ANCHORAGE SCHOOL DISTRICT

Purchasing Department
4919 Van Buren Street
Anchorage, AK 99517-3137

REQUEST FOR PROPOSAL

THIS IS NOT AN ORDER

Show the following on the outside of the sealed proposal envelope: **RFP 2026-603 PROFESSIONAL SERVICES OCEAN VIEW AND WILLIWAW ELEMENTARY SCHOOLS TIER 2/3 SEISMIC EVALUATION**	ISSUED DATE: **AUGUST 12, 2025**	DUE: **PRIOR TO 10:00 A.M., LOCAL TIME** DATE: **SEPTEMBER 2, 2025**

The Anchorage School District (referred to as the "District" or the "ASD") invites sealed proposals from qualified persons/firms to **PERFORM A TIER 2/3 SEISMIC EVALUATION OF OCEAN VIEW AND WILLIWAW ELEMENTARY SCHOOLS** to the District in accordance with the following documents that are a part of this RFP 2026-603:

Cover Page	This Notice/Cover Page	Page(s) 1 – 2
Section I	Instructions to Offerors	Page(s) 3 – 13
Section II	Evaluation of Proposals	Page(s) 14 – 15
Section III	Proposal Format	Page(s) 16 – 17
Section IV	Specifications and Scope of Services	Page(s) 18 – 20
Attachment A	Proposal Transmittal Form	1 Page(s)
Attachment B	Sample Professional Services Agreement (PSA)	4 Page(s)
Attachment C	Seismic Evaluation and Retrofit Guide for Existing Anchorage School District Buildings Updated 07/2025 to Reference IBC 2024 and ASCE 41-23	36 Pages
Attachment D	Ocean View Elementary School ASCE 41-Tier 1 Evaluations (January 2022)	43 Pages
Attachment E	Anchorage School District Seismic Evaluation: Williwaw Elementary Tier – 1 Report (February 2022)	388 Pages
Attachment F	Ocean View Elementary Usage Floor Plan	1 Page
Attachment G	Williwaw Elementary Floor Plan	1 Page
Attachment H	Offeror's Checklist	1 Page
Exhibit 1	Supplemental Terms, Conditions and Forms	7 Pages
Exhibit 2	Disadvantaged Business Enterprises Contract Participation Form	2 Pages
Exhibit 3	Disadvantaged Business Enterprises Prime Consultant/Contractor Certification	1 Page
Exhibit 4	Disadvantaged Business Enterprises Contact Documentation Form	1 Page
Special Provisions	Disadvantaged Business Enterprise Program Program Specifications for District Contracts	5 Pages

THIS RFP HAS FEDERAL GRANT REQUIREMENTS (DISADVANTAGED BUSINESS ENTERPRISE (DBE) PROGRAM PARTICIPATION REQUIREMENTS).

DBE PARTICIPATION REQUIREMENTS MUST BE COMPLETED BY THE PROPOSAL SUBMISSION DATE.

AVAILABILITY OF RFP: This Request for Proposals (.pdf) is available electronically at the District's Purchasing website: http://asdk12.org/depts/purchasing/

A copy of the current plan holder's list can be viewed at:
http://apps.asdk12.org/depts/purchasing/meeting/Plan_Holders/2026/603.xlsx

SUBMISSION OF PROPOSALS: Proposals must be submitted to the Anchorage School District Purchasing Department, 4919 Van Buren Street, Anchorage, Alaska 99517-3137 prior to the time specified above. Proposals received after that time will not be considered and will be returned. FAXED or ELECTRONIC proposals are not acceptable. Proposals must be submitted in a SEALED package with the outside of the package clearly marked with Offeror's name, address, and phone number, and as follows:

REQUEST FOR PROPOSALS RFP 2026-603
PROFESSIONAL SERVICES OCEAN VIEW AND WILLIWAW ELEMENTARY SCHOOLS TIER 2/3 SEISMIC EVALUATION
DUE: Prior to 10:00 a.m., Local Time
DATE: September 2, 2025

PRE-PROPOSAL SITE-VISIT: **A pre-proposal site-visit will be held at 3:00 p.m., Local Time, August 19, 2025** starting at Ocean View Elementary School and then moving to Williwaw Elementary School. Prospective proposers are encouraged to meet the ASD Project Manager at the School's main office entrance and walk through the proposed area of professional services for this RFP.

PRE-PROPOSAL CONFERENCE: A **pre-proposal conference will be held at 10:00 a.m., Local Time, August 20, 2025**, in the conference room of the Anchorage School District Purchasing Department, 4919 Van Buren Street, Anchorage, Alaska to discuss any matter concerned with this RFP. Prospective Offerors who wish to participate by teleconference may participate by calling (907) 742-6750. The line will be available approximately 5 minutes' prior the conference start time.

The Anchorage School District is committed to providing reasonable accommodations, according to applicable state and federal laws, to all individuals with a qualifying disability. If you require a reasonable accommodation in order to participate in this or any other district process, please contact the Anchorage School District's Compliance/Equal Employment Opportunity Office (907) 742-4132.

Estimated amount of proposed contract: $30,000 to $50,000 for each contract.

END OF COVER PAGE

A. GENERAL REQUIREMENTS

This solicitation is a REQUEST FOR PROPOSALS ("RFP") governed by applicable Anchorage School Board Policies, including Section 3311 of such Policies. Anchorage School Board Policies are available at
https://www.boardpolicyonline.com/?b=anchorage

Offerors should read this RFP carefully and review all instructions contained herein. Incomplete or incorrect proposals may be rejected as not conforming to the essential requirements of the RFP. Proposals submitted on other than the prescribed forms contained in this RFP will be rejected. Offerors may copy the forms contained in the RFP for use in their proposals, but substitute forms or formats are unacceptable. Electronic copies of the forms which Offerors must submit as part of any proposal, if any—if not provided with this RFP—may be obtained by contacting the Anchorage School District Purchasing Department. Forms shall not be altered except to supply requested offeror information.

B. INTENT OF SPECIFICATIONS

The Anchorage School District desires to enter into two contracts with an offeror(s) whose primary business is to provide professional Structural Engineering services to complete the contracts in accordance with all of its terms and conditions and in compliance with all applicable laws. The scope of work is considered performance oriented and it is the intent of the District to rely on the experience and expertise of the offeror to fully appraise itself of the work required to fulfill the terms of the contract resulting from the RFP.

C. EXAMINATION OF CONTRACT DOCUMENTS

Offerors should read this Request for Proposals carefully and review all instructions contained herein. The submission of a proposal shall constitute acknowledgement that the offeror has thoroughly examined and is familiar with the solicitation documents.

D. CONDITIONS OF THE WORK

Each offeror must acquaint itself thoroughly as to the character and nature of the services to be provided to fulfill the requirements of the resulting contract. Each offeror must complete a careful examination of the existing systems, infrastructure, geographical features, and prevailing weather conditions, as applicable, and must inform itself fully as to the difficulties to be encountered in the performance of the work, the availability of a qualified work force and other conditions related to providing the required services. No claim of ignorance of conditions that exist or hereafter may exist, or difficulties that may be encountered in the execution of the work, as a result of failures to make necessary investigations and examinations, will be accepted as an excuse for any failure or omission on the part of a successful offeror(s) to fulfill all of the requirements of the contract documents and to complete the work for the consideration set forth therein, or as the basis for any claim whatsoever.

E. QUESTIONS; METHOD FOR CLARIFICATION

Any offeror in doubt as to the true meaning of any part of this RFP may submit to the District a written request for an interpretation thereof. Questions must be received by the District's Purchasing Department at least seven (7) days prior to the date set for the submission of proposals. If such date falls on a weekend or holiday, the deadline shall be the last business day before the weekend or holiday. Questions can be delivered as follows:

Fax: Anchorage School District Purchasing Department @ 907-243-6293
Attn: Shannon Powers, Sr. Purchasing Agent

Reference: RFP 2026-603 PROFESSIONAL SERVICES OCEAN VIEW AND WILLIWAW ELEMENTARY SCHOOLS TIER 2/3 SEISMIC EVALUATION

E-mail: purchasing@asdk12.org PREFERRED METHOD
Attn: Shannon Powers, Sr. Purchasing Agent
Reference: RFP 2026-603 PROFESSIONAL SERVICES OCEAN VIEW AND WILLIWAW ELEMENTARY SCHOOLS TIER 2/3 SEISMIC EVALUATION

Mail: Anchorage School District Purchasing Department
Attn: Shannon Powers, Sr. Purchasing Agent
4919 Van Buren Street
Anchorage Alaska 99517-3137
Reference: RFP 2026-603 PROFESSIONAL SERVICES OCEAN VIEW AND WILLIWAW ELEMENTARY SCHOOLS TIER 2/3 SEISMIC EVALUATION

Two types of questions generally arise. One may be answered by directing the offeror to a specific section of the RFP. These questions may be answered by direct communication to the offeror submitting the question. Questions which in the opinion of the Purchasing Senior Director require a more detailed or complex reply, or require an answer that may affect responses to this RFP or may be prejudicial to other prospective Offerors, will be answered by issuing an addendum to all RFP holders prior to the submittal opening.

F. ERRORS AND AMBIGUITIES

1. Offeror comments concerning discrepancies, defects, ambiguities or other errors in the RFP must be made in writing and received by the District's Purchasing Department at least seven (7) days prior to the date set for the submission of proposals. If such date falls on a weekend or holiday, the deadline shall be the last business day before the weekend or holiday. Comments can be delivered as set forth in Section E, above. Any clarifications, changes or corrections to the RFP will be made only by written notice or addendum issued by the District.

2. If an offeror fails to notify the District of a discrepancy, defect, ambiguity or other error in the RFP, the offeror's proposal shall be submitted at the offeror's own risk and if a contract is awarded as a result of such proposal, the offeror shall not be entitled to additional compensation or other consideration by reason of the discrepancy, defect, ambiguity or other error, or its later correction or clarification. Protests based on any error or omission, or on the content of the solicitation, will be disallowed if the fault has not been brought to the attention of the District, in writing, at least five (5) days prior to the date set for submission of proposals. If such date falls on a weekend or holiday, the deadline shall be the last business day before the weekend or holiday.

G. ADDENDA

Addenda may be issued when changes, clarifications, or amendments to this RFP are deemed necessary by the District for any reason. If an addendum is issued, the District will make reasonable efforts to ensure that each prospective offeror receives the addendum in a timely fashion. However, the risk of non-receipt of any addendum lies solely with prospective Offerors. Offerors should contact the District at the addresses set forth in Section E, above, to ascertain if any addenda have been issued. Offerors must acknowledge receipt of each addendum issued in the space provided on the appropriate addendum form and submit such signed addendum with the proposal. No oral change or interpretation of this RFP shall be relied upon by prospective Offerors or shall be binding on the District whether issued at a pre-proposal conference or otherwise.

H. SUBMISSION OF PROPOSALS

1. **All proposals, addenda, and forms must be manually signed. One (1) original and three (3) copies of the proposal, for a total of four (4). Each site must be a separate submittal meeting the requirements above.**

2. Proposals delivered by telefax, facsimile or by electronic means are not acceptable and will not be considered.

3. Signed and sealed Proposals must be at the District Purchasing Department on or before the time and date stated on the face page of this RFP. Offerors are solely responsible for ensuring that the offeror's proposal package is received by the District's Purchasing Department by the deadline.

4. Late proposals will not be considered and will be returned to the offeror unopened.

5. Photographs may be included with a proposal as appropriate or as desired by the offeror. Photographs will not be returned to an offeror.

6. Offerors may submit only one proposal for evaluation.

7. No responsibility will attach to any officer or agent of the District for the premature opening of, or the failure to open, a proposal not properly addressed and identified.

I. ALASKA BUSINESS LICENSE

Offerors must hold a valid Alaska business license and any necessary applicable professional licenses required by Alaska Statute as a condition of award. Offerors should contact the State of Alaska, Department of Commerce, Community and Economic Development, Division of Occupational Licensing, for information regarding business licensing. Contact information, information regarding business licensing, and business licenses, are available at http://www.dced.state.ak.us/occ.

J. FIRM OFFER

Offers made in response to this RFP must be good and firm for a period of ninety (90) calendar days from the date specified for submittal of proposals.

K. WITHDRAWAL OF PROPOSALS

Proposals may be withdrawn on written request delivered to the District Purchasing Director (fax is acceptable) prior to the time specified for submittal. Proposals not withdrawn prior to the specified time may not be withdrawn for a period of ninety (90) calendar days after the time for receipt of proposals.

L. DISTRICT NOT RESPONSIBLE FOR PREPARATION COSTS

Each offeror understands and agrees that it submits its proposal at its own risk and expense and releases the District from any claim for damages or other liability arising out of the Request for Proposals and award process, including but not limited to: proposal preparation costs and costs associated with any challenge (administrative, judicial or otherwise (including attorney fees)) to the determination of the highest ranked proposal and/or award of contract and/or rejection of proposals, except as follows: in the event that a contract is awarded to one offeror, and it is determined after award of the contract that it should have been awarded to some other offeror, the only financial liability of the District, if any, to the aggrieved offeror shall be actual costs reasonably incurred by that offeror in the preparation and submittal of its proposal. No other obligation of any sort is created nor may liability, financial or otherwise, be asserted against the District, its Board, Board members,

employees, agents or insurers to offer to award or award a contract. By submitting a proposal, each offeror agrees to be bound in this respect.

M. REJECTION OF PROPOSALS

1. Offerors must comply with all of the terms of this RFP, and all applicable local, state, and federal laws, codes and regulations. The District may reject any proposal that does not comply with all of the material and substantial terms, conditions, and performance requirements of this RFP and any proposal which contains information or material which cannot be verified or otherwise confirmed for purposes of determining responsiveness to the solicitation.

2. The District reserves the right to waive informalities and minor irregularities, and/or reject any and all proposals, and to not award the proposed contract, if in its best interest. “Informalities and minor irregularities” means matters of form rather than substance which are evident from the submittal, or are insignificant matters that have a negligible effect on price, quantity, quality, delivery, or contractual conditions and that can be waived or corrected without prejudice to other Offerors. These include items that:

    - Do not affect responsiveness;
    - Are merely a matter of form or format;
    - Do not change the relative standing or otherwise prejudice other offers;
    - Do not change the meaning or scope of the RFP;
    - Are trivial, negligible, or immaterial in nature;
    - Do not reflect a material change in the work, or;
    - Do not constitute a substantial reservation against a requirement or provision of the RFP.

N. SELECTION FOR AWARD

1. Selection for award will be accomplished in accordance with Anchorage School Board Policy Section 3311 and the terms and conditions of this solicitation. A recommendation for award, based upon the evaluation criteria specified in this RFP, will be made to the Anchorage School Board for approval, unless approval is not required under Board Policy Section 3311.

2. The District may award a contract on the basis of initial proposals received, without discussions. Therefore, each proposal should contain the offeror's best efforts from a technical standpoint.

3. For those awards requiring Board approval, the District’s Purchasing Department will make public in the Purchasing Department each Notice of Intent to Award ten (10) calendar days prior to the scheduled date for award by the Board. Offerors may, upon request to the Purchasing Department, review the proposal scoring summary prior to the scheduled Board award date.

4. Any contract awarded as a result of this solicitation will incorporate the contents of this RFP and the successful offeror's proposal, subject to the reservations set forth herein for provisions of a proposal that do not comply with material and substantial terms, conditions, and requirements of this RFP or that impermissibly restrict the rights of the District. The successful offeror(s) will be required to execute a written contract in the form included as part of this RFP and comply with its terms.

O. NEGOTIATIONS

After final evaluation, the District may negotiate with the offeror of the highest-ranking proposal. Negotiations, if held, shall be within the scope of the RFP and limited to those items which would not have an effect on the ranking of proposals. The District reserves the right to change terms and conditions during contract negotiations. If the highest-ranked offeror fails to provide necessary

information for negotiations in a timely manner or fails to negotiate in good faith, or if the offeror and the District, after a good faith effort, cannot come to terms, the District may terminate negotiations and commence negotiations with the offeror of the next highest-ranking proposal.

P. RESPONSIBLE OFFERORS

1. A contract will be awarded only to prospective Offerors who are determined to be responsible.

2. In order to determine responsibility of a prospective offeror, the District may require Offerors to supply additional information or documentation and may perform on-site pre-award surveys. Failure of an offeror to promptly cooperate or supply information in connection with a District inquiry with respect to responsibility may result in a determination of non-responsibility with respect to the offeror.

