high school are founded on a structural slab on grade spanning to beams and spread footings, and the gymnasium area of the high school is founded on a structural slab spanning to pile caps and driven wood piles. However, the northern areas of the high school are founded on conventional spread and strip footings without interior strip footings or tie beams. The soil capacity and pile capacity to resist seismic demands is unknown at this time. It is recommended that a detailed geotechnical study and investigation be completed on the building site to determine the nature of the liquefaction hazard, the characteristics of the site soils, and adequacy of the wood piling. Foundation mitigation and ground improvement may be required, and the recommended geotechnical investigation could have a major impact on the scope of work required for seismic retrofit.

4.3 Tsunami Considerations

The building is not located in a tsunami inundation zone according to Washington State Department of Natural Resources tsunami inundation mapping. It is not necessary to consider tsunamis when planning seismic upgrades to this building.

4.4 Nonstructural Recommendations and Considerations

Table 3.2.3-1 identifies nonstructural deficiencies that do not meet the performance objective selected for Ilwaco High School. It is recommended that these deficiencies be addressed to provide nonstructural performance consistent with the performance of the upgraded structural lateral-force-resisting system. As-built information for the existing nonstructural systems, such as fire sprinklers, mechanical ductworks, and piping, are not available for review. Only limited visual observation of the systems was performed during field investigation due to limited access or visibility to observe existing conditions. The conceptual mitigation strategies provided in this study are preliminary only. The final analysis and design for seismic rehabilitation should include a detailed field investigation.

4.4.1 Architectural Systems

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

For any remodel project of an existing building, the International Existing Building Code (IEBC) would be 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.

Energy Code

Elements of the exterior building envelope to be affected by the proposed seismic upgrade work may be required to be brought up to the current Washington State Energy Code per Chapter 5, where applicable.

Accessibility

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 the current accessibility standards of the Americans 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, and Life Safety alarm systems. 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 should be performed to determine the extent to which an existing facility would need to be improved to comply with current ADA requirements.

Hazardous Materials Survey

Given the age of the building, there may be existing construction elements such as floor tile and/or adhesive, pipe insulation, etc., that could contain asbestos. Verify that a hazardous materials survey and abatement of the building has been performed, prior to the start of any demolition work.

Diaphragm Strengthening

Adding plywood sheathing to existing walls to reduce diaphragm spans will create new shear walls that will require in-plane connections to the roof diaphragm and floor slab.

New shear walls may require removal of the flooring materials at least 3 feet out from the walls to construct new foundations, where required. Some flooring appears to be vinyl composition tiles; given the age of the building, the tile and/or adhesive could contain asbestos. An asbestos survey of the building would be recommended prior to any demolition.

Attachment at the top of the new shear walls may damage existing ceiling tiles. Depending on existing ceiling condition, extensive ceiling tile replacement may be necessary.

Portions of the existing roof sheathing and roofing will need to be removed to perform the work. Depending on the condition of the existing roof, it might be advisable to reroof the affected structures. The drawings show batt insulation laid above the interior ceiling surfaces. As part of a reroof project, we recommend installing an above-roof continuous rigid insulation of R-38 over the entire roof to comply with current energy code. Any mechanical equipment curbs should be raised to accommodate the thicker insulation. Alternately, additional batt insulation above the ceilings at the bottom of the trusses would need to be added to increase the existing R-13 insulation to an R-49.

Existing electrical outlets, switches, and other items will need to be reinstalled in new 2x6 stud shear walls with 5/8-inch gypsum board on both sides. Paint and new rubber base would be installed to match adjacent wall finishes.

It is also recommended to add blocking and strapping at select locations to reduce stress concentrations within the diaphragm. Access to connection points could impact existing floor, wall, and ceiling finishes, depending on location.

Wood Shear Wall Strengthening

Typical existing shear walls depend on gypsum board for lateral resistance and lack adequate shear capacity to withstand a seismic event. Installation of plywood panels, hold-downs, and in-plane connections will strengthen the shear capacity but may affect existing floor finishes including wood gymnasium flooring, wall finishes, and ceilings.

Existing electrical outlets, switches, and other items will need to be reinstalled in new 2x6 stud shear walls with 5/8-inch gypsum board on both sides. Paint and new rubber base would be installed to match adjacent wall finishes.

Vertical irregularities

Adding plywood, in-plane connections, and hold-downs to existing walls at the west side of the gymnasium and south side of the school may impact existing floor finishes including wood gymnasium flooring, floor and wall finishes, and ceilings.

For the east side of the gymnasium, adding FRP to the existing concrete wall could impact existing electrical outlets, switches, and other items which may need to be reinstalled in affected areas. Finishes at FRP will need to coordinate with adjacent wall finishes.

Bracing of Masonry Partitions in Locker Rooms

The non-load bearing masonry partitions in the Unit No. 3 Locker rooms, below the Gymnasium, require that vertical and horizontal strongbacks (HSS 4x4) be installed to support the walls out of plane. These elements should be painted both to protect the metal from the damp, corrosive locker room atmosphere and to minimize visual impact. There locations may impact existing outlet and switch locations, so should be located to minimize this conflict. Floor, wall, and ceiling finishes will be affected where attachments are made.

Removal of the masonry walls and replacement with a light-frame wood or metal-stud wall, also a mitigation strategy to consider, would require installation of new in-wall utilities and related switches, outlets, etc.

Ceiling in Paths of Egress

The suspended acoustical tile ceiling in the main corridor is an integrated acoustical ceiling system, likely with a suspended metal T-grid. Because this corridor is a main path of egress, it is recommended that the ceiling grid support system be further investigated and checked for proper seismic bracing and compression support for every 12 square feet of area and proper edge clearance detailing at the corridor walls. Preventing the risk of a fallen integrated ceiling system will mitigate the risk of obstructions impeding the paths of egress as students and faculty evacuate the building following a seismic event.

Lighting Fixtures in Paths of Egress

The light fixtures observed in the main corridor are supported within an integrated ceiling system that is over a main path of egress. Maintenance and facility staff should verify that each fixture is independently supported to the roof structure from opposite corners and add wire supports as necessary.

Contents and Furnishings

Buildings often contain various tall and narrow furniture, such as shelving and storage units, that are freestanding away from any backing walls. High book shelving in the library, for example, can be highly susceptible to toppling if not anchored properly to the backing walls or to each other, and can become a life safety hazard. It is recommended that maintenance and facility staff verify that the tops of the shelving units are braced or anchored to the nearest backing wall or provide overturning base restraint. Heavy items weighing more than 20 pounds on upper shelves or cabinet furniture should also be restrained by netting or cabling to avoid becoming falling hazards to students or faculty below.

4.4.2 Mechanical Systems

The main seismic concerns for mechanical equipment are sliding, swinging, and overturning. Inadequate lateral restraint or anchorage can shift equipment off its supports, topple equipment to the ground, or dislodge overhead equipment, making them falling hazards. Investigation of above-ceiling mechanical equipment and systems was not part of this study, but an initial investigation for the presence of mechanical equipment bracing can be performed by maintenance and facility staff to see if equipment weighing more than 20 pounds with a center of mass more than 4 feet above the adjacent floor level is laterally braced. If bracing is not present, and the equipment poses a falling hazard to students and faculty below, further investigation is recommended by a structural engineer.

4.5 Opinion of Probable Conceptual Seismic Upgrades Costs

An opinion of probable project costs of the concept-level seismic upgrade recommendations provided in this report is included in Appendix C. The input of the scope of work to develop the probable costs is 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 the 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.

For this preliminary opinion of probable costs the estimate of construction costs of the preliminary scope of work is developed based on current 1st Quarter (1Q) 2021 costs. Costs are then escalated to 4Q 2022 at 6% per year of the baseline cost estimate. Costs are developed based on the Tier 1 checklist, concept-level seismic upgrade design sketches, and project narratives.

A range of the cost estimate of -20% (low) to +50% (high) is used to develop the range of the construction cost estimate for the concept-level scope of work. The -20% to +50% range guidance is from Table 1 of the AACE International Recommended Practice 56R-08, *Cost Estimate Classification System*. This estimate is classified as a Class 5 based on the level of design of 0% to 2%. The range of a Class 5 construction cost estimate based on the AACE guidance selected for this estimate is a -20% to +50%.

The estimated total cost (construction costs plus soft costs) to mitigate the deficiencies identified in the Tier 1 checklists of the Ilwaco High School Main Building ranges between approximately $12.2M and $22.9M (-20%/+50%). The baseline estimated total cost to seismically upgrade this building is approximately $15.3M. On a per-square-foot basis, the baseline seismic upgrade cost is estimated to be approximately $171 per square foot in 4Q 2022 dollars, with a range between $137 per square foot and $256 per square foot. Note however that this estimated cost and cost range could be significantly higher if the presence of liquefiable soils is discovered and requires ground improvements on the Ilwaco High School campus to mitigate post-earthquake liquefaction settlement. A detailed geotechnical investigation is also recommended prior to doing a seismic upgrade design project.

4.5.1 Opinion of Probable Construction Costs

This conceptual opinion of construction cost includes labor, materials, equipment, and scope contingency, general contractor general conditions, home office 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 soft costs are described below in Section 4.1.2.

The cost is developed in 1Q 2021 costs. The costs are then escalated to 4Q 2022 using an escalation rate of 6.0% per year. If the mid-point of construction will occur at a date earlier or later than 4Q 2022, then it is appropriate to adjust the escalation to the revised mid-point of construction. Construction costs excluded from the estimate are site work, phasing of construction, additional building modifications not directly related to the seismic scope of work, off hours labor costs, accelerated schedule overtime labor costs, replacement/relocation/additional FF+E, and building code changes that occur after this report.

For project budget planning purposes, it is highly recommended that the opinion of probable project costs is determined including: the overall construction budget of the seismic upgrade and additional scope of work for the building via the services of an A/E design team to study the proposed seismic mitigation strategies to refine the concept-level seismic upgrades design approach contained in this report, determine the construction timeline to adjust the escalation costs, define the construction phasing, if any, and the project soft costs.

4.5.2 Opinion of Probable A-E Design Budgets and Owner's Additional Project Costs (Soft Costs)

Additional owner's project costs would likely include owner's project administration costs, including project management, financing/bond costs, administration/contract/accounting costs, review of plans, value engineering studies, building permits, bidding costs, equipment, fixtures, furnishings and technology, and relocation of the school staff and students during construction. These costs are known as soft costs.

These soft costs have been included in the opinion of probable costs at 40% of the baseline probable construction cost for the seismic upgrade of this building.
The soft costs used for the projects that total to 40% are:
A+E Design - 10%
QA/QC Testing - 2%
Project Administration - 2%
Owner Contingency - 11%
Average Washington State Sales Tax - 9%
Building Permits - 6%

It is typical for soft costs to vary from owner to owner. Based upon our team members' experience on K-12 school projects in the state of Washington, it is our opinion that an allowance of 40% of the average probable construction cost is a reasonable and appropriate soft cost recommendation for planning purposes. We also recommend that each owner develop their own soft costs as part of their budgeting process and not rely solely on this recommended percentage.

4.5.3 Opinion of Escalation Rate

A 6.0%/year construction cost escalation rate is used for planning purposes for the conceptual estimates. The rate is compounded annually to the projected midpoint of construction. This rate is representative of the escalation based on the previous five years of market experience of construction costs throughout the State of Washington and is projected going forward for these projects. This rate is calculated to the 4th Quarter of 2022 as an allowance for planning purposes. The actual construction schedule for the project is to be determined and we recommend the escalation cost be revised based on revised construction schedule using the 6%/year rate.

Table 4.5.3-1. 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)
Ilwaco High School Main Bldg	W2,C2	High / D	**Structural**			
			Life Safety	89,250 SF	$54 ($4.84M) - $102 ($9.08M)	$68 ($6.05M)
			Nonstructural			
			Life Safety	89,250 SF	$43 ($3.87M) - $81 ($7.26M)	$54 ($4.84M)
			Total			
				89,250 SF	$87 ($8.72M) - $183 ($16.3M)	$122 ($10.90M)
					Estimated Soft Costs:	$4.36M
					Total Estimated Project Costs:	**$15.26M**

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

Appendix A: ASCE 41 Tier 1 Screening Report

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1. Ocean Beach, Ilwaco High School, Ilwaco High School

1.1 Building Description

Building Name:	Ilwaco High School
Facility Name:	Ilwaco High School
District Name:	Ocean Beach
ICOS Latitude:	46.313
ICOS Longitude:	-124.04
ICOS County/District ID:	25101
ICOS Building ID:	20728
ASCE 41 Bldg Type:	W2
Enrollment:	286
Gross Sq. Ft. :	89,249
Year Built:	1971
Number of Stories:	1
$S_{XS\ BSE\text{-}2E}$:	1.037
$S_{X1\ BSE\text{-}2E}$:	0.721
ASCE 41 Level of Seismicity:	High
Site Class:	D
V_{S30}(m/s):	184
Liquefaction Potential:	Low
Tsunami Risk:	None
Structural Drawings Available:	Yes
Evaluating Firm:	WRK Engineers

The Ilwaco High School building is a one-story wood-framed structure with a concrete-framed basement at the gymnasium. The 1971 building is constructed on sloping ground and is located in Ilwaco, Washington. The building consists of five separate units that are connected by the roof, each rectangular in plan. The complete building footprint is mostly rectangular in plan, approximately 450 feet by 250 feet. The building has a maximum roof height of around 45 feet at the gymnasium at the downslope side of the building. The lower roof height is around 15 feet. Building construction consists of wood stud walls throughout. The gymnasium basement is constructed out of concrete bearing/shear walls and masonry non-bearing walls. The roof system is a flexible diaphragm composed of glulam beam framing and 2x joist framing. The gymnasium floor level is composed of a wood floor over a concrete slab supported by concrete beams and post-tensioned concrete joists. The building shares the site with the Ilwaco Stadium Complex.

1.1.1 Building Use

The Ilwaco High School building includes classrooms, a gymnasium, a library, a kitchen, and administrative offices. The school has over 280 student occupants.

1.1.2 Structural System

Table 1.1-1. Structural System Description of Ilwaco High School

Structural System	Description
Structural Roof	The roof system is composed of ½-inch plywood over 2x8 roof framing and glulam beams.
Structural Floor(s)	The floor system is a concrete slab-on-grade with a suspended concrete slab at the northwest corner. The gymnasium floor system is a concrete slab over concrete beams and post-tensioned concrete joists.
Foundations	The walls are supported by continuous wall footings. Columns are supported by spread footings. At the gymnasium, the columns, walls, and structural slab on grade are supported by pile caps and timber piling.
Gravity System	The gravity system consists of glulam beam framing supported by the wood stud bearing walls. The upper level of the gymnasium is supported by the concrete beams and concrete bearing walls and columns.
Lateral System	Lateral forces are resisted by the plywood roof diaphragm, which transfers the forces into wood shear walls in both the longitudinal and transverse directions. The wood shear walls are typically sheathed with gypsum board at interior shear walls and plywood sheathing at exterior shear walls. The lateral forces at the gymnasium level are resisted by the concrete slab, which transfers the forces to the concrete shear walls below.

1.1.3 Structural System Visual Condition

Table 1.1-2. Structural System Condition Description of Ilwaco High School

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, not visible.
Gravity System	No visible signs of corrosion, damage, or deterioration.
Lateral System	No visible signs of corrosion, damage, or deterioration.

Photos:

Figure 1-1. Ilwaco High School - South Exterior

Figure 1-2. Ilwaco High School - East Exterior

Figure 1-3. Ilwaco High School - North Exterior

Figure 1-4. Typical Classroom with Tall Unbraced Cabinets

Figure 1-5. Library

Figure 1-6. Cafeteria Showing Glulam Beam Roof Framing

Figure 1-7. Main Entrance

Figure 1-8. Gymnasium with Glulam Arches

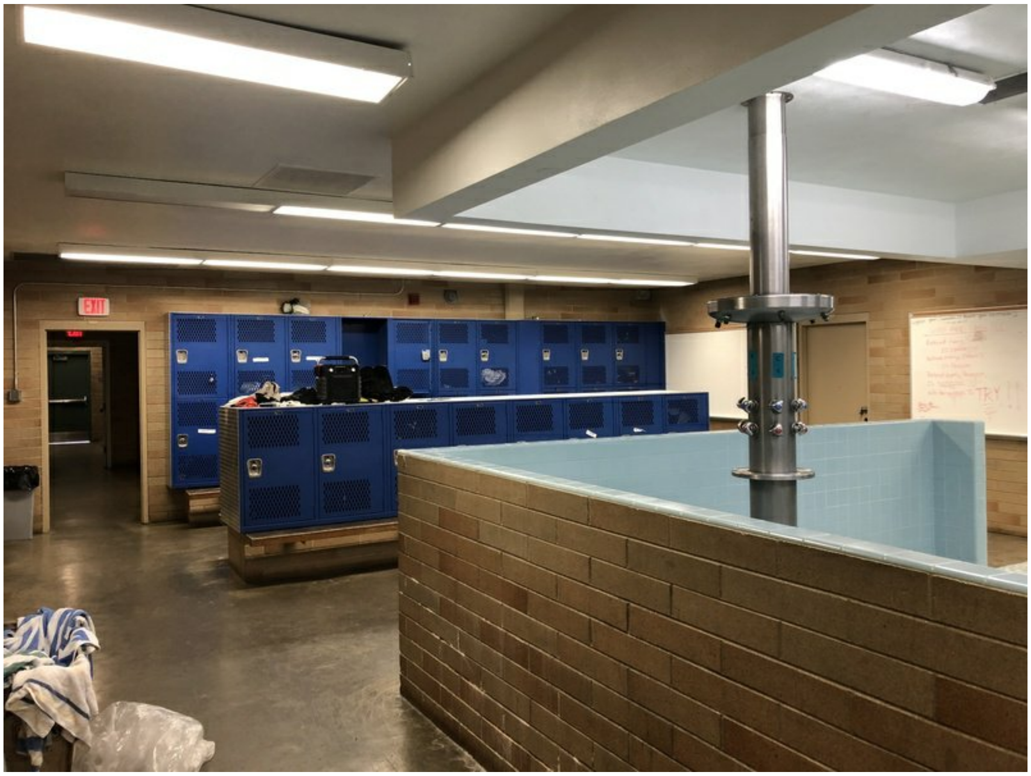

Figure 1-9. Unbraced Nonstructural Masonry Half-Walls in Locker Room

Figure 1-10. Tall Unbraced Nonstructural Components, Typical Throughout

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 Ocean Beach Ilwaco High School Ilwaco High School

Deficiency	Description
Vertical Irregularities	Vertical elements resisting shear wall overturning are discontinuous at the west gymnasium wall. Wood shear wall and diaphragm strengthening or the addition of new shear walls may be appropriate to mitigate seismic risk.
Shear Stress Check	Pseudo shear stress is greater than 1000 lb/ft. The building likely requires wood shear wall strengthening. Adding new plywood shear walls and replacing gypsum sheathing with plywood sheathing may be appropriate. Further investigation is required.

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 Ocean Beach Ilwaco High School Ilwaco High School

Unknown Item	Description
Liquefaction	The liquefaction potential of site soils is unknown at this time given available information. Low liquefaction potential is identified per ICOS based on state geologic mapping. Requires further investigation by a licensed geotechnical engineer to determine liquefaction potential.
Slope Failure	Requires further investigation by a licensed geotechnical engineer to determine susceptibility to slope failure.
Surface Fault Rupture	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.

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 Ocean Beach Ilwaco High School Ilwaco High School

Deficiency	Description
LSS-3 Emergency Power. HR-not required; LS-LMH; PR-LMH.	Inadequate anchoring/bracing of life-safety equipment. All life-safety equipment should be braced or anchored.
P-2 Heavy Partitions Supported by Ceilings. HR-LMH; LS-LMH; PR-LMH.	The top of the masonry partition walls in the locker room below the gym are supported by integrated ceiling systems. Independent bracing or vertical strongbacking should be provided at the tops of heavy partitions.
LF-1 Independent Support. HR-not required; LS-MH; PR-MH.	Inadequate independent attachments for light fixtures. All light fixtures in grid ceiling system should be braced to the structure by a minimum of two wires at diagonally opposite corners of each fixture.
CF-2 Tall Narrow Contents. HR-not required; LS-H; PR-MH.	Anchorage is required for tall narrow contents more than six feet high to provide overturning restraint.
CF-3 Fall-Prone Contents. HR-not required; LS-H; PR-H.	Anchorage is required for fall-prone contents. Heavy items on upper shelves should be restrained to avoid becoming falling hazards.
ME-1 Fall-Prone Equipment. HR-not required; LS-H; PR-H.	Anchorage is required for fall-prone equipment weighing more than 20 pounds.
ME-2 In-Line Equipment. HR-not required; LS-H; PR-H.	Independent vertical support and lateral bracing is required for in-line equipment.
ME-3 Tall Narrow Equipment. HR-not required; LS-H; PR-MH.	Anchorage is required for tall narrow equipment.

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 Ocean Beach Ilwaco High School Ilwaco High School

Unknown Item	Description
LSS-1 Fire Suppression Piping. HR-not required; LS-LMH; PR-LMH.	Further investigation is required to review fire suppression anchorage and bracing. All fire suppression piping should be braced in accordance with NFPA-13.
LSS-2 Flexible Couplings. HR-not required; LS-LMH; PR-LMH.	Further investigation is required to review fire suppression for flexible couplings.
LSS-4 Stair and Smoke Ducts. HR-not required; LS-LMH; PR-LMH.	Further investigation is required to review stair and smoke ducts for bracing and flexible connections at seismic joints.
LSS-5 Sprinkler Ceiling Clearance. HR-not required; LS-MH; PR-MH.	Further investigation is required to review penetration clearances at panelized ceilings for fire suppression devices.
HM-2 Hazardous Material Storage. HR-LMH; LS-LMH; PR-LMH.	Further investigation is required to review breakable containers storing hazardous material.
HM-4 Shutoff Valves. HR-MH; LS-MH; PR-MH.	Further investigation is required to locate shutoff valves or spill/leak protection for hazardous material piping.
HM-5 Flexible Couplings. HR-LMH; LS-LMH; PR-LMH.	Further investigation is required to locate flexible couplings on hazardous material ductwork/piping.
P-3 Drift. HR-not required; LS-MH; PR-MH.	Further investigation is required to verify detailing of rigid cementitious partitions for drift.
C-1 Suspended Lath and Plaster. HR-H; LS-MH; PR-LMH.	Further investigation is required to review suspended ceiling attachments.
C-2 Suspended Gypsum Board. HR-not required; LS-MH; PR-LMH.	Further investigation is required to review suspended ceiling attachments.
PCOA-2 Canopies. HR-not required; LS-LMH; PR-LMH.	Further investigation is required to verify anchorage of canopies at building exits to the main structure.
PP-1 Flexible Couplings. HR-not required; LS-not required; PR-H.	Non-applicable due to ASCE 41 Performance Level: \Life Safety (LS)\
PP-2 Fluid and Gas Piping. HR-not required; LS-not required; PR-H.	Non-applicable due to ASCE 41 Performance Level: \Life Safety (LS)\

Ocean Beach, Ilwaco High School, Ilwaco High School

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				
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			Vertical elements resisting shear wall overturning are discontinuous at the west gymnasium wall. Wood shear wall and diaphragm strengthening or the addition of new shear walls may be appropriate to mitigate seismic risk.
Geometry	There are no changes in the net horizontal dimension of the seismic-force-resisting system of more than 30% in a story relative to adjacent stories, excluding one-story penthouses and mezzanines. (Tier 2: Sec. 5.4.2.4; Commentary: Sec. A.2.2.5)	X				
Mass	There is no change in effective mass of more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Tier 2: Sec. 5.4.2.5; Commentary: Sec. A.2.2.6)	X				
Torsion	The estimated distance between the story center of mass and the story center of rigidity is less than 20% of the building width in either plan dimension. (Tier 2: Sec. 5.4.2.6; Commentary: Sec. A.2.2.7)	X				

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

Geologic Site Hazards

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

Surface Fault Rupture	Surface fault rupture and surface displacement at the building site are not anticipated. (Tier 2: Sec. 5.4.3.1; Commentary: Sec. A.6.1.3)				X	Requires further investigation by a licensed geotechnical engineer to determine whether site is near locations of expected surface fault ruptures.

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

Foundation Configuration

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

17-6 Collapse Prevention Structural Checklist for Building Type W2

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 shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than the following values: Structural panel sheathing – 1,000 lb/ft; Diagonal sheathing – 700 lb/ft; Straight sheathing – 100 lb/ft; All other conditions – 100 lb/ft. (Tier 2: Sec. 5.5.3.1.1; Commentary: Sec. A.3.2.7.1)		X			Pseudo shear stress is greater than 1000 lb/ft. The building likely requires wood shear wall strengthening. Adding new plywood shear walls and replacing gypsum sheathing with plywood sheathing may be appropriate. Further investigation is required.
Stucco (Exterior Plaster) Shear Walls	Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system. (Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.2)			X		
Gypsum Wallboard or Plaster Shear Walls	Interior plaster or gypsum wallboard is not used for shear walls on buildings more than one story high with the exception of the uppermost level of a multi-story building. (Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.3)			X		
Narrow Wood Shear Walls	Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces. (Tier 2: Sec. 5.5.3.6.1; Commentary: Sec. A.3.2.7.4)	X				
Walls Connected Through Floors	Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor. (Tier 2: Sec. 5.5.3.6.2; Commentary: Sec. A.3.2.7.5)			X		
Hillside Site	For structures that are taller on at least one side by more than one-half story because of a sloping site, all shear walls on the downhill slope have an aspect ratio less than 1-to-1. (Tier 2: Sec. 5.5.3.6.3; Commentary: Sec. A.3.2.7.6)	X				

Cripple Walls	Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels. (Tier 2: Sec. 5.5.3.6.4; Commentary: Sec. A.3.2.7.7)			X		
Openings	Walls with openings greater than 80% of the length are braced with wood structural panel shear walls with aspect ratios of not more than 1.5-to-1 or are supported by adjacent construction through positive ties capable of transferring the seismic forces. (Tier 2: Sec. 5.5.3.6.5; Commentary: Sec. A.3.2.7.8)	X				

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Wood Posts	There is a positive connection of wood posts to the foundation. (Tier 2: Sec. 5.7.3.3; Commentary: Sec. A.5.3.3)	X				
Wood Sills	All wood sills are bolted to the foundation. (Tier 2: Sec. 5.7.3.3; Commentary: Sec. A.5.3.4)	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				

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

Connections

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Wood Sill Bolts	Sill bolts are spaced at 6 ft (1.8 m) or less with acceptable edge and end distance provided for wood and concrete. (Tier 2: Sec. 5.7.3.3; Commentary: Sec. A.5.3.7)	X				

Diaphragms

EVALUATION ITEM	EVALUATION STATEMENT	C	NC	N/A	U	COMMENT
Diaphragm Continuity	The diaphragms are not composed of split-level floors and do not have expansion joints. (Tier 2: Sec. 5.6.1.1; Commentary: Sec. A.4.1.1)	X				
Roof Chord Continuity	All chord elements are continuous, regardless of changes in roof elevation. (Tier 2: Sec. 5.6.1.1; Commentary: Sec. A.4.1.3)	X				
Diaphragm Reinforcement at Openings	There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension. (Tier 2: Sec. 5.6.1.5; Commentary: Sec. A.4.1.8)			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 have aspect ratios less than or equal to 4-to-1. (Tier 2: Sec. 5.6.2; Commentary: Sec. A.4.2.3)			X		
Other Diaphragms	The 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				

Ocean Beach, Ilwaco High School, Ilwaco High School

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	Further investigation is required to review fire suppression anchorage and bracing. All fire suppression piping should be braced in accordance with NFPA-13.
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	Further investigation is required to review fire suppression for flexible couplings.
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			Inadequate anchoring/bracing of life-safety equipment. All life-safety equipment should be braced or anchored.
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	Further investigation is required to review stair and smoke ducts for bracing and flexible connections at seismic joints.
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	Further investigation is required to review penetration clearances at panelized ceilings for fire suppression devices.
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		Non-applicable due to ASCE 41 Performance Level: "Life Safety (LS)"

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	Further investigation is required to review breakable containers storing hazardous material.
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	Further investigation is required to locate shutoff valves or spill/leak protection for hazardous material piping.
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	Further investigation is required to locate flexible couplings on hazardous material ductwork/piping.
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		
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			The top of the masonry partition walls in the locker room below the gym are supported by integrated ceiling systems. Independent bracing or vertical strongbacking should be provided at the tops of heavy partitions.
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	Further investigation is required to verify detailing of rigid cementitious partitions for drift.

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	Further investigation is required to review suspended ceiling attachments.
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	Further investigation is required 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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			Inadequate independent attachments for light fixtures. All light fixtures in grid ceiling system should be braced to the structure by a minimum of two wires at diagonally opposite corners of each fixture.
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		Non-applicable 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		Non-applicable 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		No masonry veneer
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		No masonry veneer
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		No masonry veneer
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		No masonry veneer
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		No masonry veneer
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		No masonry veneer
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		No masonry veneer
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		No masonry veneer

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	Further investigation is required to verify anchorage of canopies at building exits to the main structure.
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			Anchorage is required for tall narrow contents more than six feet high to provide overturning 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			Anchorage is required for fall-prone contents. Heavy items on upper shelves should be restrained to avoid becoming falling hazards.
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		Non-applicable 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		Non-applicable 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		Non-applicable 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			Anchorage is required for fall-prone equipment weighing more than 20 pounds.
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			Independent vertical support and lateral bracing is required for in-line 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			Anchorage is required for tall narrow equipment.
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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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	Non-applicable 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	Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		Non-applicable 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		No elevator
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		No elevator

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		No elevator
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		No elevator
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		No elevator
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		No elevator
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		No elevator
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		No elevator
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		No elevator

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Appendix B: Concept-Level Seismic Upgrade Figures

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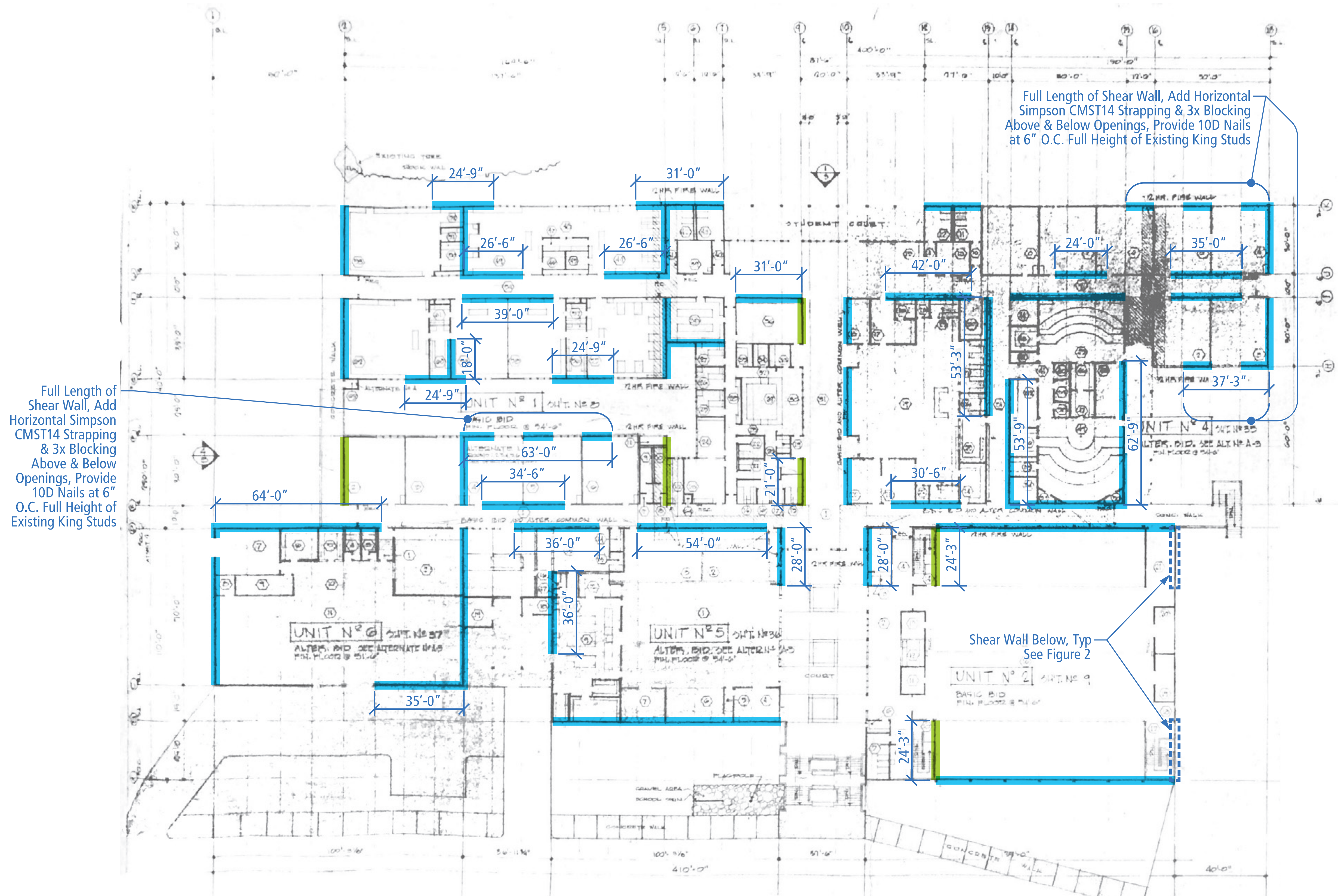


LEGEND

- Existing Wall, Install 1/2" Plywood at Existing Stud Wall With 10D Nails at 6" OC at Panel Edges, Add Studs as Required to Achieve Stud Spacing of 16" OC, Install 5/8" Titen HD Anchors at 24" OC at Sill Plate, Install Simpson HDU-2 Adhesive Anchors at Each End of Shear Wall
- Existing Wall, Add 1/2" Plywood Each Side of Existing Stud Wall With 10D Nails at 6" OC at Panel Edges, Add Studs as Required to Achieve Stud Spacing of 16" OC at Sill Plate, Install 5/8" Titen HD Anchors at 12" OC Install Simpson HDU-2 Adhesive Anchors at Each End of Shear Wall

NOTES

1. Remove and replace existing ceiling and existing wall finishes as required to perform work.

Figure 1 – First Floor Strengthening Plan

LEGEND

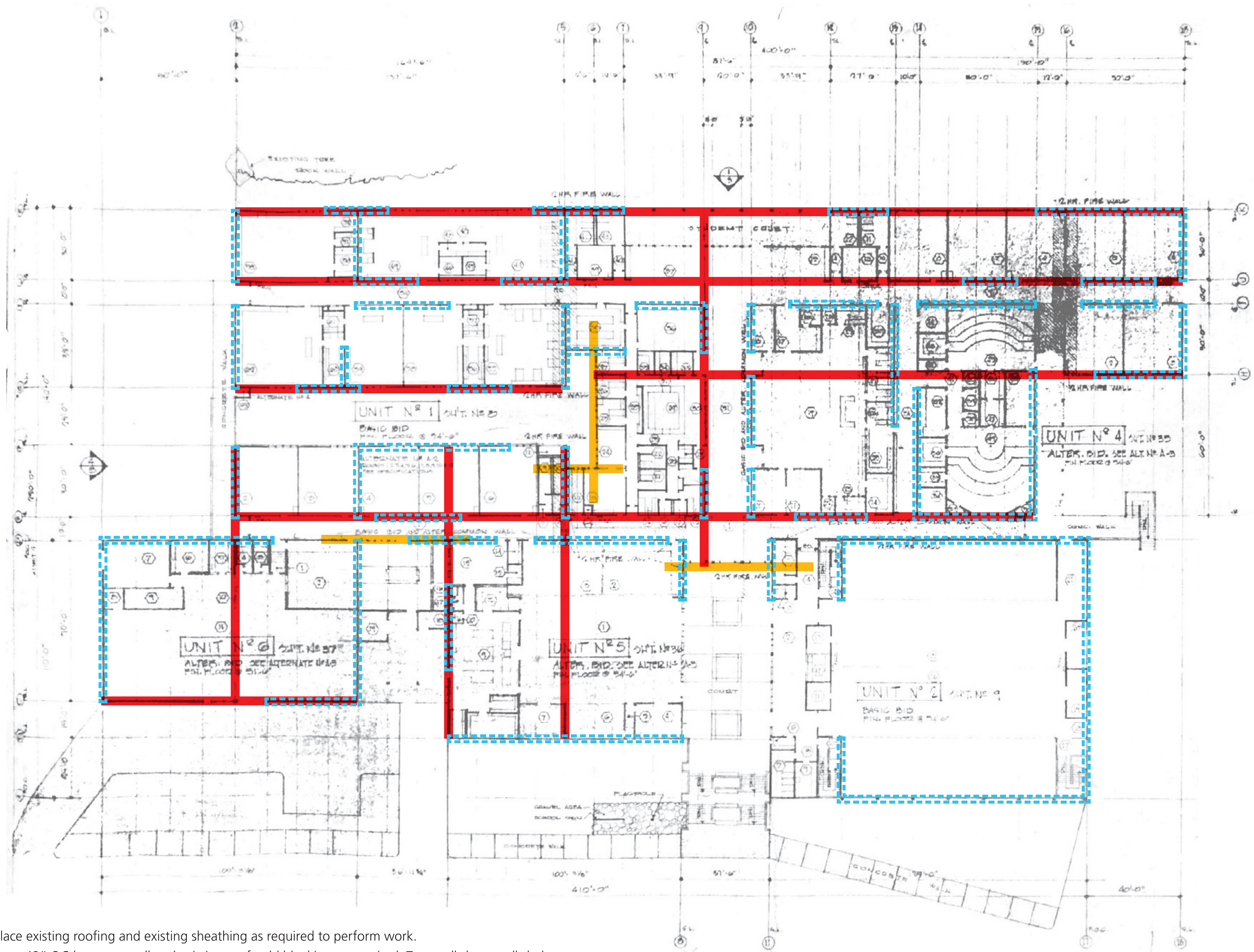
Existing Concrete Shear Wall, Add (2) Layers of FRP 15'-0" X 6'-0" Wide at Each End of Existing Concrete Shear Wall

See Figure 4 for Partial Nonstructural Plan

NOTES

1. Remove and replace existing ceiling and existing wall finishes as required to perform work.

Figure 2 – Gym Foundation Strengthening Plan



LEGEND

- Red line: Add (2) Simpson CMST16 Straps With 4x Blocking as Required, Typ. Unless Otherwise Noted
- Yellow line: Add Simpson CMST16 Straps With 4x Blocking as Required, Continue 8'-0" Beyond Opening
- Blue dashed box: Shear Wall Below, See Figure 1

NOTES

1. Remove and replace existing roofing and existing sheathing as required to perform work.
2. Add (2) steel clips at 12" OC between wall and existing roof, add blocking as required, Typ at all shear walls below.