3. To be determined responsible, a prospective offeror must:

    a. Have adequate financial resources to perform the contract or the ability to obtain them;

    b. Be able to comply with the contract performance schedule taking into consideration all existing other business commitments;

    c. Have a satisfactory performance record;

    d. Have a satisfactory record of integrity and business ethics;

    e. Have the necessary organization personnel, experience, accounting and operational controls, and technical skills, or the ability to obtain them;

    f. Have the necessary equipment and facilities or the ability to obtain them; and

    g. Be otherwise qualified and eligible to receive an award under applicable laws and regulations.

Q. AWARD OF CONTRACT

1. Award of Contract

    a. The District may select up to two (2) firms from the highest ranked proposals, 1 for each site for award.

    b. Selection of the successful offeror will be by a notice in writing signed by a duly authorized representative of the District and no other act of the District or its representative will constitute an acceptance of a proposal.

2. Execution of Contract

    a. The offeror whose proposal is accepted by the District shall execute the contract and furnish the required insurance within five (5) days after presentation of the contract for signature. Failure or neglect to provide the required insurance or to execute the contract within the time specified, or within such additional time as the District, in its sole discretion, may allow, shall constitute a breach of the agreement affecting the award. The damages to the District for such breach shall include loss due to delay and interference with the District's general operations improvements program, and increased administrative expense, and other items whose accurate amount would be difficult or impossible to compute.

b. Upon receipt of the above-referenced contract executed by the offeror, and all required insurance certificates, the properly authorized District representatives will execute the contract. The Contract shall not be effective until it is executed by a properly authorized representative of the District.

R. AGGRIEVED OFFERORS

1. Protest

   a. An interested party may protest a solicitation or a proposed award of a contract.

      i. A protest as to the specifications and/or terms and conditions of a solicitation must be received by the Purchasing Senior Director at least five (5) calendar days prior to the due date of the bid or proposal; failure to protest as provided herein constitutes a waiver of any objection to the solicitation.

      ii. For construction projects and architectural/engineering design services, the protest of a proposed award of a contract must be received by the Purchasing Senior Director within ten (10) calendar days after issuance of the Notice of Intent to Award.

      iii. For goods or services, the protest of a proposed award of a contract must be received by the Purchasing Senior Director within seven (7) calendar days after issuance of the Notice of Intent to Award, except that for purchases under $100,000, the protest must be received within three (3) business days.

      iv. The protest must include the name of the person submitting the protest, the name of the bidder/proposer represented by that person, the specific action or bid/request for proposal contract award which is being protested, a detailed explanation of the reasons for the protest, and the relief requested.

      v. The aggrieved person must serve all other interested parties with its protest.

   b. The Purchasing Senior Director shall stay the intended award of a contract unless the Purchasing Senior Director determines the award of the contract without further delay is necessary to protect the District's best interest.
   c. The Purchasing Senior Director may, in his/her sole discretion, hold a hearing.

   d. The rights and remedies granted by this section are not available for informal small purchases with an actual or potential value of less than twenty-five thousand dollars ($25,000).

   e. Failure to protest as provided herein constitutes a waiver of any objection to the solicitation and contract award.

2. Appeal

   a. A decision by the Purchasing Senior Director may be appealed to the Anchorage School Board.

   b. Any appeal shall be filed with the Superintendent within five (5) days after the decision is received by the protester and must include the name of the person submitting the appeal, the name of the bidder/proposer represented by that person, and a detailed explanation of the basis for the appeal.

   c. The aggrieved bidder/proposer must serve all other interested parties with its appeal.

d. The Superintendent may obtain an independent review of the appeal issues if the Superintendent determines such review will assist consideration of the appeal.

e. The independent review shall not be conducted by a District employee, but must be conducted by an experienced but disinterested third party from outside the District.

f. Failure to appeal to the Anchorage School Board as provided herein constitutes a waiver of any objections to the solicitation and the contract award.

3. Consideration of Appeal

a. The decision being appealed and the findings from the independent review, if any will be reported to the Board.

b. Upon consideration of the appeal and allowing interested parties an opportunity to address the issues on appeal, the Board may:

i. Award the contract as recommended, if applicable, indicating its reasons for rejecting the appeal;

ii. Grant the appeal, indicating its reasons for granting the appeal, and determine an appropriate remedy consistent with AR3311.1(c).1 of Board Policy. The Board may award the contract at that meeting to some other bidder/proposer if it finds that a delay in making the award would adversely affect the District.

iii. Stay any award of the contract to permit further consideration of the appeal, with action to be scheduled as soon as practicable, but in no event more than twenty (20) days after the stay as initiated.

iv. Reject all bids/proposals

v. Take such other action as appears appropriate and in the best interest of the District under the circumstances.

4. Frivolous Protests

a. Signature on Protest Constitutes Certificate

i. The signature of an attorney or party on a request for review, protest, motion, or other document constitutes a certificate by the signer that the signer has read the document, to the best of his/her knowledge, information, and belief formed after reasonable inquiry it is well grounded in fact and is warranted by existing law or a good faith argument for the extension, modification, or reversal of existing law, and that it is not interposed for an improper purpose, such as to harass, limit competition, or to cause unnecessary delay or needless increase in the cost of the procurement or of the litigation.

b. Sanctions for Violation

i. If a request for review, protest, pleading, motion, or other document is filed with the Purchasing Senior Director is signed in violation of Board Policy AR3311.1(c).1, the School Board may impose upon the person who signed it, a represented party, or both, an appropriate sanction, that may include an order to pay to the other party or parties the amount of the reasonable expenses incurred because of the filing of the protest, pleading, motion, or other paper, including a reasonable attorney's fee.

S. PUBLIC RECORDS/CONFIDENTIALITY

1. This RFP and the resulting proposals received, together with copies of all documents pertaining to the award of a contract, will be kept by the District's Purchasing Office and made a part of the record which will be open to public inspection after contract award. Proposers, upon request to the Purchasing Officer, may review the proposal scoring summary after issuance of the notice of intent to award has been issued, except to the extent permissibly restricted by the offeror.

2. Offerors are advised to consult School Board Policy Section 1340 and the Alaska Public Records Act, A.S. 40.25.100-40.25.295 to verify if any of their proposal information may qualify for exemption from public disclosure. Exemptions to public disclosure requirements are narrowly construed. As such, the District cannot exempt materials that are not of a truly proprietary nature under applicable law and policy, and cannot be held liable for the disclosure of such information, even if marked for restriction by an offeror.

3. If a proposal contains any information that an offeror reasonably believes is proprietary or confidential, and is subject to protection under applicable law, each such page of the proposal must be marked "Confidential" by the offeror and the offeror must explain the basis for its determination that the information is not subject to disclosure under applicable public records laws. Cost or price information may not be restricted and will be open to public inspection. Marking an entire proposal "confidential" is not acceptable and may result in disclosure of the entire proposal.

4. By submitting a proposal, the offeror agrees to release the District from any liability resulting from the District's disclosure of information not clearly marked "Confidential." The offeror also agrees to defend any action seeking release of information marked "Confidential" and to indemnify and hold the District, its Board, employees and agents, harmless from any judgments, damages and costs awarded against the District, its Board, employees or agents, in favor of a party requesting information submitted by an offeror. Additionally, the offeror understands and agrees that if a request is made under applicable public records laws, the District will notify the offeror of such request but under no circumstance shall the District be required to commence or defend any action to prevent the disclosure of any information submitted by an offeror, including information the offeror believes to be confidential or proprietary.

T. EQUAL EMPLOYMENT OPPORTUNITY

1. The Contractor certifies that it will not discriminate against any employee or applicant for employment because of race, color, religion, national origin, ancestry, age, sex, marital status, mental or physical disability, or change in marital status, in employment, provision of services or otherwise. The Contractor shall take affirmative action to ensure such non-discrimination, including but not limited to the following: employment, upgrading, demotion, transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2. The Contractor shall state, in all solicitations or advertisements for employees to work in the performance of this Agreement, that all qualified applicants will receive consideration for employment without regard to race, color, religion, national origin, ancestry, age, sex, marital status, mental or physical disability, or change in marital status.

3. The Contractor shall comply with the requirements of the Anchorage Municipal Code, Chapter 7.50.010-.120, as well as any procedures adopted by the District to implement the policies set forth therein.

4. The Contractor shall comply with any and all of the applicable laws and directives, and any regulations which may be applicable to the Project or this Agreement.

5. The Contractor shall include the provisions of this Article in every Subcontract and purchase order, and shall require each Subcontractor to include these provisions in every sub-subcontract, so that these provisions will be binding upon each Subcontractor, sub-subcontractor and vendor providing services or goods to the Project.

6. The Contractor shall cooperate fully with the District's efforts which seek to deal with the problem of unlawful discrimination, and with all other District efforts to guarantee fair employment practices under this contract and promptly comply with all requests and directions from the Anchorage Equal Rights Commission and State Commission for Human Rights or any of its officers or agents relating to prevention of discriminatory employment practices.

U. NON-DISCRIMINATION

1. No Contractor on any District contract may illegally discriminate on the basis of sex, race, color, religion, gender identity, sexual orientation, national origin, ancestry, age, marital status, changes in marital status, pregnancy, parenthood, physical or mental disability, Vietnam era veteran status, genetic information, or good faith reporting to the board on a matter of public concern in employment, provision of services, or otherwise.

2. Any Contractor submitting a bid or proposal of one hundred thousand ($100,000) or more must certify that if awarded a contract on the basis of that bid or proposal, he/she as the contractor will not illegally discriminate against any member or applicant for employment because of sex, race, color, religion, gender identity, sexual orientation, national origin, ancestry, age, marital status, changes in marital status, pregnancy, parenthood, physical or mental disability, Vietnam era veteran status, genetic information, or good faith reporting to the board on a matter of public concern in employment, provision of services, or otherwise.

V. NOTICE OF COMPLIANCE

1. All successful Contractors shall ensure such non-discrimination.

2. All successful Contractors must agree to post in conspicuous places, available to employees and applicants for employment, notice setting forth the provisions of this non-discrimination section and this section shall be deemed to be a part of every contract entered into by the District under these policies.

W. CONFLICT OF INTEREST

1. The Contractor agrees to certify that Anchorage School District employees, School Board members, or a member of their household are not in conflict of interest with the contract and Board Policy as follows (AR3311.1(e).1 Disclosure and Waiver of Conflict of Interest):

a. No Board member, employee, or a member of their household, shall acquire, directly or indirectly, an economic interest in a District or Municipal contract, or engage in business with the District or the municipality, unless the contract is competitively solicited and other requirements of Section 3311 of Board Policy and section 1.15 of the Anchorage Municipal Code are met.

b. The following acts and circumstances shall not be deemed to be in conflict with the performance of official duties if, at the earliest opportunity after having acquired such knowledge, the Board member or employee files a disclosure pursuant to

AR3311.1(e).1 or requests and obtains a waiver pursuant to Board Policy AR3311.1(e).2:

1. **Such person owns a sole proprietorship, or is a partner in a partnership, or is an officer, director, major shareholder (five percent (5%) or more of the outstanding shares) or has management control in a corporation that submits a bid, proposal or quotation to the District or attempts to enter or enters into a contract with the District;**

2. **Such person has any significant (five percent (5%) or more) financial interest in any sale, lease or rental to the District of any service or property and such person has knowledge that the District intends to purchase, lease or rent the property or service;**

3. **Such person wishes to sell or receive royalties on books or materials sold to the District for use in the school system for which the employee is the author;**

4. **Such person is an employee who has been providing private services to a child who transfers to a new school or class or advances to a higher grade and the child becomes a student in the class being taught/aided by his/her provider.**

2. **Board Members, District employees, and their household and/or immediate family members are required to comply with Board Policies and the Municipal Ethics Code by disclosing conflicts of interest.**

   a. **When a board member, employee, or their household and/or immediate family member intends to do business with the District, the appropriate District and Municipal forms must be filed by the Board Member or District employee with the Municipal Clerk's Office and the Purchasing Department.**

> **Note:** ***Notice of Intent to Respond to Public Solicitation*** **shall be filed with the Municipal Clerk's office in advance to allow a minimum of 7 calendar days to elapse between electronic publication by the clerk and the final date for submitting a response to the solicitation. The form may be obtained from the Municipality of Anchorage website, www.muni.org.**
>
> **District *Disclosure* and *Request for Waiver* forms and instructions may be obtained from the Conflict of Interest link on the Procurement Department page of the ASD website, www.asdk12.org.**

   b. **The responsibility for complete and timely filing rests solely with the Board Member or District employee.**

X. SEX OFFENDER/CHILD KIDNAPPER REGISTRY

Anchorage School Board Policy 3515.5 prohibits a contractor whose employees or agents may have direct or incidental contact with District students from sending any employee or agent to district property who has been convicted of a sex offense under federal law or the law of any state and who is required to register as a sex offender under Alaska law or by court order, or who has been convicted of child kidnapping under federal law or the law of any state and who is required under Alaska law or court order to register on the Alaska Department of Public Safety Sex Offender/Child Kidnapper Central Registry. Board Policy 3515.5 requires contractors to certify in writing the contractor's knowledge of and compliance with Board Policy 3515.5. ***Prior to executing a contract*** for this project, the selected Contractor shall verify that no employee or agent who will be on district property is registered as a sex offender or child kidnapper in Alaska [Alaska Department of Public Safety "Sex Offender/Child Kidnapper Registry"] or in any other state. In

addition, the contractor shall certify that, to its knowledge, no employee or agent is a convicted sex offender or child kidnapper. Certification will be required at time of award.

Y. CONTACT WITH SCHOOL STAFF AND AUTHORIZED SCHOOL COMMUNITY GROUPS

Offeror is not to contact site's school staff or authorized community groups for purposes of solicitation unless otherwise authorized by the Purchasing Senior Director.

Z. CONTRACT INDUCEMENTS

No payment, gratuity or offer of employment shall be made in connection with any contract, by or on behalf of the subcontractor to the prime contractor or higher tier subcontractor or any person associated therewith, as an inducement for the award of a subcontract or order.

AA. STANDARD CONTRACT TERMS

In addition to carefully reading all of the information in the RFP, Offerors must carefully read and review the attached standard contract terms and conditions. The successful Offeror shall be required to enter into an agreement with the District which will be substantially similar to the sample.

END OF SECTION I

A. EVALUATION OF PROPOSALS

1. All proposals will be reviewed by the District's Purchasing Department to evaluate administrative responsiveness of proposals to determine if Offerors have complied with the administrative proposal requirements and to determine if proposals meet the minimum mandatory criteria set forth below.

2. Proposals meeting minimum mandatory requirements then will be evaluated by an evaluation committee comprised of District employees or other persons deemed appropriate by the District using the Evaluation Criteria specified in this RFP. Evaluation of proposals in accordance with the evaluation criteria will result in a numerical score for each proposal. Each criterion has an assigned weight for this RFP which demonstrates its relative importance. Evaluation of proposals will be accomplished as follows:

   a. Each Evaluator will individually review and score each offeror's proposal on a scale of 0 to 1 for each of the Technical Evaluation Criteria.

      A rating of "0" indicates a proposal which is non-responsive and/or provides no quality or value to the District and a rating of "1.0" indicates a proposal which is completely responsive and/or provides significant quality and value to the District. Ratings within the range indicate the level at which the proposal is responsive and/or provides quality and value to the District.

   b. After completion of ratings by each Evaluator, the Selection Committee may discuss the proposal. Evaluators may then alter their ratings; however, any changes shall be based only on the proposal and the Evaluation Criteria.

   c. The chairperson will obtain the ratings for the Evaluation Criteria, which ratings will then be multiplied against the points available for each criterion. The sum of the weighted scores for each proposal will result in a total weighted score from each member of the evaluation committee. The total weighted scores of all Evaluators will be summed to determine the total weighted score for each proposal. The maximum score obtainable for any proposal is equal to the product of the maximum points for the evaluation criteria multiplied by the number of Evaluators.

   d. Based upon the results of the proposal scoring, the District may, in its discretion, conduct discussions with Offerors whose proposals are determined to be reasonably susceptible to award. Such discussions, visits and presentations are for the purpose of ensuring full understanding of the requirements of the RFP and offeror proposals and may not result in any material or substantive change to proposals. Offerors selected by the Selection Committee for interviews may be permitted to submit final written, graphic and verbal presentation information for consideration by the Selection Committee in response to the above purposes. Only those members of the offeror's staff who will be in responsible charge and/or will carry out the actual tasks should participate in the interviews.

   e. Subsequent to the interviews, the Selection Committee will make a final rating based upon the original criterion supplemented by interview information for the purposes of determining the highest ranked proposer. The Selection Committee shall use the same procedure as specified for the initial proposal rankings. The final ranking may or may not be the same as the order of ranking after completion of the initial ranking.

   f. For purposes of this RFP, proposals that are "reasonably susceptible to award" means the three (3) highest scoring proposals, unless, in the sole discretion of the District's Purchasing Senior Director, one or more of the three highest scoring proposals did not achieve a score high enough to be within the competitive range and to remain under consideration for award when ranked with other proposals or the District received one or

more additional proposals that are within the competitive range of the three highest scoring proposals such that the additional proposal(s) may remain under consideration when ranked with the other proposals. This is not a strict mathematical formula and may not be challenged on that basis except in the case of obvious arithmetic errors.