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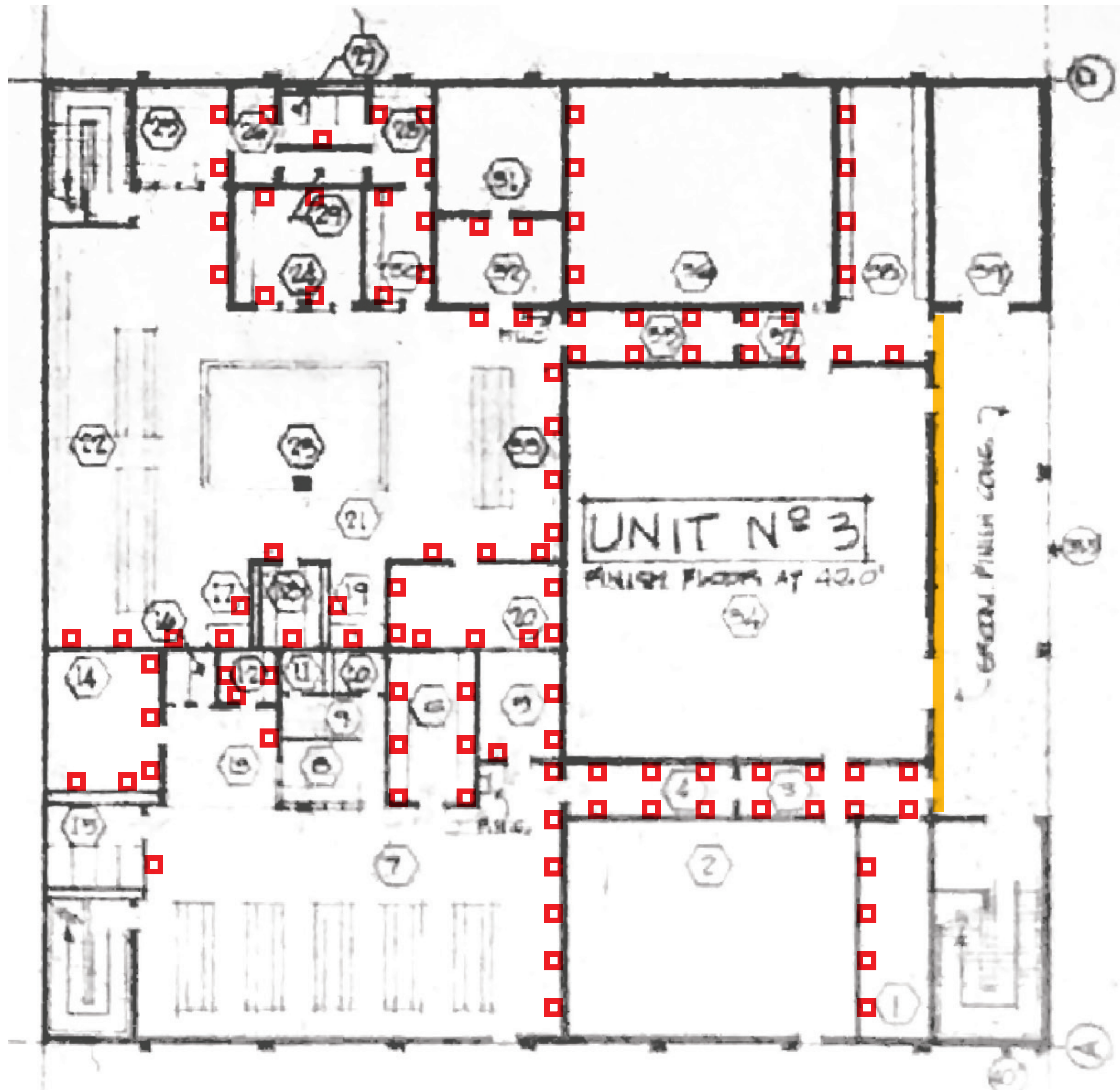
Ilwaco High School Seismic Upgrades – High School Building

Washington State School Seismic Safety Assessments Project – Ocean Beach School District – June 2021

Figure 3 – Roof Strengthening Plan



LEGEND

- HSS 4x4x1/4 at 6' OC With 5/8" Diameter Anchors at 2' OC Install Anchors With Screen Tubes, Add PL 1/4x8x5 With (2) 5/8" Diameter Adhesive Anchors, Welded to HSS T&B
- Horizontal HSS 4x4x1/4 @ 6' OC With 5/8" Diameter Anchors @ 2' OC Install Anchors With Screen Tubes, Add (2) 5/8" Diameter Adhesive Anchors at Each Concrete Column

NOTES

1. Remove and replace existing architectural finishes and furniture as required to perform work.

Figure 4 – Partial Nonstructural Plan

Appendix C: Opinion of Probable Construction Costs

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520 Kirkland Way, Suite 301
Kirkland, WA 98033
tel: (425) 828-0500
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Name:	**Wa State School Seismic Safety Assessment Phase 2**
Second Name:	**Ilwaco High School**
Location:	**Ilwaco, WA**
Design Phase:	**ROM Cost Estimates**
Date of Estimate:	**March 5, 2021**
Date of Revision:	**April 12, 2021**
Month of Cost Basis:	**1Q, 2021**

Ilwaco High School

Master Estimate Summary

Project Name	Construction Cost Type	Estimated Construction Cost
Ilwaco High School	Structural Costs	$6,053,711
Ilwaco High School	Non-Structural Costs	$4,842,969
TOTAL ESTIMATED CONSTRUCTION COST →		**$10,896,680**

Soft Costs	Soft Costs % Construction Cost	Estimated Soft Costs
Project Soft Cost Allowance	40.0%	**$4,358,672**
		Sum of the Above
TOTAL ESTIMATED PROJECT COST →		**$15,255,352**

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 the month of Cost Basis noted above right.

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 Allowance are: A/E design fees, QA/QC, Project Administration, Owners Project Contingency, Average Washington State Sale Tax and
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

Structural Costs

Name:	Wa State School Seismic Safety Assessment Phase 2
Second Name:	Ilwaco High School
Location:	Ilwaco, WA
Design Phase:	ROM Cost Estimates
Date of Estimate:	March 5, 2021
Date of Revision:	April 12, 2021
Month of Cost Basis:	1Q, 2021

Areas	sqft
Building Area	89,250
Total Areas	89,250

520 Kirkland Way, Suite 301
Kirkland, WA 98033
Phone: 425-828-0500 Fax: 425-828-0700
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Ilwaco High School

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 4,112,810

	Percentage of Previous Subtotal	Amount	Running Subtotal
Scope Contingency	10.0%	$ 411,281	$ 4,524,091
General Conditions	10.0%	$ 411,281	$ 4,935,372
Home Office Overhead	5.0%	$ 205,641	$ 5,141,013
Profit	6.0%	$ 246,769	$ 5,387,781
Escalation Included to 4Q, 2022	12.4%	$ 665,930	$ 6,053,711
Washington State Sales Tax - Included in Soft Costs			
Total Markups Applied to the Direct Cost	47.19%		

Markups are multiplied on each subtotal- They are not multiplied from the direct cost

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--	**$ 6,053,711**	**$ 67.83**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 4,842,969**	**$ 54.26**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --	**$ 9,080,567**	**$ 101.74**

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											
Foundations											
	Hold Down System - Nail to Wood Studs, Epoxy Anchor Bolt	116	each	$ 128.76	$ 14,936.16	$ 93.24	$ 10,815.84	$ 13.32	$ 1,545.12	$ 235.32	$ 27,297.12
Superstructure											
Roof Systems											
	Install Tube Steel Columns and Girts HSS 4x4x1/4 for Strongback Support Fasten to Concrete Wall with 5/8" Epoxy Bolts 24" o.c. with Plates at CMU Wall	24.80	ton	$ 5,551.00	$ 137,656.53	$ 3,549.00	$ 88,009.91	$ 546.00	$ 13,539.99	$ 9,646.00	$ 239,206.43
	FRP at Concrete Walls - 2 Layers	720	sqft	$ 10.40	$ 7,488.00	$ 5.60	$ 4,032.00	$ 0.96	$ 691.20	$ 16.96	$ 12,211.20
	New Shearwall with 1/2" Plywood Sheathing with Studs with Sill Bolts - Remove GWB and Reinstall	25,000	sqft	$ 4.68	$ 117,082.50	$ 2.31	$ 57,667.50	$ 0.42	$ 10,485.00	$ 7.41	$ 185,235.00
	Upgrade Shearwall with 1/2" Plywood Sheathing at Each Face with Studs as Required - Remove GWB and Reinstall	3,000	sqft	$ 6.18	$ 18,525.00	$ 3.33	$ 9,975.00	$ 0.57	$ 1,710.00	$ 10.07	$ 30,210.00
	Add A35 Steel Clips at 12" o.c. at Top of Wall to Roof	1,850	each	$ 17.85	$ 33,022.50	$ 3.15	$ 5,827.50	$ 1.26	$ 2,331.00	$ 22.26	$ 41,181.00
	CMSTC14 Nailed to Sheathing with 4X Blocking	725	lnft	$ 10.40	$ 7,540.00	$ 5.60	$ 4,060.00	$ 0.96	$ 696.00	$ 16.96	$ 12,296.00
	2 Rows of CMSTC14 Nailed to Sheathing with 4X Blocking	2,300	lnft	$ 14.63	$ 33,637.50	$ 7.88	$ 18,112.50	$ 1.35	$ 3,105.00	$ 23.85	$ 54,855.00
	Add 1/2" Plywood Sheathing at Existing Roof - Allow 75%	66,938	sqft	$ 0.86	$ 57,432.38	$ 0.46	$ 30,925.13	$ 0.08	$ 5,301.45	$ 1.40	$ 93,658.95
Roofing System											
	Remove Roofing System Down to Plywood Deck	89,250	sqft	$ 4.04	$ 360,346.88	$ 0.21	$ 18,965.63	$ 0.26	$ 22,758.75	$ 4.51	$ 402,071.25
	New Membrane Roofing System with R-38 Rigid Insulation, Flashing and Trim and Downspout Roof Drainage System	89,250	sqft	$ 8.78	$ 783,168.75	$ 10.73	$ 957,206.25	$ 1.17	$ 104,422.50	$ 20.67	$ 1,844,797.50

WBS	Description	Quantity	U of M	Labor	Labor Total	Material	Material Total	Equipment	Equipment Total	Total $/U of M	Direct Cost
Interior Wall/Door/Casework/Specialties Systems											
	Remove and Reinstall Floor Finish Systems-Allow 50% of the Floor Area	44,625	sqft	$ 3.01	$ 134,187.38	$ 1.84	$ 82,243.88	$ 0.29	$ 12,985.88	$ 5.14	$ 229,417.13
	Remove and Reinstall Wall Finish Systems-Allow 100% of the Floor Area	89,250	sqft	$ 2.79	$ 249,007.50	$ 1.71	$ 152,617.50	$ 0.27	$ 24,097.50	$ 4.77	$ 425,722.50
	Remove Ceiling and Reinstall New ACT Ceiling Systems-Allow 80% of the Floor Area	71,400	sqft	$ 4.22	$ 301,022.40	$ 2.58	$ 184,497.60	$ 0.41	$ 29,131.20	$ 7.21	$ 514,651.20
Subtotal of the Direct Cost of Construction				**Ilwaco High School**							**$ 4,112,810**

PRODIMS

Non-Structural Costs

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

Name:	Wa State School Seismic Safety Assessment Phase 2	Areas	sqft
Second Name:	Ilwaco High School	Building Area	89,250
Location:	Ilwaco, WA		
Design Phase:	ROM Cost Estimates		
Date of Estimate:	March 5, 2021		
Date of Revision:	April 12, 2021		
Month of Cost Basis:	1Q, 2021	Total Areas	89,250

Ilwaco High School

Construction Cost Estimate

Subtotal Direct Cost From the Estimate Detail Below $ 3,290,248

	Percentage of Previous Subtotal	Amount		Running Subtotal
Scope Contingency	10.0%	$ 329,025	$	3,619,273
General Conditions	10.0%	$ 329,025	$	3,948,298
Home Office Overhead	5.0%	$ 164,512	$	4,112,810
Profit	6.0%	$ 197,415	$	4,310,225
Escalation Included to 4Q, 2022	12.4%	$ 532,744	$	4,842,969
Washington State Sales Tax - Included in Soft Costs				
Total Markups Applied to the Direct Cost	47.19%			
Markups are multiplied on each subtotal- They are not multiplied from the direct cost				

		$/sqft
TOTAL ESTIMATED CONSTRUCTION COST--→	**$ 4,842,969**	**$ 54.26**
-20% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 3,874,375**	**$ 43.41**
+50% TOTAL ESTIMATED CONSTRUCTION COST VARIANCE --→	**$ 7,264,453**	**$ 81.39**

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*										
	M/E/P/FP Systems										
	Mechanical/Electrical/Fire Protection Systems *	89,250	sqft	$ 19.13	$ 1,707,204.26	$ 15.65	$ 1,396,803.49	$ 2.09	$ 186,240.47	$ 36.87	$ 3,290,248.22
	*Allows 80 percent of existing nonstructural systems M/E/P/FP require upgrades/replacement.										
	Subtotal of the Direct Cost of Construction			**Ilwaco High School**							**$ 3,290,248**

Appendix D: Earthquake Performance Assessment Tool (EPAT) Worksheet

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Washington Schools Earthquake Performance Assessment Tool (EPAT)
RESULTS SUMMARY

District Name	Ocean Beach	**Existing Building Life Safety Risk & Priority for Retrofit or Replacement**
School Name	Ilwaco Middle High School	
Building Name	Ilwaco High School	Very High

Building Data

HAZUS Building Type	W2	Wood, Commercial & Industrial (>5,000 SF)
Year Built	1971	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	No	Buildings with irregularities have greater earthquake damage than otherwise similar buildings that are regular.
Moderate Vertical Irregularity	Yes	
Plan Irregularity	Yes	

Seismic Data

Earthquake Ground Shaking Hazard Level	Very High	Frequency and severity of earthquakes at this site
Percentile S_s Among WA K-12 Campuses	98%	Earthquake ground shaking hazard is higher than 98% of WA campuses.
Site Class (Soil or Rock Type)	D	Stiff Soil
Liquefaction Potential	Low	Liquefaction increases the risk of major damage to a building
Combined Earthquake Hazard Level	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	78%	76%	Very High	Red
Life Safety Retrofit Building	20%	11%	Very Low	Green/Yellow
Current Code Building	16%	7.6%	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:	Brian Matsumoto, Reid Middleton
User Overrides of Default Parameters:	Building Design Code Year, Latitude, Longitude, Site Class, Liquefaction, Geographic Region

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Appendix E: Existing Drawings

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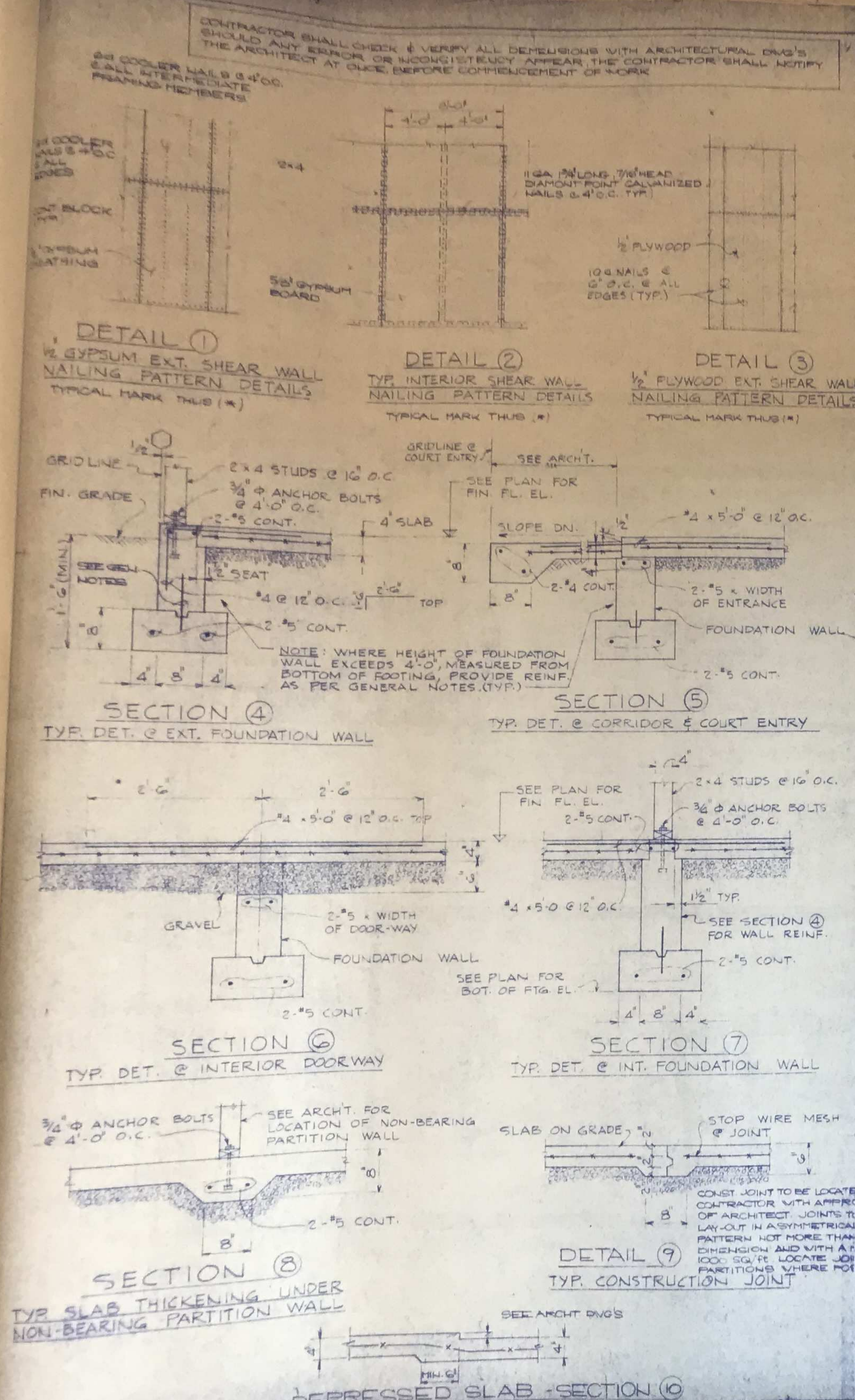
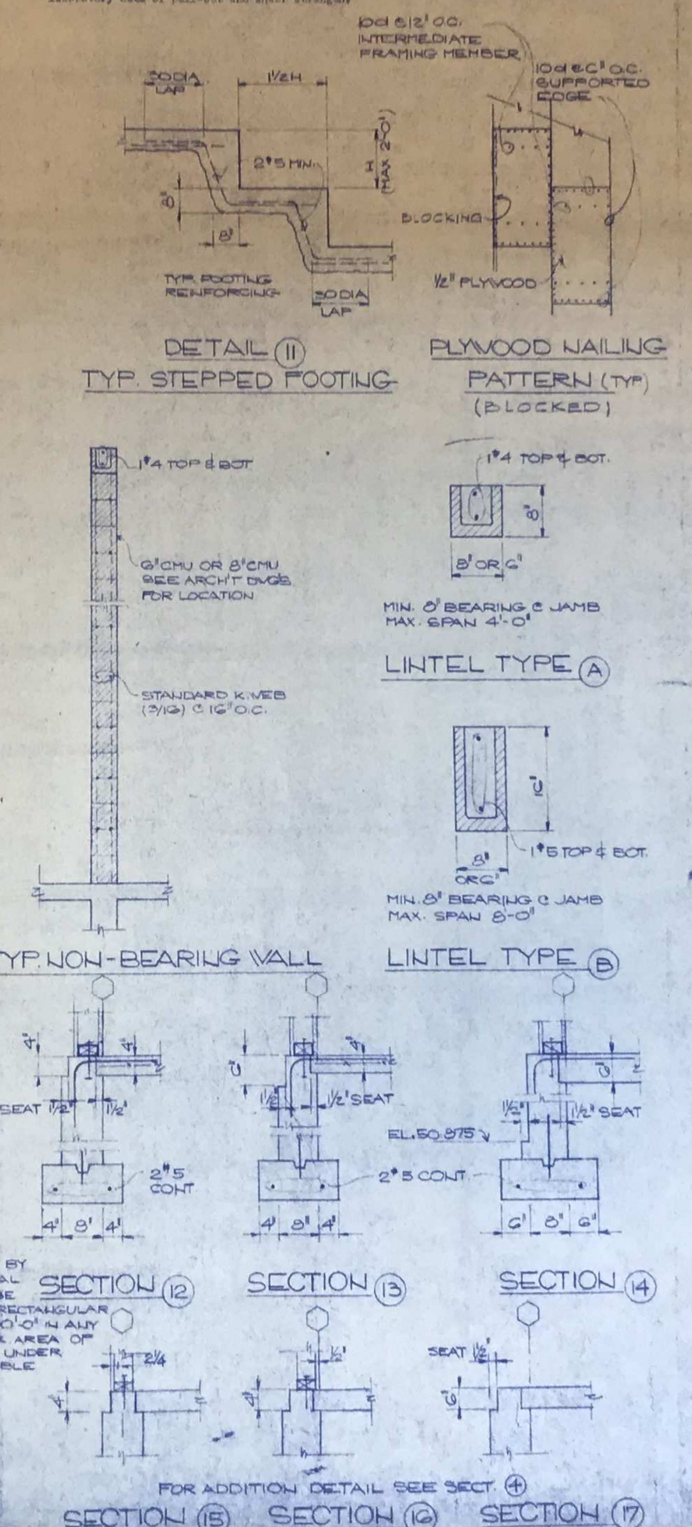


PLYWOOD

Plywood roof to be Structural II C.D.X. Minimum plywood nailing to be 6" o.c. at all supported or blocked panel edges and 12" o.c. at interior supports. Nails to be 8d for 1/2" plywood, 10d for 5/8" and 3/4" plywood. Stagger end laps at roof sheathing.

STRUCTURAL STEEL

Structural Grade ASTM A36, fs = 22,000 psi. (24,000 psi for compact sections). Tube columns ASTM A36, 22,000 psi. All steel, except steel embedded in concrete, shall be given one shop coat of approved paint. Welds 3/16" minimum continuous fillet by certified welders, heavy coated electrodes. Field connections not shown shall be bolted framed beam connections per AISC. Field bolts to be A-307. During erection structural steel shall be assured from collapsing with temporary bracing. Where expansion anchors are specified, the contractor shall submit to the structural engineer a sample of the anchor to be used with laboratory data of pull-out and shear strength.



THE FOLLOWING NOTES APPLY EXCEPT WHERE SHOWN OTHERWISE

CODE: Uniform Building Code, 1967

LIVE LOADS

Roof	25 PSF	Mechanical Space and Fan Room	100 PSF
Classrooms	40 PSF	Shop Area	100 PSF
Toilet and Office	50 PSF	Supplies and Book Storage	125 PSF
Kitchen	75 PSF	Storage	125 PSF
Stairs and Corridor	100 PSF	Wind	30 PSF
Public Areas	100 PSF	Seismic	Zone 3
Shops and Gyms	100 PSF		

FOUNDATIONS

Maximum soil pressure 2000 PSF for Unit #1, Unit #4, Unit #5 and Unit #6 only. Exterior footings and exterior spandrel beams 1'-6" minimum below finish grade. All footings to bear on firm undisturbed earth, 1'-0" minimum below existing grade. Backfill to be thoroughly compacted per Specifications. Provide 2 - #5 continuous minimum bottom of all walls and footings.

PILING (UNIT 3 ONLY)

All piles to be treated Douglas Fir driven to a capacity of 20 tons. Method of determination set forth in Specifications. ENR formula will be used where it is applicable. Piles to be driven with Vulcan #1 or approved equal, using a hammer delivering a driving energy of at least 15,000 foot pounds per blow.

CONCRETE

CLASS AND USE	f'c	SLUMP	SACKS/C.Y.	ADMIXTURE
A - Footings and Foundations	2500	4 - 5	5½	None
B - Slabs on Grade	2500	3 - 4	5½	Plastiment, Pozzolith or equ.
C - Structural Concrete	3000	3 - 4	6	Plastiment, Pozzolith or equ.
D - Sidewalk Slabs, Exterior Stairs	2500	3 - 4	5½	3% to 5% air entrainment
E - Setting Bearing Plates	2500	Dry Pack	--	Non shrink

REINFORCING STEEL

Reinforcing steel to be ASTM A615 grade 40, except column verticals grade 60, or unless otherwise noted on drawings. Reinforcing steel details shall be prepared by an experienced professional detailer approved by the Architect and conform to standard practice outlined in ACI Report 315-57.

CONCRETE COVER OF REINFORCING

- 3" Concrete poured against earth.
- 2" Formed concrete with earth backfill.
- 1½" Beams and columns (stirrups, ties) walls exposed to weather, slabs on moisture barrier.
- 1" Walls, inside face.
- 3/4" Joists and formed slabs.

Lap column verticals, Class "A" concrete 32 diameters. Lap all other reinforcing 24 diameters. Splices at tension regions shall not be permitted.

WALLS

Reinforcing:

THICKNESS	HORIZONTAL	VERTICAL
6" wall & under	#5 at 18" o.c.	#5 at 18" min.
8" wall	#5 at 12" o.c.	#5 at 18" min.
10" wall	#4 at 12" e.f.	#4 at 18" e.f.
12" wall	#5 at 18" e.f.	#5 at 18" e.f.

At heads of all openings provide #3 hairpin bars with 12" legs at 6" o.c. minimum. At openings provide 2 - #5 extra bars at top, bottom and each side extending 40 diameters or 24" minimum beyond corners and 2 - #5 x 4'-0" diagonals at each corner, except 6" walls 1 - #5 diagonal. At corners and intersections extend horizontal wall steel to 2" from outside face and lap with elbow bars (30 diameters) of same size and spacing. Lap outside face only at corners. Wall stubs shall project 27 diameters and shall be a minimum of 1'-6" long, same size and spacing as vertical steel. Where walls without vertical reinforcing are poured separate from footing provide #4 x 1'-6" stubs at 18" o.c.

SLABS AND BEAMS

Steel shall be rigidly supported using concrete blocks or approved chairs. Use #5 raiser bar for all slabs. Where slab steel is parallel to a beam or wall provide #4 x 5'-0" at 12" o.c. in top of slab across beam or wall. Where slab is on one side only, top elbow bars shall be #4 x 3'-0" at 12" o.c. At openings over 18" square, provide 2 bars same size as main steel extending 30 diameters past opening at each side and diagonally at corners. Where beam or slab steel is indicated as bent up, it shall be bent up at the one-sixth point of clear span for simple supports and one-fifth point for continuous supports extending into adjacent span a distance equal one-fourth greater span. Non structural slabs on grade to be 4" thick placed on gravel and reinforced with 6 x 6 6/6 mesh.

Slab Temperature Steel: Provide area equal to 0.024T for floor slabs and 0.03T for roof slabs with #4 at 18" minimum. (T equals slab thickness).

MASONRY

Concrete block non-bearing walls to be grade per ASTM C90-59 and to be laid up in Type "N" mortar. See plan for lintel details and masonry reinforcing.

PRE-STRESSED CONCRETE

All pre-stressing shall conform to UBC, Chapter 26, "Pre-Stressed Concrete". Inspection shall be made per Specifications.

Minimum Concrete Cover on Pre-Stress Steel, Ducts and Non Pre-Stress Steel:

- 1½" Pre-stressing steel and main reinforcing bars
- 1" Stirrups and ties
- 1" Slabs and joist exposed to weather
- 3/4" Slabs and joist not exposed to weather

TIMBER

Structural timber and lumber 1500 psi Stress Grade Douglas Fir (Construction or Industrial Grade), Paragraphs 122B through 125B and 153B, WCLA Grading Rules #15. Provide double joists under partitions that extend at least half joist span. Bolt heads and nuts bearing against wood to be provided with M.I. washers except on sill plates and steel beam nailers use cut washers. Nailers to steel beams shall be attached with 5/8" bolts at 3'-0" o.c. staggered. Wood bearing on or installed within 1" of masonry or concrete to be treated with an approved preservative. Solid blocking of not less than 2" thickness shall be provided at ends and at all supports of joists and rafters. Between supports provide blocking or approved bridging at 8'-0" o.c. for joists, 10'-0" for rafters. Beam and joist hangers to have capacity equal to shear strength of beam or joist.

GLUE-LAM MEMBERS

Glued laminated beams, Douglas Fir dried to a moisture content 8 to 12%. Stress Grade Combination "C" or better, or as otherwise noted on drawings. Fb = 2200 psi. Fv = 1500 psi. Glue shall be casein, water resistant type and shall comply with Federal Specification MMM-A-125, and shall contain a mold inhibiter. See Architect's Specifications for additional requirements. Glue-lam members to be AITC certified. The fabricator shall be approved by the Architect.

CAMBER -
CAMBER GL. 1½ x DEAD LOAD

AS BUILT DRAWINGS

PROJECT TITLE: JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SHEET TITLE: GENERAL NOTES & TYPICAL DETAILS

PROJ NO 6808 · DATE MAY 1970

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S1

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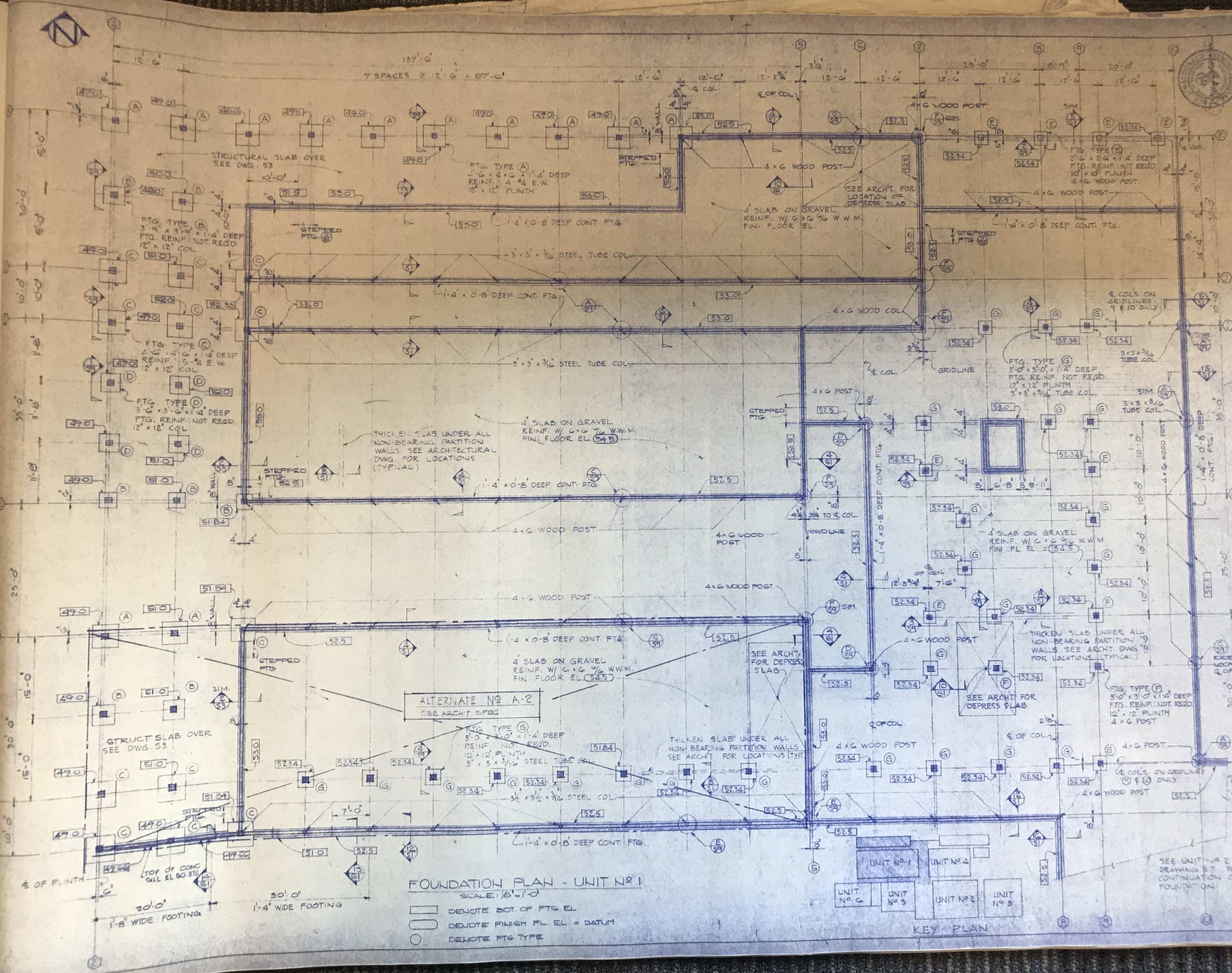
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

FOUNDATION PLAN
BASIC BID - UNIT Nº 1

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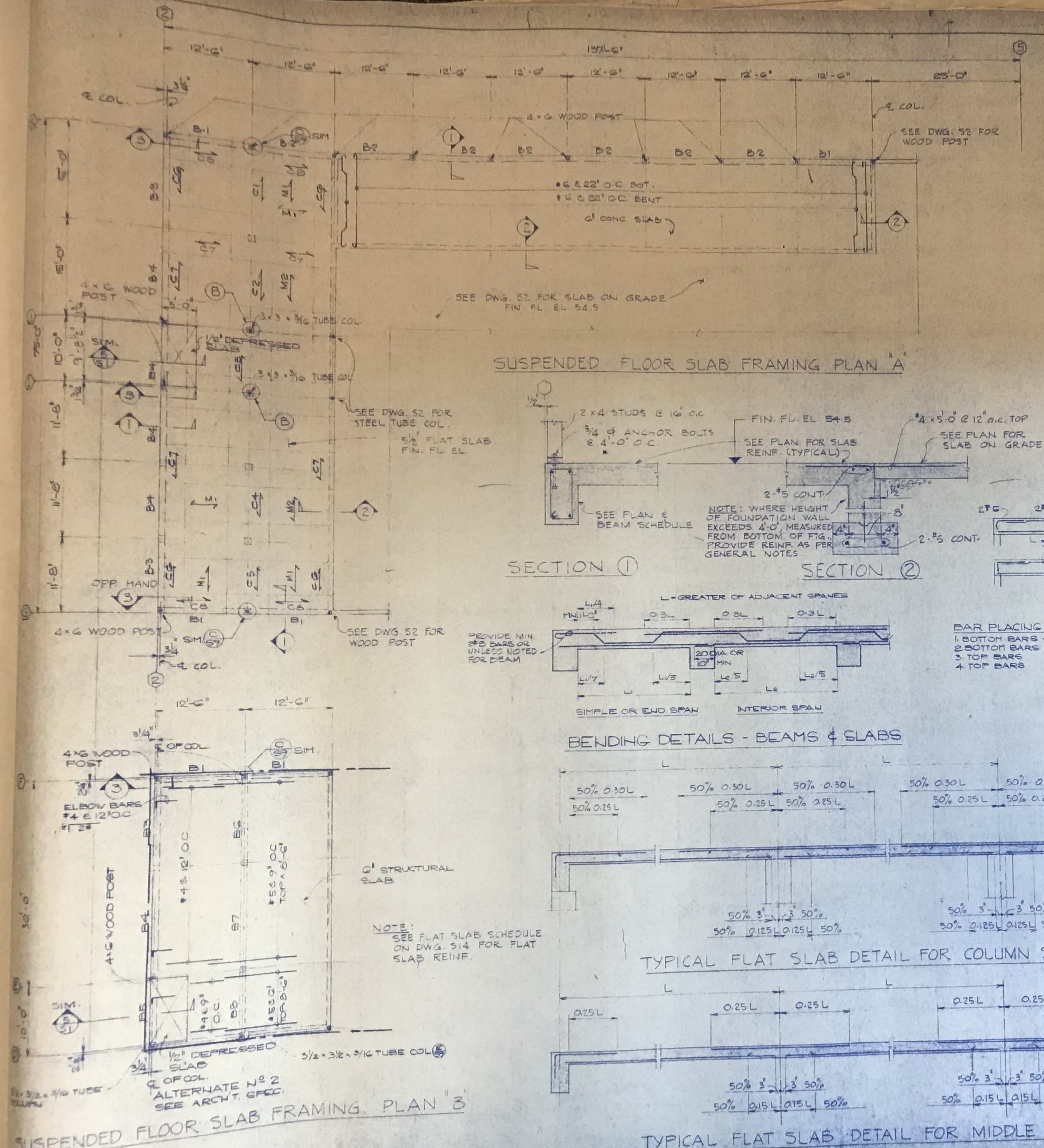
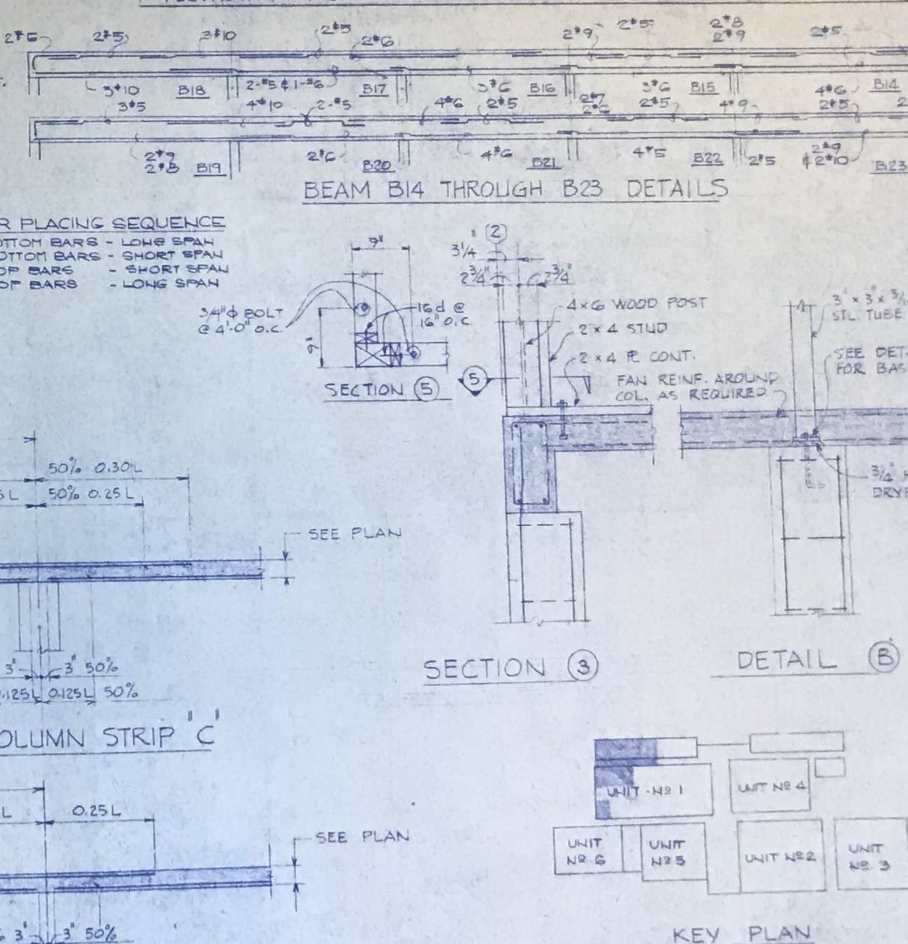
AS BUILT DRAWINGS