3. The District reserves the right, at any time, to determine that a proposal is non-responsive and to request additional information to determine responsiveness.

4. All Offerors will be advised of the offeror selected for negotiation with a Notice of Intent to Negotiate. If contract negotiations are unsuccessful with offeror selected for negotiation, the School District may either cancel the solicitation or negotiate with other Offerors in the order of ranking.

B. EVALUATION CRITERIA

Proposals will be scored using the criteria listed below to determine which proposal best meets the needs of the Anchorage School District. The criteria to be considered during the evaluation and their associated weights are as follows:

Item	Criteria	Points
1.	**PROJECT APPROACH**	25
2.	**METHODS**	20
3.	**MANAGEMENT**	10
4.	**FIRM'S EXPERIENCE**	25
5.	**PROPOSED PROJECT STAFF**	10
6.	**WORKLOAD AND RESOURCES**	10
	TOTAL POINTS POSSIBLE	**100**

END OF SECTION II

Each response must be identified and keyed to the applicable criterion and assembled in the order in which the criteria are listed in Section II, Part B, so the criterion to which information applies shall be plainly evident. Material not so identified or assembled may be discarded without evaluation. Each proposal shall be submitted on standard 8 1/2" x 11" bond paper bound on one side. Proposals should be prepared simply and economically, providing a straightforward, concise delineation of the capabilities proposed to satisfy the requirements of this RFP. In addition, small print or typeface that is difficult to read may affect scoring.

To achieve a uniform review process and obtain the maximum degree of comparability, it is required that the proposals be organized in the manner specified below. **Proposals shall not exceed twenty (20) pages in length (excluding letter of transmittal, resumes (resumes shall not exceed two (2) pages in length), table of contents, attachments, or dividers. Information in excess of those allowed will not be evaluated or scored.** One page shall be interpreted as one side of single lined, typed, 8 1/2" X 11", piece of paper.

To ensure that proposals are evaluated fairly and that comparisons between proposals are accurate, Offerors must submit proposals in the format outlined below. Failure to comply with these requirements may cause a proposal to be rejected as non-responsive and eliminated from further consideration.

A. PROPOSAL TRANSMITTAL FORM

Submit the completed Proposal Transmittal Form (Attachment A) as the first page of the proposal. The Proposal Transmittal Form must be signed by an authorized representative of the offeror.

B. PROPOSAL NARRATIVE

1. PROJECT APPROACH — Weight: 25

   Restate the proposed Scope of Services, outlining the objectives and scope as perceived. Do not repeat the statement of services provided herewith, but elaborate on the tasks, conditions, deliverables or other specifics deemed significant and necessary to demonstrate a complete understanding of the technical and substantive issues to be addressed. Define any assumptions made in formulating response. If scope includes design services for a construction project, express any opinions regarding alternative design considerations that could impact construction costs.

2. METHODS — Weight: 20

   Response must outline the methods for accomplishing the proposed contract. Consider what, when, where, how, and in what sequence the work will be done. Include proposed timeline with milestones. Identify the amount and type of work to be performed by any sub-consultants. Consider how each task may be carried out; what services or interaction may be required from/with the Contracting Agency. Suggest alternatives, if appropriate. Identify any distinct and substantive qualifications for undertaking the proposed contract, such as the availability of specialized equipment or unique approaches or concepts relevant to the required services, which the firms may use.

3. MANAGEMENT — Weight: 10

   Response must describe the administrative and operational structures that will be used for performing the proposed contract. Address who will have overall responsibility for the contract and who will have direct responsibility for specific disciplines. Discuss the lines of authority. Use of a table or chart is preferred in your response. When applicable, include discussion of public participation process and coordination with State and Municipal agencies.

4. FIRM'S EXPERIENCE — Weight: 25

   Discuss the offeror's background and qualifications to establish experience and performance as a team leader for professional services similar to those required by this project. Discuss the relevance of past projects (program, unique features, schedules, budgets, etc.) to this project. List at least three (3) references (contact persons and telephone numbers) for the firm.

5. PROPOSED PROJECT STAFF Weight: 10

Response must name proposed leader(s) for the following categories plus any other essential personnel who will be directly and routinely engaged in performing the work:

1 – Principal-in-Charge	3 – Project Manager
2 – Contract Manager	4 – Project Engineer

Describe the work to be performed by the named Leader(s), and their qualifications in terms of educational and substantive experience directly related to the proposed services**.** Identify: employer, professional discipline and/or job classification, Alaskan registration number, and state of residency. A response prepared specifically for this proposal is required. Marketing resumes often include irrelevant information, which may detract from the evaluation of proposal. Lists of projects without relevant details are not useful. Focus on individuals' specific duties and responsibilities and how project experience is relevant to the proposed services.

6. WORKLOAD AND RESOURCES Weight: 10

Response must: (1) discuss both current and potential time commitments to all clients (i.e. not only the District) for the proposed Project Staff; and (2) demonstrate adequate support personnel, facilities and other resources to provide the services required throughout the project's term. Briefly address capabilities for providing additional services and/or services under an accelerated schedule. Address capacity to reassign personnel, equipment and facilities whenever the proposed contract would not require such capabilities or would be delayed.

END OF SECTION III

A. SCOPE OF WORK

1. The requirements of this project shall consist of providing complete professional services necessary to provide a Tier 2/3 Seismic Evaluation at the location(s) identified below.

    a. Ocean View Elementary School – 11911 Johns Rd. Anchorage, Alaska 99515

    b. Williwaw Elementary School – 1200 San Antonio St. Anchorage, Alaska 99508

    This qualifications-based selection focuses on the Prime Consultant as the responsible and contractual leader of a team. The Offeror will only identify required disciplines in the proposal. Once selected and given a Notice of Intent to Negotiate by the School District, the Prime Consultant Offeror will proceed with a qualifications-based selection of Sub-consultants. The School District will consult with the Offeror, reviewing and commenting on proposed Sub-consultants as appropriate. The School District reserves the right to object to selection of Sub-consultants based on considerations of cost, performance, special qualifications, and/or known work load relative to resources.

    The Prime Consultant is the project design coordinator and document quality control authority. Prime Consultant will review and verify deliverables prior to submission to Owner. Incomplete or lacking deliverables may be rejected. Owner will review complete deliverables for compliance and acceptance.

    Each site will be negotiated and contracted separately.

2. Planned Project Scope of Work: This project is funded by a Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) grant.

    a. The evaluation will follow the Anchorage School District Seismic Evaluation and Retrofit Guide and ASCE 41-23.

    b. Review the attached Tier 1 evaluations.

    c. Investigate the areas of potential weaknesses identified in the Tier 1 report.

    d. Recommend retrofits that will increase the seismic resiliency of the building including ROMS estimate.

    e. Complete FEMA Benefit Cost Analysis (BCA) on recommended seismic retrofits, for potential inclusion in a future FEMA grant opportunity.

B. SCOPE OF CONSULTANT SERVICES

For the purpose of this document, the phrase “Consultant(s)” refers to the person, partnership, corporation, joint venture, or other business entity with which the District contracts to provide the professional services required for this project.

Anticipated Scope of Consultant Services: For this project, the Consultant shall provide all professional services necessary to support the successful completion of this project. The Consultant’s services shall include, but are not limited, to the following:

1. Consultant Design Phases/Deliverable Requirements: The following design phases with corresponding design deliverables shall be required for this project.

    a. Draft Report

b. Final Report

2. Phase 1 Evaluation Development

a. Develop Report

i. Verification of the Planned Project Scope of Work: the Consultant shall verify and update the Planned Project Scope of Work. The Consultant shall consult with the District Project Manager for any deviation from the Planned Project Scope of Work prior to completing the Draft Report. The Draft Report shall reflect the final approved evaluation scope of work.

ii. Verification of the Construction Budget: The Consultant shall verify the recommended seismic retrofit projects with respect to required cost estimates.

iii. Project Report Review: ASD Reviews are organized by the ASD PM and executed using Bluebeam Revu (Bluebeam) sessions at the draft report phase. The use of Bluebeam allows for a collaborative, digital review for the Project; involving ASD Reviewers and Consultants, including the Consultant's cost estimator. ASD will provide all comments, written and noted, in the Bluebeam session and the Consultant shall assist the District by reviewing and responding in writing to all comments in the Bluebeam session; identifying and making written recommendations to the ASD Project Manager regarding the most critical design issues. The most critical path design issues will be summarized and discussed in a Post-Review Debrief. The Project Manager will organize/invite Reviewers to the Post-Review Debrief. The Consultant shall act as the Meeting Facilitator of the Post-Review Debrief. The Post-Review Debrief is not meant to be a 'page-turn' review of documents and comments, but a one-hour summarization of the most critical path items and the team's intent/approach to resolve. Once the Post-Review Debrief is held, the PM will give Consultant notice to proceed to the final report, pending any requested changes prior to NTP. The Project Manager will then verify that each comment and response has a Bluebeam ***status*** set and ***finish*** the Bluebeam session for ASD archives.

3. Anticipated Required Consultant Service Disciplines: Anticipated disciplines required for this project shall include, but are not limited to:

a. Structural Engineering

b. Cost Estimating

4. Additional Requirements:

a. Extended District Review: The Consultant shall acknowledge that while review periods are scheduled during the design process, the District plan review resources may not be able to accommodate the schedule due to work load. In some cases, follow-up comments beyond the scheduled review period may be necessary. The Consultant is encouraged to be proactive in assisting the District in facilitating the design review process.

b. Use of Standard Anchorage School District Invoice Format: The Consultant shall utilize a standardized Anchorage School District Invoice Format. The format will be provided by the District to the consultants.

C. PROJECT SCHEDULE

Based on the Tentative Project Schedule and Specific Project Schedule Requirements below, the Offeror shall develop a preliminary project schedule covering the period from Notice to Proceed (NTP) through Design Completion based on anticipated workload and resources and include it as part of the Offeror's proposal response to Part B, Article 2 Methods. Identify all submittal milestones including submittal dates, cost estimate submittal dates and District review comments periods.

1. Tentative Project Schedule for Design Work:

Requirement		**Anticipated Dates**
RFP/Consultant Selection/Negotiation:		September 2025
Anticipated Contract Award/NTP:		October – November 2025
Draft Report:		March 2026
Final Report, Estimates and BCA (Williwaw):		June 2026
Final Report, Estimates and BCA (Ocean View):		August 2026

2. Specific Project Schedule Requirements:

   a. Allow 2 weeks after each submittal for review by the District.

D. INFORMATION TO BE PROVIDED BY THE DISTRICT

The following information is available for review and use by the consultants during design:

1. Site locations:

   a. Ocean View Elementary School
   11911 Johns Rd.
   Anchorage, Alaska 99515

   b. Williwaw Elementary School
   1200 San Antonio St.
   Anchorage, Alaska 99508

2. Historical As-Built/Project Documents/AHERA Documents – Existing documents are available at the District Capital Planning & Construction Department. Proposers can view existing documents by coordinating with the planning & design section for access to the plans room. Proposer must coordinate the time at least 24 hours in advance with Capital Planning & Construction (CP&C) planning & design staff at 907-348-5264.

E. ADDITIONAL INFORMATION

1. Attachment C – Seismic Evaluation and Retrofit Guide for Existing Anchorage School District Buildings Updated 7/2025 to Reference IBC 2024 and ASCE 41-23
2. Attachment D – Ocean View Elementary School ASCE 41-Tier 1 Evaluations (January 2022)
3. Attachment E – Anchorage School District Seismic Evaluation: Williwaw Elementary School Tier – 1 Report (February 2022)
4. Attachment F – Ocean View Elementary Usage Floor Plan
5. Attachment G – Williwaw Elementary Floor Plan

END OF SECTION IV

THIS FORM MUST BE RETURNED WITH THE OFFEROR'S PROPOSAL

Addendum Number(s)/Date(s) _____ is/are hereby acknowledged.

REPRESENTATION. THE OFFEROR REPRESENTS THAT IT [ ] IS, [ ] IS NOT A MINORITY BUSINESS ENTERPRISE;
AND/OR
REPRESENTATION. THE OFFEROR REPRESENTS THAT IT [ ] IS, [ ] IS NOT A WOMEN BUSINESS ENTERPRISE;
AND/OR
REPRESENTATION. THE OFFEROR REPRESENTS THAT IT [ ] IS, [ ] IS NOT A LABOR SURPLUS AREA FIRM.

FIRM'S NAME:_____

MAILING ADDRESS:_____

CITY/STATE/ZIP:_____

PHYSICAL BUSINESS ADDRESS:_____

CITY/STATE/ZIP:_____

CONTACT PERSON FOR THIS SOLICITATION:_____

FAX NO.:_____

TELEPHONE NO.:_____

CELL PHONE NO.:_____

ALASKA BUSINESS LICENSE NO.:_____

FEDERAL TAX ID NO.:_____

EMAIL ADDRESS: _____

CERTIFICATION

I certify that I am a duly authorized representative of the firm listed above and that the information and materials enclosed with this proposal accurately represent the capabilities of the firm to provide the services indicated in compliance with the requirements of the solicitation. I certify that no member of the School Board or District employee, or spouse or other member of his/her household, has or shall have any undisclosed interest in the firm or this proposal, as provided in the Instructions to Offerors ("Conflicts of Interest"). The School District is hereby authorized to request from any individual any pertinent information deemed necessary to verify information regarding the capacity of the firm and for purposes of determining responsiveness of the proposal or responsibility of the firm as a prospective contractor. In compliance with the solicitation, the offeror agrees, if this offer is accepted within 90 calendar days from the date specified in the solicitation for receipt offers, to furnish any or all items on which prices are offered at the price set opposite each item, delivered at the designated places, within the times specified in the solicitation.

SIGNATURE: _____

PRINTED NAME AND TITLE: _____

DATE: _____

ANCHORAGE SCHOOL DISTRICT
PROFESSIONAL SERVICES AGREEMENT
(LESS Than $100,000)

CONTRACT/P.O. NUMBER:
DATE PREPARED:

PROJECT TITLE:
PROJECT NUMBER:
CONTRACTOR:

ASD PROJECT MANAGER: PHONE NUMBER:

ARTICLE 1 – SERVICES
(DESCRIBED BELOW OR IN REFERENCED ATTACHMENT)

1.1 Provide professional design services @

ARTICLE 2 – PERIOD OF PERFORMANCE

2.1 The Contractor shall commence the services described herein upon receipt of this fully executed Agreement and shall complete services @

ARTICLE 3 – COMPENSATION

3.1 Compensation for services shall not exceed the authorized amount(s) entered below and is in accordance with the attached proposals from @ dated @.

Following completion of services and receipt of specific approval from the Anchorage School District, the Contractor shall submit one invoice. If the period of performance is in excess of three months, the Contractor may submit interim billings monthly, which represent the percentage of completed work for fixed-price work or substantiated charges for other than fixed-price work. The Contractor shall substantiate all charges other than for fixed price or fixed profit by attaching receipts, time sheets, summary of units completed, or other proof of expenditures.

Method of Payment	**Authorized Amount(s)**	**Funding Code(s):**
Fixed Price		
Time and Materials		
Unit Prices		
Salaries		
Expenses		
Hourly Rate		
TOTALS		

ARTICLE 4 – SIGNATORIES

4.1 To this Agreement between the above-named Contractor and the Anchorage School District, effective on the last date executed by its parties, in consideration of the terms, conditions and requirements of Articles 1 through 6 herein, the parties hereto agree. (Incorporated Contractor must affix corporate seal or attach corporate resolution authorizing signatory to execute this Agreement.)

CONTRACTOR NAME	ANCHORAGE SCHOOL DISTRICT
SIGNATURE DATE	SIGNATURE DATE
TITLE: Principal	NAME: David Whiting TITLE: Senior Director, Purchasing/ Warehouse

SAMPLE

ARTICLE 5 - INDEMNIFICATION AND INSURANCE

5.1 The A/E consultant shall obtain and maintain all insurance required under this section. The A/E consultant shall file with the Contracting Officer a Certificate of Insurance showing the type and amounts of insurance, the policy number, and the expiration date.

5.2 Certificates of Insurance shall be in the name of the Anchorage School District as an additional insured and shall provide the Contracting Officer, Anchorage School District, with at least a thirty (30) day written notice of any material change, cancellation or non-renewal of the policy(s) during the Contract Period.

5.3 Statement of Insurance. At the time of contract execution the A/E consultant must have in effect:

WORKER'S COMPENSATION	Statutory Limit	
EMPLOYER'S LIABILITY	$1,000,000	
COMMERCIAL GENERAL LIABILITY	$1,000,000 $2,000,000	Combined Single Limit Aggregate Limit
COMPREHENSIVE AUTOMOBILE	$1,000,000	per accident for any auto
PROFESSIONAL LIABILITY INSURANCE	$100,000	☐ not required if checked

ARTICLE 6 - GENERAL CONDITIONS

6.1 Termination

6.1.1 Termination - This Agreement may be terminated for just cause by either party upon ten days written notice. If warranted, the Contractor will be compensated for reasonable expenses incurred for services completed prior to the date of termination. Federal funding agency, if any, must approve any settlement in conformance with applicable federal regulations.

6.1.2 Termination - The Anchorage School District may at any time terminate (convenience termination) or suspend this Agreement for its needs or convenience upon ten (10) Days' written notice to the Contractor. In the event of a convenience termination or a suspension of the Agreement for more than three (3) months, the Anchorage School District will compensate the Contractor for services performed and any expenditures incurred prior to the effective date of the written notice of termination or suspension. No fee, profit or other compensation for the uncompleted portion of the services will be paid, except for already incurred indirect costs which the Contractor can establish and for which the Anchorage School District would have compensated the Contractor over the life of this Agreement, but because of the termination or suspension would have to be absorbed by the Contractor without further compensation.

6.2 Officials not to Benefit - The Contractor shall comply with all applicable federal and state laws and regulations regarding ethical conduct of public officials and employees.

6.3 Independent Contractor - The Contractor and their agents and employees shall act in an independent capacity and not as officers or agents of the Anchorage School District in the performance of this Agreement except that the Contractor may function as the Anchorage School District's agent as may be specifically set forth in this Agreement.

6.3.1 Any and all employees of this Contractor while engaged in the performance of any work or services required by the Contractor under this Agreement, shall not be considered employees of the Anchorage School District and any and all claims that may or might arise under the Worker's Compensation Act on behalf of said employees, while so engaged and any and all claims made by a third party as a consequence of any negligent act or omission on the part of the Contractor's employees, while so engaged on any of the services to be rendered herein, shall be the sole obligation and responsibility of the Contractor.

SAMPLE

6.3.2 This Agreement will be declared null and void should the Anchorage School District determine that by Internal Revenue Service definitions employees of the Contractor or of any subcontractor may be an employee of the Anchorage School District.

6.4 Proselytizing - The Contractor agrees that it will not engage, on a full or part time basis, during the period of this Agreement, any person or persons who are or have been employed by the Anchorage School District during the period of this Agreement or during the 90 days immediately preceding the date of this Agreement except those who have been regularly retired or approved in writing by the Anchorage School District.

6.5 Covenant Against Contingent Fees - The Contractor shall comply with the Copeland "Anti-Kickback" Act (18 USC 874) as supplemented in federal Department of Labor Regulations (29 CFR, Part 3), which are incorporated by reference and made a part of this Agreement.

6.6 Subcontractors - The Contractor shall not engage any subcontractor(s) without the prior approval of the Anchorage School District.

6.7 No Assignment or Delegation - The Contractor may not assign or delegate this contract, or any part of it, or any right to any of the money to be paid under it, except with the written consent of the Anchorage School District.

6.8 Disputes - Any dispute concerning a question of fact arising under this Agreement which is not disposed of by mutual consent shall be decided without bias by the Anchorage School District which shall reduce the decision to writing and furnish a copy of it to the Contractor within 30 days of receipt of all necessary information from the Contractor upon which to base the decision. The Anchorage School District's decision is final and conclusive unless, within 30 days of receipt of the decision, the Contractor delivers a Notice of Appeal to the Anchorage School District. The Notice of Appeal shall include specific exceptions to the Anchorage School District's decision including specific provisions of this Agreement, which the Contractor intends to rely upon on appeal. General assertions that the Anchorage School District's decision is contrary to law or to fact are not sufficient. The Superintendent will appoint an Appeals Officer who will render a decision within 60 days of Notice of Appeal and the decision constitutes the exhaustion of contractual and administrative remedies.

6.9 Extent of Agreement/Changes - This Agreement represents the entire and integrated Agreement between the Anchorage School District and the Contractor and supersedes all prior negotiations, representations or agreements, written or oral. This Agreement may be changed only by written amendment executed by both the Anchorage School District and the Contractor.

6.10 Taxes - As a condition of performance of this Agreement, the Contractor shall pay all federal, state and local taxes incurred by the Contractor and shall require their payment by any other persons in the performance of this Agreement.

6.11 Governing Laws - This Agreement is governed by the laws of the State of Alaska and federal and local laws and ordinances applicable to the work performed. The Contractor shall be cognizant and shall at all times observe and comply with such laws which in any manner affect those engaged or employed in the performance, or which in any way affects the manner of performance, of this Agreement.

6.12 Ownership of Work Products

6.12.1 Ownership of Work Products produced under this Agreement, including items which have pre-existing copyrights, shall remain with the Contractor. The Anchorage School District shall have an unrestricted, irrevocable license to use the Work Products without infringing any copyrights, and without additional compensation to the Contractor.

6.12.2 Unrestricted use shall include use: (1) for any additions, alterations, or other subsequent work to the Project; (2) to demonstrate or reference conceptual arrangements, in whole or in part, for incorporation into any District project; and (3) reuse of a prototypical design on an Anchorage School District project.

6.12.3 Should the Anchorage School District elect to reuse Work Products produced by the Contractor and its Subcontractors under this Agreement and owned by the Contractor on any other project, the Anchorage School District shall indemnify, hold harmless and defend the Contractor and its Subcontractors against any damages or liabilities arising from such reuse.

SAMPLE

6.12.4 When Work Products produced by the Contractor and its Subcontractors under this Agreement are reused by the Anchorage School District, the Contractor's and Subcontractors' signatures, professional seals and dates shall be removed. Such Work Products, which require professional signature and seal, will be signed, sealed and dated by the professional who is in direct supervisory control and responsible for the new project for which such Work Products are being reused.

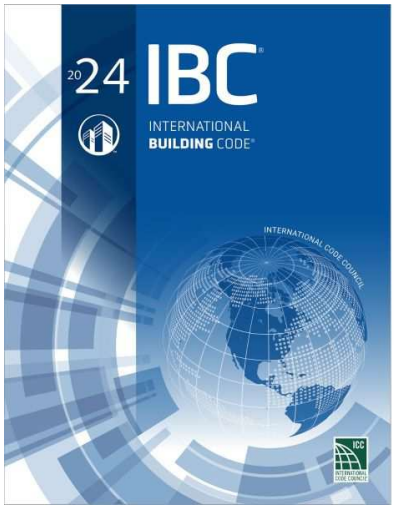
6.12.5 The Contractor shall include this provision in every Subcontract so as to be binding on every Subcontractor.

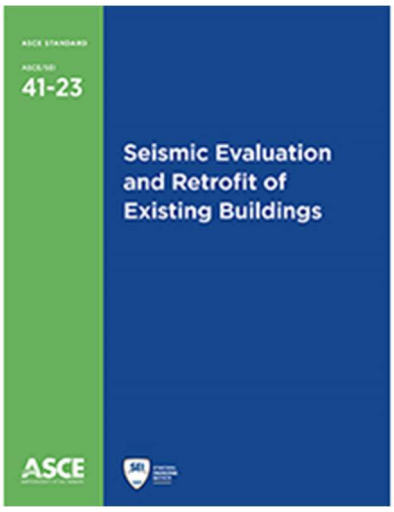
SAMPLE

SEISMIC EVALUATION AND RETROFIT GUIDE

For Existing Anchorage School District Buildings

Updated 07/2025 to Reference IBC 2024 and ASCE 41-23





Preface

This guide is a revision to the 2021 edition of the Seismic Evaluation and Retrofit Guide for Existing Anchorage School District Buildings. A summary of the most significant changes that are in this current version includes the following:

Significant Changes in ASCE 41-23

- Chapter 4 Tier 1 Screening
  - Changed several of the Tier 1 Quick Check procedures
- Chapter 5 Tier 2 Deficiency-Based Evaluation and Retrofit
  - Aligned the Tier 2 Knowledge Factor with the Tier 3 requirements
  - Updated Tier 2 evaluation requirements for Steel Deck diaphragms
  - Updated the Tier 2 Deficiency-Based Retrofit requirements to include retrofit-specific requirements on the resulting structure, design and detailing requirements, and the definition of the scope of evaluation requirements for existing components
- Chapter 6 Tier 3 Systematic Evaluation and Retrofit
  - Revised the condition assessment and data collection requirements
  - Eliminated the dependence of performance level for data collection and material testing
  - Granted permission to use material property bounding in a nonlinear analysis in lieu of material testing

Significant Changes in ASCE 7-22

- Chapter 7 Snow Loads
  - New risk-targeted snow loads; four separate maps for reliability-targeted ground snow load values for Risk Category I through IV
- Chapter 11 Seismic Design Criteria
  - Site Classes BC, CD, and DE added
  - Use of Default Site Conditions revised
  - Multi-Period Response Spectrum (MPRS) added
  - Risk-targeted maximum considered earthquake (MCE_R) spectral response acceleration parameters shall be obtained from the USGS Seismic Design Geodatabase for the applicable site class

Significant Changes to this 'Seismic Evaluation and Retrofit Guide'

Technical updates were made to align with referenced codes and additional verbiage was added to provide clarity.

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Executive Summary

The following document is to be used to assist in the seismic screening, evaluation, and retrofit of existing Anchorage School District (ASD) school buildings. It outlines four progressive methods for screening, evaluating, and retrofitting these buildings, all in relation to seismic events: Rapid Visual Screening, Screening, Evaluation, and Retrofit.

Rapid Visual Screening (RVS) is a method to determine the probability of failure based on basic criteria determined about the building such as building type, year of construction, soil type, etc. The RVS section is based on Federal Emergency Management Agency (FEMA) 154. Because of the basic nature of this method, this can be conducted on an inventory of buildings for easy comparison and understanding of the relative/ranked seismic risk. Buildings are rated by Seismic Score “S”, and buildings receiving a lower score have a higher probability of failure during large earthquakes.

The Screening section (Tier 1) is based on American Society of Civil Engineers (ASCE) 41-23, Chapter 4. This section of the guide is used to identify possible structural and nonstructural deficiencies based on an ASD-determined performance objective using checklists accumulated from observed deficiencies revealed within distinct building types during previous large earthquakes. These potential deficiencies are prioritized and put into a report that includes a conceptual narrative on how these potential deficiencies could be grouped and mitigated.

The Evaluation section (Tier 2 or 3) is based on ASCE 41-23, Chapters 5 and 6. This section of the guide is used to further evaluate existing building components in more detail and to verify structural and nonstructural deficiencies identified in the Screening report, based on ASD-determined performance objectives. The verified deficiencies are prioritized and put into a report that includes a schematic narrative on how these verified deficiencies could be grouped and mitigated.

The Retrofit section (Tier 2 or 3) is also based on ASCE 41-23, Chapters 5 and 6. This section of the guide is to be used following the Screening and Evaluation phases for developing the retrofits for specific deficiencies, to a performance objective determined by ASD. The deficiencies mitigated by any retrofit project are typically voluntary and may not include the retrofit of all verified deficiencies listed in the Evaluation report, depending on ASD funding priorities and the cost of retrofit versus replacement of the entire school.

A. Definitions

The following terms are used throughout this document. In this section, no specific guidance is given, only general descriptions.

- IBC/ASCE 7
  - The International Building Code (IBC) and American Society of Civil Engineering (ASCE) 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* are the basic building codes to which new buildings are designed.
  - At the time of publication, this guide is based on IBC 2024 and ASCE 7-22, with local amendments as expected to be adopted by the Municipality of Anchorage (MOA) in the spring of 2026.
  - Life Safety is a concept that governs all new building code provisions within IBC/ASCE 7 for Risk Category II buildings. The basic goal in any extreme event is that all persons can safely egress the building. This concept does not ensure the repairability of the building or the state of the building after the event. The only objective is that there is no loss of life.
- Risk Category
  - Buildings are categorized into four groups, generally by number of occupants, but also by community need. These are defined by the IBC and ASCE 7.
  - Risk Category I – Buildings that represent a low hazard to human life in the event of failure, such as minor storage facilities, barns, sheds, temporary facilities, etc.
  - Risk Category II – All buildings except those listed in Risk Categories I, III, and IV. An example would be a single-family home, a retail store, or an office building.
  - Risk Category III – Buildings that represent a substantial hazard to human life in the event of failure. This would include buildings where 300 people or more congregate in one area, detention facilities, and primary and secondary schools with a capacity of 250 or more.
  - Risk Category IV – Buildings designated as essential facilities, including hospitals, fire stations, police stations, or buildings designated as emergency shelters.
- IEBC
  - The International Existing Building Code (IEBC) governs existing buildings and their repair, alteration, addition, and repurposing (change of use or occupancy).
  - At the time of publication, this guide is based on IEBC 2024, with local amendments as expected to be adopted by the MOA in the spring of 2026.
  - The IEBC does not require existing buildings, that are not undergoing a change of use or occupancy, to be upgraded to current IBC/ASCE 7 (current building code) force levels and detailing standards. Instead, it sets limits on the amount of mass that can be added (increasing the seismic force) before the building needs to be analyzed to ensure that the building can support the new mass. Until that threshold is reached, the original design and construction is assumed to be acceptable.
  - Under an “Alteration – Level 1” a new 3-psf second roofing layer may be added and no evaluation of the existing structure is required. However, for the majority of Anchorage that is in a high wind zone (basic wind speed, V, for Risk Category II greater than 130 mph), when

a reroof occurs, the existing roof diaphragm, existing connections of the roof diaphragm to roof framing members, and existing roof to wall connection must all be evaluated for a reduced wind load. Reference IEBC Sections 706.2 and 706.3.2 and the MOA's Three Second Gust Wind Zones map, Risk Category II.

- Under an "Alteration – Level 2" the stress in any gravity or lateral element may be increased up to 10% (per expected MOA local amendments) without evaluation of the existing structure. Voluntary alterations (retrofits) may be made to the lateral force resisting system under this level of alteration if they do not create (or worsen) an irregularity. See the Retrofit section (Tier 2 or Tier 3) for more information.
- "Alterations – Level 3" are separated into substantial and unsubstantial (based on work area as defined by IEBC). Where substantial, the building shall undergo a whole-building evaluation (Tier 3, but with reduced seismic forces, BSE-1E and BSE-2E, or 75% of IBC earthquake forces). Where unsubstantial, refer to Alteration - Level 2. Under all Level 3 Alterations, anchorage of masonry and masonry walls, partitions, and parapets shall be verified. Reference IEBC Section 906.
- Once a structural Evaluation is required by the IEBC, there are several specified checks and calculations that are required be performed, but the IEBC also allows for an alternate approach called Performance Based Design, such as ASCE 41.