52



BEAM SCHEDULE

GRADE OF STEEL	MK.	SIZE W	SIZE D	BOTTOM NO.	BOTTOM SIZE	TOP NO.	TOP SIZE	TOP REMARKS	STIRRUPS SIZE	STIRRUPS SPACING FROM FACE OF EA. SUPPORT
	B1	8	15	2	#6	1	6	@ CONT. END	#3	3 @ 7½" o.c. BAL @ 12" o.c.
	B2	8	15	2	#5	1	6	@ EA. END	#3	DO
	B3	8	18	2	#6	1	6	@ CONT END	#3	DO
	B4	8	18	2	#5	1	6	@ EA. END	#3	DO
	B5	8	18	2	#6	1	6	@ CONT END	#3	DO
	B6	8	22	2	#6	2	7	@ CONT. END	#3	DO
	B7	8	22	2	#6	1	7	@ EA. END	#3	DO
	B8	8	22	2	#6	1	7	@ CONT. END	#3	DO
	B9	8	18	2	#6				#3	@ 12" o.c. THRU-OUT
	B10	8	22	2	#5	1	7	@ CONT. END	#3	4 @ 7½" o.c. BAL @ 12" o.c.
	B11	8	22	2	#5	1	7	@ EA. END	#3	3 @ 7½" o.c. BAL @ 12" o.c.
	B12	8	18	2	#7	1	6	@ CONT END	#3	@ 12" o.c.
	B13	8	18	2	#6	2	6	@ EA. END	#3	@ 12" o.c.
	B14	14	30	4	#6	SEE BEAM BELOW (TYP.)			#3	2 @ 5", 3 @ 6, 2 @ 8, 2 @ 10 BAL @ 12
	B15	14	30	3	#6	"	"	"	#3	3 @ 6 3 @ 8 BAL @ 12
	B16	14	30	3	#6	"	"	"	#3	2 @ 5, 3 @ 6, 2 @ 8, 2 @ 10 BAL @ 12
	B17	14	30	2 / 1	#5 / #6	"	"	"	#3	DO
	B18	14	30	3	#10	"	"	"	#3	DO
	B19	14	30	2 / 2	#8 / #9	"	"	"	#3	DO
	B20	14	30	2	#6	"	"	"	#3	3 @ 2½, 6 @ 3, 3 @ 4, 2 @ 5, 2 @ 6, 2 @ 5, BAL @ 12
	B21	14	30	4	#6	"	"	"	#3	2 @ 5, 3 @ 6, 2 @ 8, 2 @ 10 BAL @ 12
A615 GRADE 60	B22	14	30	4	#5	"	"	"	#3	DO
	B23	14	30	2 / 2	#9 / #10	"	"	"	#3	5 @ 2½, 6 @ 3, 3 @ 4, 2 @ 5, 2 @ 6, 3 @ 8 @ 12
	B24	14	30	3	#5	2	7	@ CONT END	#3	1 @ 6, 2 @ 8, 2 @ 10 BAL @ 12
	B25	14	30	3	#5	2	7	@ CONT END	#3	DO
	B26	14	30	3	#5	2	7	@ EA. END	#3	DO
	B27	12	36	3	#5	2	7	@ EA. END	#3	4 @ 6" BAL @ 12"
	B28	12	36	4	#5	2	7	@ CONT END	#3	4 @ 6", BAL @ 12"
	B29	8	16	4	#5	2	7	CONT & HOOK E/E	#3	3 @ 6" BAL @ 12"



AS BUILT DRAWINGS

JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SUSPENDED SLAB PLANS BASIC BID - UNIT NO. 1 & DETAILS

DATE MAY 1970 — PROJ. NO. 6805

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S3

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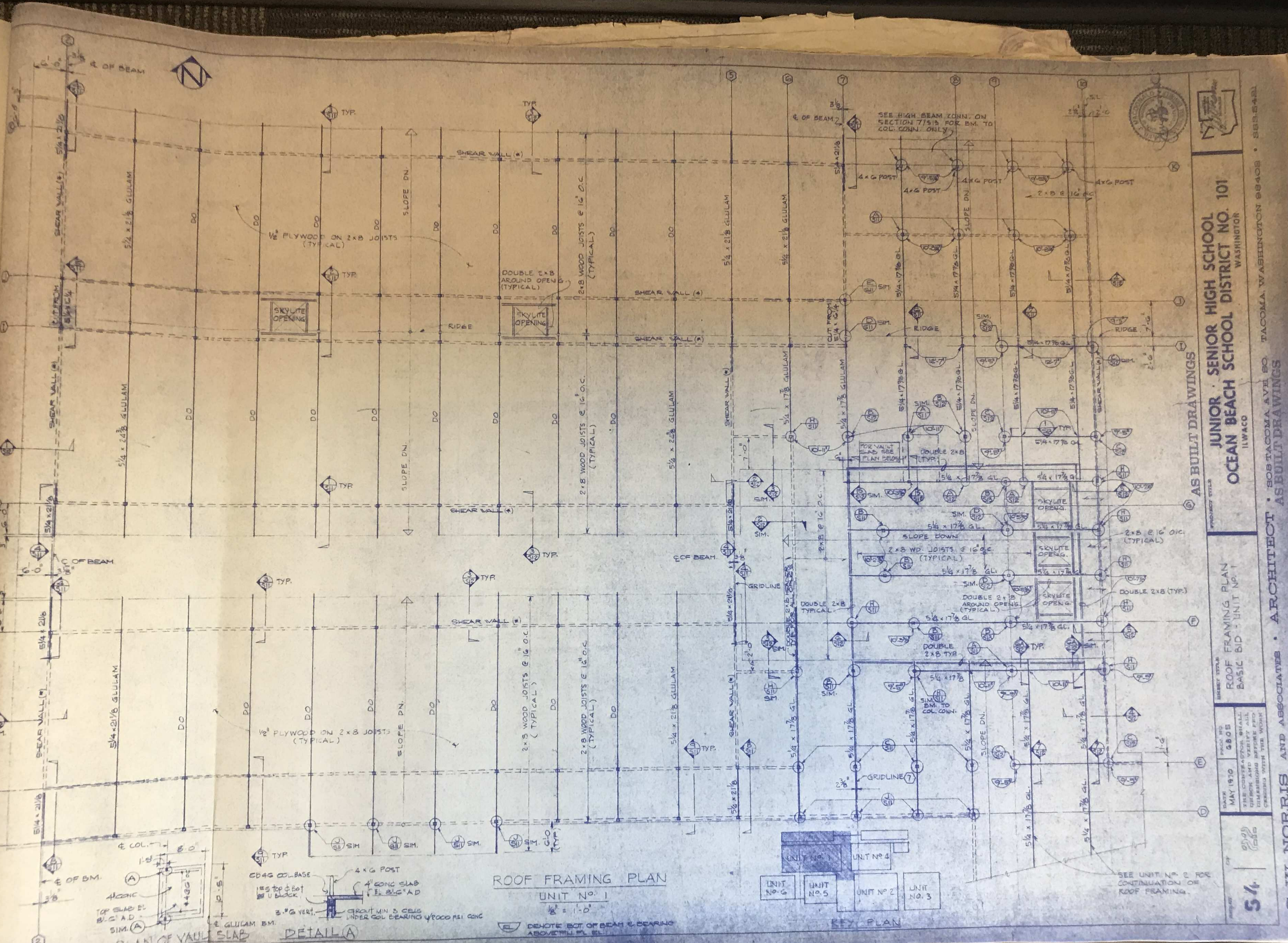
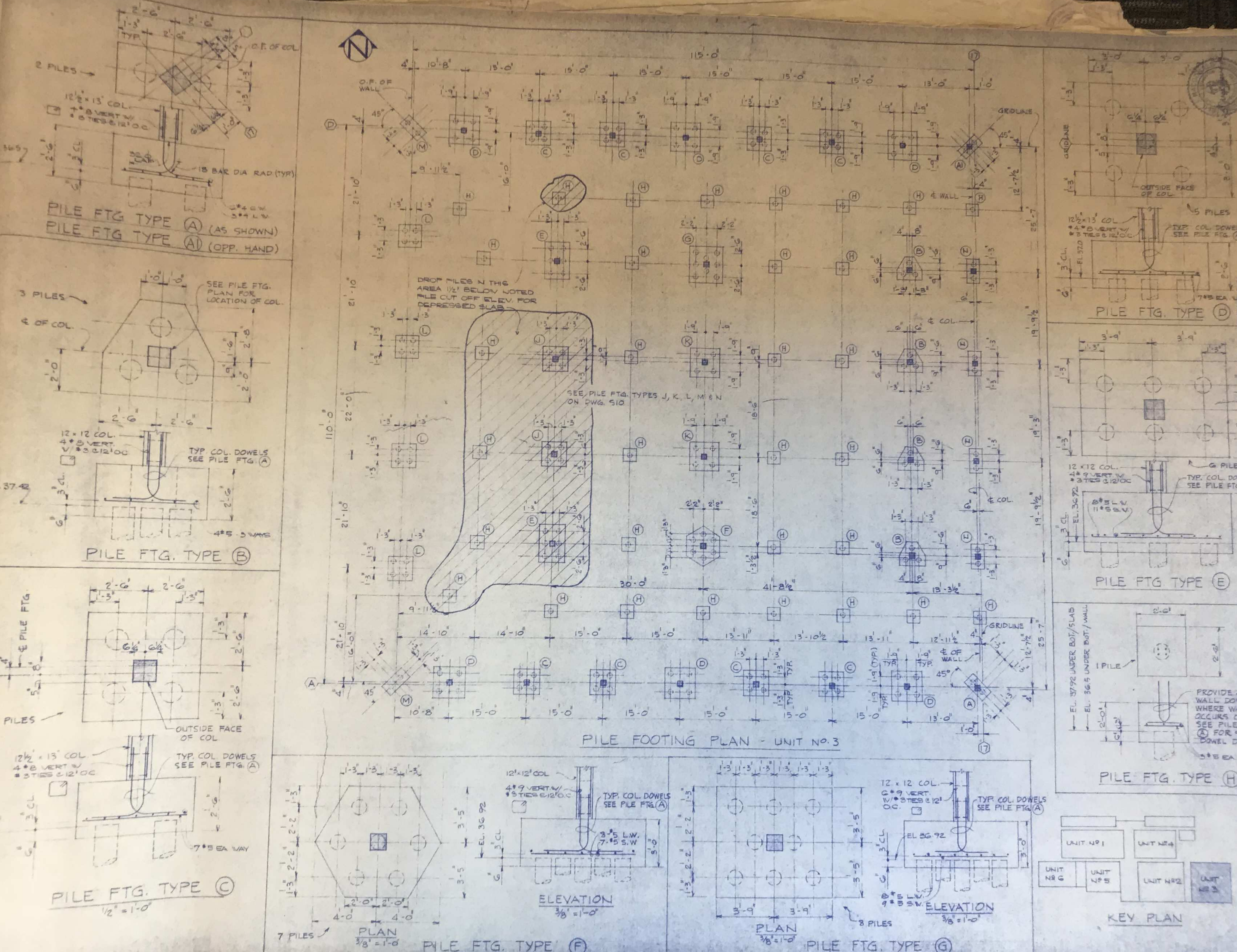

ROOF FRAMING PLAN
UNIT No 1
1/8" = 1'-0"
KEY PLAN
UNIT No 1
UNIT No 4
UNIT No 6
UNIT No 5
UNIT No 2
UNIT No 3
PLAN OF VAULT SLAB
DETAIL A
SEE UNIT No 2 FOR CONTINUATION OF ROOF FRAMING.
DENOTE BOT OF BEAM & BEARING ABOVE FIN FL EL
1/2" PLYWOOD ON 2x8 JOISTS (TYPICAL)
2x8 WOOD JOISTS @ 16" O.C. (TYPICAL)
SHEAR WALL
SKYLITE OPENING
RIDGE
SLOPE DN.
AS BUILT DRAWINGS
JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
ROOF FRAMING PLAN
BASIC BID - UNIT No 1
MAY 1970
S4
G. W. NORRIS AND ASSOCIATES • ARCHITECT • 508 TACOMA AVE SO TACOMA WASHINGTON 98402
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

PILE FOOTING PLAN & PILE FOOTING DETAILS
BASIC BID - UNIT NO. 3

DATE MAY 1970

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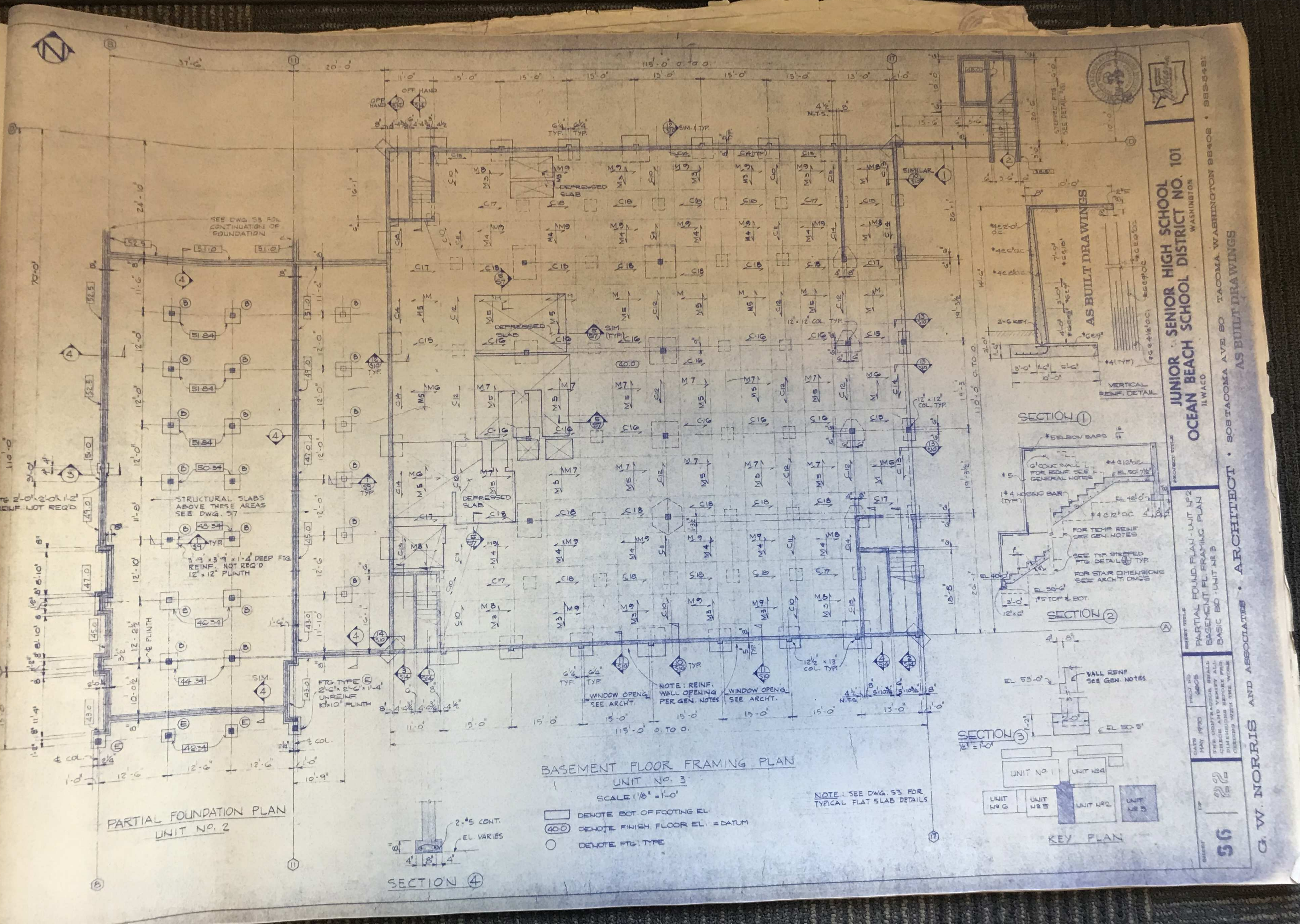
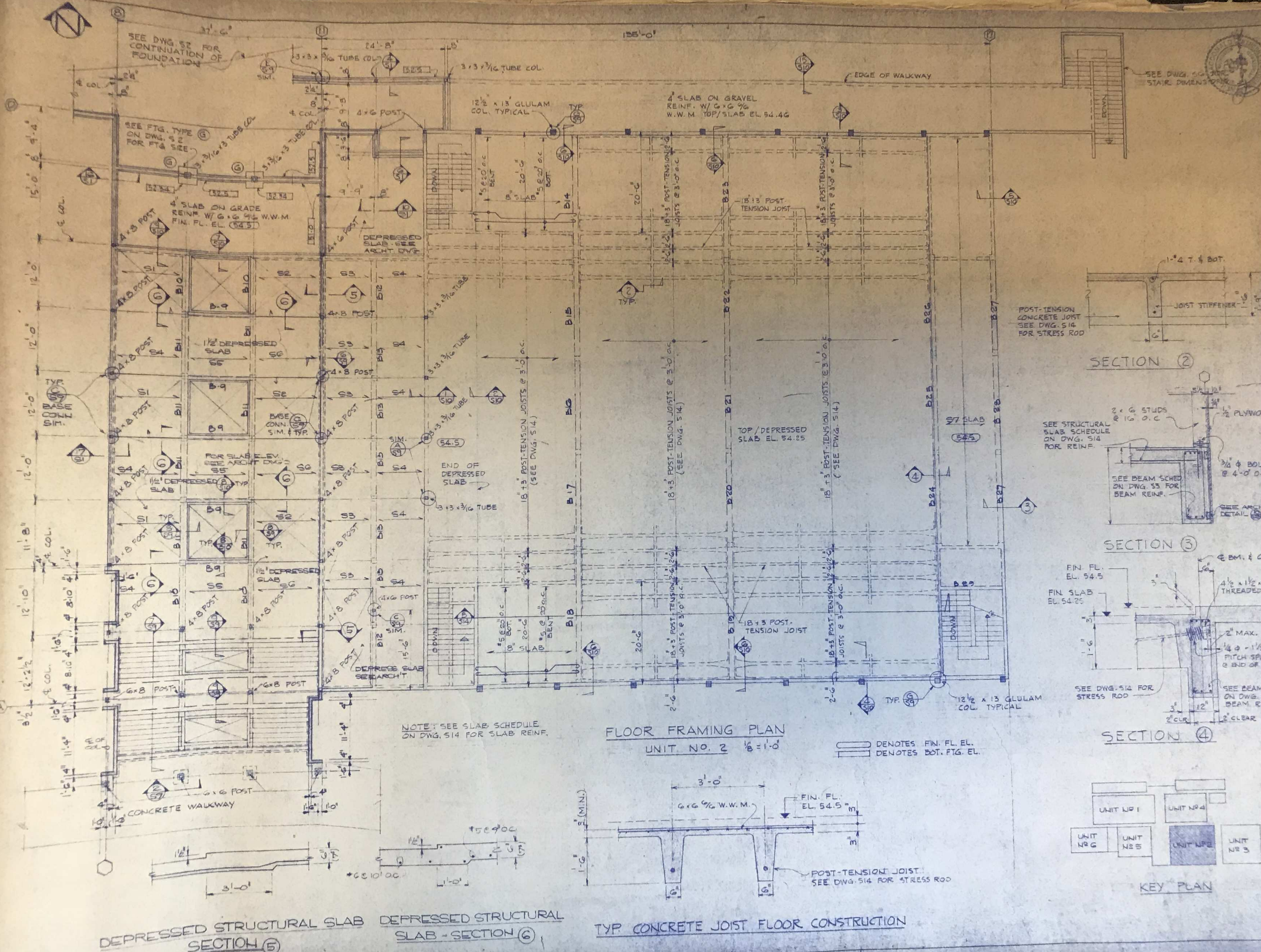
SHEET S5


BASEMENT FLOOR FRAMING PLAN
UNIT NO. 3
SCALE 1/8" = 1'-0"
PARTIAL FOUNDATION PLAN
UNIT NO. 2
SECTION 1
SECTION 2
SECTION 3
SECTION 4
KEY PLAN
UNIT NO. 1
UNIT NO. 2
UNIT NO. 3
UNIT NO. 4
UNIT NO. 5
UNIT NO. 6
VERTICAL REINF. DETAIL
SEE DWG. S3 FOR CONTINUATION OF FOUNDATION
STRUCTURAL SLABS ABOVE THESE AREAS SEE DWG. S7
DEPRESSED SLAB
NOTE: SEE DWG. S3 FOR TYPICAL FLAT SLAB DETAILS
DENOTE BOT. OF FOOTING EL.
DENOTE FINISH FLOOR EL. = DATUM
DENOTE FTG. TYPE
NOTE: REINF. WALL OPENING PER GEN. NOTES
WINDOW OPENG. SEE ARCHT.
115'-0" O. TO O.
AS BUILT DRAWINGS
JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
PARTIAL FOUND. PLAN - UNIT NO 2
BASEMENT FL FRAMING PLAN
BASIC BID - UNIT NO 3
G. W. NORRIS AND ASSOCIATES • ARCHITECT • 808 TACOMA AVE SO TACOMA WASHINGTON 98402 • 383-5481
AS BUILT DRAWINGS
MAY 1970
S6



AS BUILT DRAWINGS

JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

MAIN FLOOR FRAMING PLAN
BASIC BID - UNIT NO 2

DATE: MAY 1970

PROJ. NO: 6805

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S7

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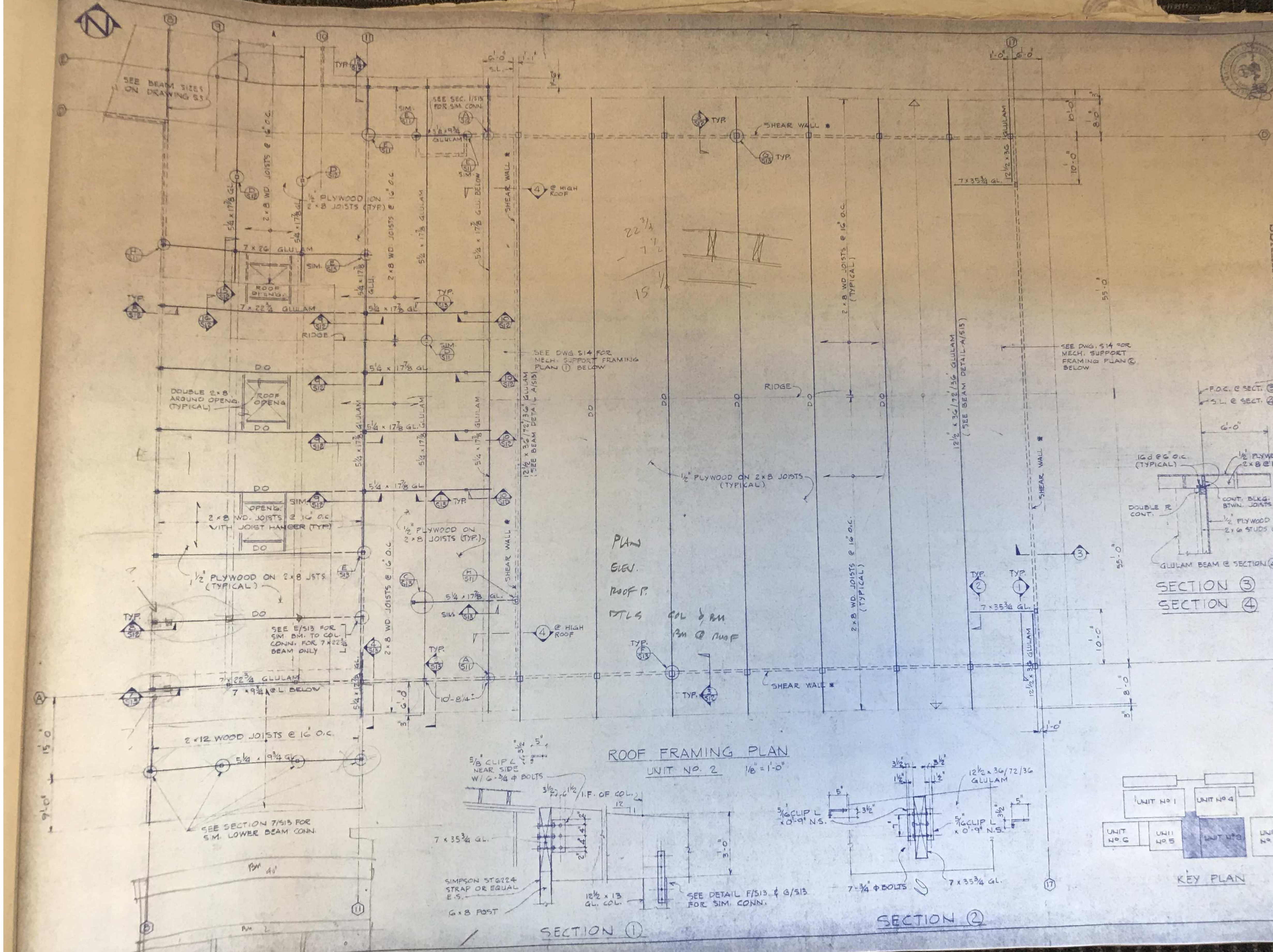
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

ROOF FRAMING PLAN
BASIC BID · UNIT NO. 2

DATE MAY 1970

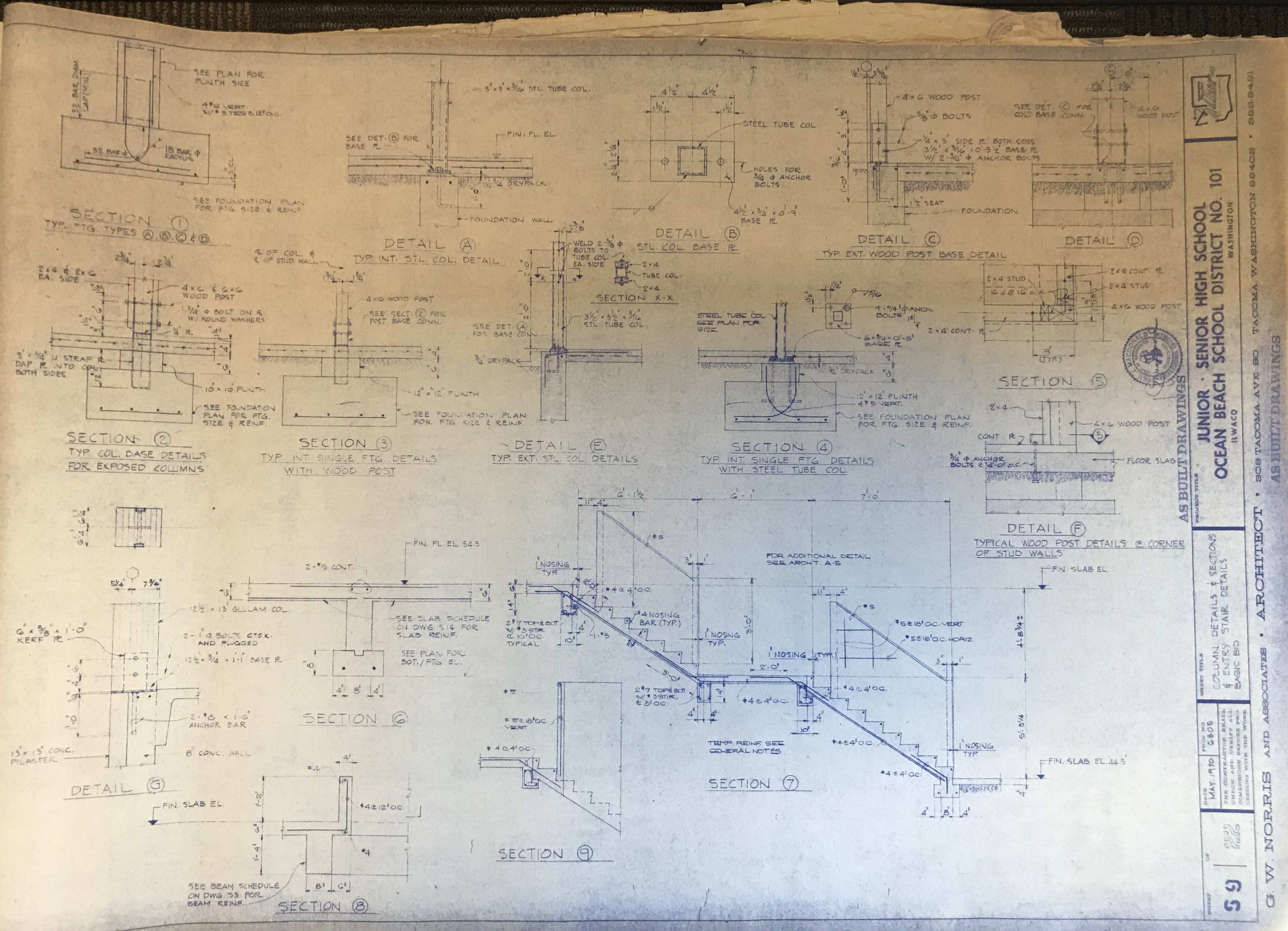
PROJ. NO. 6805

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

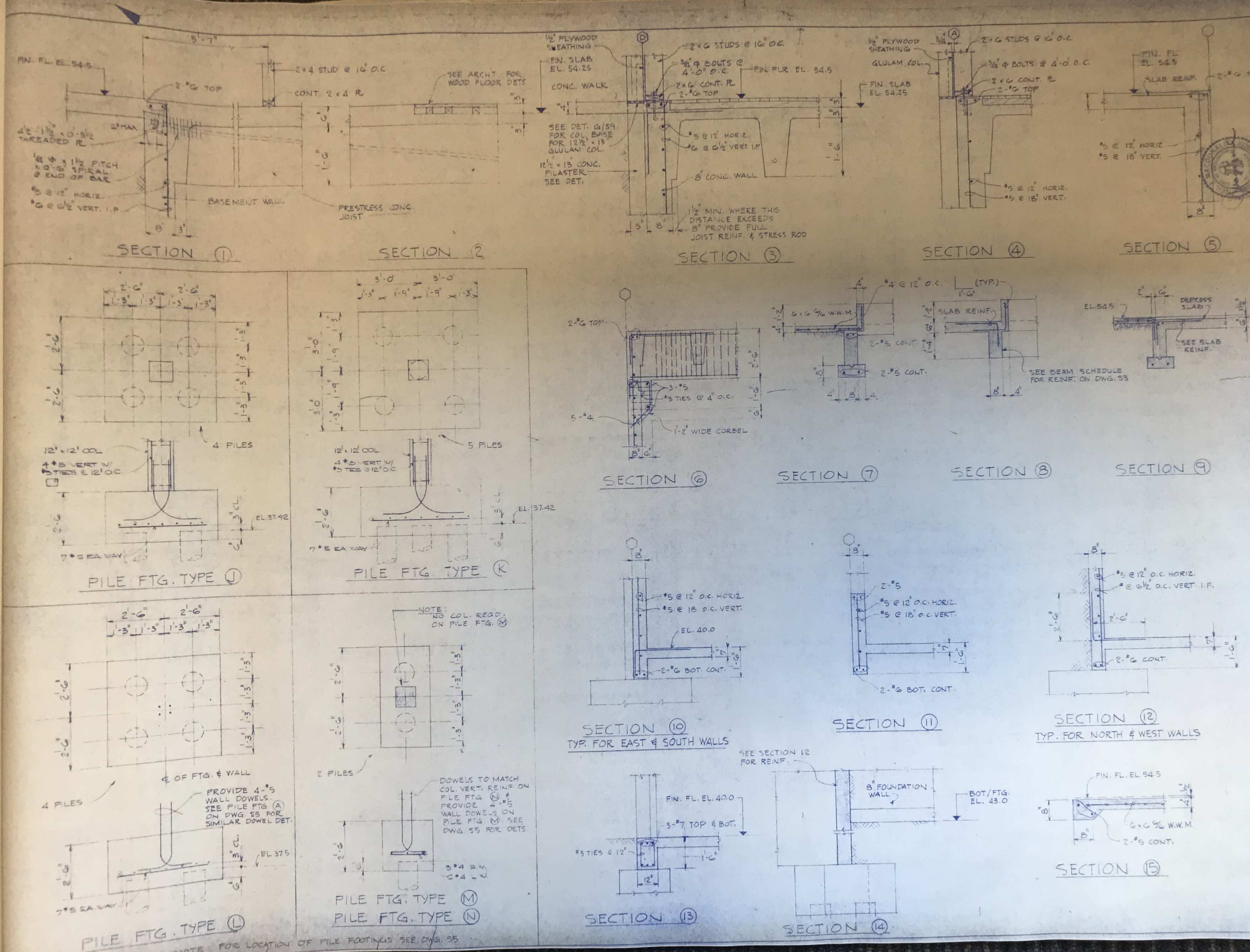
SHEET S8 OF 22

G. W. NORRIS AND ASSOCIATES · ARCHITECT · 308 TACOMA AVE SO. TACOMA, WASHINGTON 98402 · 383-5491

AS BUILT DRAWINGS



SECTION 1
TYP. FTG. TYPES A, B, C & D
DETAIL A
TYP. INT. STL. COL. DETAIL
DETAIL B
STL. COL. BASE PL
DETAIL C
TYP. EXT. WOOD POST BASE DETAIL
DETAIL D
SECTION 2
TYP. COL. BASE DETAILS FOR EXPOSED COLUMNS
SECTION 3
TYP. INT. SINGLE FTG. DETAILS WITH WOOD POST
DETAIL E
TYP. EXT. STL. COL. DETAILS
SECTION X-X
SECTION 4
TYP. INT. SINGLE FTG. DETAILS WITH STEEL TUBE COL.
SECTION 5
DETAIL F
TYPICAL WOOD POST DETAILS @ CORNER OF STUD WALLS
DETAIL G
SECTION 6
SECTION 7
SECTION 8
SECTION 9
FOR ADDITIONAL DETAIL SEE ARCHT. A-5
TEMP. REINF. SEE GENERAL NOTES
AS BUILT DRAWINGS
JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
COLUMN DETAILS & SECTIONS & ENTRY STAIR DETAILS
BASIC BID
MAY, 1970
6805
S9
22
G. W. NORRIS AND ASSOCIATES · ARCHITECT · 808 TACOMA AVE SO TACOMA WASHINGTON 98402 · 383-5481
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