- Performance Based Design
  - Performance Based Design (PBD) is a nuanced design methodology that allows an Owner to select either the Life Safety objective that is built into the building code (IBC/ASCE 7) or elect to use an enhanced performance objective that produces a better outcome after a large ground shaking. ASCE 41 (Tier 2 or 3) is a PBD methodology that is adopted, by reference, into the IEBC and is approved by the MOA Building Safety Department.
  - Reduced performance objectives with lower outcomes can also be directed by the Owner and accepted by the Engineer and MOA under this methodology.
- Seismic Screening
  - Screenings are relatively quick analyses that allow an Owner to define the relative seismic risk of a building to the other buildings in a given inventory of buildings.
  - Two types are represented in this guide:
    - Rapid Visual Screening (RVS) - This can be used as a preliminary step to the ASCE 41 tiered evaluation. RVS allows for an inventory of buildings to be easily and quickly compared with one another.
    - ASCE 41 Tier 1 Screening – See ASCE 41 Tier 1 below.
- ASCE 41 Tiers
  - ASCE 41, *Seismic Evaluation and Retrofit of Existing Buildings*, is organized as a series of tiers, each more time intensive than the previous.
  - At the time of publication, this guide is based on ASCE 41-23.
  - *Tier 1* – The screening phase. This tier consists of reviewing the existing building versus a **checklist** of 'known deficiencies' that have been shown to be dangerous in previous earthquakes in similar building types. These known deficiencies were acceptable practice

when the building was designed and constructed but have since been shown to be seismically vulnerable. Potential deficiencies are checked against acceptable standards and determined to be compliant (C), non-compliant (NC), non-applicable (N/A), or unknown (U). Separate checklists are used for Collapse Prevention and for Immediate Occupancy performance levels. No other checklists are available for different performance levels. Tier 1 checklists are 'red-flag' checklists and raise only potential concerns, not verified problems that need repair. Non-compliant items may be shown to not need retrofit at the conclusion of a Tier 2 Evaluation.

- *Tier 2* – This **deficiency-only** tier is used for evaluation or retrofit after a Tier 1 screening. Tier 2 allows for the elements deemed non-compliant from Tier 1 to be reevaluated with more-detailed calculations to determine the degree of deficiency. Once the degree of deficiency is determined, a decision can be made on whether each element should be retrofitted.
- *Tier 3* – This is an in-depth, comprehensive structural analysis of the **entire structure**. This analysis does not just look for deficient elements but looks at the interaction of all of the structure's elements. This tier is only used for buildings where the entire structure needs to be upgraded or where buildings do not meet the limitations for using Tier 1 or 2 evaluations. A Tier 3 retrofit is analogous to a new building design under IBC and ASCE 7, with either full or reduced seismic forces, dependent on Seismic Hazard Level.

- Seismic Hazards
  - The seismic hazard caused by ground shaking is based on a building's geographic location, proximity to faults (earthquake epicenter), and soil properties. The level of the ground shaking observed at the epicenter of an earthquake will be much higher than what is observed at the building. This reduction in intensity depends on distance and soil properties between the epicenter and the building site. Per ASCE 41, there are four specified seismic hazard levels that are tied to the intensity of shaking expected over the 50-year life of a building (mean return period), or put inversely, the probability of a certain intensity of shaking occurring at any one time (probability of exceedance). The seismic hazard level chosen for analysis is dependent on the desired performance objective and can be selected by the Owner of a building. ASCE 41 uses the following predefined hazard levels, or basic safety earthquakes (BSE):
    - Those noted with an '-E' suffix are more applicable to existing buildings, and those with an '-N' suffix are more applicable to new buildings.
    - The hazards noted as '-2' are larger (less frequent/likely) than those noted as '-1' (more frequent/likely).
    - *BSE-2N* – Also known as the Maximum Considered Earthquake, Risk-Targeted (MCE_R), this would be the largest earthquake expected for the area in question. This level of shaking in Anchorage, Alaska could be caused by megathrust faults, such as the Aleutian Subduction Zone, which is capable of M9+ earthquakes. At this intensity of shaking, one would likely see large cracks forming in the ground,

significant roadway damage, loss of utilities, and most buildings would be highly damaged.

- *BSE-1N* – This is 2/3 of the MCE_R, and still a sizeable earthquake. This level of shaking in Anchorage, Alaska could be caused by crustal faults, such as the Castle Mountain Fault, which is capable of M7+ earthquakes. At this intensity of shaking, one would see ground cracking, damage to houses and office buildings, roadway damage, and underground utility disruption. This is also noted as S_{DS} and S_{D1} (design level earthquake) in IBC/ASCE 7, and new building codes provide Life Safety performance during this large of a seismic hazard.
- *BSE-2E* – This level of shaking would be a M8+ earthquake caused by crustal faults (like the Denali Fault, although the Denali Fault is too far from Anchorage to create this level of ground shaking in Anchorage). At this intensity of shaking, one would likely see large cracks forming in the ground, significant roadway damage, loss of utilities, and some buildings would be moderately damaged.
- *BSE-1E* –This would be a smaller earthquake than all others considered above but still capable of causing observable damage to structures. This level of shaking could be caused by a crustal fault, such as the Castle Mountain Fault, which can produce M6+ earthquakes on an annual basis. At this intensity of shaking, there would be general alarm and cracks forming in some building shear walls. For buildings with a shorter remaining useful life, less than 20 years, this may be an acceptable reduced seismic hazard.

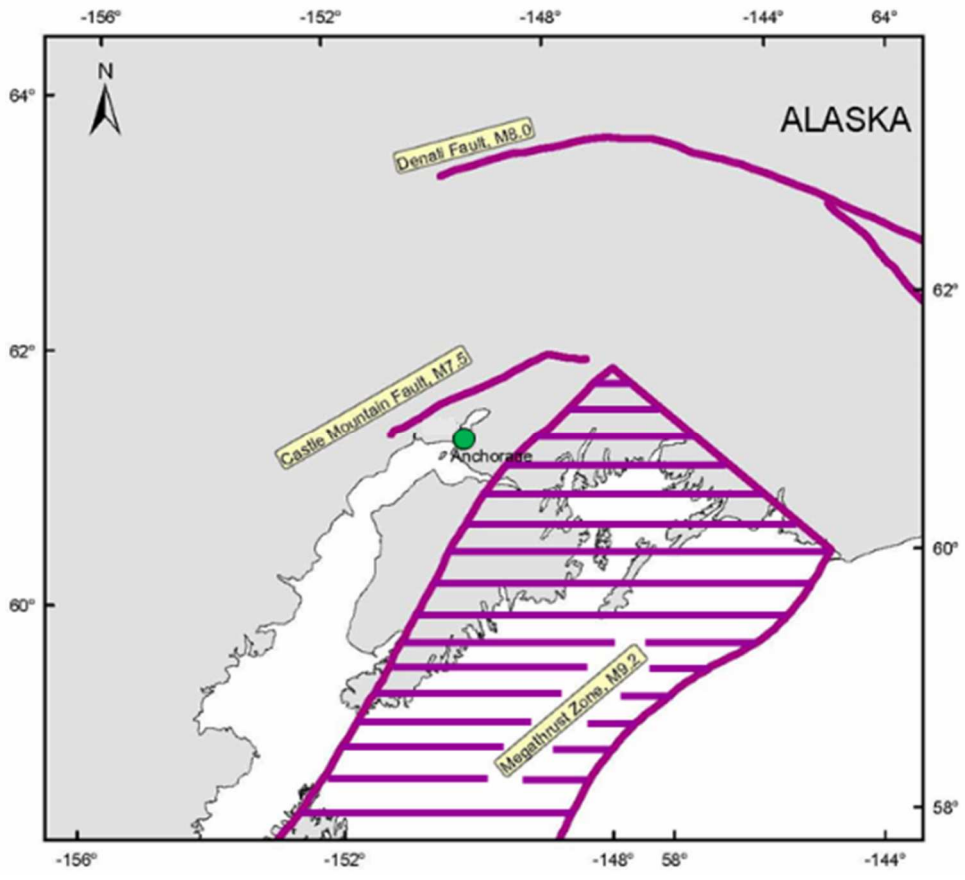


Figure 1: Faults near Anchorage Capable of Producing High Magnitude Earthquakes.

- For Anchorage, Alaska, using the *ASCE Hazard* tool (https://ascehazardtool.org), and Site Class C, the seismic accelerations (at a short period of 0.2 seconds, S_{XS}, and a longer period of 1.0 seconds, S_{X1}) of the seismic hazards above are:

Seismic Hazard	*Probability of Exceedance*	*Mean Return Period*	S_{XS}	S_{X1}
BSE-2N (MCE_R)	*2% in 50 years*	*2475 years*	*1.54g*	*0.88g*
BSE-1N	*2/3 of BSE-2N (~10% in 50 years)*	*475 years*	*1.03g*	*0.59g*
IBC/ASCE 7, current code, S_{DS}, S_{D1}				
BSE-2E	*5% in 50 years*	*975 years*	*1.38g*	*0.82g*
BSE-1E	*20% in 50 years*	*225 years*	*0.95g*	*0.46g*

Table Note: Seismic accelerations (S_{XS} and S_{X1}), for location and site class described, per ASCE 41-23 are, on average, 8% lower than seismic accelerations per ASCE 41-17. Differences in accelerations between code years are due to refined/increased United States Geological Survey (USGS) data and updates to the US National Seismic Hazard Model (NSHM).

Table 1: Seismic Accelerations of Anchorage, AK at Predefined Seismic Hazard Levels.

- Performance Level
  - These are the levels at which a building should perform under a given seismic hazard. Levels of performance exist for both structural and nonstructural components.
  - *Structural* – Structural refers to all elements and systems that make up the building's gravity and lateral force resisting system. Structural components would include such items as shear walls, roof deck, braced frame, etc. Structural performance levels are classified with an 'S-' prefix followed by a number, with a lower number representing a better performance.
    - *Immediate Occupancy (S-1)* - The structure will retain the pre-earthquake strength and stiffness and can be utilized immediately. Few to no injuries should occur to persons within the structure due to building failure. (Figure 2).



Figure 2: Immediate Occupancy (S-1) - Note damage to facade, but underlying structural brick in working condition.

    - *Damage Control (S-2)* – Some damage will occur to the building, with small permanent drift. Damage should be economical to repair. Building is capable of being occupied following shaking, but damage should be addressed as soon as feasible.
    - *Life Safety (S-3)* – Moderate damage will be present in the building, with some residual strength left in the elements. Minor permanent drift will be present. The building may be beyond economical repair (Figure 3). Injuries due to structural failure should be few.



Figure 3: Life Safety (S-3) - Cracking/deflection in concrete beam, cannot be repaired.

    - *Limited Safety (S-4)* – Moderate to severe damage. The building will have permanent drift and will be beyond economical repair. The building should not be reused following an earthquake. Damage to structure may cause injuries or obstacles to evacuation, but these should be minor.

- *Collapse Prevention (S-5)* – Severe damage is present throughout the structure. Little residual strength and stiffness remains, but load-bearing columns and walls should function. Large permanent drifts exist in the structure and exits may be blocked. Building is near collapse. This is a hazard to human safety and will not be reusable (Figure 4). Risk of injury due to structural damage is high.



Figure 4: Collapse Prevention (S-5) - Severe buckling of members, near collapse.

- *Structural Performance Not Considered (S-6)* – Used where an evaluation or retrofit does not address the structure.

- *Nonstructural* – Nonstructural refers to all aspects of a structure that do not provide structural support. This would include architectural elements (soffits, moldings, and drop ceilings), mechanical elements (boilers, generators, and HVAC; Figure 5), and electrical components (fans and lights). Nonstructural levels are classified with an 'N-' prefix followed by a letter from A to D, with the lower order letters representing a higher performance.
  - *Operational (N-A)* – Elements will resume pre-earthquake functions without repair. Power and utilities are available, possibly from a standby source.
  - *Position Retention (N-B)* – Elements are damaged and may not function but are secured in place following an earthquake. May require repair or replacement before reuse.
  - *Life Safety (N-C)* – Elements are damaged and may be dislodged from positions, though the consequences of damage do not pose a high risk to life safety, e.g., items are not major falling hazards and will remain anchored until repaired or replaced.
  - *Hazards Reduced (N-D)* – Elements are damaged, will require replacement, and could become falling hazards.

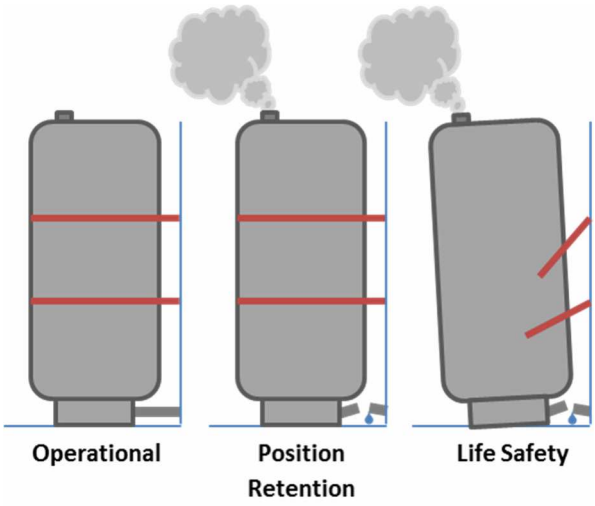


Figure 5: Example of performance levels for nonstructural element (water heater).

  - *Nonstructural Performance Not Considered (N-E)* – Used where an evaluation or retrofit does not address all nonstructural components to one of the previous levels (N-A through A-D)

- Performance Objectives
  - Performance Objectives are the combination of Seismic Hazard and Structural and Nonstructural Performance Levels. Performance Objectives are abbreviated as 'S-N', dropping the 'S-' and 'N-' prefixes.
  - These are overlaid below on the Risk Categories defined by IBC and ASCE 7 and are defined by ASCE 41 as the Basic Performance Objective for Existing Buildings (BPOE). ASCE 41 also defines Basic Performance Objectives for New Buildings (BPON).
  - The Owner can select to use a higher or lower performance objective for any element or building, if the IEBC does not require retrofit.

Risk Category (IBC)	BSE-1E		BSE-2E	
I and II	Structural: Life Safety (S-3) Nonstructural: Life Safety (N-C)	3-C	Structural: Collapse Prevention (S-5) Nonstructural: Hazards reduced (N-D)	5-D
III	Structural: Damage Control (S-2) Nonstructural: Position Retention (N-B)	2-B	Structural: Limited Safety (S-4) Nonstructural: Hazards reduced (N-D)	4-D
IV	Structural: Immediate Occupancy (S-1) Nonstructural: Position Retention (N-B)	1-B	Structural: Life Safety (S-3) Nonstructural: Hazards reduced (N-D)	3-D

Table 2: Basic Performance Objective for Existing Buildings (BPOE).

B. Rapid Visual Screening

Pre-Screening

In order to conduct Rapid Visual Screening (RVS) per FEMA 154, the following data should be collected for each school:

- Construction drawings and as-built drawings
  - Floor area (square feet)
  - Building type (e.g. braced frame steel building)
  - Building height
  - Irregularities (plan/vertical)
  - Year(s) of construction/design
- Soil type (A, B, BC, C, CD, D, DE, E, F, or Default)
- Field study
  - Falling hazards
  - Occupancy (Number of persons)
  - Verify as-built drawings

Rapid Visual Screening

Fill out the Rapid Visual Screening FEMA-154 Data Collection Form for High Seismicity. The form should be filled out during the site visit to each school.

Basic Score

The basic score is based on the building type. The building type is determined from the as-built drawings and a site visit for verification.

Building Height

The height of the building is used to modify the basic score through two checks: Mid Rise (4 to 7 stories) and High Rise (>7 stories). These modifiers are only used if the building fits within these criteria.

Irregularities

Irregularities (vertical or plan) should be determined from the as-built drawings and verified through the site visit.

Year of Design

There have been great changes in the seismic code over the years. The importance of the code the building was designed under is also given weight through two modifiers: Pre-Code and Post-Benchmark.

The earliest code that MOA has on record as acceptable for seismic considerations is the UBC 1946, adopted on June 9, 1948. Buildings designed before this year are considered “Pre-Code” for FEMA 154. Buildings constructed before 1984 were not subject to the rigorous review now present in the MOA and should use a value of one-half of the “Pre-Code” value listed in FEMA 154, e.g., a 1942 S-4 would receive a -0.8; a 1970 S-4 would use ½ * -0.8 = -0.4.

Specific building types have benchmark years, or benchmark codes, that were deemed reliable for seismic design. The date that the MOA accepted these codes is the date after which all buildings are considered to surpass the "Benchmark Design Year". See Table 3 for the dates that the MOA accepted various benchmark codes. See Table 4 for specific building types and their representative benchmark years, per ASCE 41.

Building Code	Benchmark Designation	Effective Date in the MOA
UBC	1976	5/9/1978
	1988	1/24/1989
	1991	2/25/1992
	1994	5/31/1995
	1997	12/15/1998
IBC	2000	1/28/2003
	2003	11/1/2005
	2006	1/29/2008

Table 3: Date after which Benchmark Codes were accepted into MOA.

Buildings designed after their respective codes were accepted by the MOA are considered "Post Benchmark" for FEMA 154. The UBC was utilized until 2003, and the IBC has been used since that time. Previous retrofit codes are also considered benchmarks. A building can be benchmarked under any of these building codes, e.g., a W1a building designed to the 1997 UBC, the 2000 IBC, or previously retrofit to the 1998 FEMA 310 are all considered "Post Benchmark".

Table 3-2. BPOE Benchmark Building Codes and Standards for Risk Categories I and II.

Building Type[a,b]	Building Seismic Design Provisions				Seismic Evaluation or Retrofit Provisions	
	NBC/SBC	UBC	IBC	NEHRP	FEMA 310[d]/ ASCE/SEI 31[d]	FEMA 356[e]/ ASCE/SEI 41[e]
Wood Light Frames, Small Residential (Type W1)[g]	1993	1976	2000	1985	1998	2000
Wood Light Frames, Large Residential, Commercial, Industrial, and Institutional (Type W2)	*f*	1997	2000	1997	1998	2000
Steel Moment Frames (Types S1 and S1a)	*f*	1997	2000	1997	1998	2000
Steel Concentrically Braced Frames (Types S2 and S2a)	*f*	1997	2000	*f*	1998	2000
Steel Eccentrically Braced Frames (Types S2 and S2a)	*f*	1997	2000	1997	*f*	2000
Steel Buckling-Restrained Braced Frames (Types S2 and S2a)	*f*	*f*	2006	*f*	*f*	2000
Metal Building Frames (Type S3)	*f*	*f*	2000	*f*	1998	2000
Dual Frame Systems with Concrete Shear Walls and Backup Steel Moment Frames (Type S4)	1999	1997	2000	1997	1998	2000
Dual Frame Systems with Steel Braced Frames and Backup Steel Moment Frames (Type S4)	1999	1997	2000	1997	1998	2000
Steel Frames with Infill Masonry Shear Walls (Types S5 and S5a)	*f*	*f*	2000	*f*	1998	2000
Steel Plate Shear Walls (Type S6)	*f*	*f*	2006	*f*	*f*	2000
Cold-Formed Steel Light-Frame Construction: Shear Wall System (Type CFS1)	*f*	1997[h]	2000	1997[h]	*f*	2000[h]
Cold-Formed Steel Light-Frame Construction: Strap-Braced Wall System (Type CFS2)	*f*	*f*	2003	2003	*f*	*f*
Concrete Moment Frames (Type C1)	1999	1997	2000	1997	1998	2000
Concrete Shear Walls (Types C2 and C2a)	1999	1997	2000	1997	1998	2000
Concrete Frames with Infill Masonry Shear Walls (Types C3 and C3a)	*f*	*f*	2000	*f*	1998	2000
Precast or Tilt-Up Concrete Shear Walls (Types PC1 and PC1a)	*f*	1997	2000	*f*	1998	2000
Precast Concrete Frames (Types PC2 and PC2a)	*f*	*f*	2000	*f*	1998	2000
Reinforced Masonry Bearing Walls with Flexible Diaphragms (Type RM1)	*f*	1997	2000	*f*	1998	2000
Reinforced Masonry Baering Walls with Stiff Diaphragms (Type RM2)	1997	1997	2000	1997	1998	2000
Unreinforced Masonry Bearing Walls with Flexible Diaphragms (Type URM)	*f*	*f*	2000	*f*	*f*	2000
Unreinforced Masonry Bearing Walls with Stiff Diaphragms (Type URMa)	*f*	*f*	2000	*f*	1998	2000
Seismic Isolation or Supplemental Energy Dissipation[c]	*f*	1991	2000	*f*	*f*	2000

[a] Building type refers to one of the Common Building Types defined in Table 3-1.
[b] For buildings in areas defined as Very Low Seismicity, the benchmark provisions are limited to the IBC, FEMA 310/ASCE/SEI 31, and FEMA 356/ASCE/SEI 41.
[c] Applies to buildings with seismic isolation or supplemental energy dissipation systems that comply with the cited reference codes and standards.
[d] Life Safety Structural Performance Level for the seismic hazard as defined by those provisions.
[e] Life Safety Structural Performance Level for the BSE-1 Seismic Hazard Level as defined by those provisions.
[f] No benchmark year; buildings must be evaluated using this standard.
[g] W1 buildings located on hillside sites as defined by Table 17-4 cannot be considered Benchmark Buildings.
[h] Only cold-formed steel light-frame buildings with wood structural panel shear walls are permitted to be considered Benchmark Buildings.
Source: NBC = *National Building Code* (BOCA 1993, 1996, 1999); SBC = *Standard Building Code* (SBCC 1993, 1994, 1996, 1997, 1998, 1999); UBC = *Uniform Building Code* (ICBO 1976, 1979, 1982, 1985, 1988, 1991, 1994, 1997); IBC = *International Building Code* (ICC 2000, 2003, 2006, 2009, 2012, 2015, 2018, 2021); NEHRP = *NEHRP Recommended Provisions for the Development of Seismic Regulations for New Buildings* FEMA 95 (BSSC 1985), FEMA 95 (BSSC 1988), FEMA 222 (BSSC 1992), FEMA 222A (BSSC 1995), FEMA 302 (BSSC 1997), FEMA 368 (BSSC 2001). FEMA 310 (1998), ASCE/SEI 31-03 (2003), FEMA 356 (2000), ASCE/SEI 41-06 (2007), ASCE/SEI 41-13 (2014), and ASCE/SEI 41-17 (2017).

Table 4: Benchmark Codes (Table 3-2 excerpt from ASCE 41-23).

Soil Type

Soil type plays an important role in the seismic stability of a building. If there are soil reports available to help one determine the soil type, that soil type should be used in this analysis for scoring the school.

Appendix 1) may be used. The following correlation is acceptable:

Map Color	Hazard Zone	Approximate Soil Type
Dark green	'Lowest' Hazard Zone	Soil Type D
Light green	'Moderate-Low' Hazard Zone	Soil Type D
Yellow	'Moderate' Hazard Zone	Soil Type D
Orange	'High' Hazard Zone	Soil Type E
Red	'Very High' Hazard Zone	Soil Type F see note below

Table 5: Ground Failure Susceptibility Conversion to Soil Type.

Schools within the Red, 'Very High' Hazard Zone, or having Soil Type F should be given an automatic final score, S, of negative one (-1.0), because the building cannot be effectively screened by an RVS. Schools in the 'Very High' Hazard Zone require further evaluation by a geotechnical engineer.

Final Score, S

A final seismic score will be determined (S). The lower the number, the larger the probability that the school's lateral system is not adequate.

For example, a school with a seismic score S of 2 would have a 1 in 10^2 (1 out of 100) chance of failure during a BSE-2N event. A school with a seismic score of 3 would have a 1 in 10^3 (1 out of 1000) chance of failure during a BSE-2N event.

Deliverables

The FEMA 154 RVS final output for schools should be a table that includes the following:

- School Name
- Grade Level
- Year Constructed
- Building Type
- No. of Stories
- Area (sq feet)
- Ground Failure Susceptibility
- Soil Type (note if correlated from Ground Failure Susceptibility for Anchorage map)
- FEMA 154 Seismic Score (S)
- Further Evaluation, Yes/No

Any building with a seismic score at or below 2.5 should be considered high risk and should be evaluated further. Anything above 2.5 may be considered at moderate or low risk, but seismic deficiencies may still exist.

All data collection forms should be included. Additional reports or memos for clarification of specific schools or the screening conducted overall should be included in the deliverables as well.

C. Screening - Tier 1

Pre-Screening

- Confirm with ASD if any nonstructural items should be added to the checklists (See Appendix 2)
- Review as-built and construction drawings.
    - Make note of any and all missing drawings.
- Collect all available previous testing and investigation documentation.
    - If an RVS was conducted prior to this evaluation, the report should be reviewed for pertinent information such as building type, soil type, and any noted areas of structural distress or damage.

- Appendix 1.
- Review available geotechnical information for the building site or other sites nearby.

Screening Criteria

- Level of Seismicity: High
- Earthquake Hazard: BSE-2E
- Where material properties are not specified on the available drawings, utilize Default Material Properties from ASCE 41.
- BPOE for Schools (Risk Category III) in the Anchorage School District:

Structural	Nonstructural
Limited Safety* (S-4)	Hazards Reduced** (N-D) (or compliance with ASCE 7 standards)
*For Tier 1 Screening, use Collapse Prevention checklists and modify Ms factors in Quick Check Calculations to be an average of Life Safety and Collapse Prevention values. **Position Retention NS performance also required at BSE-1E; therefore in NS checklist, provide status for all items, even those listed as 'HR-not required' and 'PR-H'	

Table 6: BPOE Level of Performance for Tier 1 Screening

- Note that many schools (22) are deemed as District Designated School Shelters (DDSS) per the ASD Emergency Preparedness Plan. This does not mean that they are to be designed to Risk Category IV or Immediate Occupancy performance objectives unless specifically directed by ASD.

Screening Tasks

1. Conduct a field assessment of the building.
    a. Confirm the existing construction with the as-built drawings.
    b. Note critical details such as areas of structural distress or damage.
    c. Identify structural movement/distress if settlement problems are identified.

   d. Evaluate nonstructural components.
2. Fill out the following checklists:
   a. Basic Configuration Checklist
   b. Structural **Collapse Prevention** Checklist for all building types
      i. A school building will often have two or three building types, including additions and renovations, and a checklist for all applicable building types and additions must be completed.
   c. Nonstructural Checklist
      i. If items have been noted as Enhanced Objectives (See Appendix 2), then specifically add those items to the checklist.
3. Provide sufficient evaluation to eliminate all "UNKNOWN" answers, if possible.
   a. If UNKNOWN items cannot be resolved, coordinate with ASD prior to issuing report. Provide a thorough description of why the item remains unknown and specifically identify what is needed (destructive evaluation, material testing, etc.) to confirm compliance or non-compliance. Provide a sketch of the locations where additional evaluation is needed along with a schedule of how many locations, tests, etc., are needed to resolve the unknown.
4. Provide quick check calculations that are required by checklists.
   a. For Limited Safety Performance Objective (typical for ASD schools), use Collapse Prevention checklists and modify Ms factors to be an average of Life Safety and Collapse Prevention values.
5. Give priority rating to all elements/components deemed deficient (See Appendix 4 and Appendix 5).
   a. Tier 1 checklists are 'red-flag' checklists and raise only potential concerns, not verified problems that need repair. Non-compliant items may be shown to not need retrofit at the conclusion of the Evaluation.
6. For each of the noncompliant deficiencies, develop schematic level (10%) concepts for retrofit.

Deliverables

The Screening may be done as a standalone project or as part of a larger Screening & Evaluation project. If part of a Screening & Evaluation project, no specific screening deliverable is needed.

If standalone, create a Screening Report (Tier 1) that includes the following:

1. Document review (existing drawings, new or existing soils report, etc.).
   a. Note any missing documentation.
2. General and structural building description and description of nonstructural elements of interest.
3. List of assumptions.
4. Description of gravity and lateral structural systems present in building (sketches/diagrams as necessary).

   a. If building consists of multiple renovations and additions, provide description of each and a key map to indicate the extents of each.
5. Field assessment information, including areas of structural distress or damage.
6. Appendix 1).
7. Statement of design criteria under original design building code (for each part/generation/addition) and current IBC and the percentage change between the two.
   a. Roof Snow Load (including drift and sliding snow)
   b. Wind Load
   c. Earthquake Load
8. Statement of seismic evaluation criteria.
   a. Level of Seismicity
   b. Earthquake Hazard Levels
   c. Performance Objectives (BPOE or other/enhanced)
9. Prioritized lists of noncompliant items divided into structural (See Appendix 4) and nonstructural component lists (See Appendix 5). Also, separate those items into groups that could be retrofit with other common projects such as reroofing, residing, or maintenance.
10. Concept narrative to retrofit deficiencies. Provide sketches, as necessary, to illustrate location and extent of concept retrofit. Develop retrofit to 10% of completion.
11. Completed seismic evaluation checklists from ASCE 41 and structural quick check calculations (Append).

The report is to be presented to the ASD. Meet with ASD to discuss the Screening, ranking, grouping, and the conceptual retrofit design, as well as possible retrofit alternatives.

D. Evaluation - Tier 2 or Tier 3

Pre-Evaluation

- Confirm with ASD if any nonstructural items are subject to Enhanced Objectives (See Appendix 2).
- Review as-built and construction drawings.
    - Make note of all missing drawings.
- Collect all available previous testing and investigation documentation.
    - If an RVS was conducted prior to this evaluation, the report should be reviewed for pertinent information such as building type, soil type, and any noted areas of structural distress or damage.
    - A Tier 1 Screening is required to define the scope for a Tier 2 Deficiency-Only Evaluation.
        - If part of a Screening & Evaluation report, this work will be done just prior to this Evaluation step.
    - A Tier 3 Whole Building Evaluation does not require a previous Tier 1 report.

- Appendix 1.
- Review available geotechnical information for the building site or other sites nearby.

Evaluation Criteria

- Where material properties are not specified on the available drawings, utilize Default Material Properties from ASCE 41.
- Knowledge factor: 0.75 per ASCE 41, unless data collection complies with the requirements for a knowledge factor of 0.9 or 1.0.
- BPOE for Tier 2 Deficiency-Only Evaluations of Schools (Risk Category III) in the Anchorage School District (referred to as 'reduced seismic forces' by IEBC):

<table>
<tr><td colspan="2">BSE-2E</td></tr>
<tr><td>Structural:
Limited Safety (S-4) *</td><td rowspan="2">4-D</td></tr>
<tr><td>Nonstructural:
Hazards Reduced (N-D) **</td></tr>
<tr><td colspan="2">*For Tier 2 Evaluation, modify factors to be an average of Life Safety and Collapse Prevention values.
**Position Retention NS performance also required at BSE-1E</td></tr>
</table>

Table 7: BPOE Level of Performance for Tier 2 Evaluation.

- BPOE for Tier 3 Whole-Building Evaluations of Schools (Risk Category III) in the Anchorage School District includes two objectives (referred to as 'reduced seismic forces' by IEBC):

<table>
<tr><td colspan="2">BSE-1E</td><td colspan="2">BSE-2E</td></tr>
<tr><td>Structural:
Damage Control (S-2)</td><td rowspan="2">2-B</td><td>Structural:
Limited Safety (S-4)</td><td rowspan="2">4-D</td></tr>
<tr><td>Nonstructural:
Position Retention (N-B)</td><td>Nonstructural:
Hazards reduced (N-D)</td></tr>
</table>

Table 8: BPOE Level of Performance for Tier 3 Evaluation.

- Note that many schools are deemed as District Designated School Shelters (DDSS) per the ASD Emergency Preparedness Plan. This does not mean that they are to be designed to Risk Category IV or Immediate Occupancy performance objectives unless specifically directed by ASD.

Tier 2 Evaluation

1. Conduct Tier 2 Evaluation of non-compliant and unknown checklist items. Do not evaluate compliant or not applicable checklist items.
2. Give priority rating to all elements/components still deemed noncompliant (see Appendix 4 and Appendix 5).
3. For each of the remaining noncompliant items, develop schematic level (35%) concepts for retrofit.

Tier 3 Evaluation

1. This level of evaluation is rare and should only occur if specifically directed by ASD.
2. Conduct Tier 3 Evaluation of the entire building, considering all vertical and horizontal elements and connections of the lateral force resisting system.
3. Give priority rating to all elements/components deemed noncompliant (see Appendix 4 and Appendix 5).
4. For each noncompliant item, develop schematic level (35%) concepts for retrofit.

Deliverables

The Evaluation may be done as a standalone project or as part of a larger Screening & Evaluation project.