PILING FOOTINGS & SECTIONS
BASIC BID

DATE MAY 1970

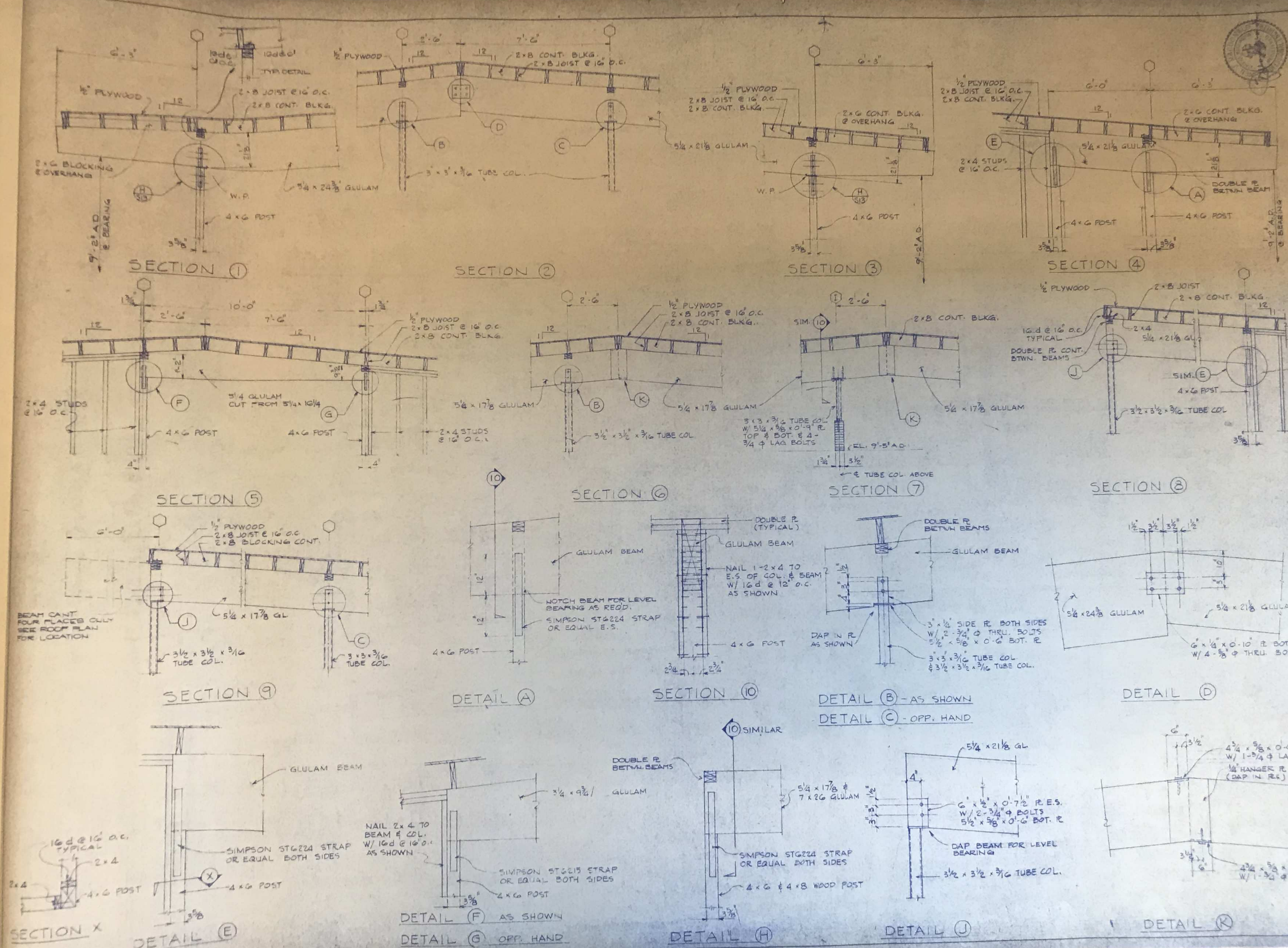
PROJ. NO. 6808

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S10 OF 22

G. W. NORRIS AND ASSOCIATES · ARCHITECT · 5013 TACOMA AVE. SO. TACOMA, WASHINGTON 98408 · 383-5481

AS BUILT DRAWINGS



AS BUILT DRAWINGS

PROJECT TITLE: JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SHEET TITLE: ROOF SECTIONS & DETAILS

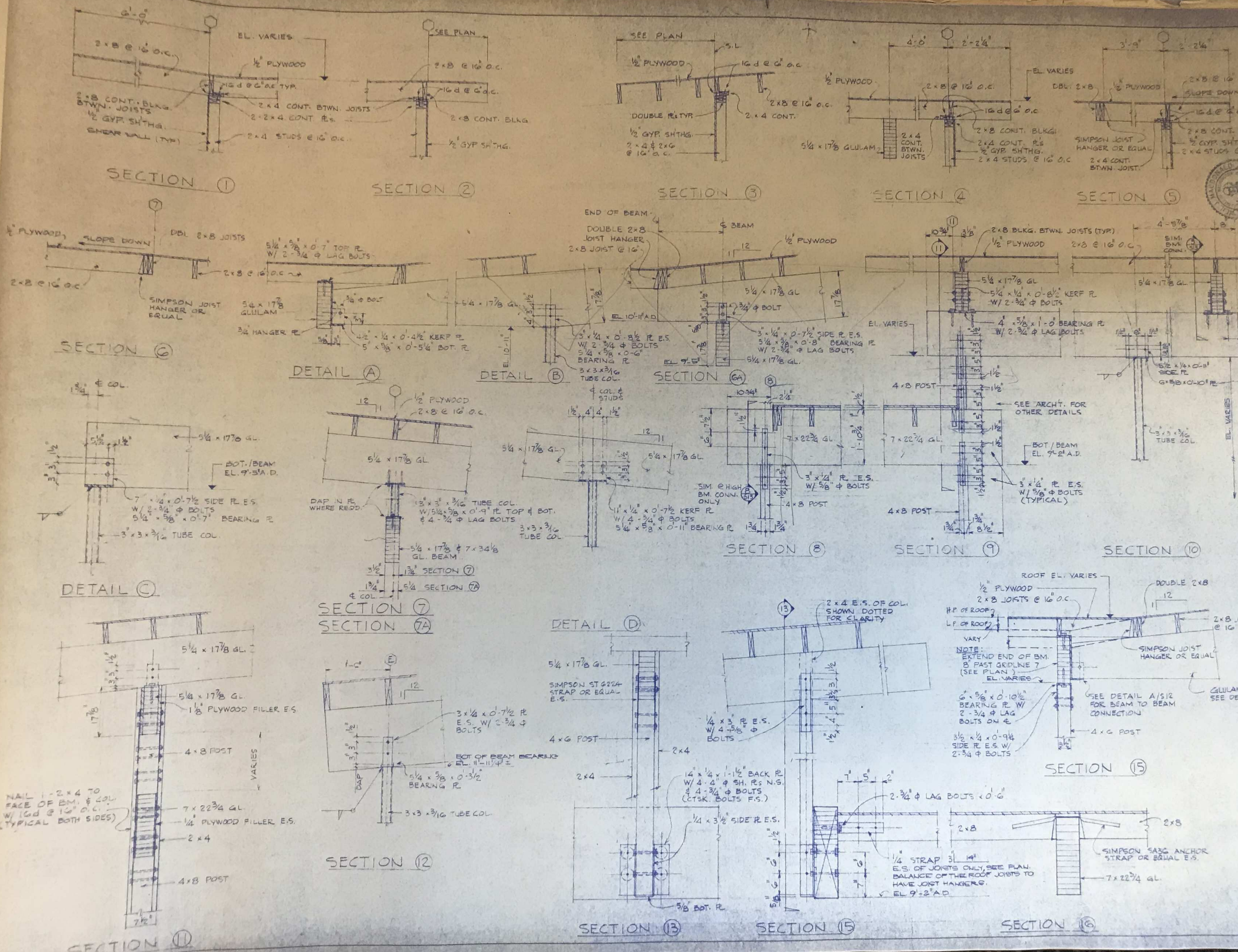
DATE: MAY 1970 | PROJ. NO. 6808

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S11 OF 22

G. W. NORRIS AND ASSOCIATES · ARCHITECT · 308 TACOMA AVE SO. TACOMA, WASHINGTON 98402 · 383-5421

AS BUILT DRAWINGS



AS BUILT DRAWINGS

PROJECT TITLE: JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SHEET TITLE: ROOF SECTIONS & DETAILS
BASIC BID

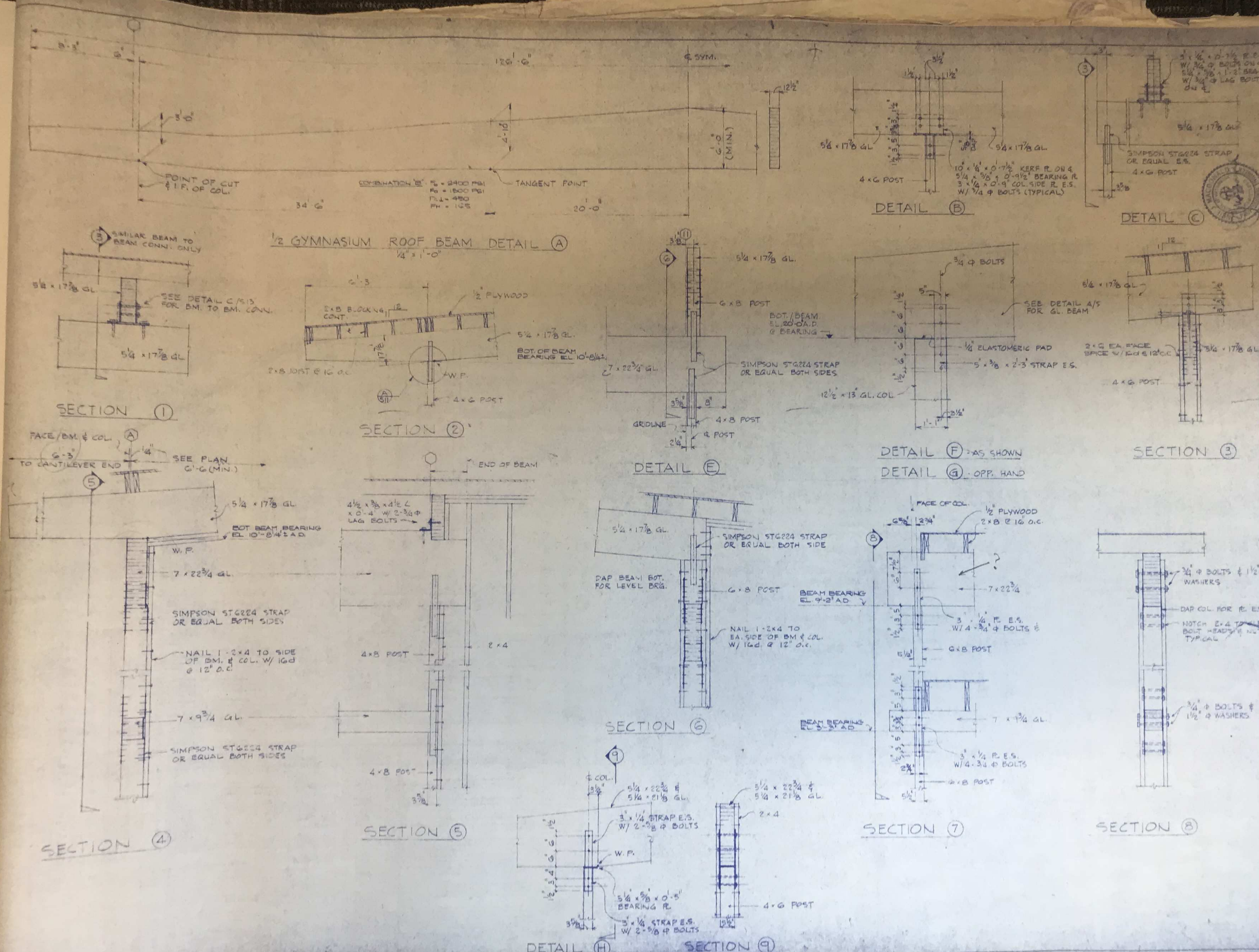
DATE: MAY 1970
PROJ. NO. 6805

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S12 OF 22

G. W. NORRIS AND ASSOCIATES • ARCHITECT • 308 TACOMA AVE. SO. TACOMA, WASHINGTON 98402 • 383-5421

AS BUILT DRAWINGS



AS BUILT DRAWINGS

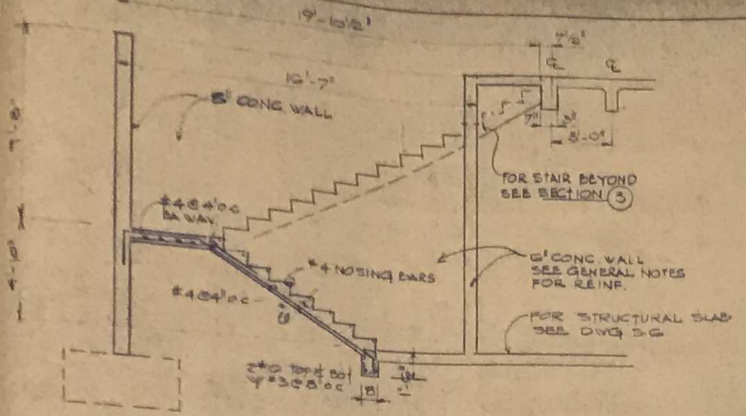
JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

ROOF SECTIONS & DETAILS
BASIC BID

S13

G. W. NORRIS AND ASSOCIATES • ARCHITECT • 908 TACOMA AVE SO TACOMA WASHINGTON 98402 • 383-5481

AS BUILT DRAWINGS



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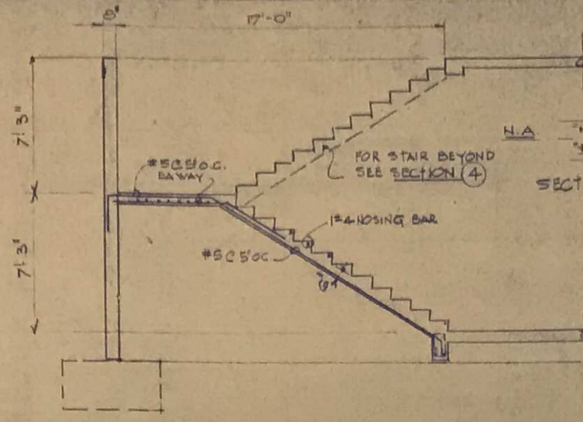

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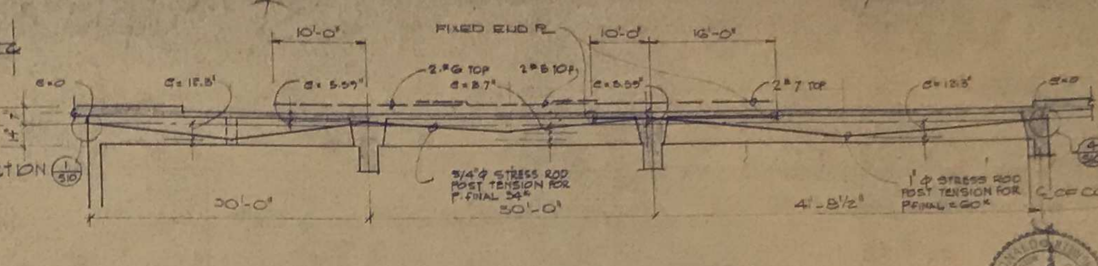
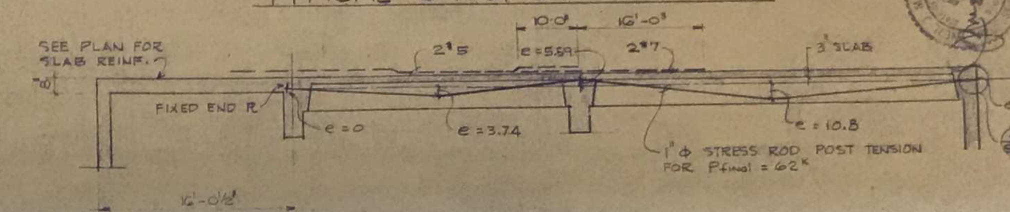
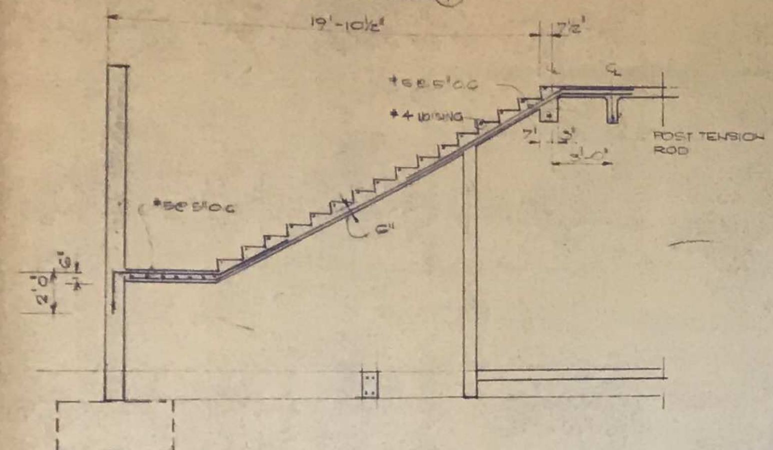


TYPICAL 6" x 21" CONCRETE JOIST





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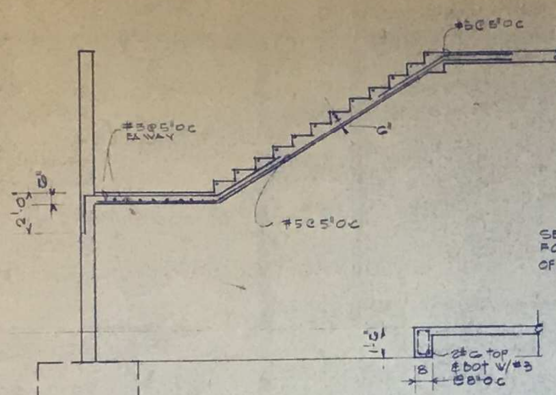
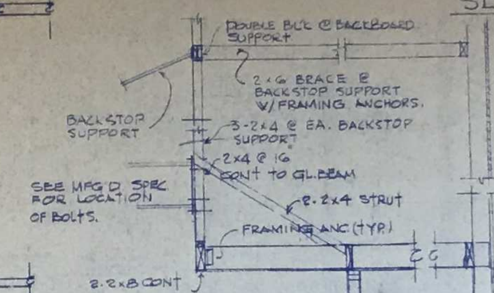


SECTION (4)

SECTION (B)



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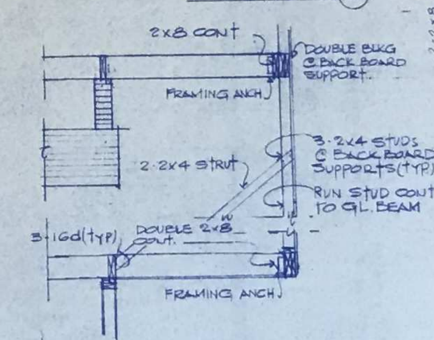

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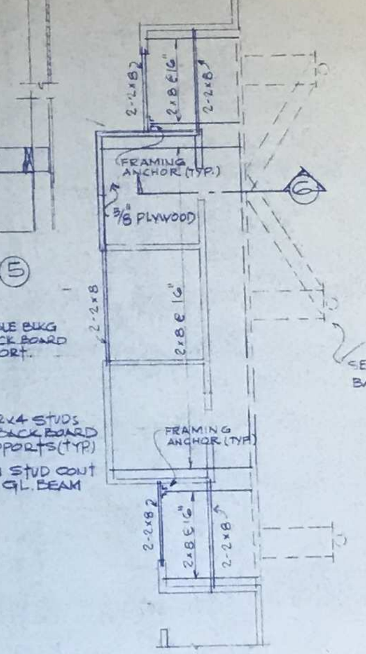
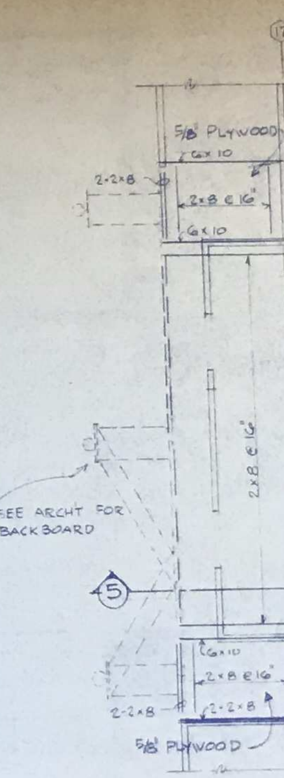


MECHANICAL SUPPORT FRAMING PLAN (1)



MECHANICAL SUPPORT FRAMING PLAN (2)

FLAT SLAB SCHEDULE FOR CLASS RM & GYM

MK	T	REINFORCING Nº	SIZE	LOC	PLACEMENT
C1	6	11 16	#4 #4	T B	℄ C2
C2	6	22 13	#4 #4	T B	C3
C3	6	10 3	#4 #4	T B	
C4	6	13 7	#4 #4	T B	C3
C5	6	10 10	#4 #4	T B	C4
C6	6	4 4	#4 #4	T B	C7
C7	6	5 5	#4 #4	T B	16#4 TOTAL
C8	6	11 16	#4 #4	T B	8#4 TOTAL
C9	6	4 8	#4 #4	T B	C-11
C10	7	13 20	#4 #4	T B	C-12
C11	7	19 20	#5 #4	T B	
C12	7	24 12	#5 #4	T B	C-14
C13	7	4 4	#4 #4	T B	
C14	7	5 5	#4 #4	T B	C-16
C15	7	30 25	#4 #4	T B	

MK	T	REINFORCING Nº	SIZE	LOC.	PLACEMENT
C16	7	21 15	#5 #4	T B	
C17	7	20 16	#4 #4	T B	C-18
C18	7	14 10	#5 #4	T B	
M1	7	6 6	#4 #4	T B	M2
M2	7	5 6	#4 #4	T B	
M3	7	10 10	#4 #4	T B	M4
M4	7	9 14	#4 #4	T B	M5
M5	7	11 9	#4 #4	T B	
M6	7	20 17	#4 #4	T B	M7
M7	7	11 11	#4 #4	T B	
M8	7	14 11	#4 #4	T B	
M9	7	8 8	#4 #4	T B	

STRUCTURAL SLAB

MK	T	REINFORCING Nº	SIZE	LOC	PLACEMENT
S1	6		4 6	TOP BOT	#4 @ 12" O.C. #6 @ 10" O.C.
S2	6		4 5	TOP BOT	#4 @ 12" · #5 @ 9" OC · S3
S3	6		5 5	TOP BOT	#5 @ 12" OC. · #5 @ 8"
S4	6		4 5	TOP BOT	S3 · #5 @ 9" O.C · #4 @ 12"
S5	6		5 5	TOP BOT.	#5 @ 9" · #5 @ 12" OC. · #5 @ 9"
S6	6		5 5	TOP BOT	SEE S5 · #5 @ 12" OC · SEE S5
S7	6		4 5	TOP BOT	#4 @ 12" · #5 @ 9" OC

AS BUILT DRAWINGS

PROJECT TITLE
JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SHEET TITLE
STAIRS, BEAM & SLAB SCHEDULES

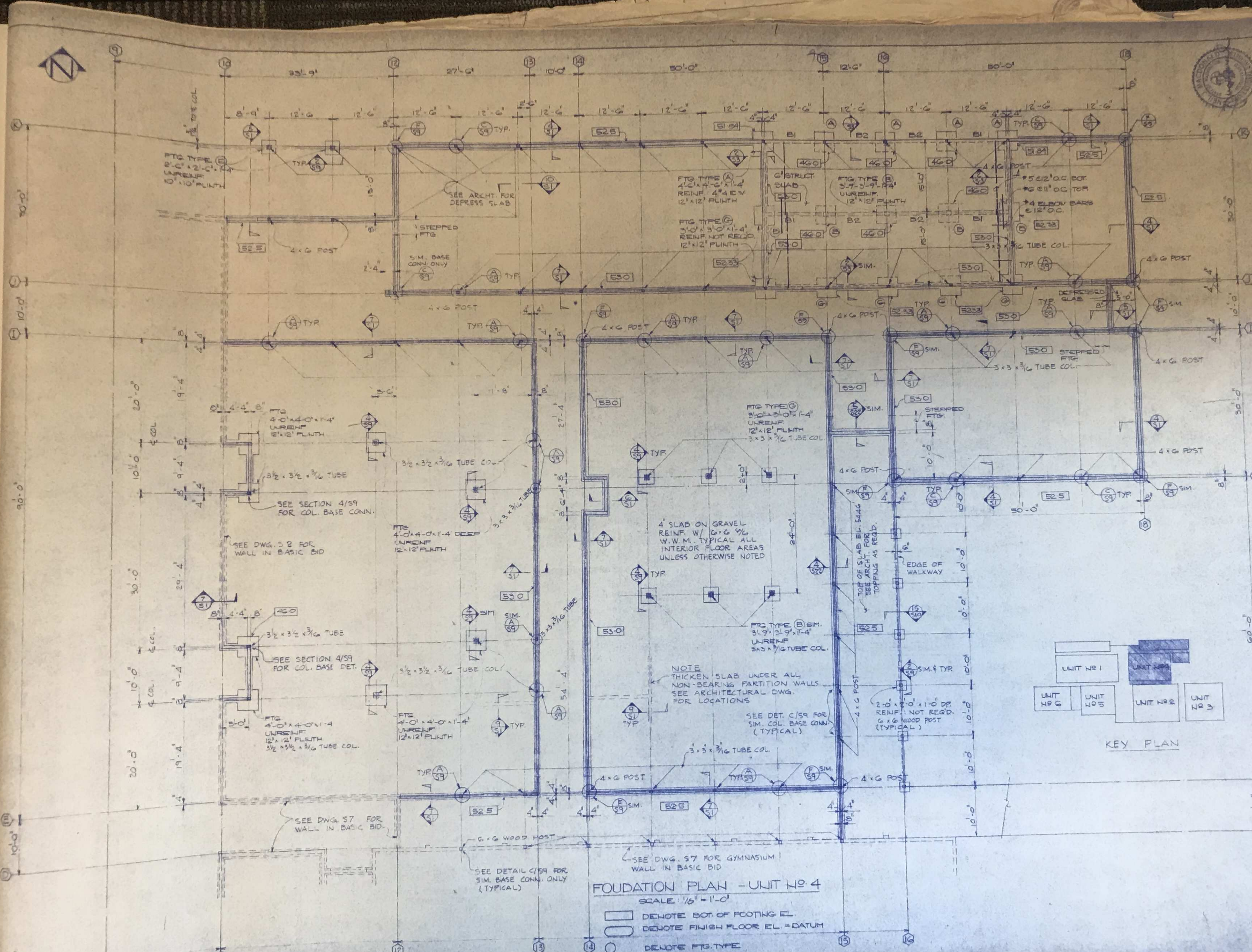
DATE MAY 1970
PROJ NO 6805

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S14 OF 21

G. W. NORRIS AND ASSOCIATES · ARCHITECT · 308 TACOMA AVE SO TACOMA WASHINGTON 98402 · 383-5481

AS BUILT DRAWINGS



FOUDATION PLAN - UNIT No 4

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

DENOTE BOT. OF FOOTING EL.

DENOTE FINISH FLOOR EL. = DATUM

DENOTE FTG. TYPE

AS BUILT DRAWINGS

JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

FOUNDATION PLAN
ALTER. BID - UNIT No 4
ALT. No A-3

DATE: MAY 1970
PROJ. NO: 6805

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET S15 OF 22

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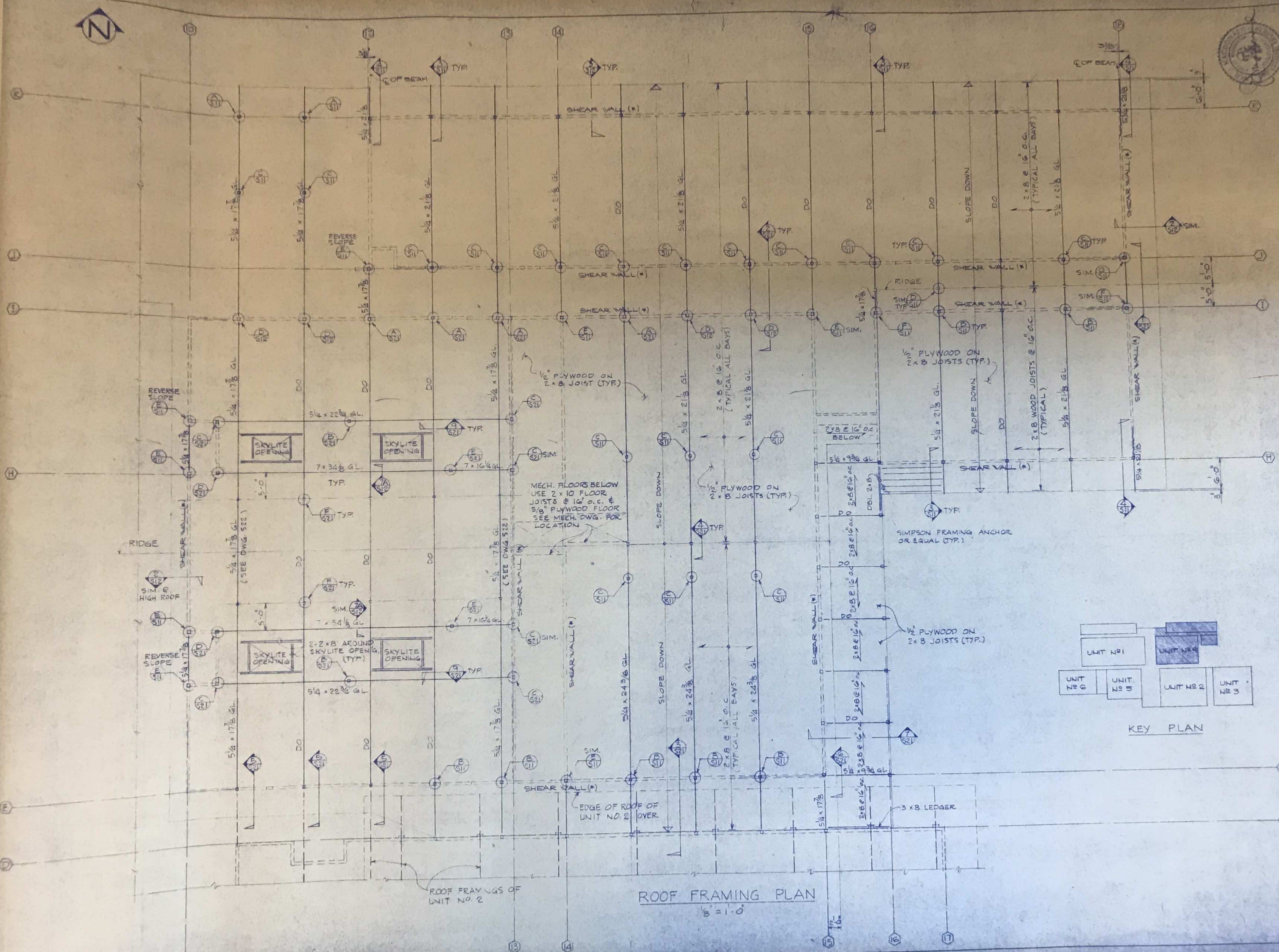
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

ROOF FRAMING PLAN
ALTER. BID. UNIT No 4
ALT. No A-3

DATE MAY 1970

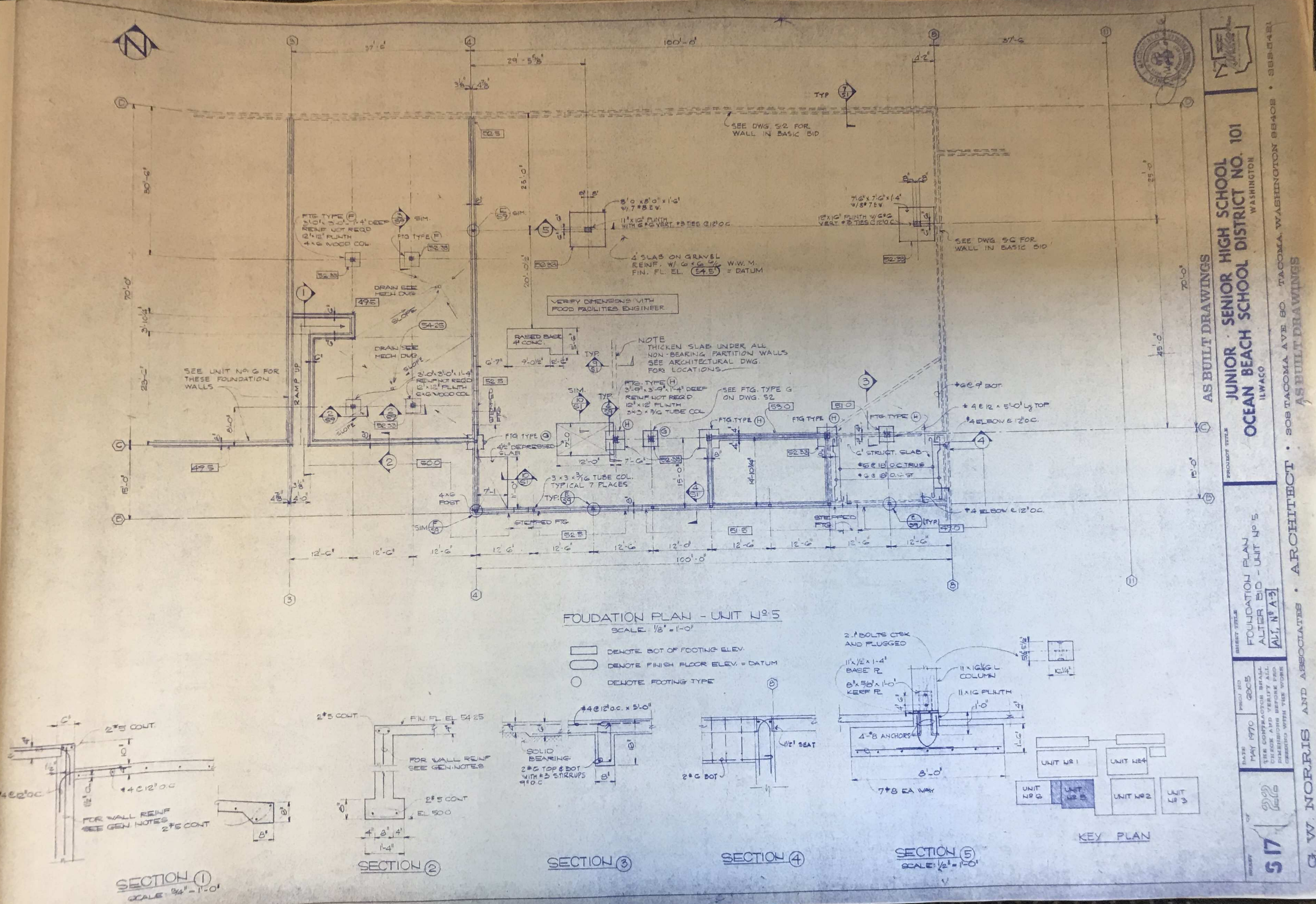
PROJ. NO. 6905

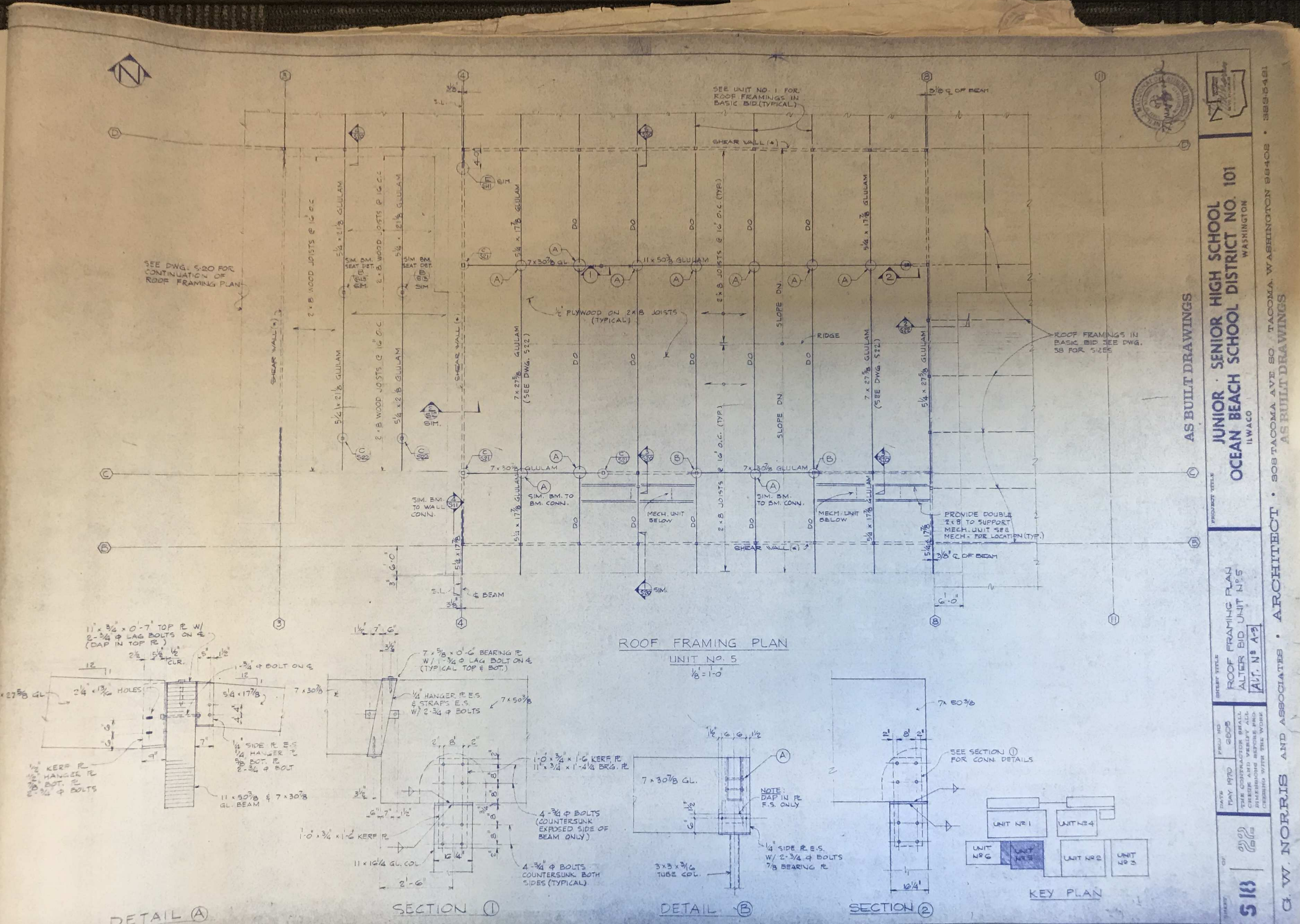
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

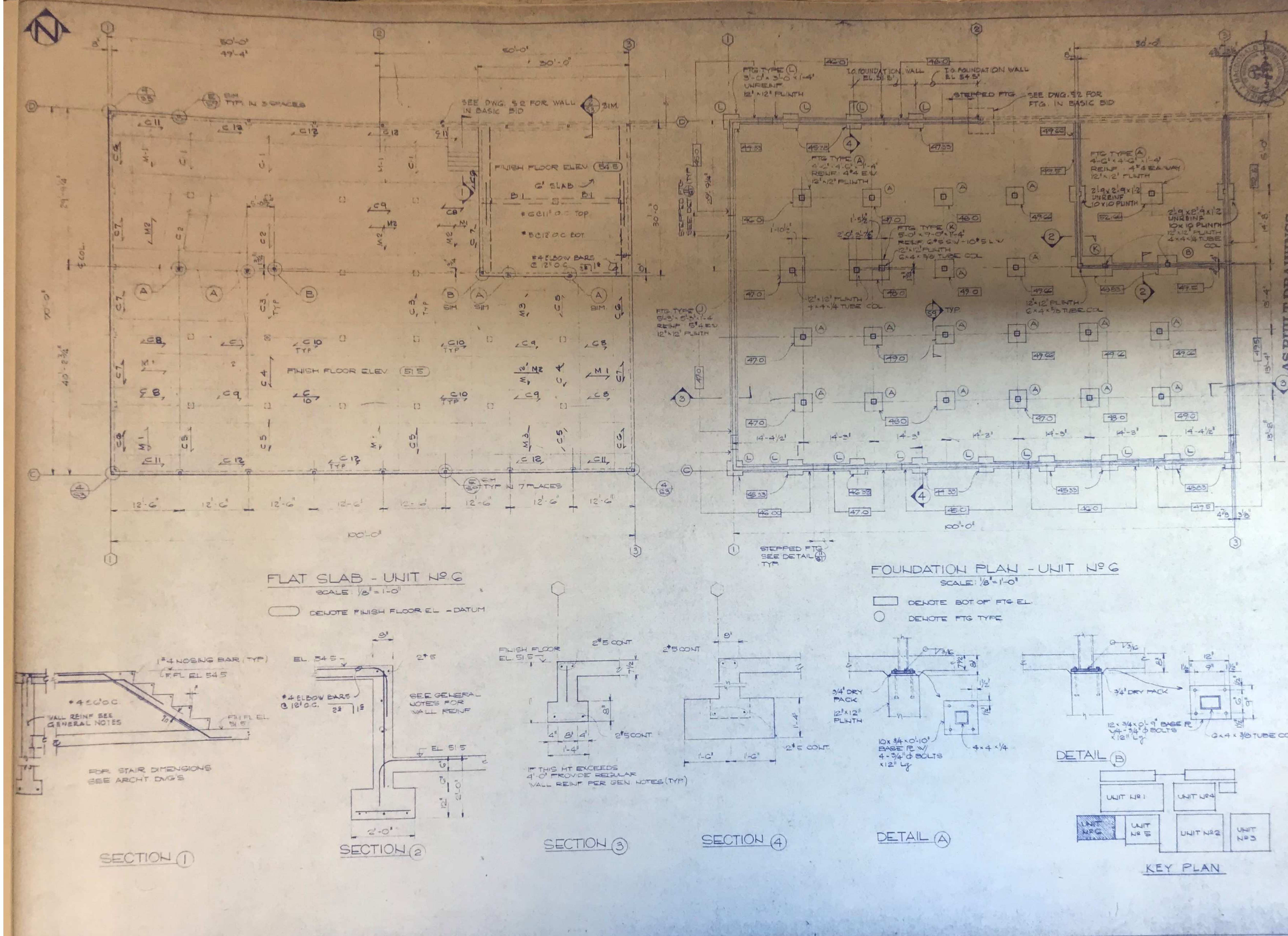
S 16 OF 22

G. W. NORRIS AND ASSOCIATES · ARCHITECT · 908 TACOMA AVE. SO. TACOMA, WASHINGTON 98402 · 383-5491

AS BUILT DRAWINGS


FOUNDATION PLAN - UNIT No 5
SCALE: 1/8" = 1'-0"
DENOTE BOT OF FOOTING ELEV.
DENOTE FINISH FLOOR ELEV. = DATUM
DENOTE FOOTING TYPE
SEE DWG S2 FOR WALL IN BASIC BID
4" SLAB ON GRAVEL
VERIFY DIMENSIONS WITH FOOD FACILITIES ENGINEER
NOTE
THICKEN SLAB UNDER ALL NON-BEARING PARTITION WALLS SEE ARCHITECTURAL DWG. FOR LOCATIONS
SEE UNIT No 6 FOR THESE FOUNDATION WALLS
RAMP UP
3 x 3 x 3/16 TUBE COL. TYPICAL 7 PLACES
STEPPED FTG
SECTION 1
SECTION 2
SECTION 3
SECTION 4
SECTION 5
KEY PLAN
UNIT No 1
UNIT No 2
UNIT No 3
UNIT No 4
UNIT No 5
UNIT No 6
AS BUILT DRAWINGS
JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO
WASHINGTON
FOUNDATION PLAN
ALTER BID - UNIT No 5
MAY 1970
S17
G. W. NORRIS AND ASSOCIATES · ARCHITECT · 908 TACOMA AVE SO. TACOMA, WASHINGTON 98402
AS BUILT DRAWINGS


ROOF FRAMING PLAN
UNIT Nº 5
1/8" = 1'-0"
SEE DWG. S-20 FOR CONTINUATION OF ROOF FRAMING PLAN
SEE UNIT NO. 1 FOR ROOF FRAMINGS IN BASIC BID (TYPICAL)
SHEAR WALL
1/2" PLYWOOD ON 2×8 JOISTS (TYPICAL)
RIDGE
SLOPE DN.
ROOF FRAMINGS IN BASIC BID SEE DWG. S8 FOR SIZES
PROVIDE DOUBLE 2×8 TO SUPPORT MECH. UNIT SEE MECH. FOR LOCATION (TYP.)
MECH. UNIT BELOW
SIM. BM. TO BM. CONN.
SIM. BM. TO WALL CONN.
7×30 7/8 GLULAM
11×50 3/8 GLULAM
DETAIL A
SECTION 1
DETAIL B
SECTION 2
KEY PLAN
UNIT Nº 1
UNIT Nº 2
UNIT Nº 3
UNIT Nº 4
UNIT Nº 5
UNIT Nº 6
AS BUILT DRAWINGS
JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
ROOF FRAMING PLAN
ALTER BID UNIT Nº 5
ALT. Nº A-3
MAY 1970
S18
22
G. W. NORRIS AND ASSOCIATES · ARCHITECT · 308 TACOMA AVE SO. TACOMA, WASHINGTON 98402



JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

FOUNDATION PLAN
ALTER. BID - UNIT No 6
ALT. No A-3

DATE May 1970

SHEET S 19 OF 22

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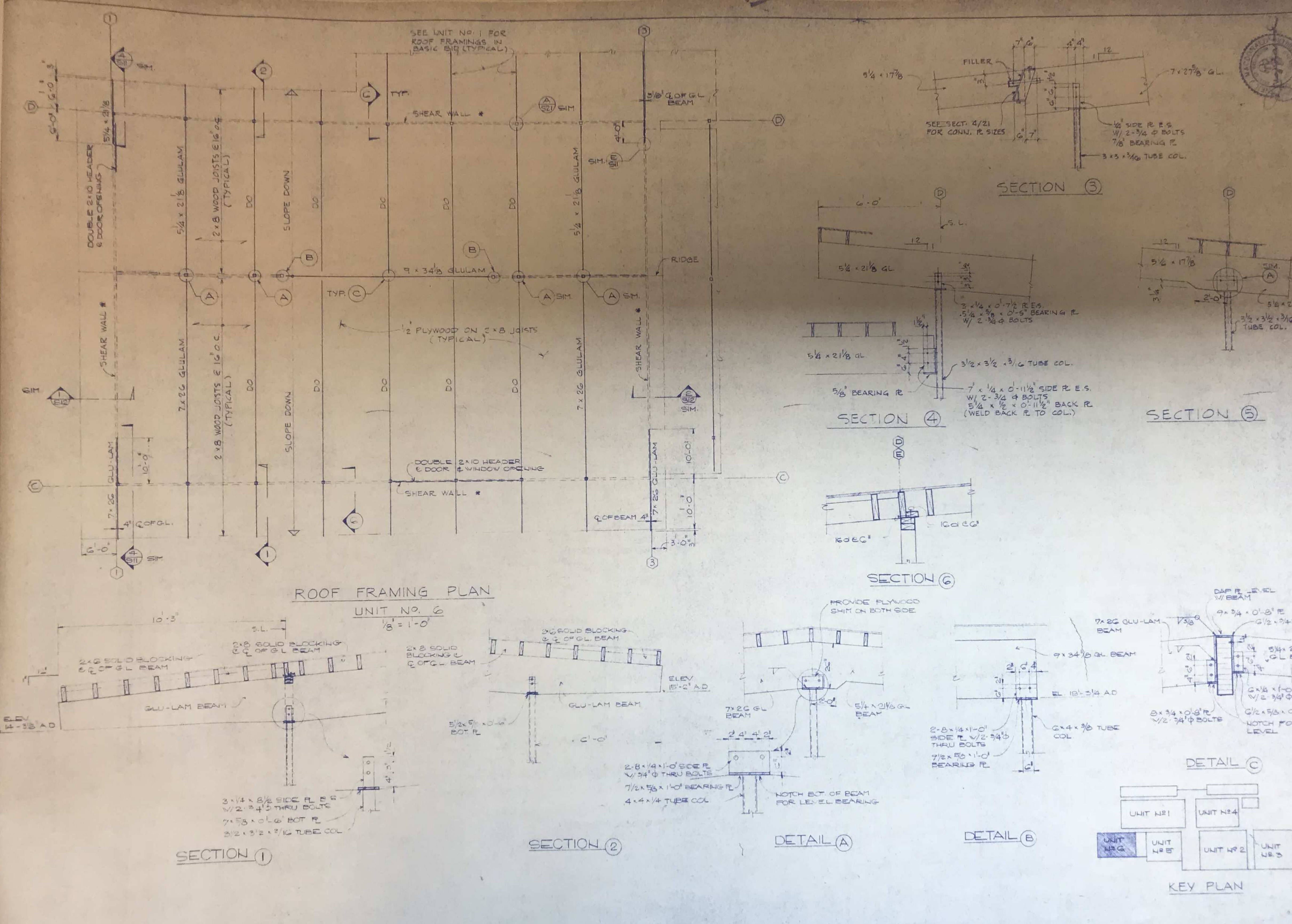
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

ROOF FRAMING PLAN, DETAIL & SECTIONS
ALTER. BID - UNIT No 6
ALT. No A-3

DATE MAY 1970

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

S20 OF 22

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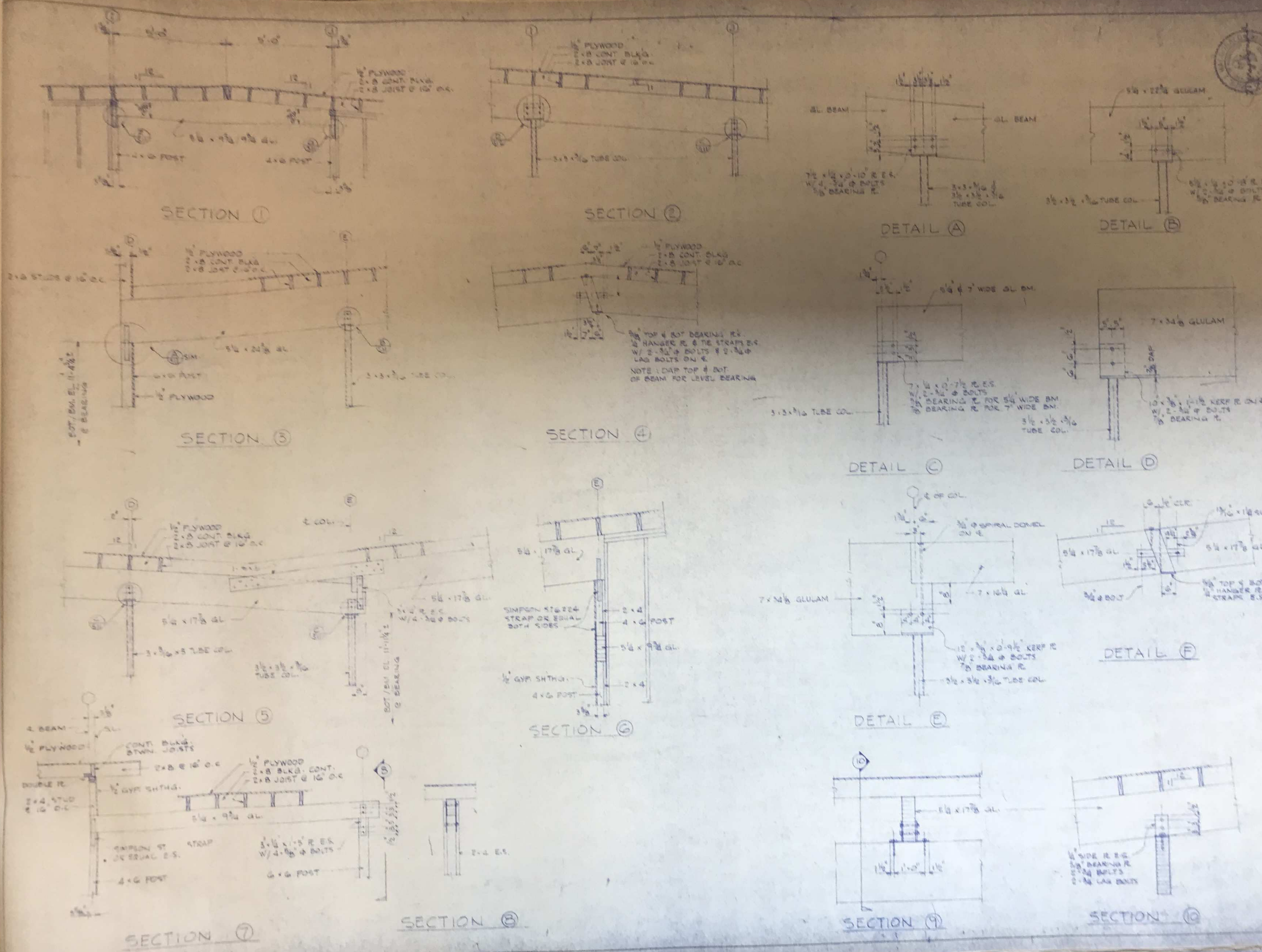
AS BUILT DRAWINGS



AS BUILT DRAWINGS

JUNIOR SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

ROOF SECTIONS & MISC DETAILS

S21 of 22

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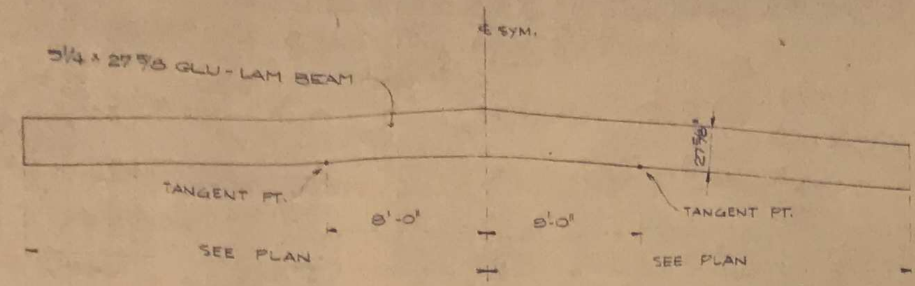
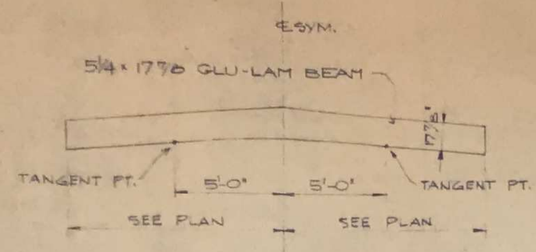
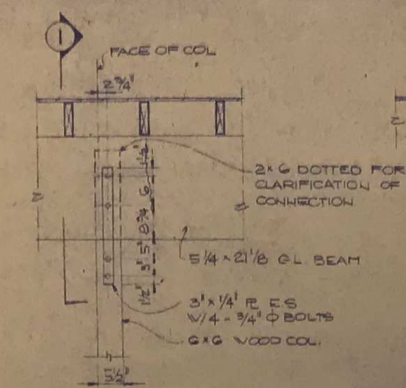
AS BUILT DRAWINGS



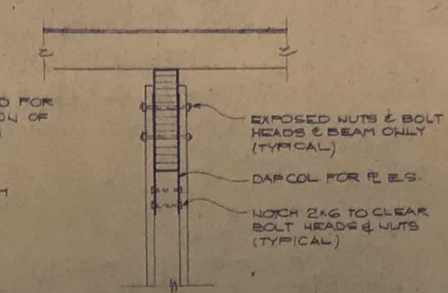
MULTI-PURPOSE ROOM - ROOF BEAM (A)



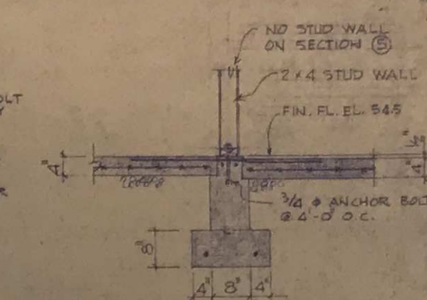
LIBRARY - ROOF BEAM (B)



DETAIL (C)



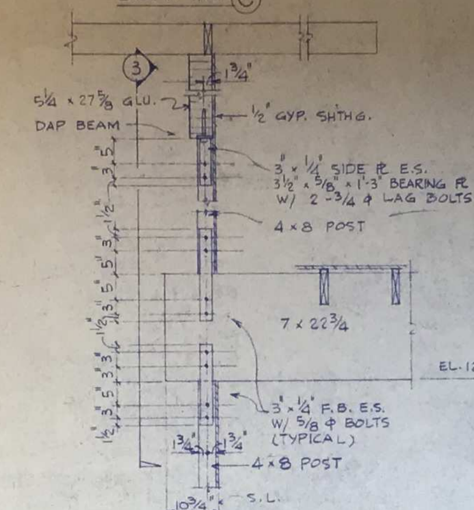
SECTION (1)



SECTION (4)

SECTION (5)

SIMILAR EXCEPT AS NOTED



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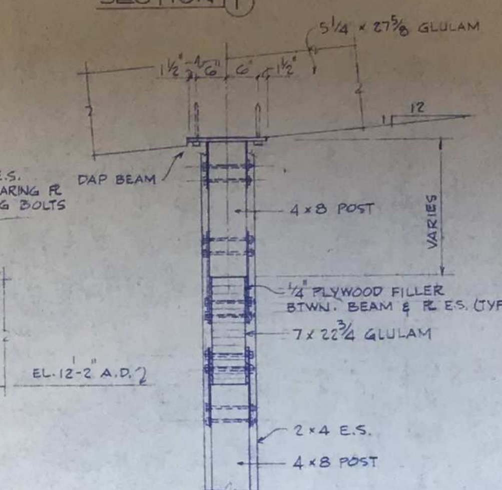

SECTION (3)

BEAM SCHEDULE

MK	SIZE		REINFORCING					STIRRUPS	
			BOTTOM		TOP				
	W	D	Nº	SIZE	Nº	SIZE	REMARKS	SIZE	SPACING FROM FACE OF EA. SUPPORT
B1	10	22	3	#5	2	#6	@ CONT END	#3	4 @ 8" BALANCE @ 12"
B2	10	22	2	#6	2	#7	@ CONT. END	#3	3 @ 7½" BALANCE @ 12"
B3	10	22	2	#6	2	#7	@ BOTH END	#3	3 @ 7½" BALANCE @ 12"

FLAT SLAB SCHEDULE SHOP AREA

MK	T	REINFORCING Nº	SIZE	LOC.	PLACEMENT
C1	7½	10 9	#4 #4	TOP BOT.	C2
C2	7½	13 7	#4 #4	TOP BOT	C3
C3	7½	16 7	#4 #4	TOP BOT.	
C4	7½	11 7	#4 #4	TOP BOT.	C3
C5	7½	9	#4 #4	TOP BOT.	C4
C6	7½	3 3	#4 #4	TOP BOT	C7
C7	7½	4 4	#4 #4	TOP BOT	
C8	7½	9 8	#4 #4	TOP BOT.	C9
C9	7½	11 6	#4 #4	TOP BOT.	C10
C10	7½	10 6	#4 #4	TOP BOT.	
C11	7½	3 3	#4 #4	TOP BOT.	C12
C12	7½	4 4	#4 #4	TOP BOT.	

MK	T	REINFORCING Nº	SIZE	LOC	PLACEMENT
M1	7½	6 6	#4 #4	TOP BOT.	M2
M2	7½	5 5	#4 #4	TOP BOT.	
M3	7½	6 6	#4 #4	TOP BOT	M2

AS BUILT DRAWINGS

PROJECT TITLE
JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SHEET TITLE
FLAT SLAB SCHEDULE & MISC DETAIL
ALTER. BID
ALT. Nº A-3

SHEET S22 OF 22
DATE MAY 1970
PROJ. NO 6605

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

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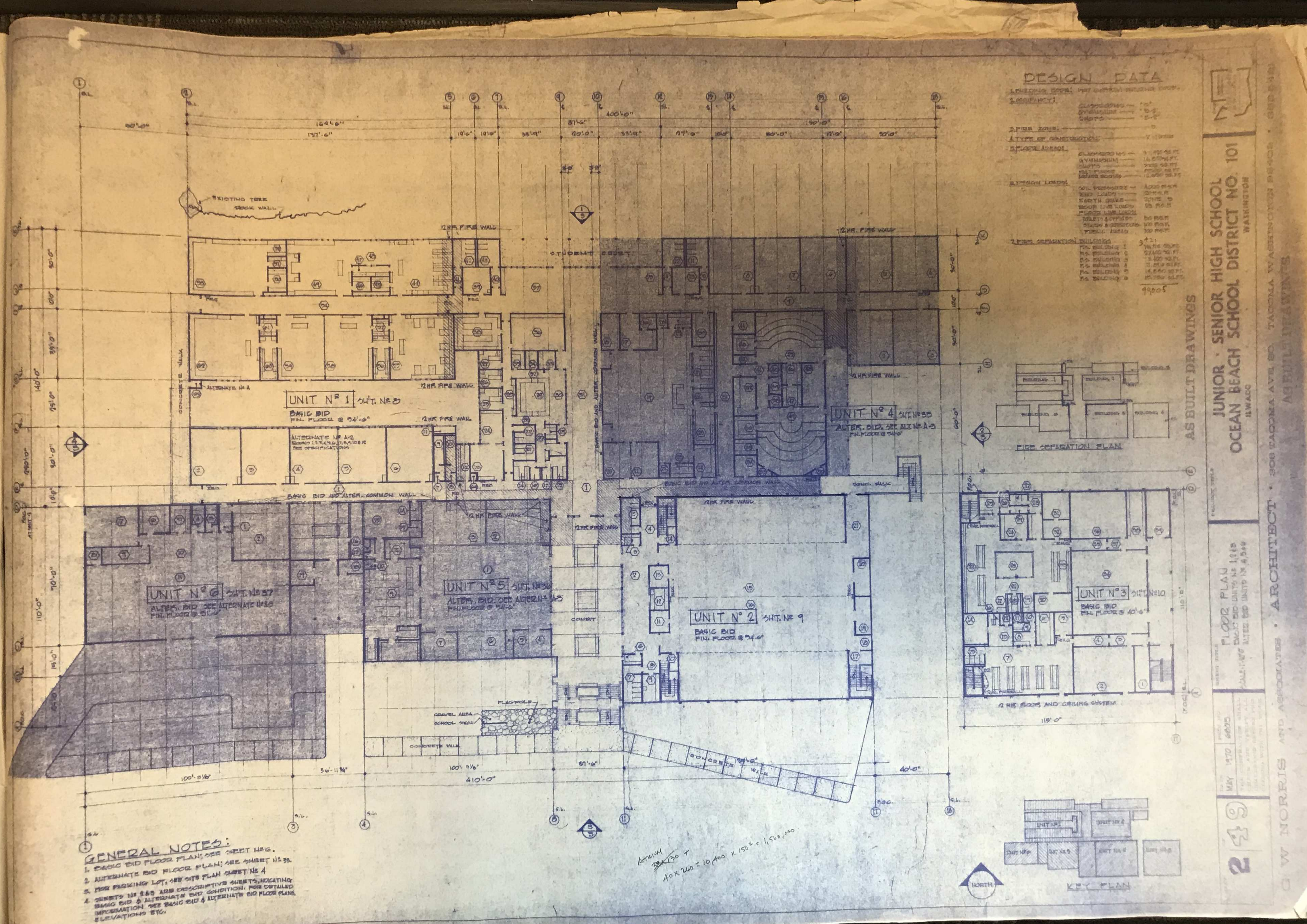
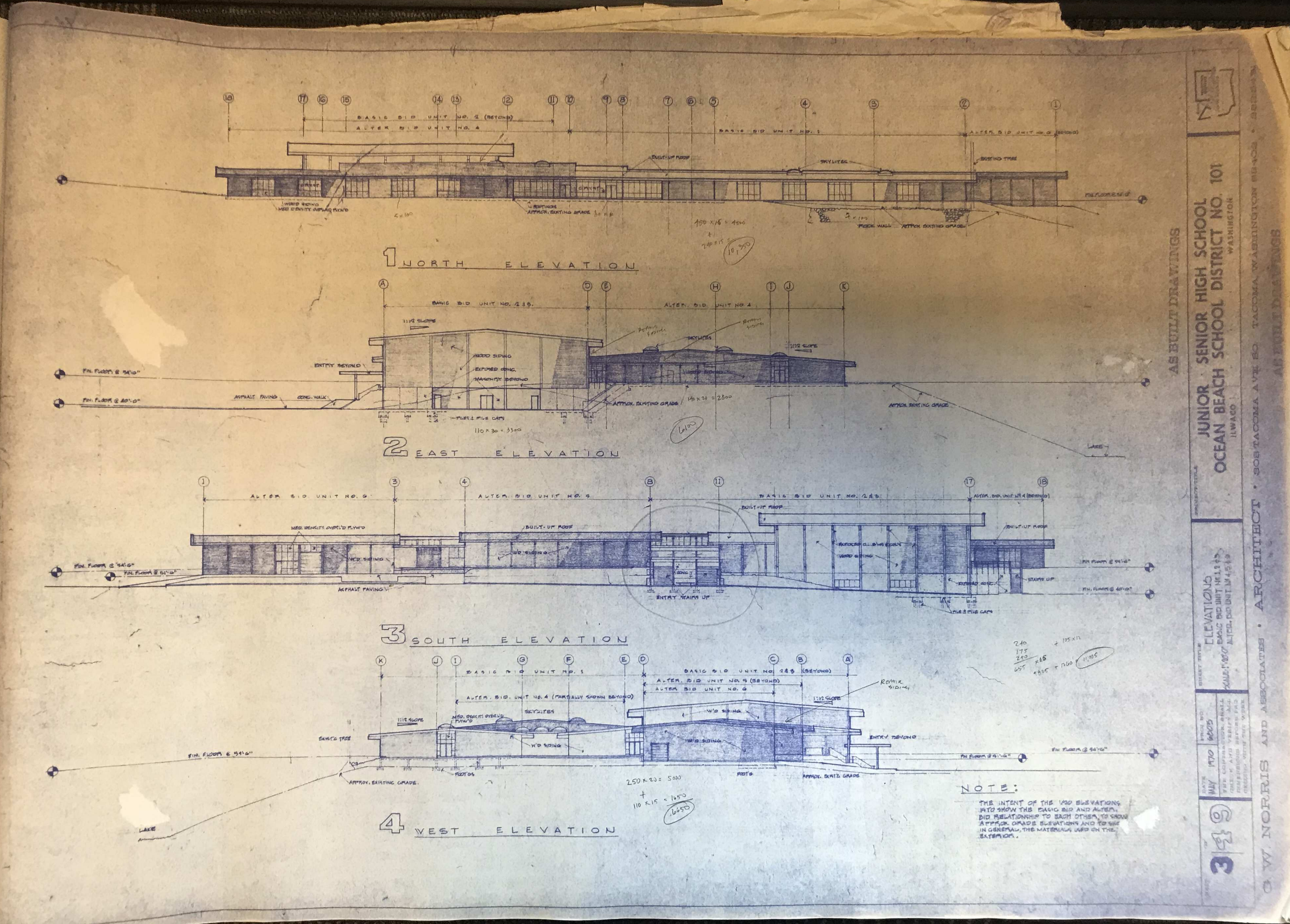
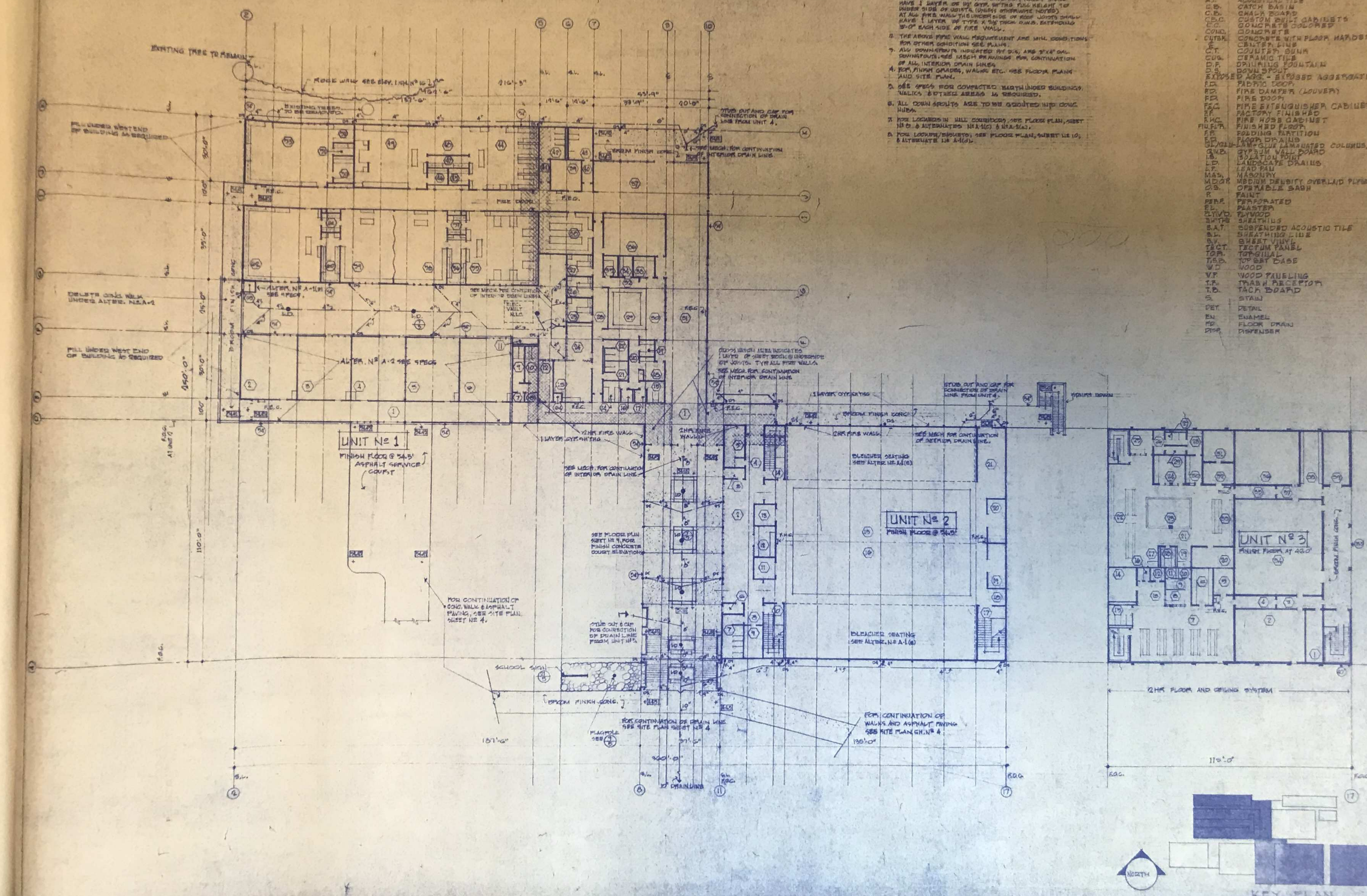
AS BUILT DRAWINGS


DESIGN DATA
STUDENT COURT
12 HR. FIRE WALL
UNIT Nº 1 SHT. Nº 8
BASIC BID
FIN. FLOOR @ 34'-0"
ALTERNATE Nº A-2
UNIT Nº 4 SHT. Nº 35
ALTER. BID. SEE ALT. Nº A-3
BASIC BID AND ALTER. COMMON WALL
UNIT Nº 6 SHT. Nº 37
ALTER. BID. SEE ALTERNATE Nº A-5
UNIT Nº 5 SHT. Nº 36
ALTER. BID. SEE ALTER. Nº A-5
COURT
UNIT Nº 2 SHT. Nº 9
BASIC BID
FIN. FLOOR @ 34'-6"
UNIT Nº 3 SHT. Nº 10
BASIC BID
FIN. FLOOR @ 40'-6"
FIRE SEPARATION PLAN
CONCRETE WALK
FLAGPOLE
GRAVEL AREA
410'-0"
NORTH
KEY PLAN
GENERAL NOTES:
1. BASIC BID FLOOR PLAN; SEE SHEET Nº 6.
2. ALTERNATE BID FLOOR PLAN; SEE SHEET Nº 33.
3. FOR PARKING LOT, SEE SITE PLAN SHEET Nº 4
4. SHEETS Nº 2 & 3 ARE DESCRIPTIVE SHEETS, INDICATING BASIC BID & ALTERNATE BID CONDITION. FOR DETAILED INFORMATION SEE BASIC BID & ALTERNATE BID FLOOR PLANS, ELEVATIONS ETC.
AS BUILT DRAWINGS
JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
FLOOR PLAN
BASIC BID UNITS Nº 1,2 & 3
ALTER. BID UNITS Nº 4,5 & 6
MAY 1970
6805
2
G W NORRIS AND ASSOCIATES · ARCHITECT · 308 TACOMA AVE. SO. TACOMA WASHINGTON 98402
AS BUILT DRAWINGS


1 NORTH ELEVATION
2 EAST ELEVATION
3 SOUTH ELEVATION
4 WEST ELEVATION
BASIC BID UNIT NO. 1
ALTER. BID UNIT NO. 4
BASIC BID UNIT NO. 2 & 3
ALTER. BID UNIT NO. 6
BUILT-UP ROOF
SKYLITES
WOOD SIDING
EXPOSED CONC.
ENTRY BEYOND
ASPHALT PAVING
APPROX. EXISTING GRADE
ENTRY STAIRS UP
LAKE
NOTE:
THE INTENT OF THE 1/32 ELEVATIONS IS TO SHOW THE BASIC BID AND ALTER. BID RELATIONSHIP TO EACH OTHER, TO SHOW APPROX. GRADE ELEVATIONS AND TO SHOW IN GENERAL, THE MATERIALS USED ON THE EXTERIOR.
AS BUILT DRAWINGS
JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
ELEVATIONS
C. W. NORRIS AND ASSOCIATES · ARCHITECT
MAY 1970
3



GENERAL NOTES:

1. FIRE WALLS (2HR)
   ALL INTERIOR FIRE WALLS SHALL HAVE 2 LAYERS OF TYPE X 5/8" THICK G.W.B. FULL HEIGHT TO UNDER SIDE OF ROOF JOISTS. ALL EXTERIOR WALLS SHALL HAVE 1 LAYER OF 1/2" GYP. SH'TNG FULL HEIGHT TO UNDER SIDE OF JOISTS. (UNLESS OTHERWISE NOTED) AT ALL FIRE WALL THE UNDER SIDE OF ROOF JOISTS SHALL HAVE 1 LAYER OF TYPE X 5/8" THICK G.W.B. EXTENDING 3'-0" EACH SIDE OF FIRE WALL.
2. THE ABOVE FIRE WALL REQUIREMENT ARE WALL CONDITIONS FOR OTHER CONDITION SEE PLANS.
3. ALL DOWNSPOUTS INDICATED BY D.S. ARE 3"x4" GAL. DOWNSPOUTS. SEE MECH DRAWINGS FOR CONTINUATION OF ALL INTERIOR DRAIN LINES.
4. FOR FINISH GRADES, WALKS ETC. SEE FLOOR PLANS AND SITE PLAN.
5. SEE SPECS FOR COMPACTED EARTH UNDER BUILDINGS, WALKS & OTHER AREAS AS REQUIRED.
6. ALL DOWN SPOUTS ARE TO BE GROUTED INTO CONC. HUBS.
7. FOR LOCKERS IN HALL CORRIDORS, SEE FLOOR PLAN, SHEET No 8 & ALTERNATES No A-1(C) & No A-2(a).
8. FOR LOCKERS/BASKETS, SEE FLOOR PLAN, SHEET No 10; & ALTERNATE No A-1(d).

SYMBOLS & ABBREVIATIONS

ALTER.	ALTERNATE
A.B.	ACOUSTICAL BLOCK
A.P.	ACOUSTICAL PANEL
A.T.	ACOUSTICAL TILE
C.B.	CATCH BASIN
C.B.	CHALK BOARD
C.B.C.	CUSTOM BUILT CABINETS
C.C.	CONCRETE COLORED
CONC.	CONCRETE
C.H.T.R.	CONCRETE WITH FLOOR HARDENER
℄	CENTER LINE
C.T.	COUNTER SUNK
C.T.	CERAMIC TILE
D.F.	DRINKING FOUNTAIN
D.S.	DOWN SPOUT
EXPOSED AGG.	EXPOSED AGGREGATE
F.D.	FABRIC DOOR
F.D.	FIRE DAMPER (LOUVER)
F.D.	FIRE DOOR
F.E.C.	FIRE EXTINGUISHER CABINET
F.F.	FACTORY FINISHED
F.H.C.	FIRE HOSE CABINET
FIN.FL.R.	FINISHED FLOOR
F.P.	FOLDING PARTITION
F.D.	FLOOR DRAINS
GL/GLU-LAM	GLUE LAMINATED COLUMNS/BEAMS
G.W.B.	GYPSUM WALL BOARD
I.P.	ISOLATION POINT
L.D.	LANDSCAPE DRAINS
L.P.	LEAD PAN
MAS.	MASONRY
M.D.O.P.	MEDIUM DENSITY OVERLAID PLYWOOD
O.S.	OPERABLE SASH
P.	PAINT
PERF.	PERFORATED
PL.	PLASTER
PLYWD.	PLYWOOD
SH'TNG	SHEATHING
S.A.T.	SUSPENDED ACOUSTIC TILE
S.L.	SHEATHING LINE
S.V.	SHEET VINYL
TECT.	TECTUM PANEL
TOP.	TOPSIGNAL
T.S.B.	TOP SET BASE
W.D.	WOOD
W.P.	WOOD PANELING
T.R.	TRASH RECEPTOR
T.B.	TACK BOARD
S.	STAIN
DET.	DETAIL
EN.	ENAMEL
F.D.	FLOOR DRAIN
DISP.	DISPENSER

AS BUILT DRAWINGS

PROJECT TITLE

JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON

SHEET TITLE

FLOOR PLAN
SCALE: 1"=20'-0" BASIC BID UNITS No 1,2 & 3

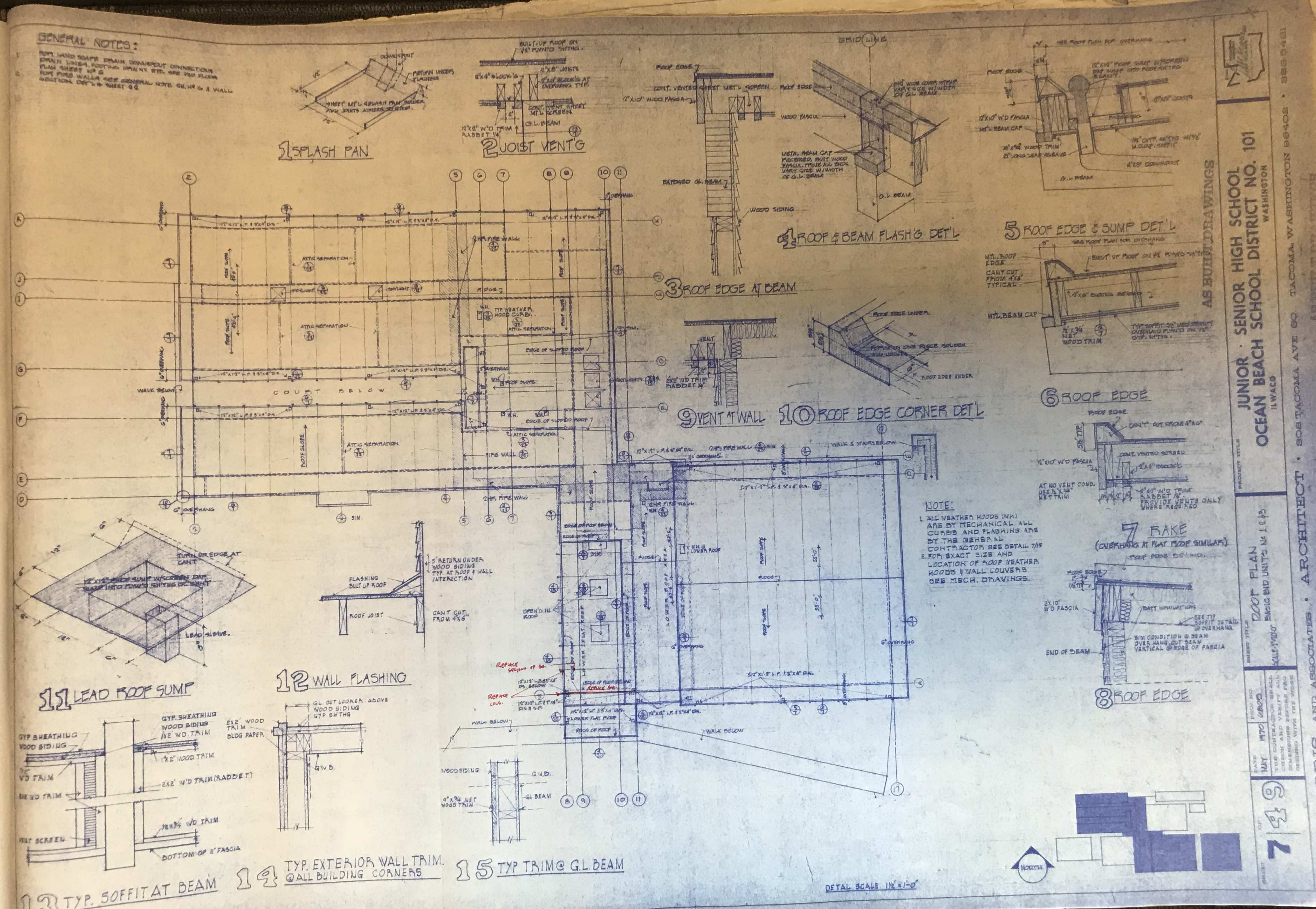
DATE MAY 1970 PROJ. NO. 6805

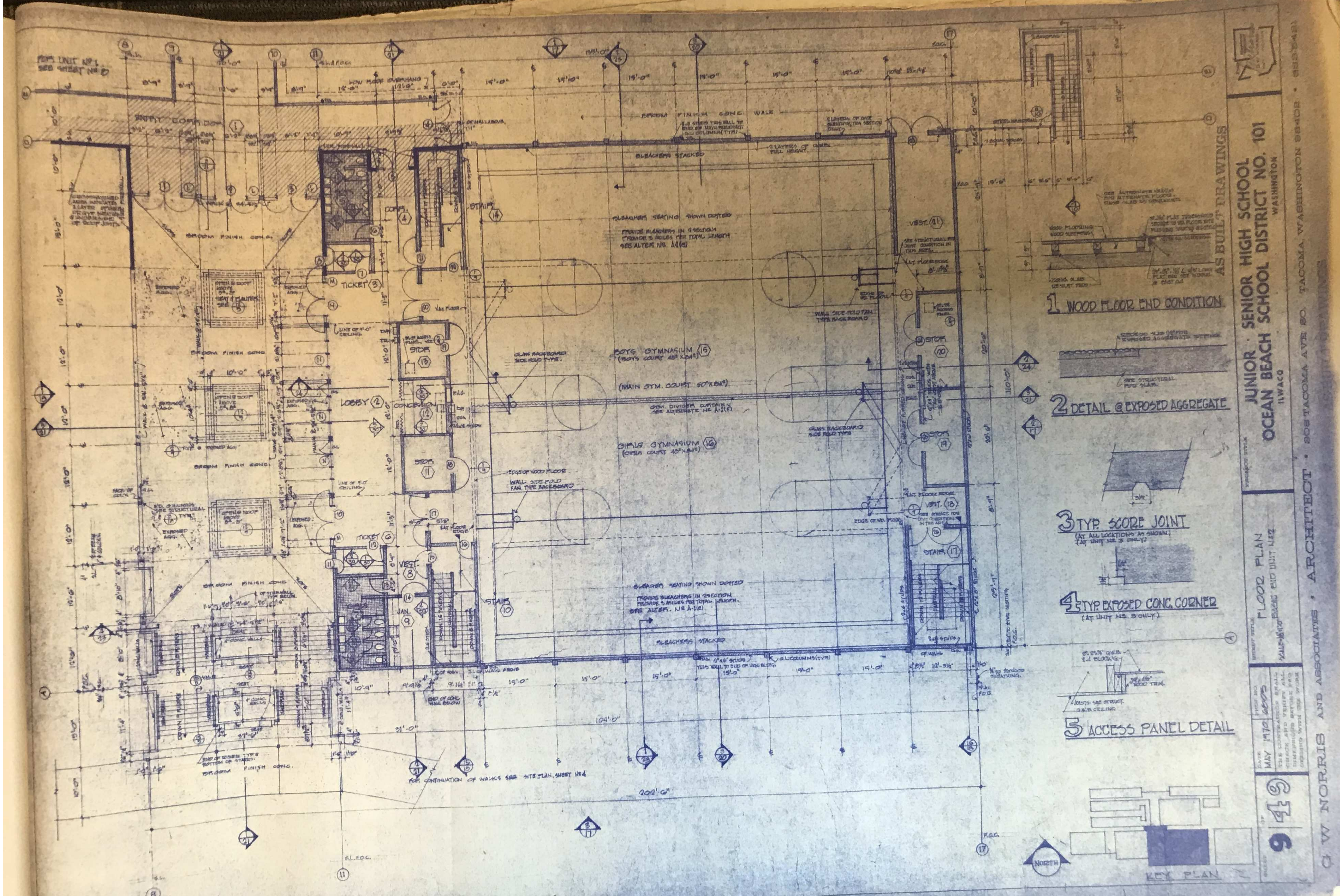
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK

SHEET 6 OF 49

G. W. NORRIS AND ASSOCIATES · ARCHITECT · 808 TACOMA AVE SO. TACOMA, WASHINGTON 98402 · 383-5481

AS BUILT DRAWINGS


GENERAL NOTES:
1 SPLASH PAN
2 JOIST VENT'G
3 ROOF EDGE AT BEAM
4 ROOF & BEAM FLASH'G DET'L
5 ROOF EDGE & SUMP DET'L
6 ROOF EDGE
7 RAKE
(OVERHANG AT FLAT ROOF SIMILAR)
8 ROOF EDGE
9 VENT AT WALL
10 ROOF EDGE CORNER DET'L
11 LEAD ROOF SUMP
12 WALL FLASHING
13 TYP. SOFFIT AT BEAM
14 TYP. EXTERIOR WALL TRIM @ ALL BUILDING CORNERS
15 TYP TRIM @ GL BEAM
NOTE:
1. ALL WEATHER HOODS (WH) ARE BY MECHANICAL. ALL CURBS AND FLASHING ARE BY THE GENERAL CONTRACTOR SEE DETAIL 7/15
2. FOR EXACT SIZE AND LOCATION OF ROOF WEATHER HOODS & WALL LOUVERS SEE MECH. DRAWINGS.
COURT BELOW
DETAIL SCALE 1½"=1'-0"
NORTH
AS BUILT DRAWINGS
JUNIOR - SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO WASHINGTON
ROOF PLAN
MAY 1970
7
49
G. W. NORRIS AND ASSOCIATES · ARCHITECT · 908 TACOMA AVE SO TACOMA, WASHINGTON 98402



BOYS GYMNASIUM 15
(BOYS COURT 48' X 84')
(MAIN GYM. COURT 50' X 84')
GIRLS GYMNASIUM 16
LOBBY 2
TICKET 3
TICKET 6
VEST. 8
VEST. 18
VEST. 21
STAIR 14
STAIR 10
STAIR 17
STOR 13
STOR 11
JAN. 9
BLEACHERS STACKED
BLEACHER SEATING SHOWN DOTTED
BROOM FINISH CONC.
BROOM FINISH CONC. WALK
1 WOOD FLOOR END CONDITION
2 DETAIL @ EXPOSED AGGREGATE
3 TYP. SCORE JOINT
4 TYP. EXPOSED CONC. CORNER
5 ACCESS PANEL DETAIL
202'-6"
104'-0"
NORTH
KEY PLAN
AS BUILT DRAWINGS
JUNIOR · SENIOR HIGH SCHOOL
OCEAN BEACH SCHOOL DISTRICT NO. 101
ILWACO
WASHINGTON
FLOOR PLAN
BASIC BID UNIT No2
MAY 1970
6605
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS BEFORE PROCEEDING WITH THE WORK
9 of 49
C W NORRIS AND ASSOCIATES · ARCHITECT · 305 TACOMA AVE SO. TACOMA, WASHINGTON 98402

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Appendix F: FEMA E-74 Nonstructural Seismic Bracing Excerpts

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Life Safety Systems

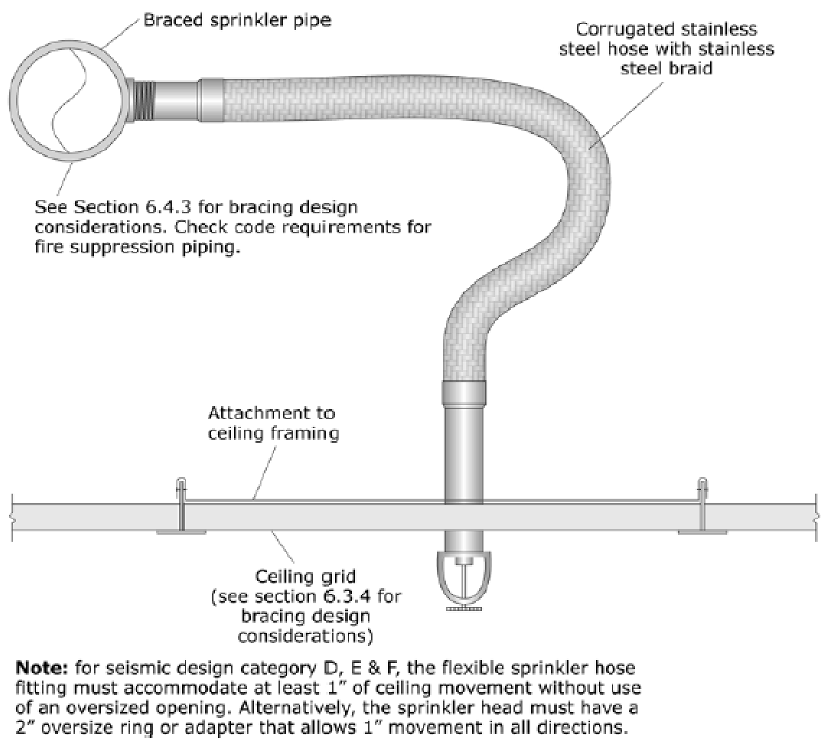


Figure G-1. Flexible Sprinkler Drop.

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

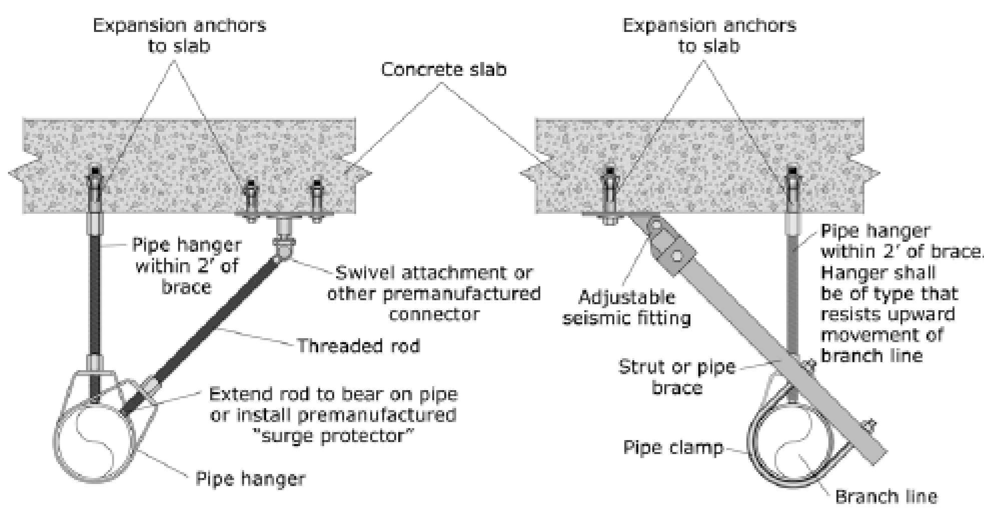


Figure G-2. End of Line Restraint.

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

Partitions

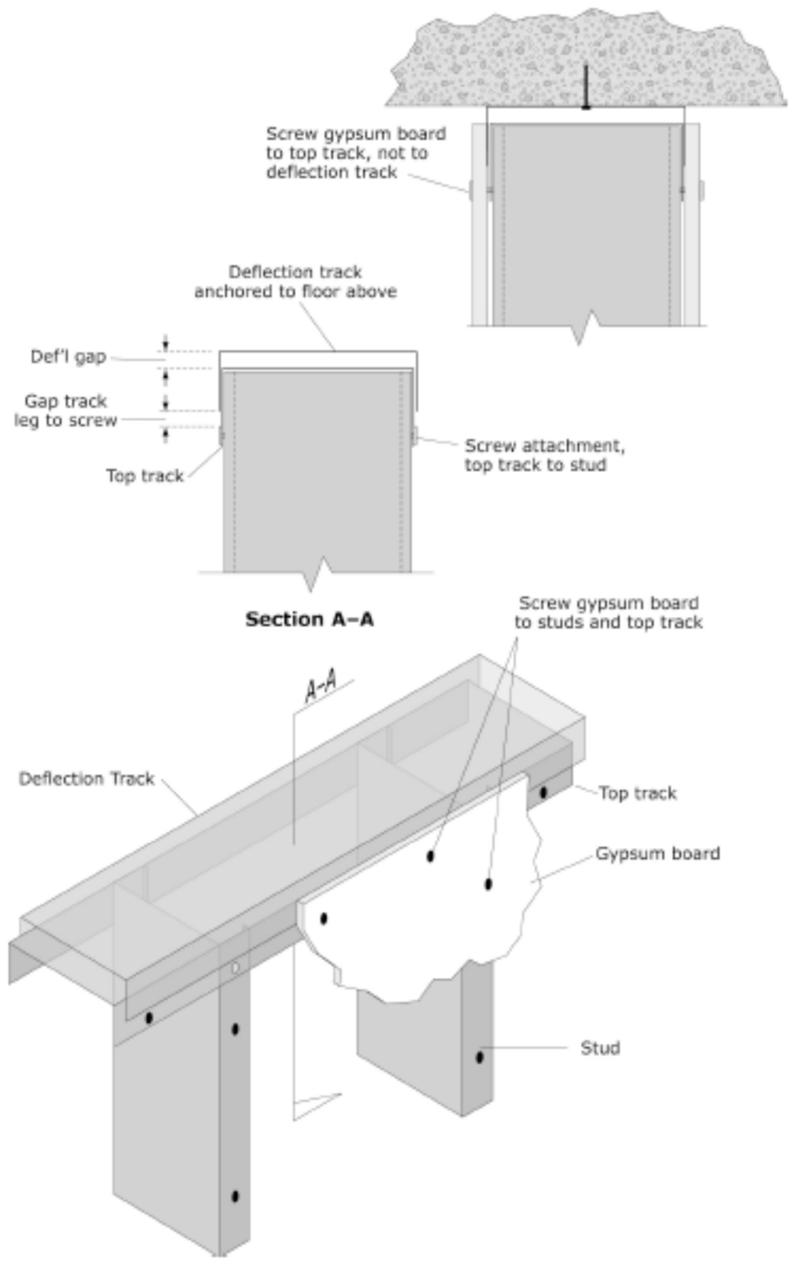


Figure G-3. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

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

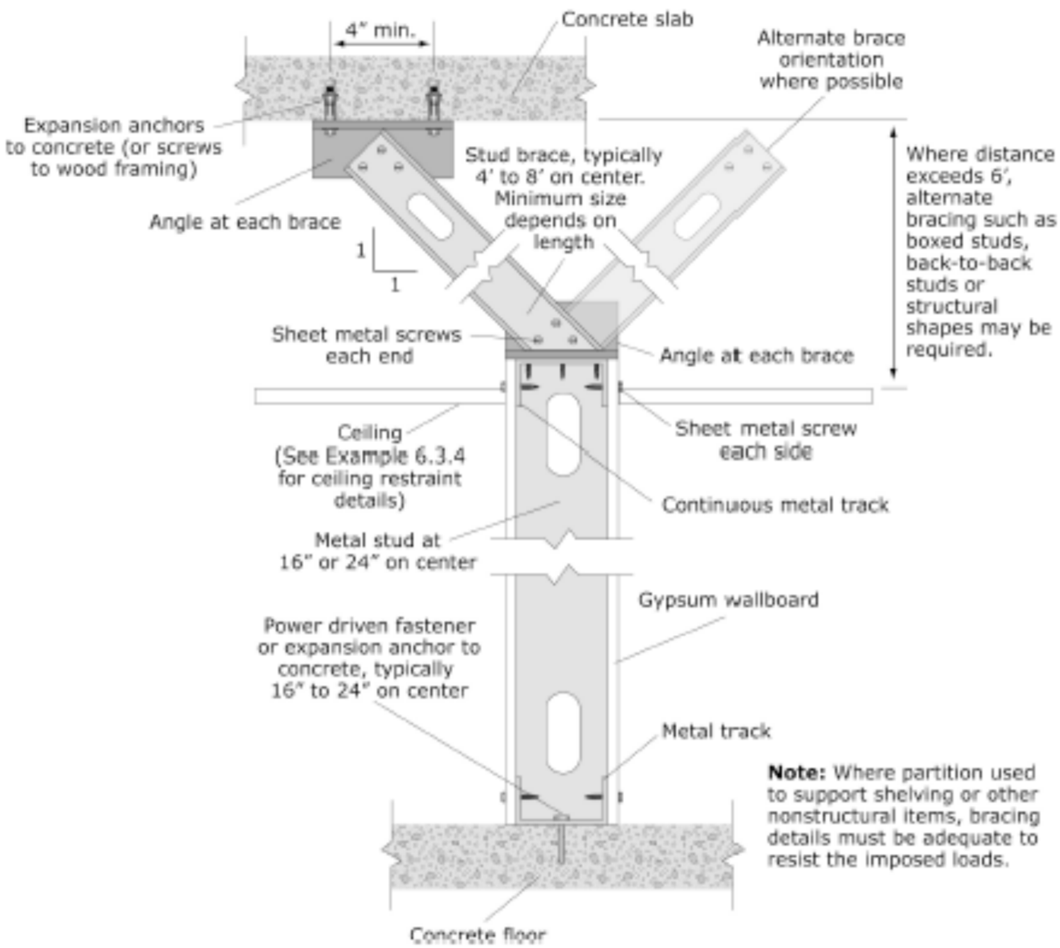


Figure G-4. Mitigation Schemes for Bracing the Tops of Metal Stud Partitions Walls.

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

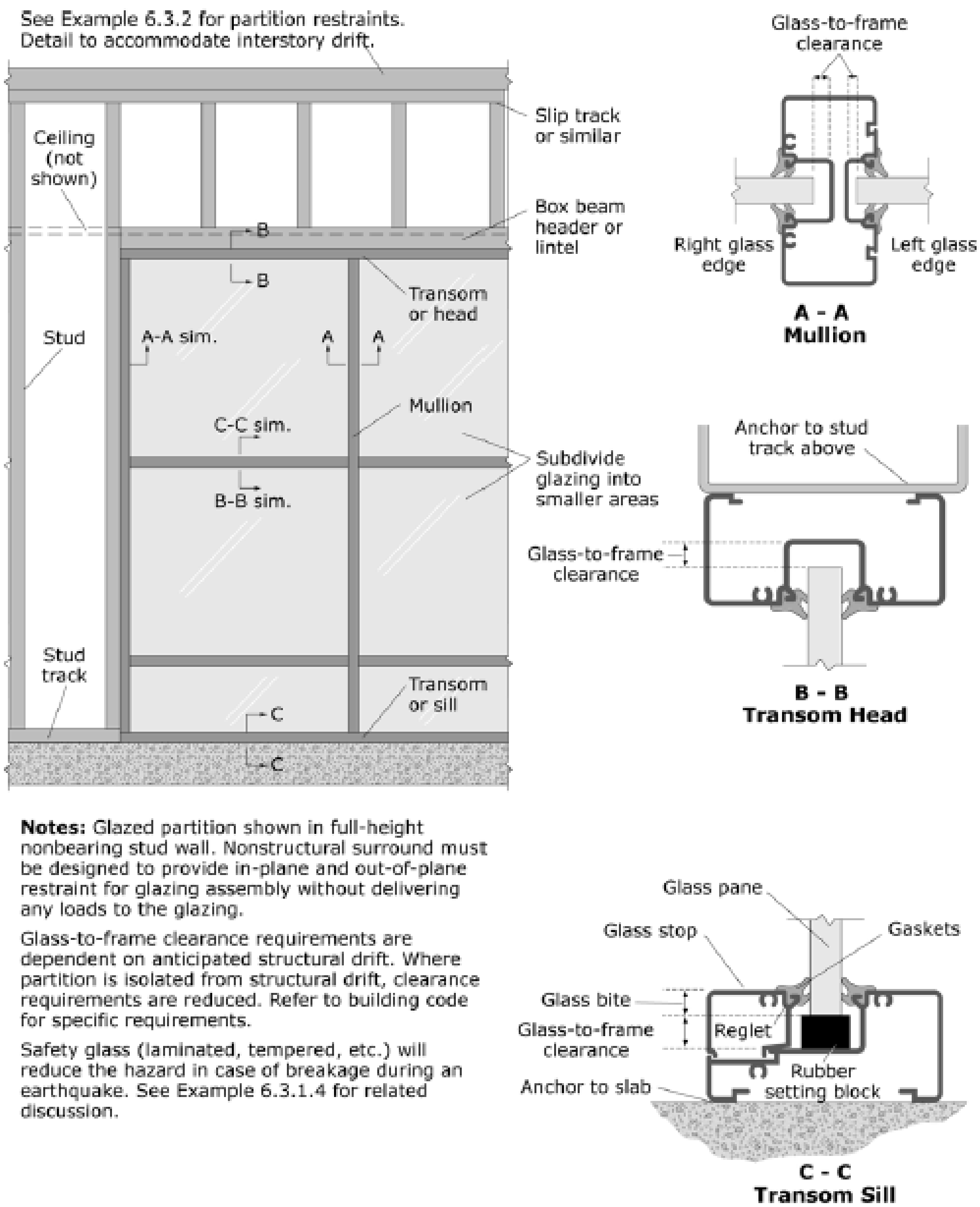


Figure G-5. Full-height Glazed Partition.

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

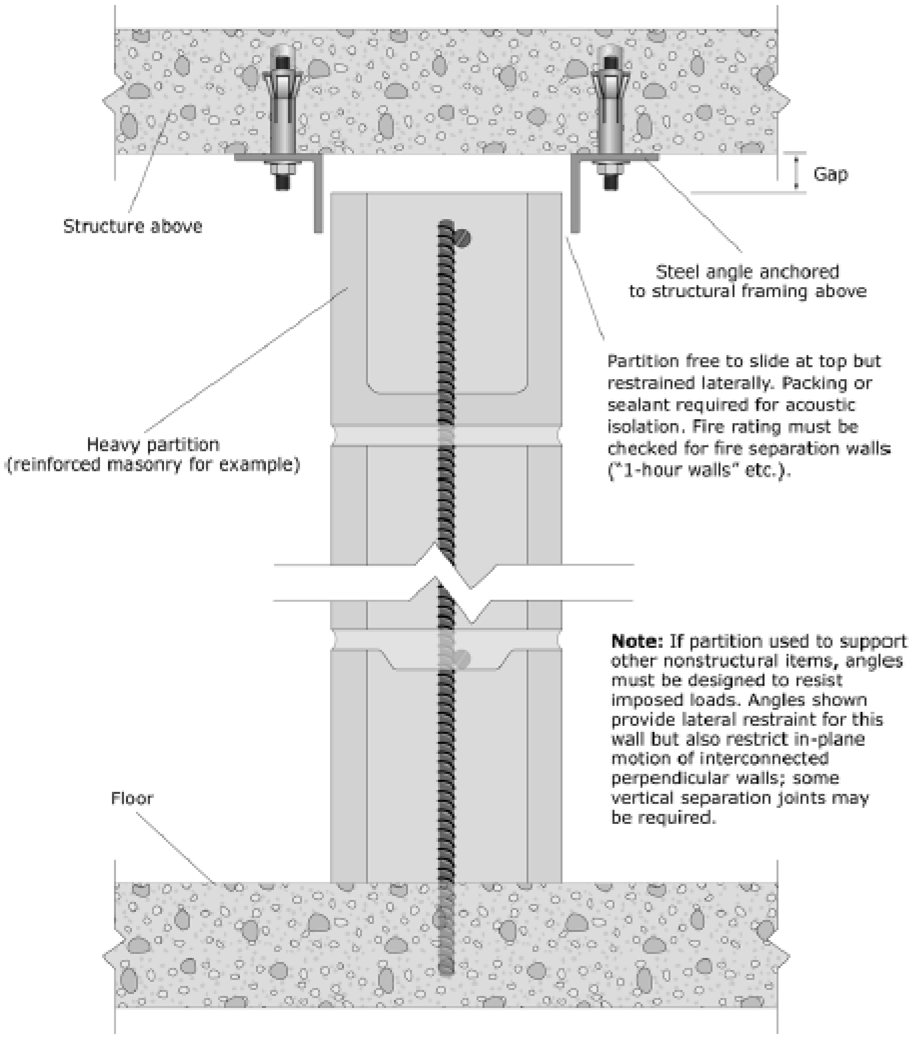


Figure G-6. Full-height Heavy Partition.

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

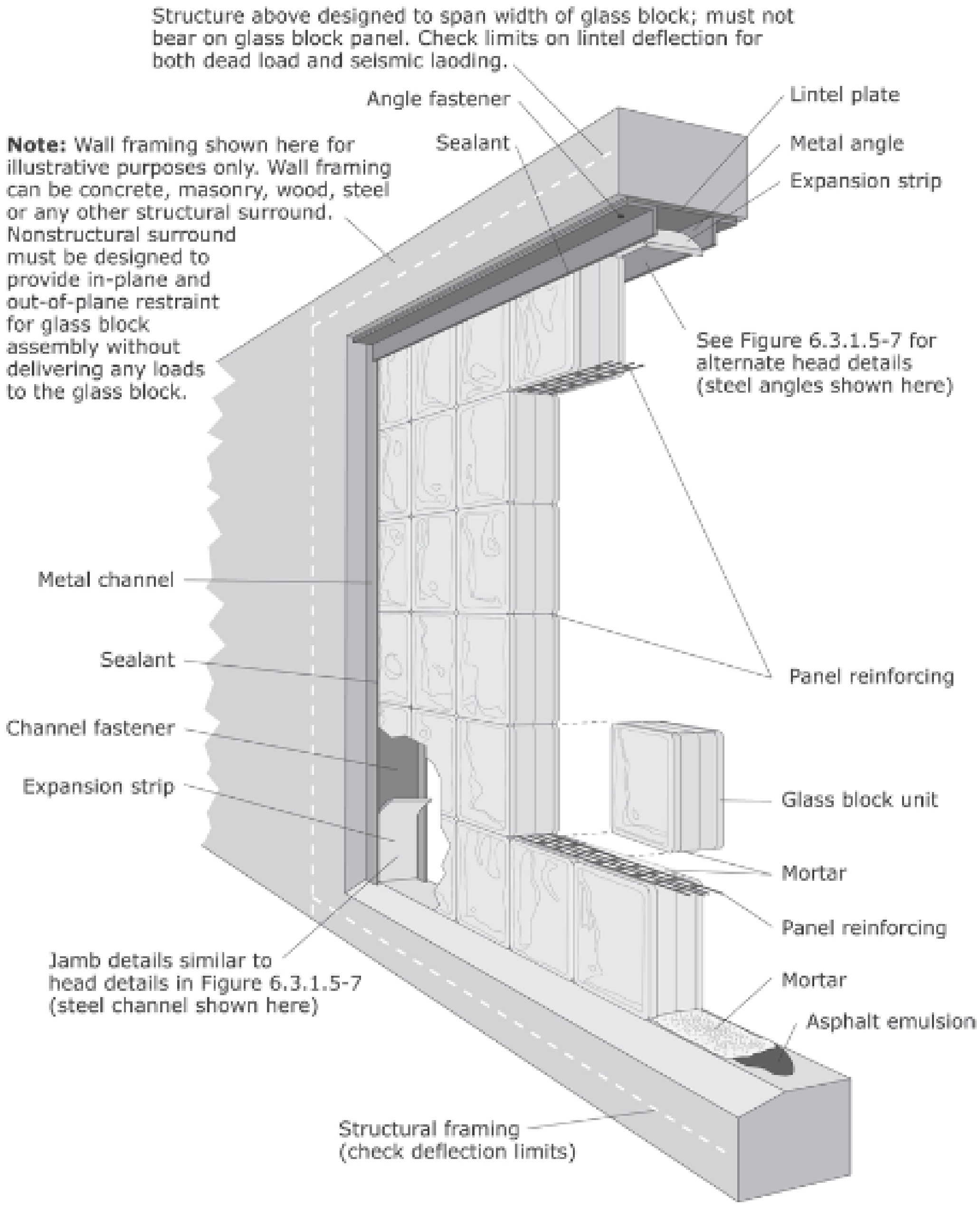


Figure G-7. Typical Glass Block Panel Details.

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

Ceilings

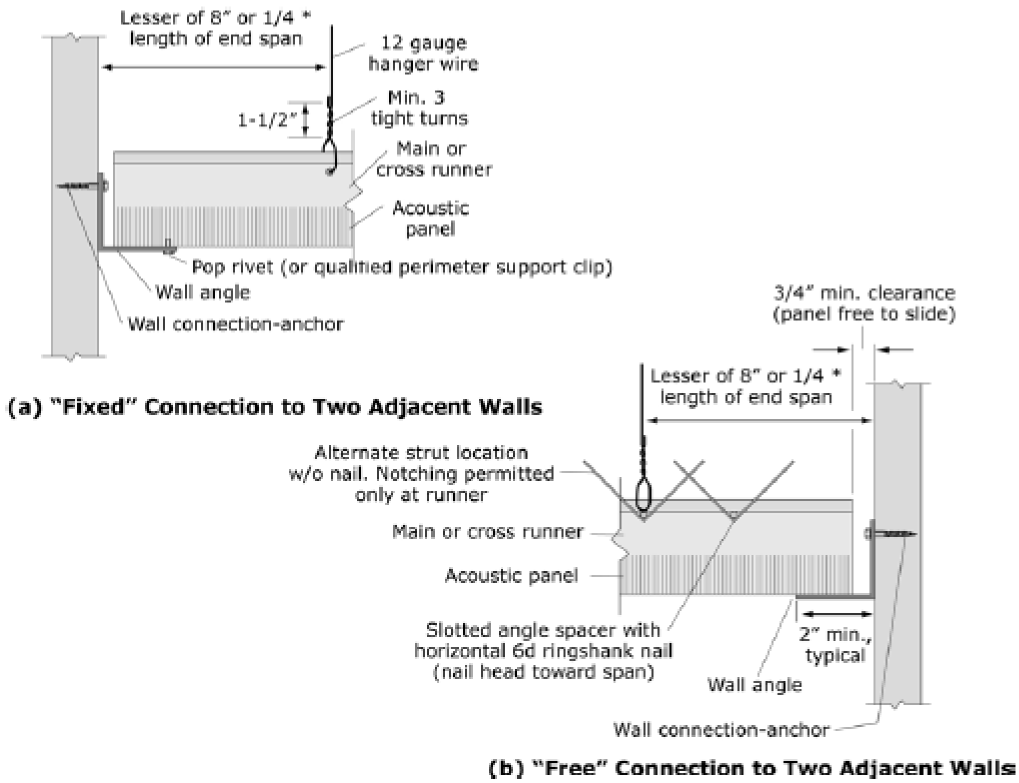
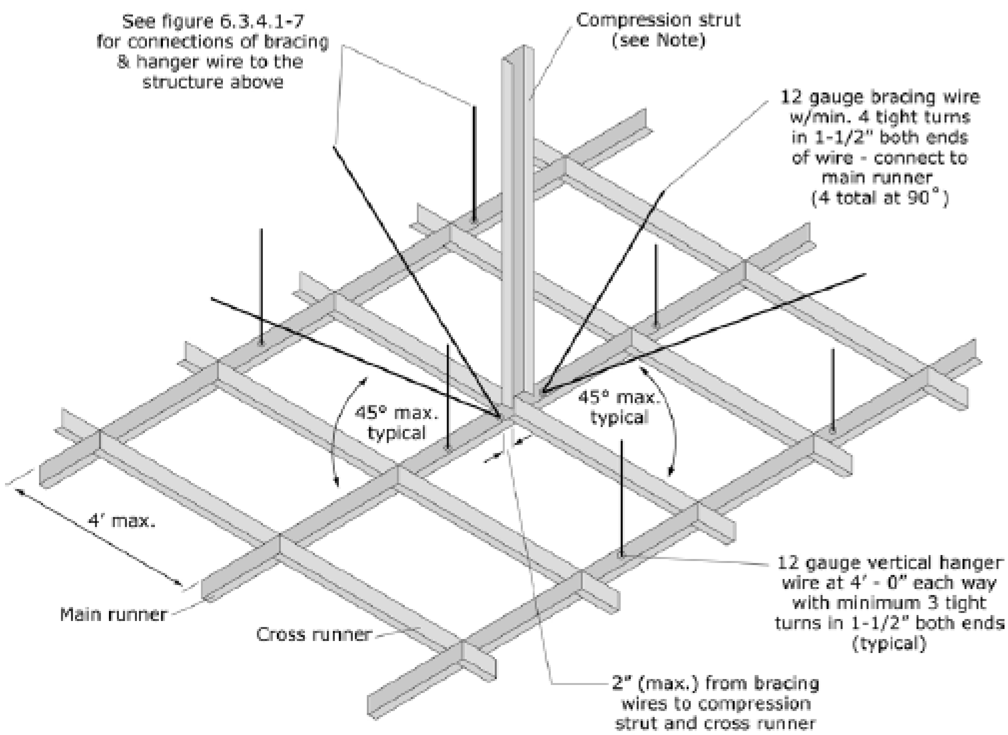


Figure G-8. Suspension System for Acoustic Lay-in Panel Ceilings – Edge Conditions.

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



Note: Compression strut shall not replace hanger wire. Compression strut consists of a steel section attached to main runner with 2 - #12 sheet metal screws and to structure with 2 - #12 screws to wood or 1/4" min. expansion anchor to structure. Size of strut is dependent on distance between ceiling and structure ($l/r \leq 200$). 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'

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)

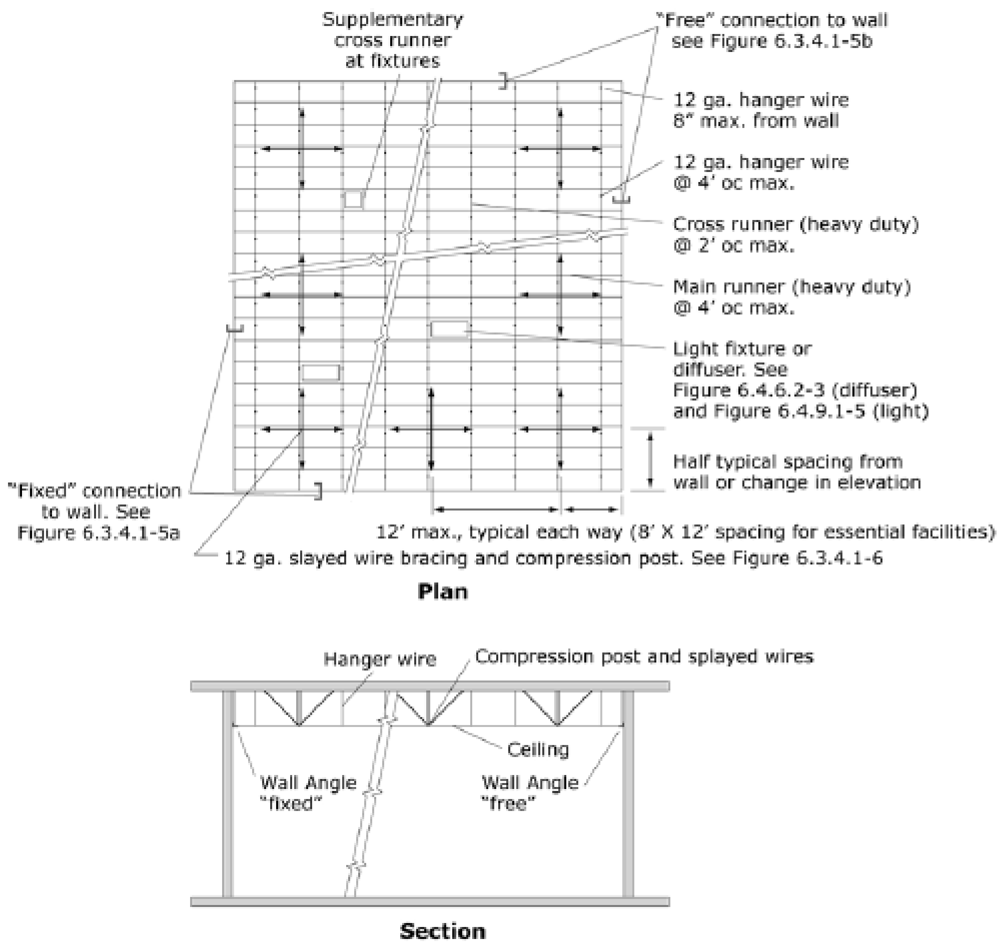


Figure G-10. Suspension System for Acoustic Lay-in Panel Ceilings – General Bracing Layout.

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

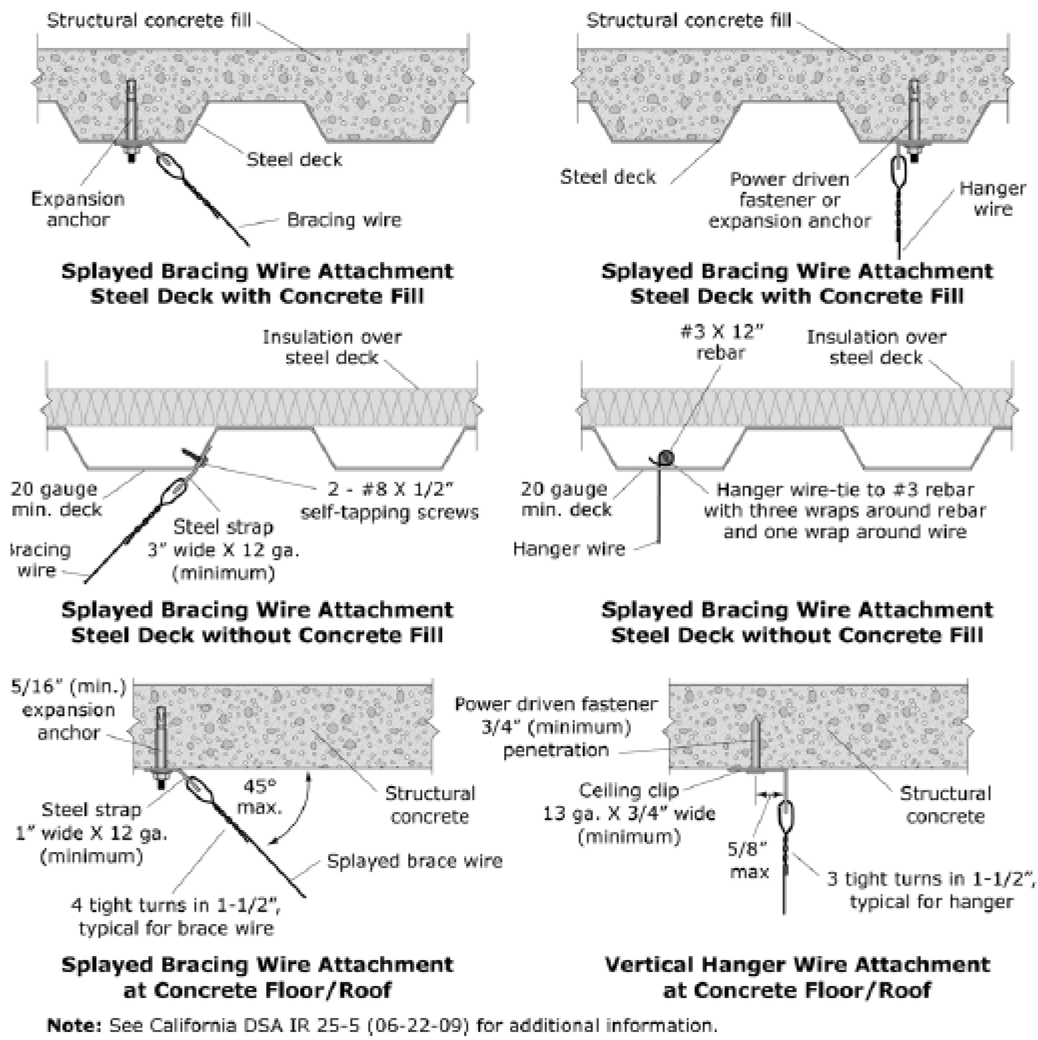
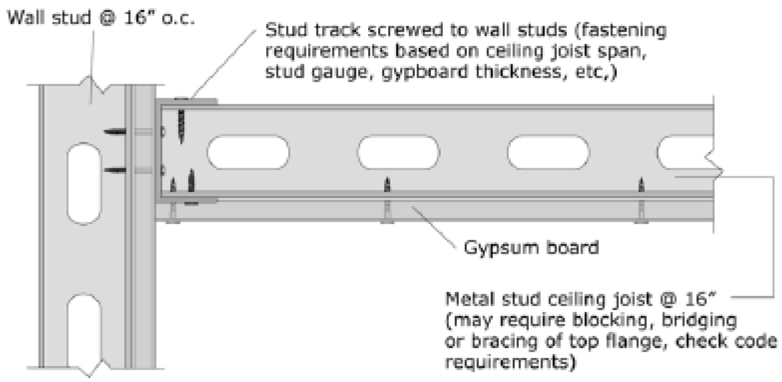
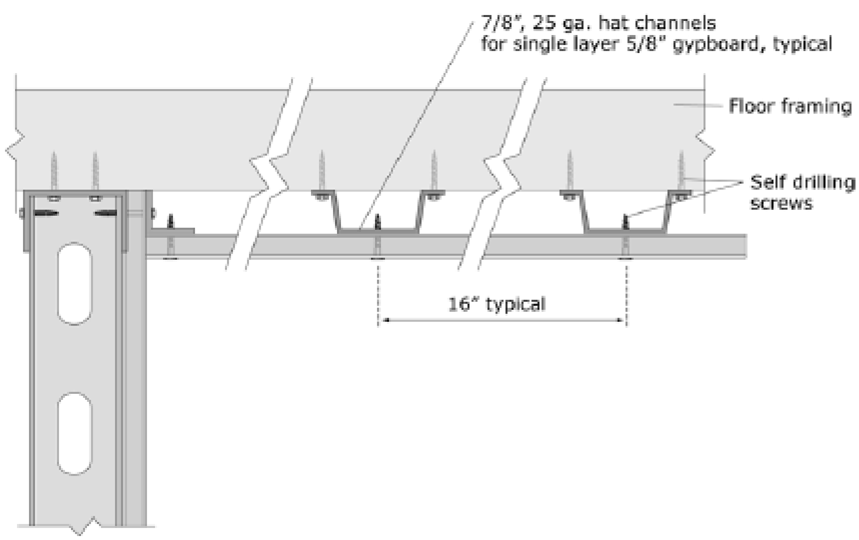


Figure G-11. Suspension System for Acoustic Lay-in Panel Ceilings – Overhead Attachment Details.

(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)

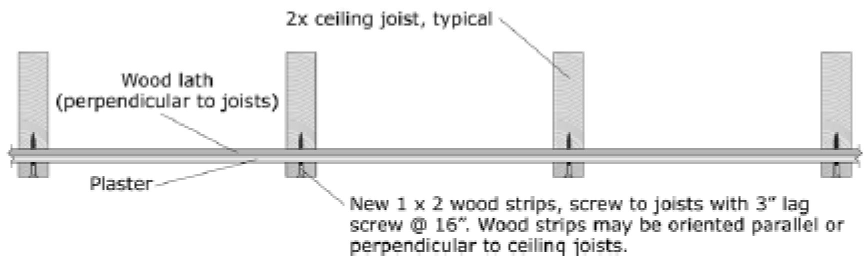


Figure G-13. Retrofit Detail for Existing Lath and Plaster.

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

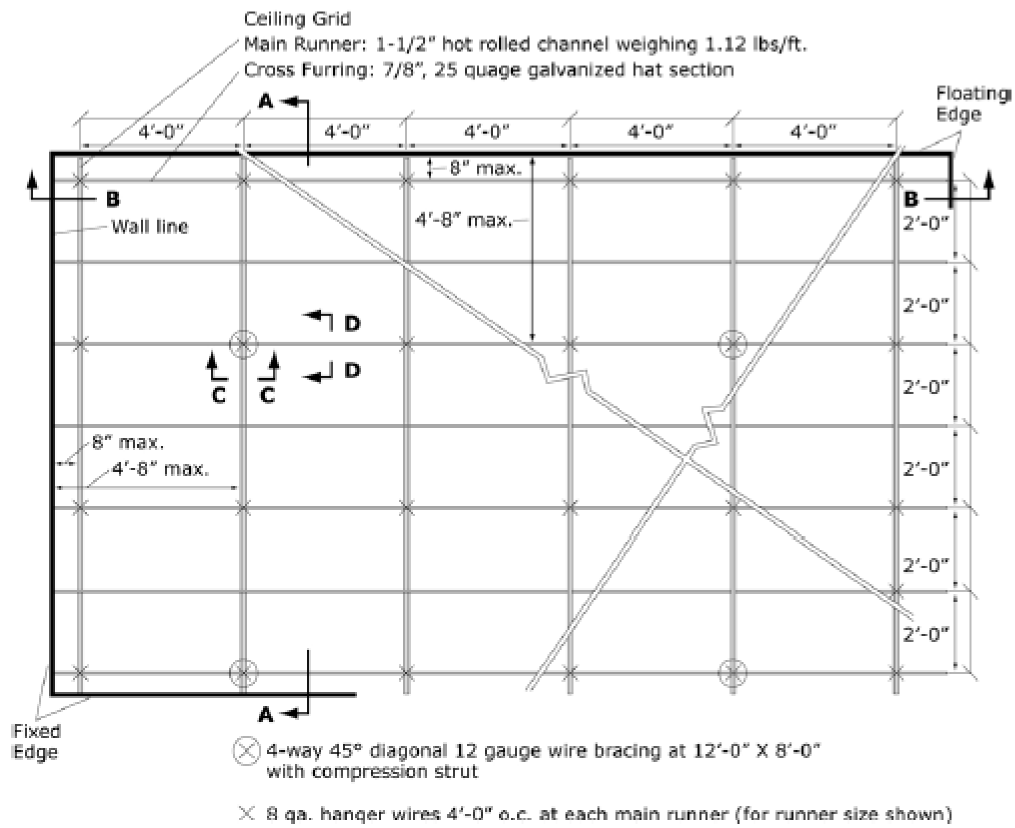
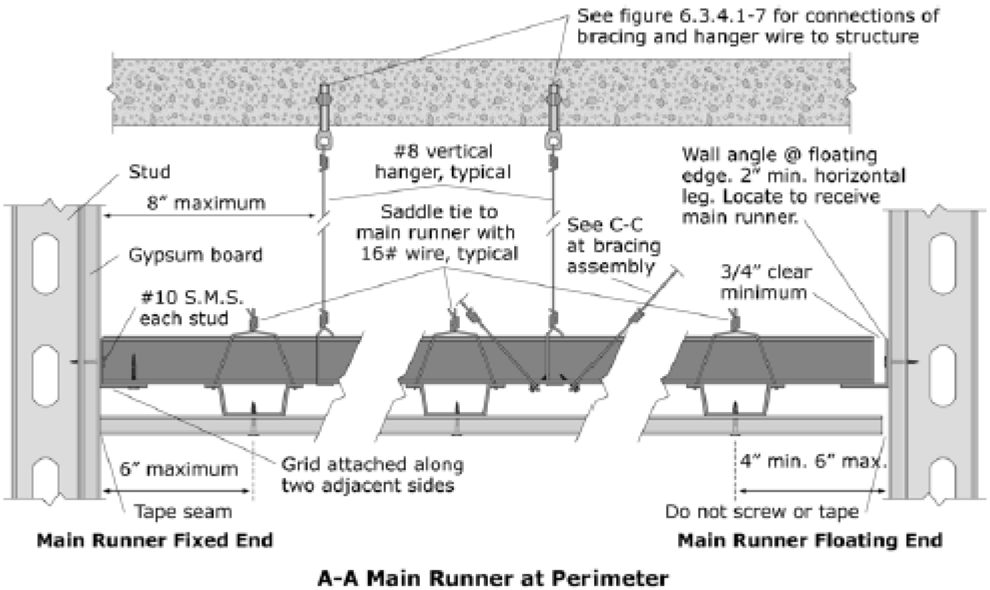


Figure G-14. Diagrammatic View of Suspended Heavy Ceiling Grid and Lateral Bracing.

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



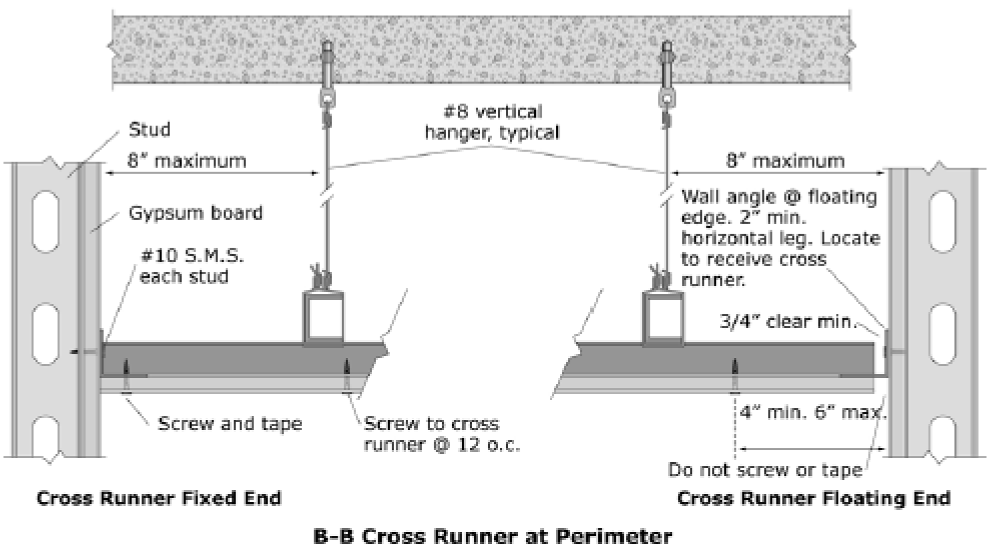


Figure G-15. Perimeter Details for Suspended Gypsum Board Ceiling.

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

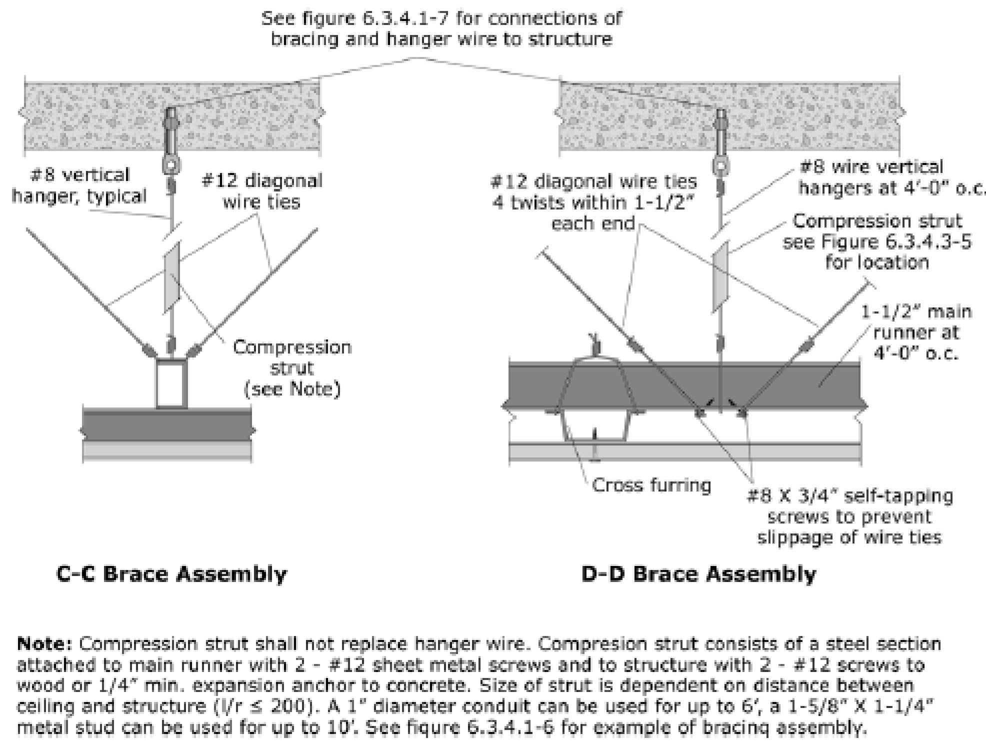


Figure G-16. Details for Lateral Bracing Assembly for Suspended Gypsum Board Ceiling.

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

Light Fixtures

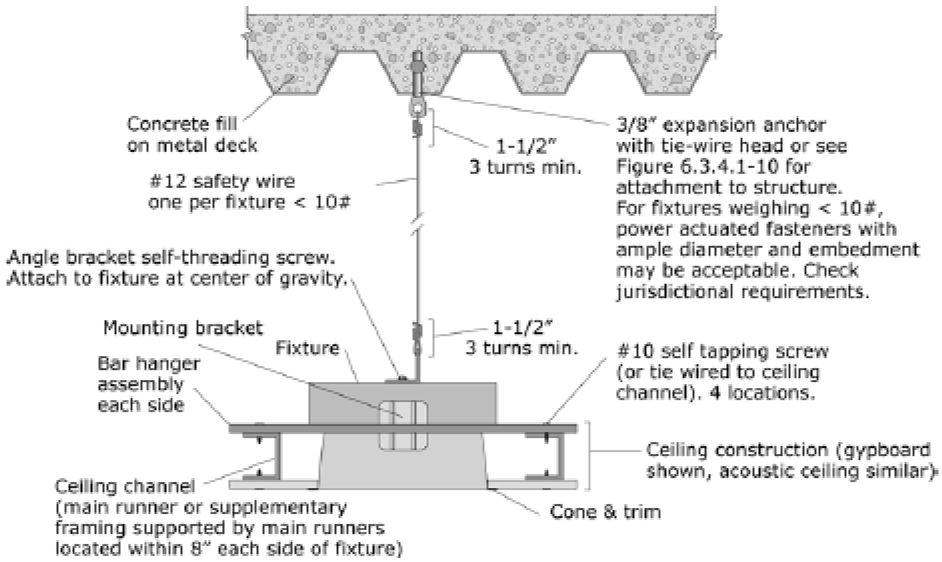


Figure G-17. Recessed Light Fixture in suspended Ceiling (Fixture Weight < 10 pounds).

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

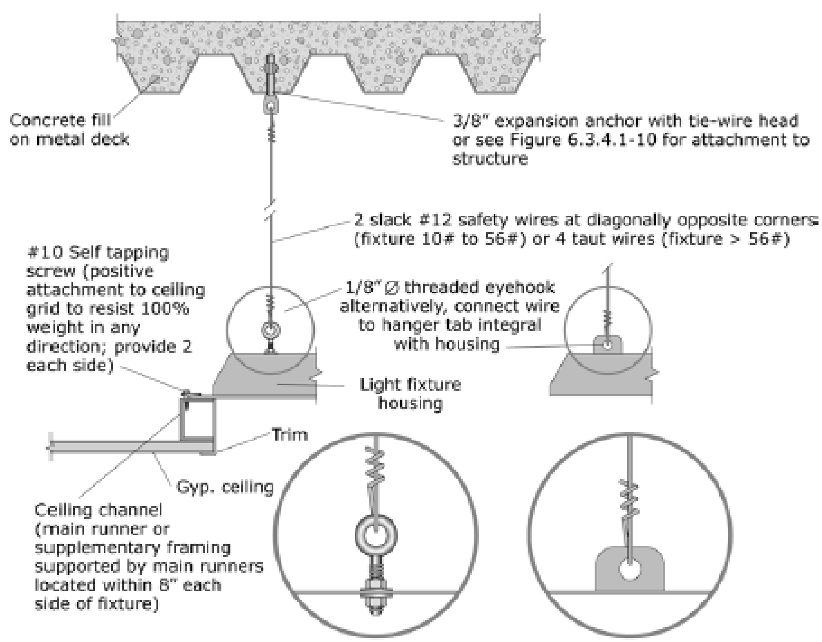


Figure G-18. Recessed Light Fixture in suspended Ceiling (Fixture Weight 10 to 56 pounds).

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

Contents and Furnishings

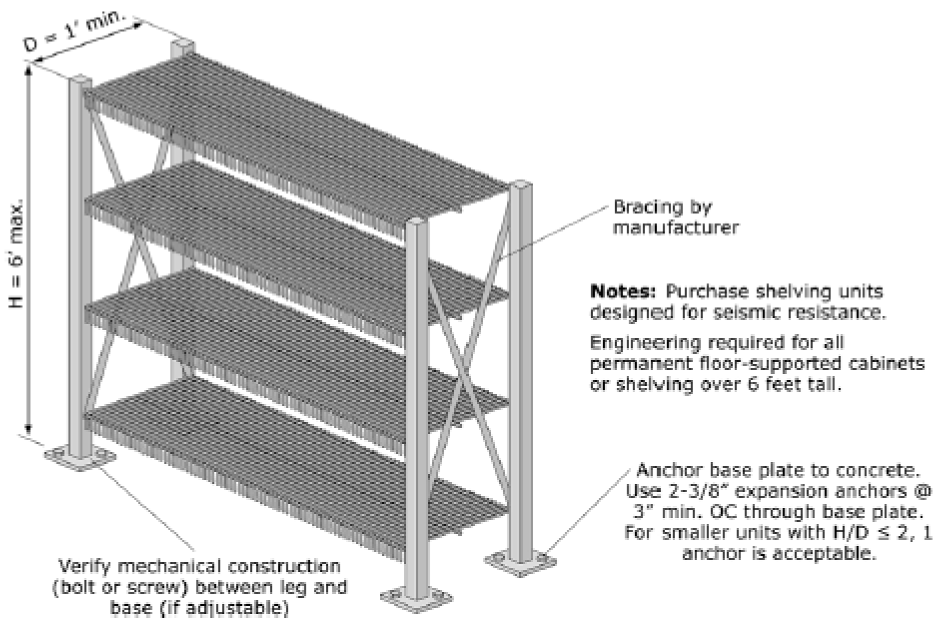


Figure G-19. Light Storage Racks.

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

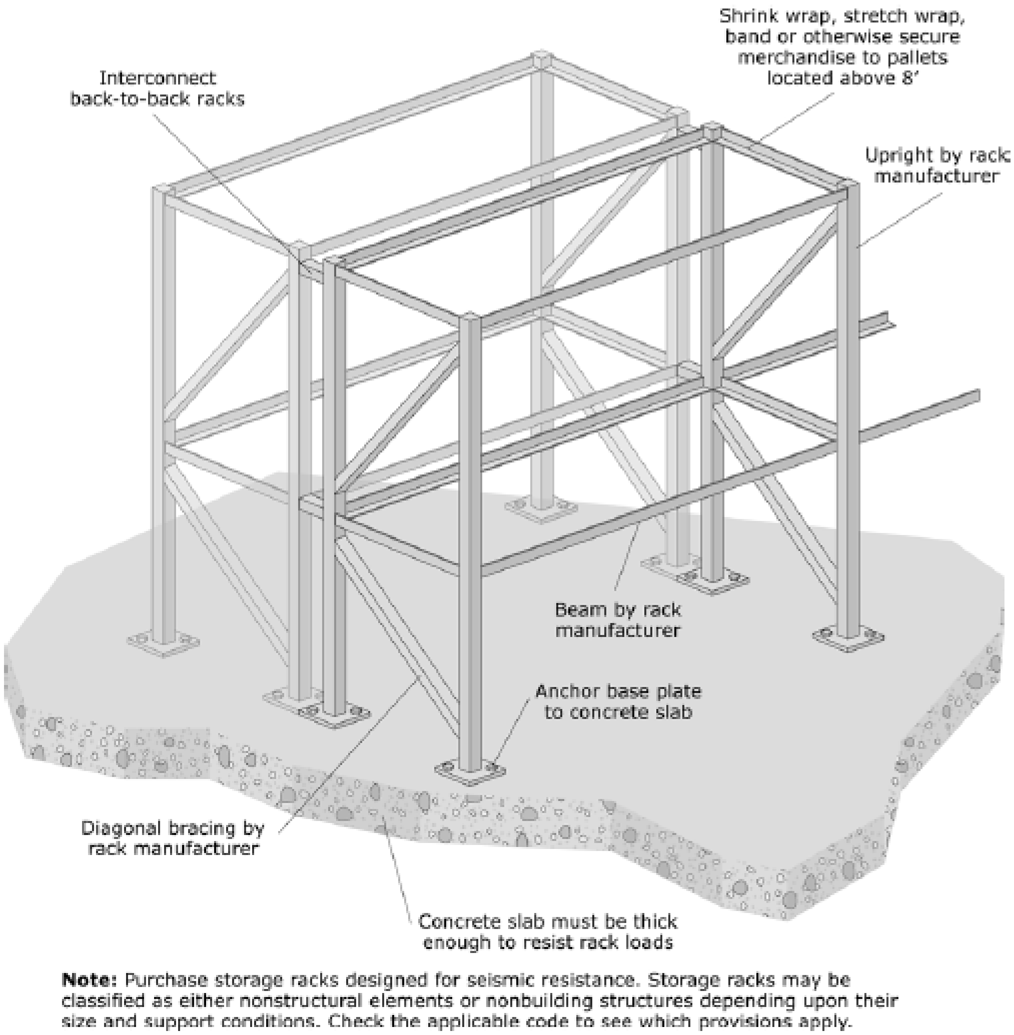


Figure G-20. Industrial Storage Racks.

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

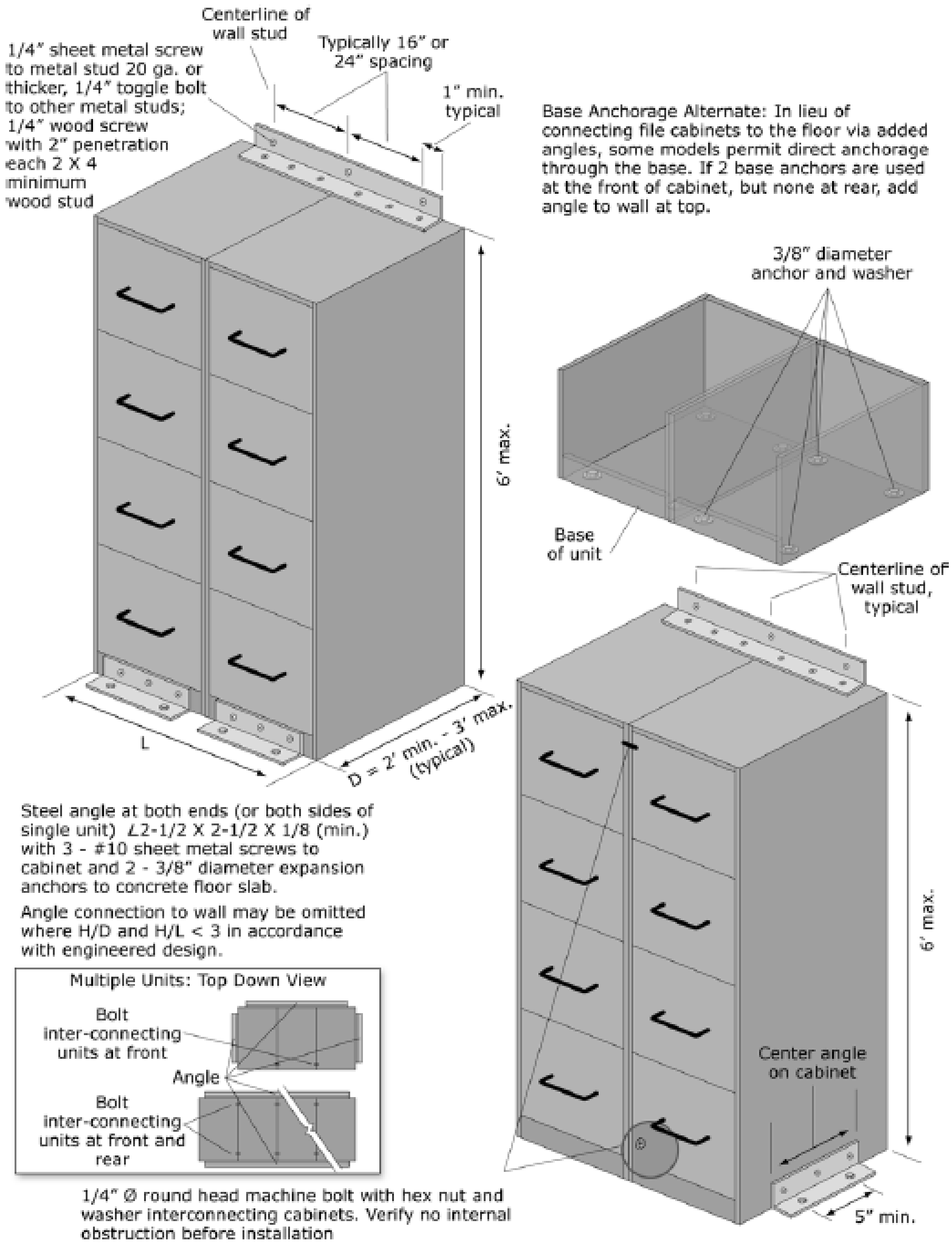


Figure G-21. Wall-mounted File Cabinets.

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

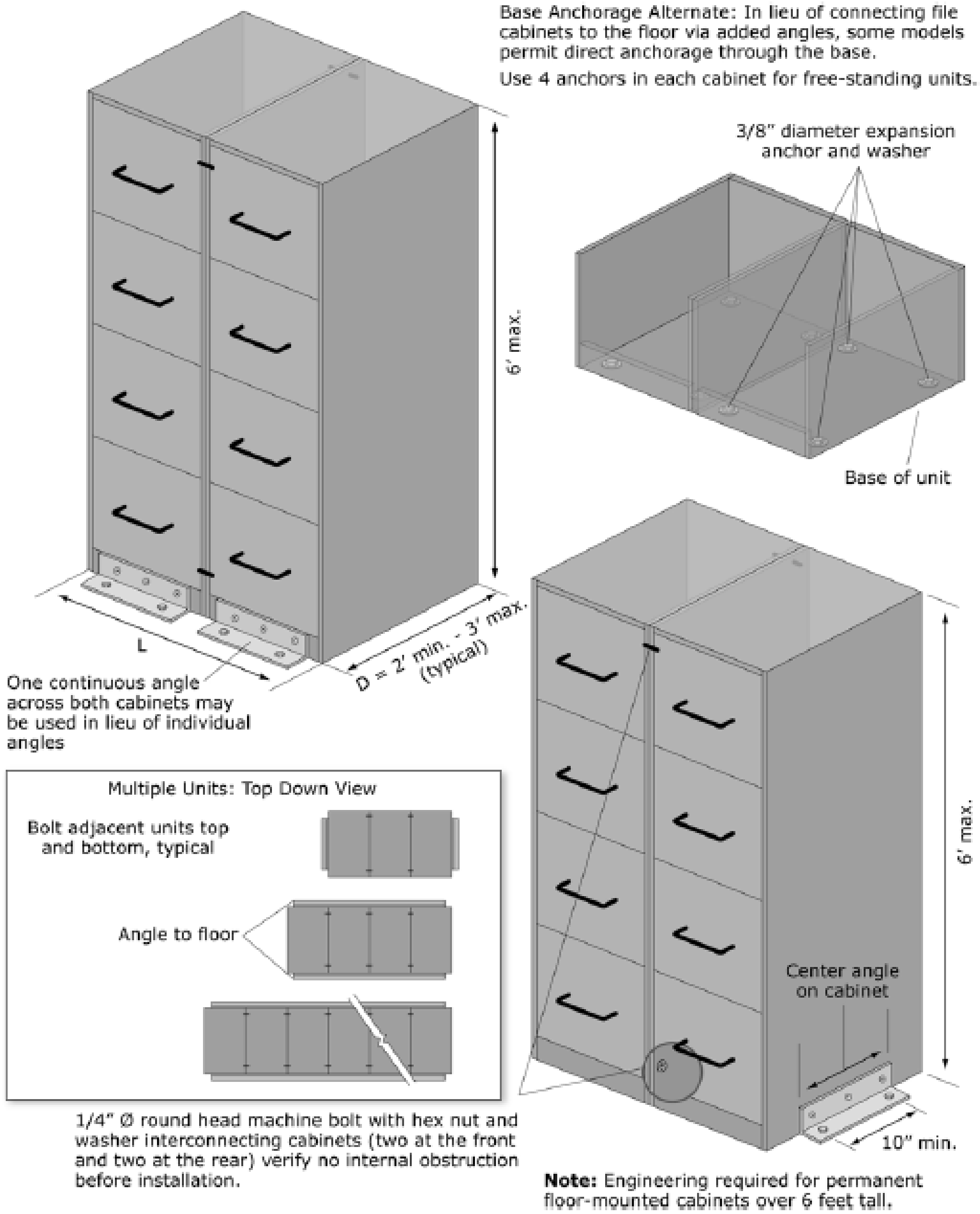


Figure G-22. Base Anchored File Cabinets.

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

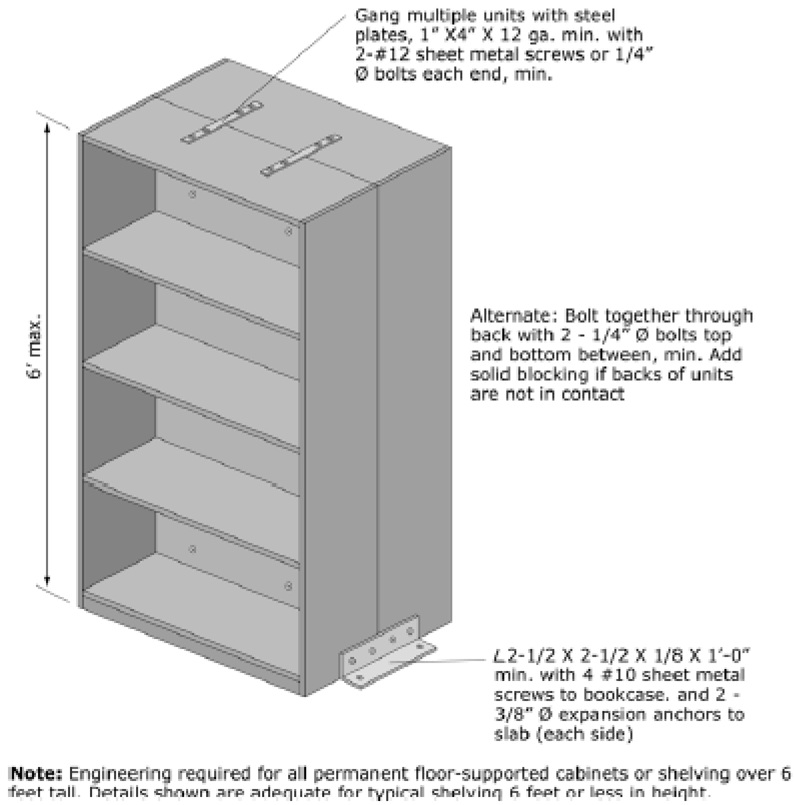


Figure G-23. Anchorage of Freestanding Book Cases Arranged Back to Back.

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

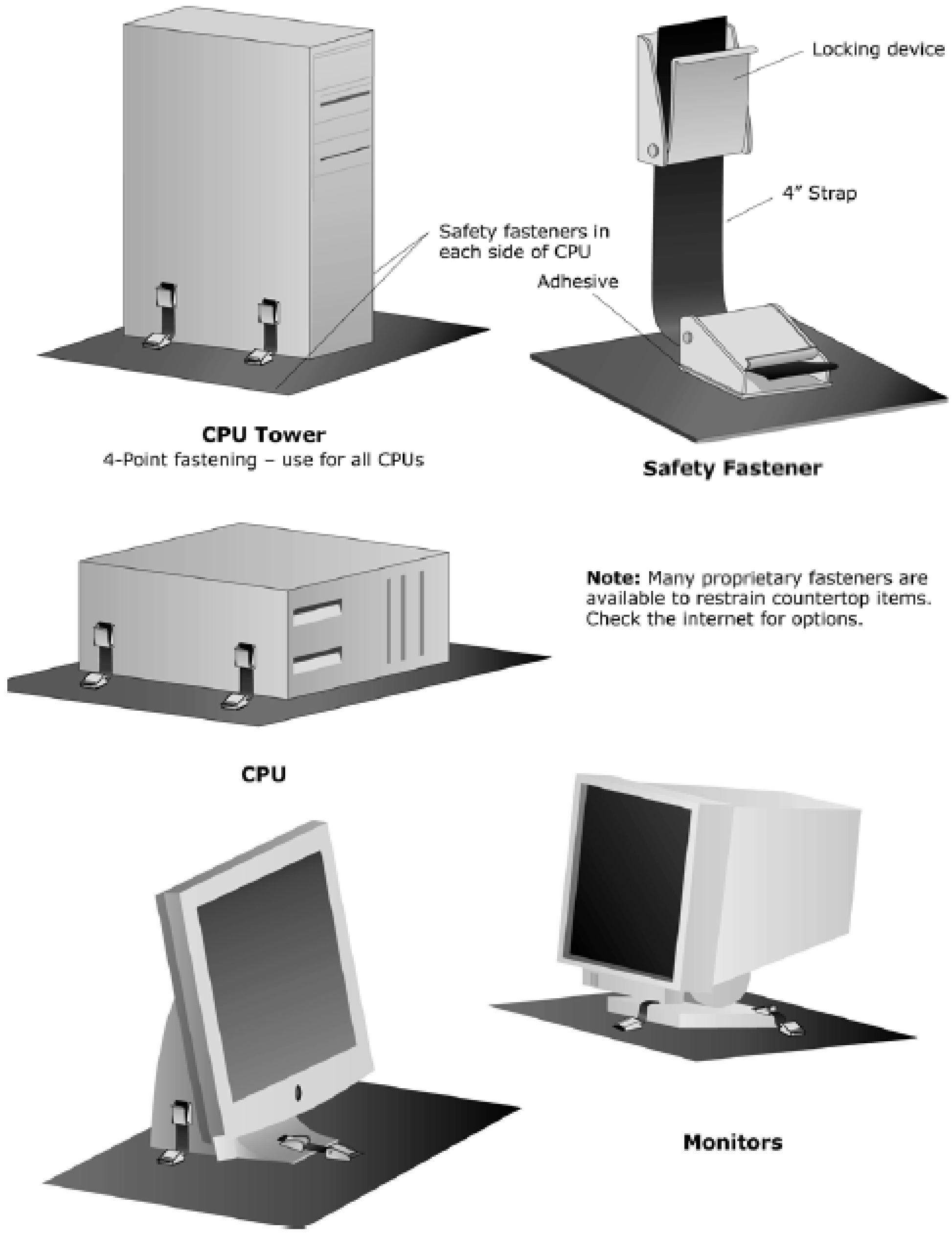
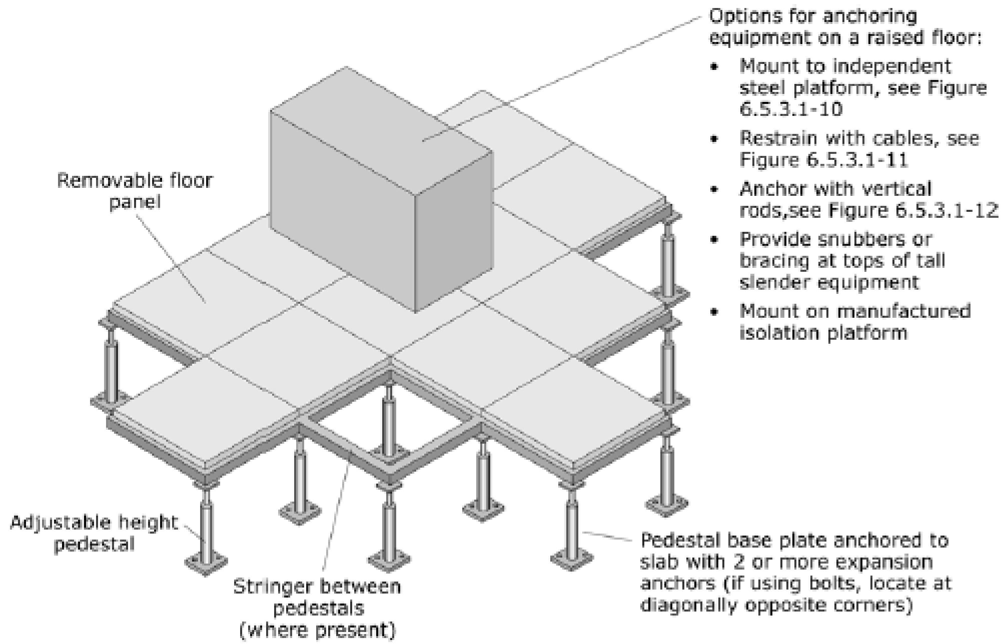
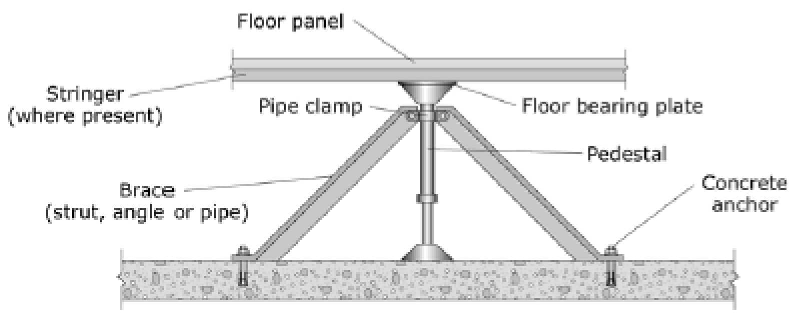


Figure G-24. Desktop Computers and Accessories.

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



Cantilevered Access Floor Pedestal



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

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

Figure G-25. Equipment Mounted on Access Floor.

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

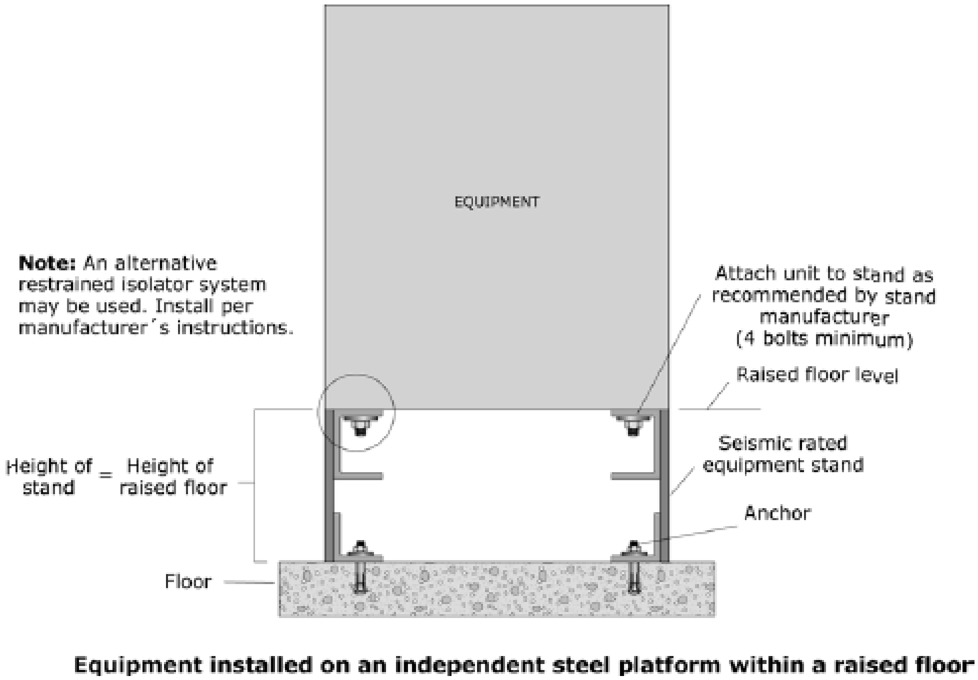


Figure G-26. Equipment Mounted on Access Floor – Independent Base.

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

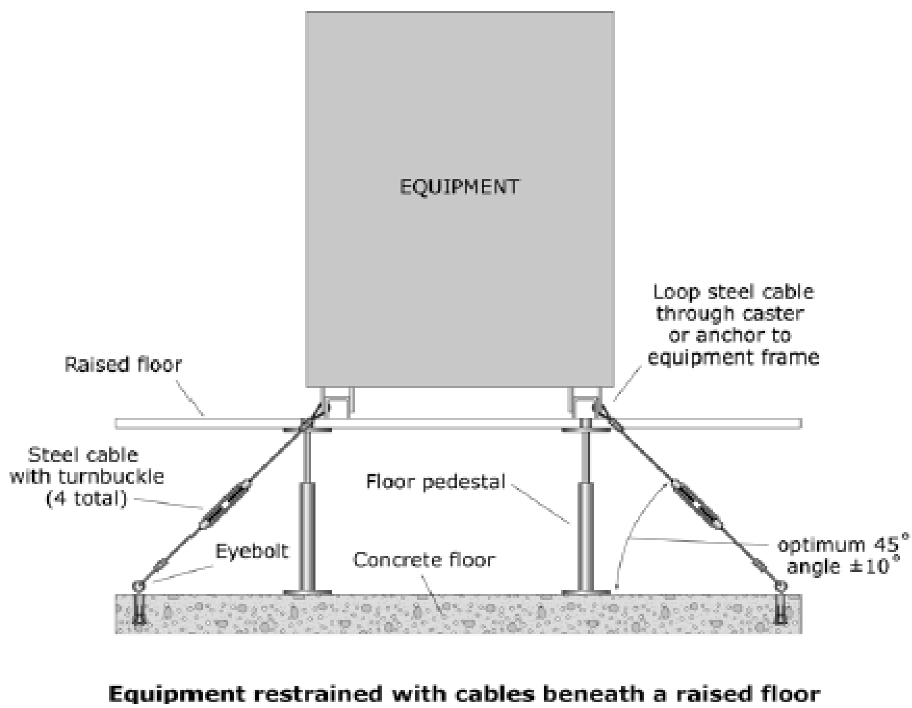
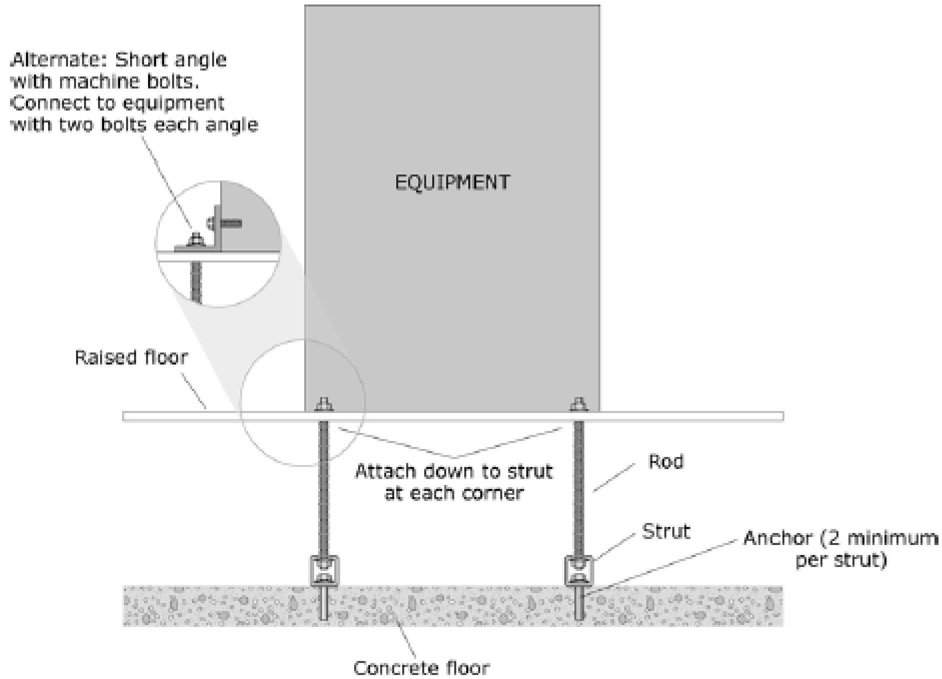


Figure G-27. Equipment Mounted on Access Floor – Cable Braced.