Create a Tier 2 Deficiency-Only (or Tier 3 Whole Building) Evaluation report to include the following:

1. Document review (existing drawings, new or existing soils report, etc.).
    a. Note any missing documentation.
2. General and structural building description and description of nonstructural elements of interest.
3. List of assumptions.
4. Description of gravity and lateral structural systems present in building (sketches/diagrams as necessary).
    a. If building consists of multiple renovations and additions, provide description of each and a key map to indicate the extents of each.
5. Field assessment information, including areas of structural distress or damage and material test results (if material tests conducted).
6. Summarize any soil data reviewed and the condition of soils on site during field survey. Report Ground Failure Susceptibility (Appendix 1)
7. Statement of design criteria under original design building code (for each part/generation/addition) and current IBC and the percentage change between the two.
    a. Roof Snow Load (including drift and sliding snow)

   b. Wind Load
   c. Earthquake Load
8. Statement of seismic evaluation criteria.
   a. Level of Seismicity
   b. Earthquake Hazard Levels
   c. Performance Objectives (BPOE or other/enhanced)
9. For Tier 2 Deficiency-Only Evaluations, list all previously identified Tier 1 deficiencies. Note whether the Tier 2 calculations verified or nullified the Tier 1 concern.
   a. If part of a Screening & Evaluation project, include all Screening Report deliverable items in the Screening & Evaluation Report.
10. Prioritized lists of remaining noncompliant items divided into structural (See Appendix 4) and nonstructural component lists (See Appendix 5). Also, separate those items into groups that could be retrofit with other common projects such as reroofing, residing, or maintenance.
11. Schematic narrative to correct deficiencies that provides adequate information to develop a cost estimate (by others). Provide sketches to illustrate location and extent of schematic repair. Develop retrofit to 35% of completion.
12. Calculations for building mathematical model, seismic accelerations, irregularities, multi-directional effects, P-delta effects, overturning, diaphragm, continuity, out-of-plane wall forces and anchorages, confirmation of material capacities, and other items as appropriate (append).

The report is to be presented to the ASD. Meet with ASD to discuss the Evaluation, ranking, grouping, and the retrofit design, as well as possible retrofit alternatives.

E. Retrofit - Tier 2 or Tier 3

Pre-Retrofit

- Collect all available previous testing and investigation documentation.
    - A Tier 2 Retrofit requires a Tier 2 Deficiency-Only Evaluation to have been completed.
    - A Tier 3 Retrofit requires a Tier 3 Whole Building Evaluation to have been completed.
- Since most retrofits are voluntary, ASD shall identify which noncompliant items are to be retrofit in any project. If the IEBC requires any retrofits, ASD and/or Engineer to identify them as such.

Retrofit Criteria

- All new items shall be designed per the IBC and ASCE 7.
- All retrofitted items shall be upgraded to the Basic Performance Objective for New Buildings (BPON).
- BPON for School Retrofits (Risk Category III) in the Anchorage School District includes two objectives (referred to as 'full seismic forces' by IEBC, IBC, and ASCE 7):

<table>
<tr><td colspan="2">BSE-1N</td><td colspan="2">BSE-2N</td></tr>
<tr><td>Structural:
Damage Control (S-2)</td><td rowspan="2">2-B</td><td>Structural:
Limited Safety (S-4)</td><td rowspan="2">4-D</td></tr>
<tr><td>Nonstructural:
Position Retention (N-B)</td><td>Nonstructural:
Hazards reduced (N-D)</td></tr>
</table>

Table 9: BPON Level of Performance for Tier 2 or Tier 3 Retrofit.

- Note that many schools are deemed as District Designated School Shelters (DDSS) per the ASD Emergency Preparedness Plan. This does not mean that they are to be designed to Risk Category IV or Immediate Occupancy performance objectives unless specifically directed by ASD.

Tier 2 Retrofit

1. Design Tier 2 Retrofit of items that are still noncompliant after the Tier 2 Deficiency-Only Evaluation.
2. Provide stamped, signed drawings, specifications, and calculations per the typical ASD project delivery matrix.
3. Provide fully developed details for the retrofit of all items designated by ASD to be included in this voluntary retrofit project.
4. If the IEBC requires any retrofits, Engineer to note on the contract documents as such.

Tier 3 Retrofit

1. Design Tier 3 Retrofit of items that are deemed non-compliant at the completion of the Tier 3 Whole-Building Evaluation.
2. Provide stamped, signed drawings, specifications, and calculations per the typical ASD project delivery matrix.
3. Provide fully developed details for the retrofit of all items designated by ASD to be included in this voluntary retrofit project.

4. If the IEBC requires any retrofits, Engineer to note on the contract documents as such.

Deliverables

1. Plans, Elevations, and Details to fully describe scope of retrofit, stamped by an Alaska-registered Structural Engineer.
2. Narrative describing deficiencies found in previous reports and detailed explanation of how and to what extent this retrofit strengthens those deficiencies. Include a list of assumptions.
3. Updated priority ranking of un-retrofitted remaining noncompliant items divided into structural (See Appendix 4) and nonstructural component lists (See Appendix 5). Also, separate those items into groups that could be retrofit with other common projects such as reroofing, residing, or maintenance.
4. Calculations for building mathematical model, seismic accelerations, irregularities, multi-directional effects, P-delta effects, and all repairs/retrofits.

Appendix 1 – Anchorage Ground Failure Susceptibility

The following map was developed by Harding and Lawson in 1979 after the 1964 Good Friday Earthquake to estimate the regions of soil in and around the Anchorage Bowl that may be susceptible to landslides under a similar magnitude and origin of earthquake. This was reaffirmed by the USGS in 2009.

- 'Very High' Hazard Zone – Areas of previous seismically induced landslides. Includes zones of tension cracks above the head wall scarp, toe bulge, and pressure ridge areas. Although portions of these previous slides may remain relatively undisturbed from future strong shaking, these slides will be the more likely site of future seismically induced sliding.
    - Red zone
    - >15cm of Newmark displacement, >32% chance of landslide occurrence.
- 'High' Hazard Zone – Fine-grained surficial and subsurface deposits within the vicinity of steep slopes; includes area above and below the slope. Highly susceptible to all types of seismically induced ground failure, including liquefaction, translational sliding, lurching, land spreading, cracking, and subsidence.
    - Orange zone
    - 5-15cm of Newmark displacement, 15%-32% chance of landslide occurrence.
- 'Moderate' Hazard Zone – Fine-grained surficial and subsurface deposits, including the Bootlegger Cove Clay and other silt, clay, and peat deposits. May experience ground cracking and horizontal ground movement due to land spreading or lurching and subsidence due to consolidation.
    - Yellow zone
    - 1-5cm of Newmark displacement, 2%-15% chance of landslide occurrence.
- 'Moderate-Low' Hazard Zone – Mixed coarse and fine-grained glacial deposits in lowland areas, thick deposits of channel, terrace, flood plain, and fan alluvium. May have very low susceptibility; may experience minor ground cracking, localized settlement due to consolidation, and perhaps liquefaction or lurching of localized saturated zones of fine-grained material.
    - Light green zone
    - 0-1cm of Newmark displacement, <2% chance of landslide occurrence.
- 'Lowest' Hazard Zone – Includes exposed bedrock, thin alluvium and colluvium over bedrock. May experience minor ground cracking and acceleration of normal mass wasting process in unconsolidated material such as rock falls and snow avalanches.
    - Dark green zone

While this map is a decent approximation of the soil class and seismic site geotechnical risk, it is not the authority. Site borings and geotechnical reports should be relied upon whenever possible during seismic screenings, evaluations, and retrofits.

Anchorage School District
Facility Locations
Anchorage Bowl

Date: 8/21/2019

Legend

High School Boundary

Emergency Shelters

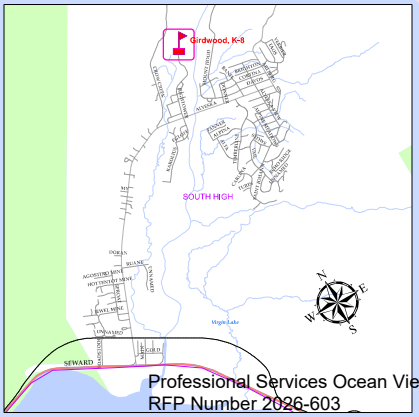
ASD Facility

- *Administrative Buildings*
- *Elementary*
- *Middle*
- *High*
- *Alternative*
- *Charter*

Ground Failure Susceptibility

- *Lowest*
- *Moderate - Low*
- *Moderate*
- *High*
- *Very High*

Girdwood



N W E S

0 0.5 1 2 Miles

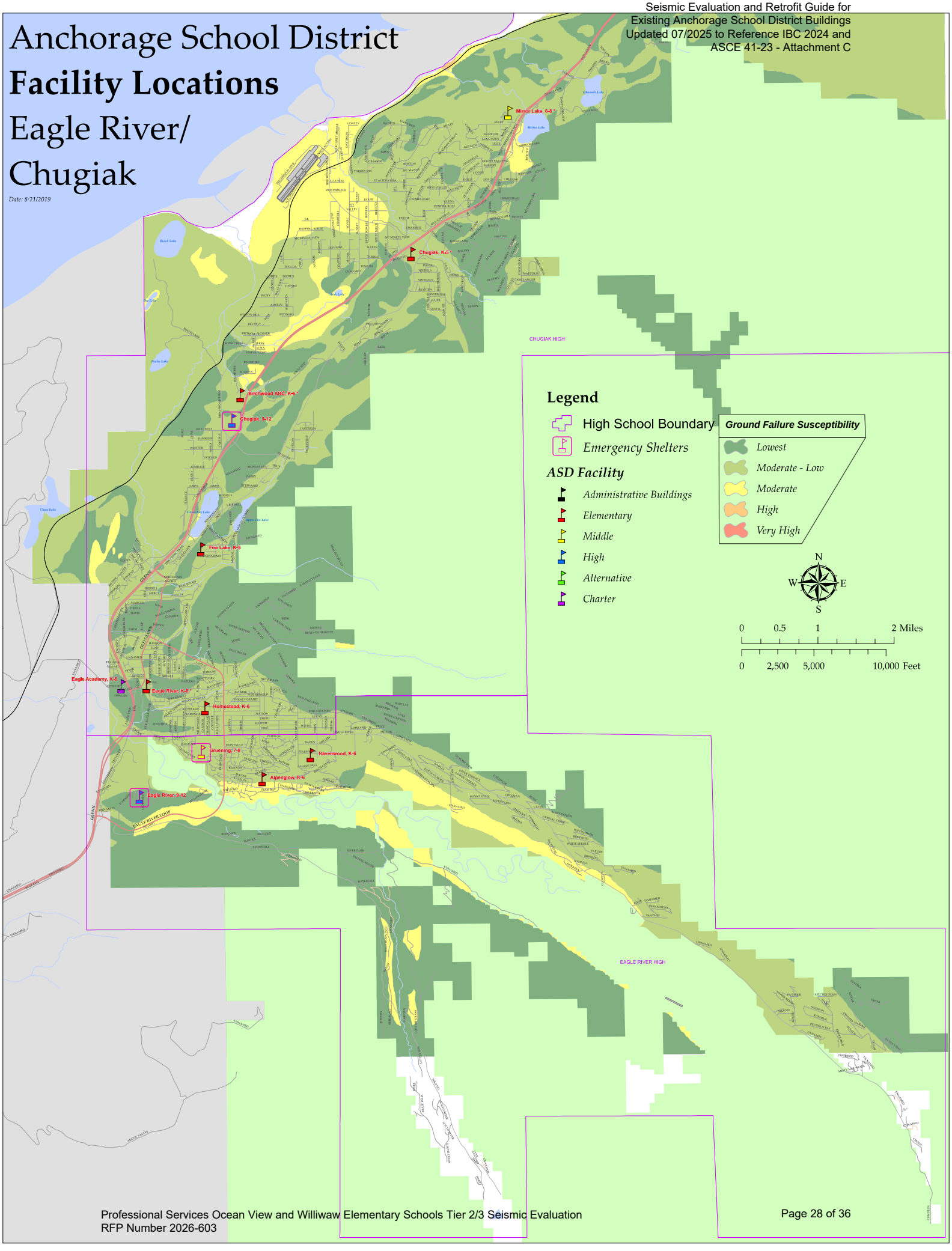
0 2,500 5,000 10,000 Feet

Anchorage School District

Facility Locations

Eagle River/ Chugiak

Date: 8/21/2019



Appendix 2 – Commonly Specified Enhanced Performance Objectives for Nonstructural Items

This form to be provided by ASD to the Engineer prior to starting the Screening, Evaluation and Retrofit stages to ensure any enhanced objectives are accounted for. At the Screening stage, this list is to ensure these items are explicitly added to the Nonstructural checklists and report, and compliance or non-compliance is noted. At the Evaluation and Retrofit stages, the **Operational** at **BSE-1N** performance objective is explicitly evaluated and retrofit if needed.

The following list of nonstructural components should be included in the enhanced performance objectives for this school:

☐ Standby generator

☐ Dual fuel boilers

☐ HVAC equipment

☐ Fire sprinkler system / Fire pumps

☐ File cabinets / bookshelves

☐ Battery racks

☐ Suspended ceilings

☐ Light fixtures

☐ Plumbing / Piping

☐ Ductwork

☐ Raised floor system

☐ Natural gas shutoff

☐ Other:

__ Artwork (only if high value or falling hazard)

__ DDSS Supply Storage (Conex or other)

__

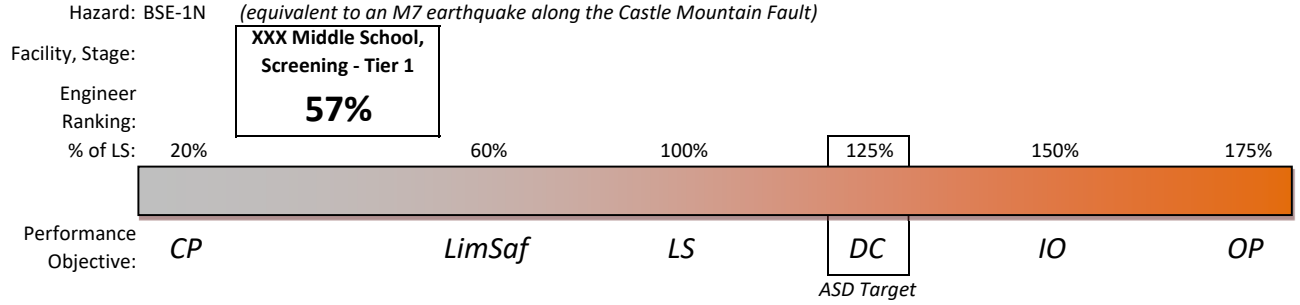
__

Appendix 3 – Seismic Performance Assessment Scale

The following figure is to be included in all Screening, Evaluation, and Retrofit reports and narratives.

While much of this scale is dependent upon engineering judgement, guidelines for how it should be applied are:

- Each performance level correlates to a rating from 20% - 175%, where 100% is a standard new code compliant office building or retail store (Risk Category II).
    - Collapse Prevention (CP) = 20%
    - Limited Safety (LimSaf) = 60%
    - Life Safety (LS) = 100%
    - Damage Control (DC) = 125%
    - Immediate Occupancy (IO) = 150%
    - Operational (OP) = 175%
- Based on the size (square footage) of additions and generations of the building, average the rankings to determine an overall school ranking.
- Based on the Demand-Capacity Ratios under the **BSE-1N**, for each portion of a building, rank those portions relative to their number scale, e.g., if a building has a few deficient items, but is mostly adequate, it would be ranked just below the Life Safety metric, 91%.
    - Note that the BSE-1N is a lower Seismic Hazard than the BSE-2E hazard used under the Tier 1 Screening and Tier 2 Deficiency-Only Evaluation. Per Table 1, you can transition between the two by multiplying by 0.75 (ratio of BSE-1N S_{XS} to BSE-2E S_{XS} Anchorage, AK). Therefore, if the BSE-2E ranking is just above Limited Safety (68%), the BSE-1N ranking that would be reported would be 68/0.75 = 91%, just below Life Safety.
    - Since the seismic hazard used in the early screenings and evaluations under previous versions of ASCE 41 used the BSE-1N, the Building Seismic Ranking will maintain that seismic hazard for reporting purposes and cross-report comparisons.
- For the retrofit reports and narratives, re-rank the building at the **BSE-1N** hazard based on the condition after the retrofits are complete.
- The target performance objective for school buildings in ASD (Risk Category III) is 125%, Damage Control.



Notes:

1. CP = Collapse Prevention; LimSaf = Limited Safety; LS = Life Safety; DC = Damage Control; IO = Immediate Occupancy; OP = Operational.

2. The "Engineer Ranking" indicated above is a qualitative assessment based on the extent of noncompliant items identified in a Tier 1 Screening and the experience of the Engineer. No published standard for the quantitative assessment of existing buildings is used, other than ASCE-41. The assignment of CP=20%, LimSaf=60%, LS=100%, DC=125%, IO=150% and OP=175% is at the discretion of ASD. The target ranking of all ASD facilities is 125% (Damage Control at BSE-1N).