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

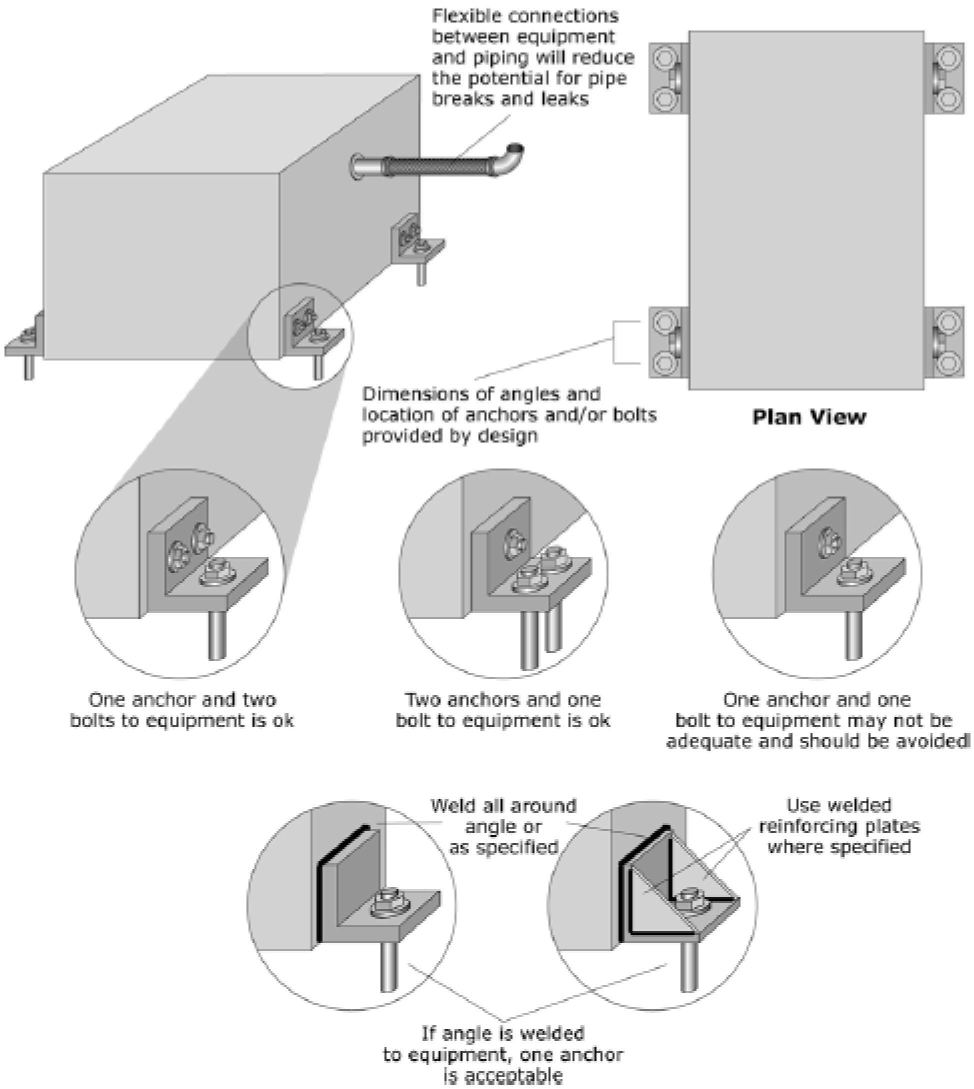


Equipment anchored with vertical rods beneath a raised floor

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

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

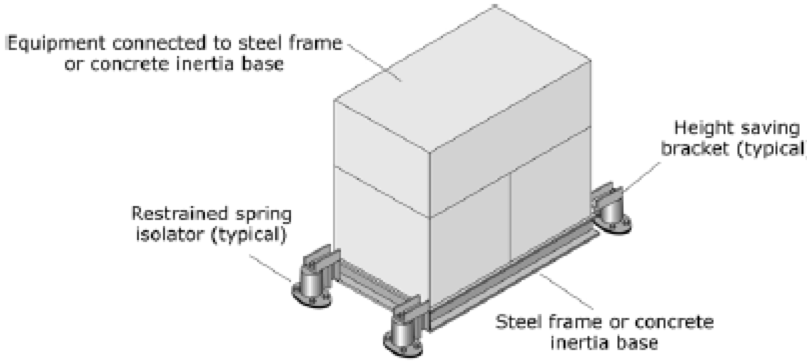
Mechanical and Electrical Equipment



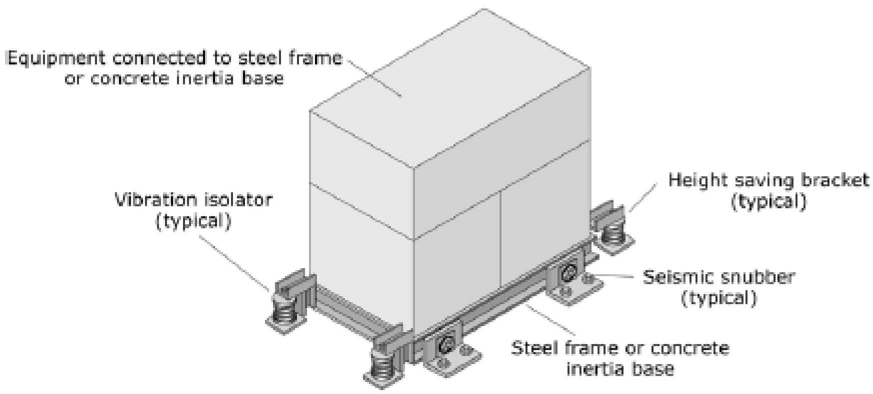
Note: Rigidly mounted equipment shall have flexible connections for the fuel lines and piping.

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

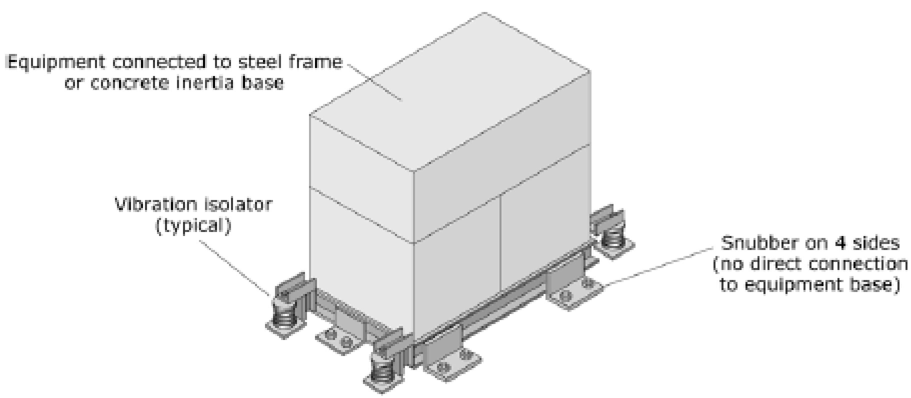
(FEMA E-74, 2012, Reducing the Risks of Nonstructural Earthquake Damage)



Supplemental base with restrained spring isolators



Supplemental base with open springs and all-directional snubbers



Supplemental base with open springs and one-directional snubbers

Figure G-30. HVAC Equipment with Vibration Isolation.

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

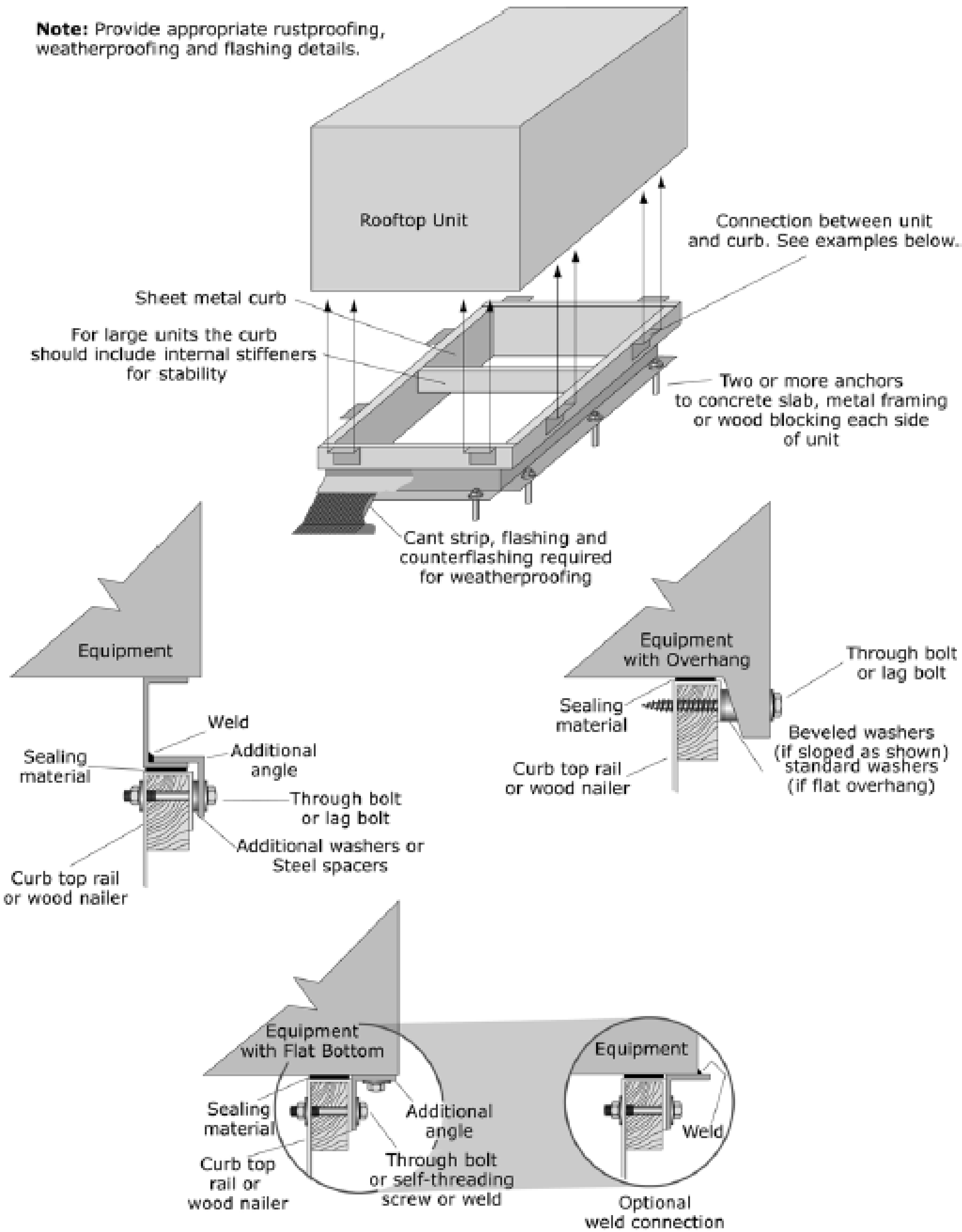


Figure G-31. Rooftop HVAC Equipment.

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

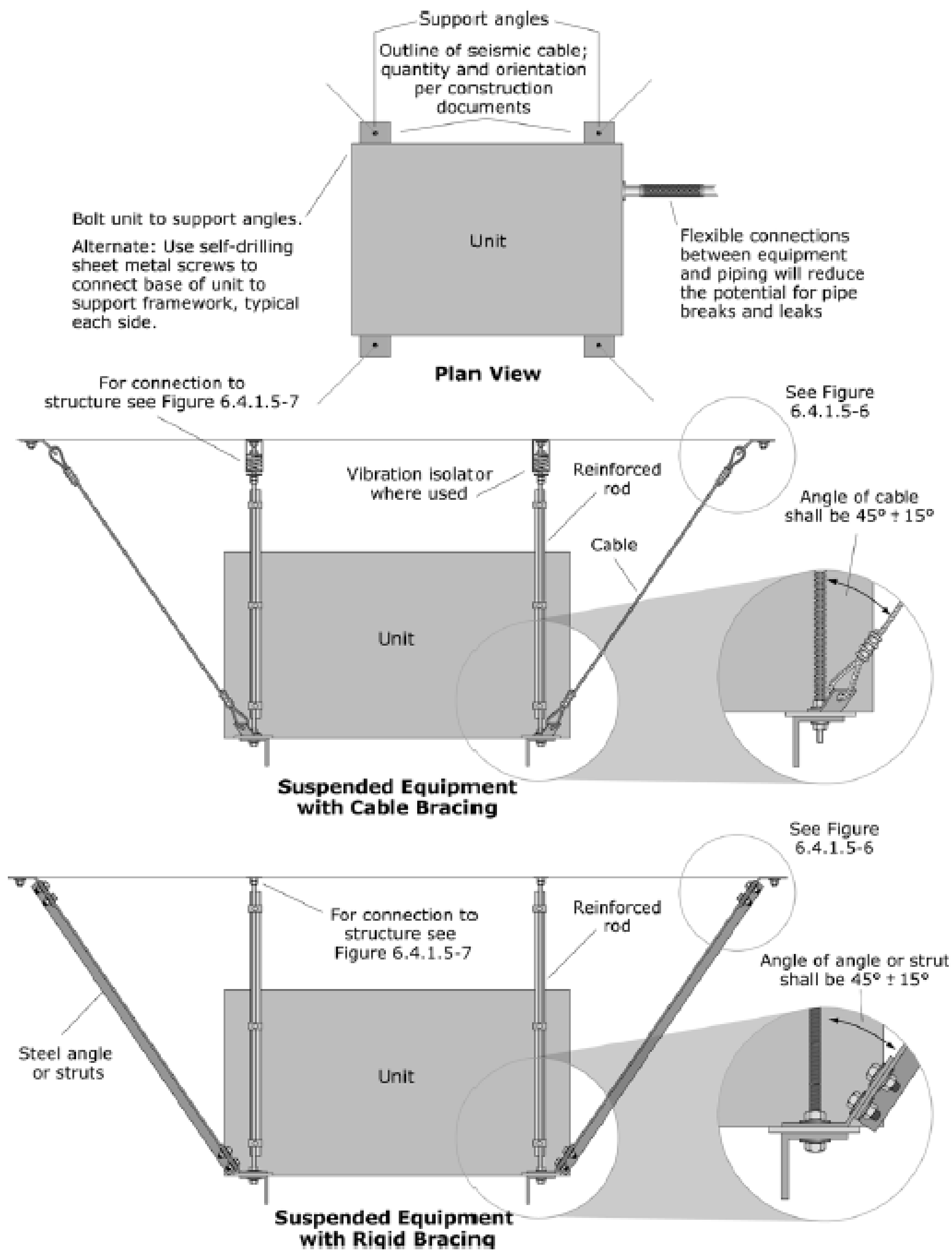


Figure G-32. Suspended Equipment.

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

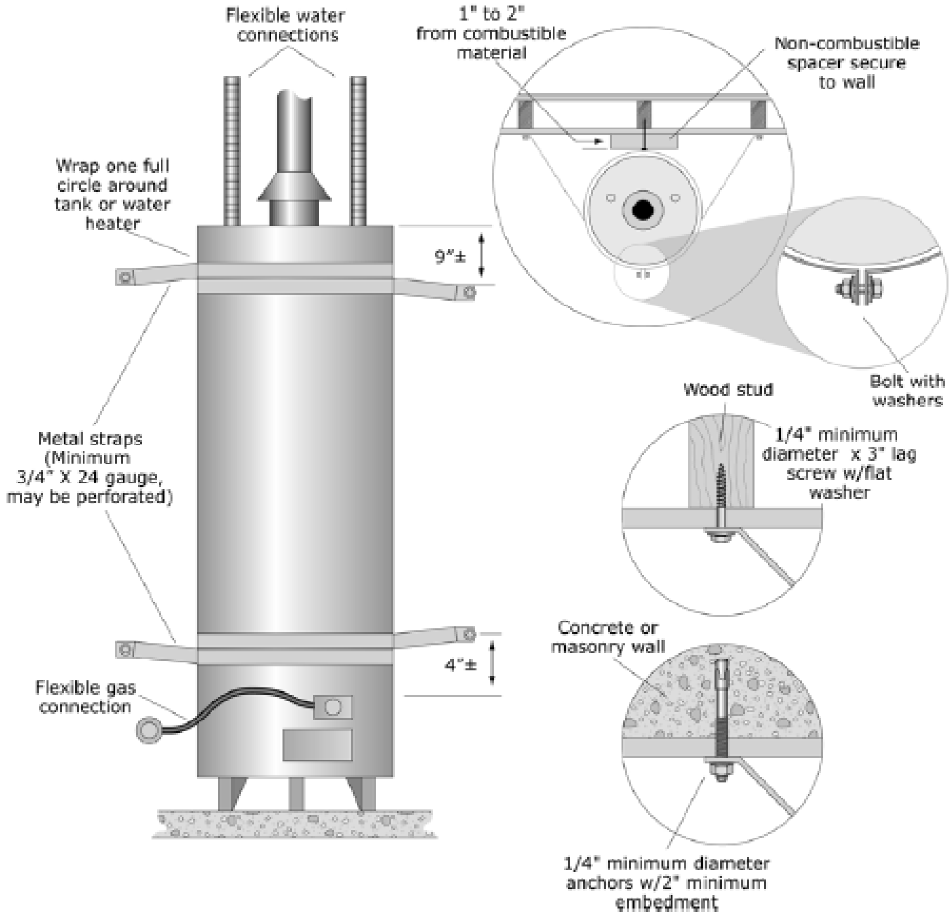


Figure G-33. Water Heater Strapping to Backing Wall.

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

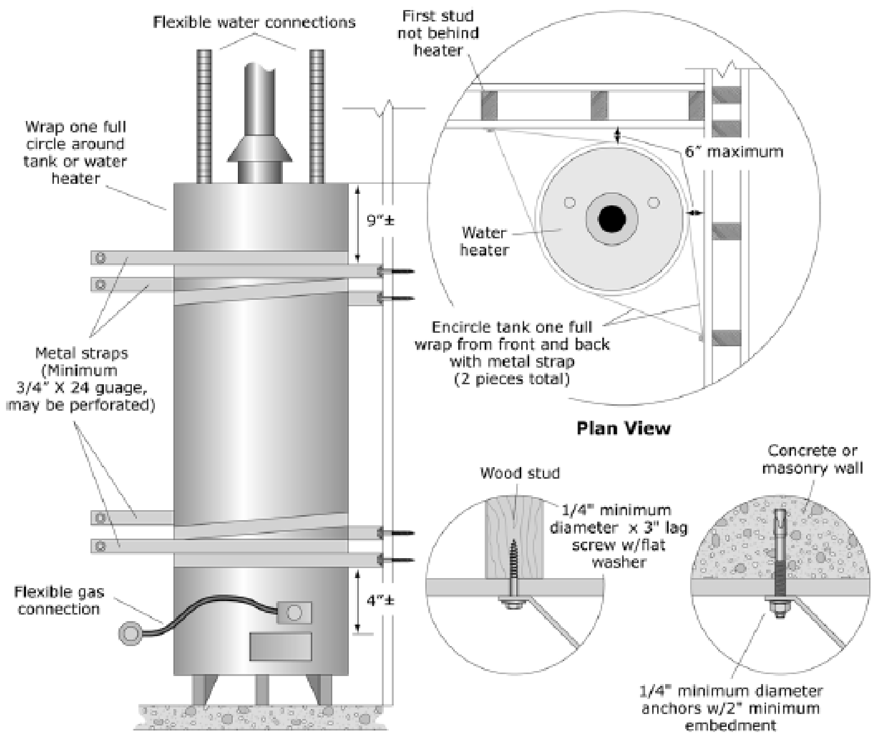


Figure G-34. Water Heater – Strapping at Corner Installation.

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

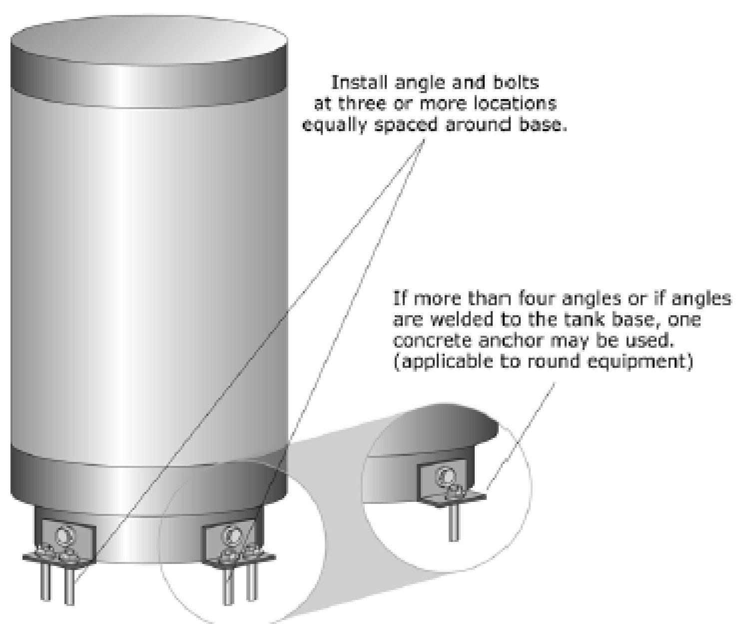


Figure G-35. Water Heater – Base Mounted.

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

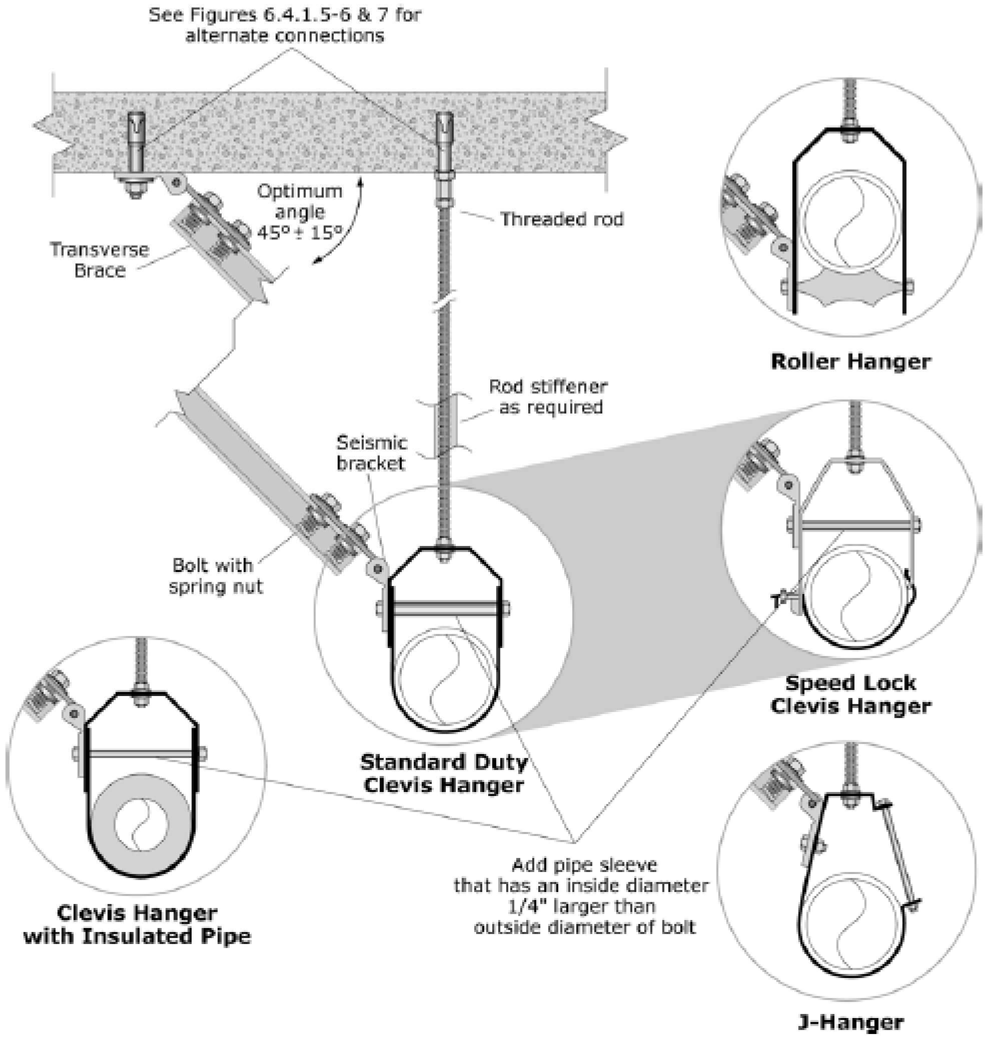


Figure G-36. Rigid Bracing – Single Pipe Transverse.

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

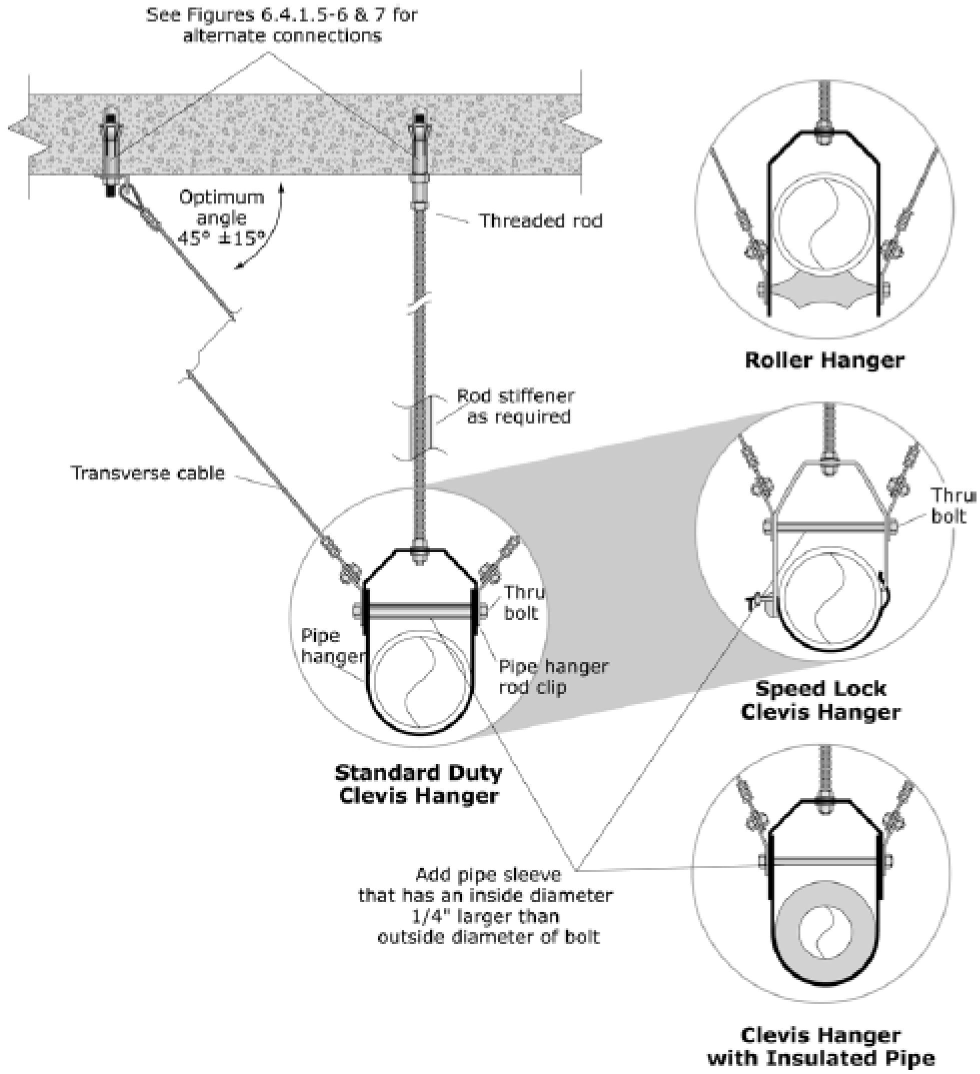


Figure G-37. Cable Bracing – Single Pipe Transverse.

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

Electrical and Communications

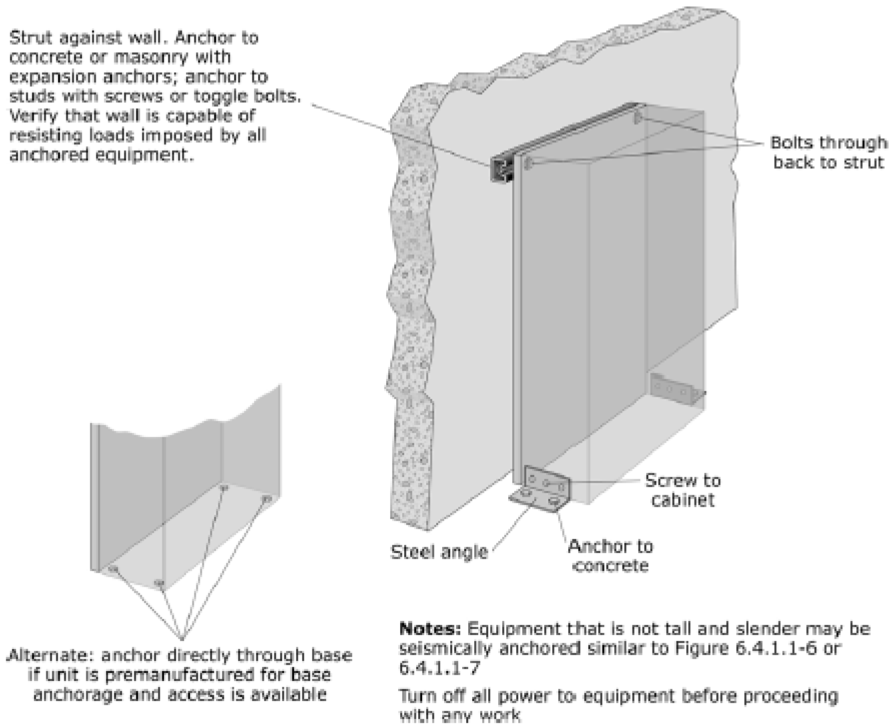


Figure G-38. Electrical Control Panels, Motor Controls Centers, or Switchgear.

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

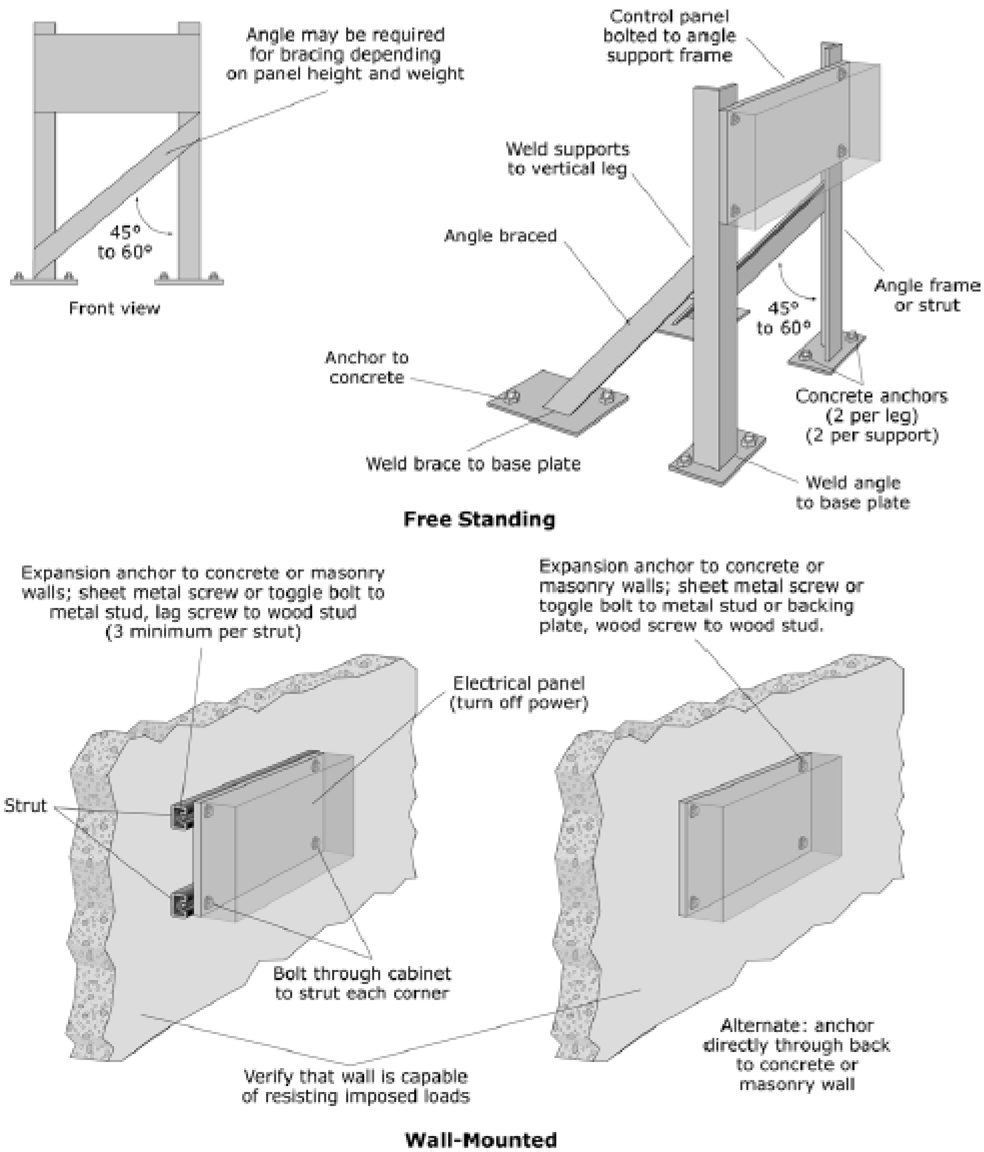


Figure G-39. Freestanding and Wall-mounted Electrical Control Panels, Motor Controls Centers, or Switchgear.

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

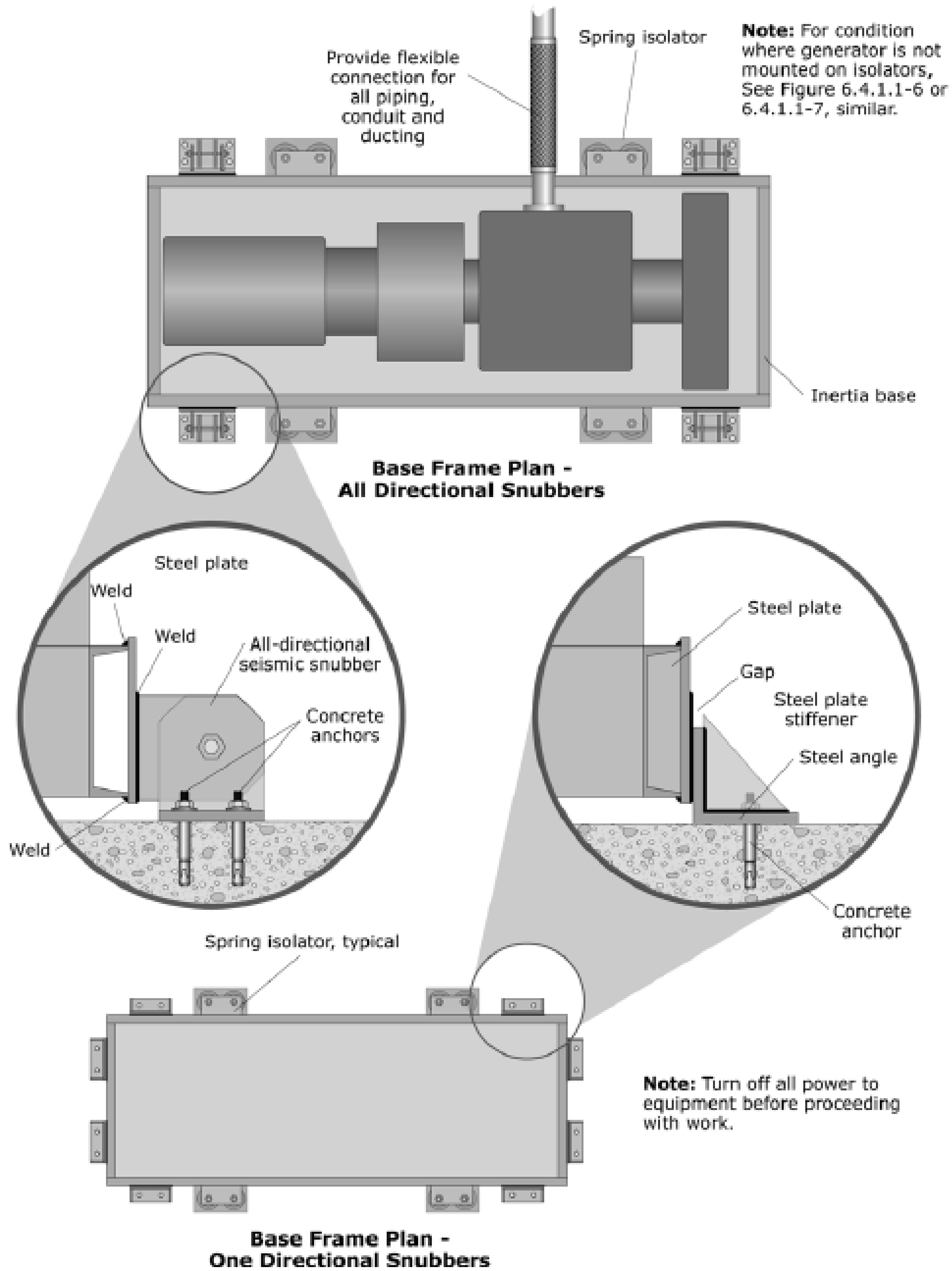


Figure G-40. Emergency Generator.

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