3. Engineer to adjust 'engineer ranking' row to place a percentage calculated for this facility, centered above the range where that percentage lies on the scale.

Appendix 4 – Structural Deficiency Priority Ranking

The Priority Ranking is a way to help determine the order in which deficiencies should be addressed. All elements with a rating above zero should be addressed, but this will allow the retrofit to be prioritized. Structural deficiencies should be rated in the following three categories: degree of deficiency, prevalence, and degree of threat.

Degree of Deficiency

The percent of nonconformance should be taken into consideration when prioritizing the deficiencies. Anything considered "code deficient" should be ranked a 5. Use the following six-point scale to rate the degree of deficiency.

0 – Elements loaded less than or equal to member capacity (<100%).
1 – Elements loaded less than 10% above member capacity (<110%).
2 – Elements loaded less than 20% above member capacity (<120%).
3 – Elements loaded less than 35% above member capacity (<135%).
4 – Elements loaded less than 50% above member capacity (<150%).
5 – Elements loaded greater than 50% of member capacity or deemed "code deficient".

Prevalence

It is important to recognize how many times this element or connection is repeated throughout the building. Prevalence allows the priority rating to include the amount of the structure that has the element problem described. Use the following five-point scale to rate the prevalence of all deficient elements.

1 – Present in 0-10% of the building.
2 – Present in 10-25% of the building.
3 – Present in 25-50% of the building.
4 – Present in 50-80% of the building.
5 – Present in 80-100% of the building.

Degree of Threat

Allowing for engineering judgment, the degree of threat is for including what would happen should this member fail. The threat or hazard to structural integrity should this element fail should be rated on the following four-point scale.

1 – The problem is not critical to structural integrity.
2 – The problem will create minor problems nearby but does not affect structural integrity.
3 – The problem will create problems nearby and will affect structural integrity.
4 – The problem will create major problems and affect structural integrity of many other members and the system.

By taking the product of the three categories above (deficiency X prevalence X threat), each noncompliant item will be rated on a scale of 0 to 100, creating a Priority Ranking for each element. See an example on the following page.

XXX Elementary School **date**

Relative Priority Rating of Tier 1 Screening Deficiencies - Structural Items

Ref Appendix 4 of ASD Seismic Evaluation & Retrofit Guide **(0-5) (1-5) (1-4)**

Area	Checklist	Item	Deficiency	Prevalence	Threat	Priority Rating
UNGROUPED / MISC						
Structural - 1964 Building	xx.xx	22 - xxxx	5	5	4	100
Structural - 1964 Building	xx.xx	24 - xxxx	4	2	3	24
Structural - 1964 Building	xx.xx	25 - xxxx	5	1	4	20
Structural - 1964 Building	xx.xx	26 - xxxx	3	1	1	3
Structural - 1983 Addition	xx.xx	28 - xxxx	0	4	2	0
REROOFING PROJECT (FROM ABOVE ONLY)						
Structural - 1983 Addition	xx.xx	30 - xxxx	5	3	4	60
Structural - 1983 Addition	xx.xx	27 - xxxx	4	1	4	16
Structural - 1983 Addition	xx.xx	31 - xxxx	5	1	2	10
RESIDING PROJECT (FROM EXTERIOR ONLY)						
Structural - 1983 Addition	xx.xx	29 - xxxx	2	1	4	8
Structural - 1964 Building	xx.xx	23 - xxxx	1	2	3	6

Appendix 5 – Nonstructural Deficiency Priority Ranking

The Priority Ranking is a way to help determine the order in which deficiencies should be addressed. All elements with a rating above zero should be addressed, but this will allow the retrofit to be prioritized. Nonstructural deficiencies should be rated in the following three categories: degree of deficiency, prevalence, and degree of threat.

Degree of Deficiency

The percent of nonconformance should be taken into consideration when prioritizing the deficiencies. Anything considered "code deficient" should be ranked a 5. Use the following scale to rate the degree of deficiency.

0 – Elements connected and connection appears to be adequate for seismic and gravity loads.
2 – Element connected, but connection is deficient.
5 – Elements not connected to the structure to resist seismic loads.

Prevalence

It is important to recognize how many of this element is in the building. Use the following five-point scale to rate the prevalence of all deficient items.

1 – One piece of equipment, or one location, is deficient.
2 – Two pieces of equipment or locations are deficient.
3 – Three pieces of equipment or locations are deficient.
4 – Four pieces of equipment or locations are deficient.
5 – More than four pieces of equipment or locations are deficient.

Degree of Threat

Allowing for engineering judgment, the degree of threat is for including what would happen should this member fail. The threat or hazard to the occupants of the building should this element fail should be rated on the following four-point scale.

1 – The problem is not critical and will not create a falling hazard or impede egress.
2 – The problem will create a minor falling hazard but will not impeded egress nearby.
4 – The problem will create major problems and/or will impede egress from the building.

By taking the product of the three categories above (deficiency X prevalence X threat), each noncompliant item will be rated on a scale of 0 to 100, creating a Priority Ranking for each element. See an example on the following page.

XXX Elementary School **date**

Relative Priority Rating of Tier 1 Screening Deficiencies - Non-Structural Items

Ref Appendix 5 of ASD Seismic Evaluation & Retrofit Guide **(0,2,5) (1-5) (1,2,4)**

Area	Checklist	Item	Deficiency	Prevalence	Threat	Priority Rating
UNGROUPED / MISC / MAINTENANCE						
Non-Structural - All Sections	XX	24 - EDGE SUPPORT	5	5	4	100
Non-Structural - All Sections	XX	53 - TALL NARROW CONTENTS	5	2	4	40
Non-Structural - All Sections	XX	54 - FALL PRONE CONTENTS	2	4	4	32
Non-Structural - All Sections	XX	5 - SPRINKLER CEILING CLEARANCE	5	1	2	10
Non-Structural - All Sections	XX	28 - LENS COVERS	2	2	2	8
Non-Structural - All Sections	XX	25 - SEISMIC JOINTS	0	1	1	0
BOILER REPLACEMENT PROJECT						
Non-Structural - All Sections	XX	8 - HAZARDOUS MATERIAL STORAGE	5	3	4	60
Non-Structural - All Sections	XX	11 - FLEXIBLE COUPLINGS	5	2	1	10
Non-Structural - All Sections	XX	67 - FLEXIBLE COUPLINGS	2	5	1	10
Non-Structural - All Sections	XX	2 - FLEXIBLE COUPLINGS	5	1	1	5

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OCEAN VIEW ELEMENTARY SCHOOL

ASCE 41-Tier 1 Evaluations

January 2022

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Ocean View Elementary School Tier 1 Evaluation Report

1 INTRODUCTION

1.1 BACKGROUND

At the request of the Anchorage School District (ASD), PND Engineers Inc. (PND) has performed an American Society of Civil Engineers (ASCE) 41 Tier 1 Seismic evaluation of certain ASD owned buildings. Tier 1 evaluations were completed to screen the buildings for potential deficiencies in each building's ability to resist the forces induced during a seismic event. PND completed the evaluations in accordance with ASD's Publication *Seismic Evaluation and Retrofit: Guides for Existing ASD Schools* (2021) and American Society of Civil Engineers and Structural Engineering Institute (ASCE/SEI) standard *ASCE/SEI 41-17 Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 41-17).

Structural Seismic Evaluations include:

- Review of existing record building documents.
- On-site inspection of each building following ASCE 41-17 Tier 1 checklists for both structural and non-structural components.
- Completion of ASCE 41-17 Tier 1 checklists for both structural (S) and non-structural (NS) components.

This report flags items that were found to be potentially deficient per the Tier 1 analysis procedures and by engineering judgement. The scope of all investigation is limited to engineering judgement of a Tier 1 evaluation. No detailed Tier 2 or 3 evaluations were performed as part of the scope of this project, and no retrofit beyond conceptual retrofit narratives are provided.

1.2 METHODOLOGY FOR SEISMIC EVALUATION

The methods used for this evaluation follow the American Society of Civil Engineers and Structural Engineering Institute (ASCE/SEI) standard *ASCE/SEI 41-17 Seismic Evaluation and Retrofit of Existing Buildings* (ASCE/SEI 41-17). This standard is accepted nationwide as a tool for determining the expected level of performance for existing buildings during a seismic event. ASCE/SEI 41-17 outlines evaluation procedures for both the seismic force resisting systems and nonstructural components.

A seismic force resisting system, also called a lateral force resisting system (LFRS), is a system that uses vertical elements such as frames and shear walls to transfer lateral forces like wind and seismic loads to the building's foundations.

Non-structural (NS) components are items such as mechanical systems, lights, electrical fixtures, and architectural features. NS components do not contribute to the stability of the building as a whole; however, these items do have mass and will develop forces during seismic events. As a result of these forces, NS items can then fall, swing, or break, which may be hazardous. Therefore, their evaluations are required as part of a Tier 1 evaluation in accordance with ASCE 41-17.

The procedures presented in ASCE 41-17 allow for engineers to identify problem areas quickly through generalized conservative "checks". As deficiencies are identified, a more refined "check" can be triggered, elevating the tier level of the evaluation. Evaluation levels range from Tier 1: generalized, globalized and conservative; to Tier 3: specific, global, and precise. Tier 1 is a screening tool used to determine if, or where, a building may have deficiencies. As the Tier increases, analysis becomes more thorough, and may remain global, or become more specific to a deficiency found in the previous screening process. A brief overview of each level of analysis is given below:

- Tier 1: ASCE/SEI 41-17 defines Tier 1 as "completion of checklists of evaluation statements that identify potential deficiencies in a building based on performance of similar buildings in the past." The checklists consist of common design practices that were once standard but are now known to result in deficiencies in a buildings performance during a seismic event. Each checklist contains statements that are marked: "Compliant", "Non-Compliant", "Not Applicable", and "Unknown". These checklists involve quick check calculations that look at the broad picture of the building to allow for fast evaluations. Items marked as Non-Compliant are not necessarily deficient: the Non-Compliant status means that the corresponding item will need to be further evaluated in additional Tiers.
- Tier 2: ASCE/SEI 41-17 defines Tier 2 as "an approach applicable to certain types of buildings and performance objectives based on specific evaluation of potential deficiencies that may require mitigation. Analysis and response of the entire building may not be required". This may involve examining the building as a whole, or focusing in solely on deficiencies found in the Tier 1 screening. For a full building evaluation, a simplified computer model of the current building is often developed. For a component-level evaluation, a smaller scale, more detailed analysis that focuses only on the identified deficiency areas is provided.
- Tier 3: ASCE/SEI 41-17 defines Tier 3 as "an approach to evaluation in which complete analysis of the response of the building to seismic hazards is performed implicitly or explicitly recognizing non-linear response". This level of evaluation requires detailed computer modeling and analysis of the entire building. An advantage of performing a full Tier 3 analysis is that this type of analysis is less conservative. Therefore, items identified as deficient under Tier 1 or 2 may be found to be satisfactory. Very complex or highly irregular buildings may automatically trigger this level of analysis, as ASCE 41-17 limits the applicability of Tier 1 and Tier 2 analyses.

The ASD has determined the scope of work for this report to be the ASCE/SEI 41 Tier 1 evaluations. This Tier 1 evaluation includes the non-structural items checklists. Per ACSE 41-17, a "Non-Compliant" element found during a Tier 1 investigation does not necessarily indicate deficiency, but may trigger a higher level of analysis. PND performed a scoring of the school in accordance with ASD Seismic Evaluation and Retrofit Guide. This scoring is intended to act as and aid to ASD in prioritizing repairs. A conceptual level narrative of possible repairs to deficient items is included as a part of this report. However, cost estimates for these repairs are not included with this report.

1.3 Seismic Conditions

The specific design short-period and one-second period spectral ground accelerations for the Maximum Considered Earthquake (MCE) are summarized with the design criteria in table 2.3.1. The accelerations present in Anchorage put the schools in the category of "high" seismicity in accordance with ASCE/SEI 41-17. Another factor determining the seismicity of a site is the soil or site classification. The Site Class is a description of soil properties at a specific site. This ranges from Site Class A, hard rock, to Site Class F, a

very soft clay soil profile. Soil-structure interaction effects can be significant, but interactions between the soil and structure can be very difficult to analyze, so conservative soil properties are provided by code to simplify this interaction. As geotechnical data is limited, a soil classification of D was assumed.

1.4 Performance Objectives

The ASCE/SEI 41 standard relies on Basic Performance Objectives for Existing Buildings (BPOE). This sets a standard of performance for the building during a seismic event. In this type of evaluation, the desired level of performance is evaluated for a particular level of earthquake to determine if the building performance is adequate.

Three levels of earthquake are considered:

- BSE-2E Is an earthquake with an expected probability of return of 5% in 50 years. This would result in an earthquake with a magnitude of approximately M8. After an earthquake of this magnitude major roadway damage, loss of utilities and moderate building damage is expected.
- BSE-1E is a smaller earthquake with an expected probability of return of 20% in 50 years. This would result in an earthquake of a magnitude of approximately M6. This magnitude of earthquake is not uncommon in the Anchorage School District area. Although it would likely cause alarm, cracks in wall sheathing, and damage to non-structural components, it is not likely for this level of earthquake to cause significant damage to structures, roads, or utilities.
- BSE-1N is a level of earthquake that is two thirds of the maximum considered earthquake. This is the standard level used for new designs. This level of earthquake would result in an approximate M7 magnitude. After an earthquake of this magnitude, it would be expected to see roadway damage, ground cracking, damage to houses, utilities, and other buildings.

The target level of performance chosen by the ASD is Damage Control (S-2) at a BSE-1N level seismic event, or a rating 125% (Risk Category III). However, all “quick checks” and evaluations are to be done for a BSE-2E, limited safety performance (S-4), or rating 60%, per ASD standard. Safety performance levels are defined as follows:

- *Immediate Occupancy (S-1)* – The structure will retain the pre-earthquake strength and stiffness and can be utilized immediately. Few to no injuries should occur to persons within the structure due to building failure.
- *Damage Control (S-2)* – Some damage will occur to the building, with small permanent drift. Damage should be economical to repair. The building is capable of being occupied following shaking, but damage should be addressed as soon as feasible.
- *Life Safety (S-3)* – Moderate damage will be present in the building, with some residual strength left in the elements. Minor permanent drift will be present. The building may be beyond economical repair. Injuries due to structural failure should be few.
- *Limited Safety (S-4)* – Moderate to severe damage. The building will have permanent drift and will be beyond economical repair. The building should not be reused following an earthquake. Damage to the structure may cause injuries or obstacles to evacuation, but these should be minor.
- *Collapse Prevention (S-5)* – Severe damage is present throughout the structure. Little residual strength and stiffness remains, but load-bearing columns and walls should function. Large permanent drifts exist in the structure and exits may be blocked. The building is near collapse. This is a hazard to human safety and will not be reusable. Risk of injury due to structural damage is high.

To evaluate the structures for this level of performance, the collapse prevention checklists were used and modification factors were interpolated to reflect the S-4 safety level as required. Ranking was then determined at BSE-2E accelerations, with a S-4 modification factor. Per ASCE 41-17 a BSE-2E ranking can be converted to a BSE-1N event by multiplying by a ratio of the BSE-1N design acceleration to BSE-2E design acceleration. A BSE-2E, S-4 converted to a BSE-1N ranks approximately 80%, ranking overall between limited safety, S-4 (60%), and life safety, S-3 (100%).

1.5 Non-Structural Evaluations

Nonstructural components are evaluated for two different performance levels. The first is hazard reduced (N-D) using a BSE-2E level seismic event. Hazards reduced means “non-structural elements are damaged and potentially create falling hazards, but high-hazard nonstructural components are secured to prevent falling into areas of public assembly”. The second performance level is position retention (N-B) using a BSE-1N level seismic event. Position retention means “non-structural components might be damaged to the extent that they cannot immediately function but are secured in place so that damage is avoided”.

2 BUILDING DESCRIPTION

2.1 GENERAL

Ocean View Elementary School was constructed in 1970. The original building is Concrete Masonry Unit (CMU) construction. In 1993 a gym was added to the structure along with new mechanical and fan rooms. The final addition was added to the school in 1999. This addition added six classrooms to the structure as well as a new fan room on the roof of the original structure. The classroom and gym additions were constructed out of CMU and were tied to the original structure. The additional fan room is constructed out of concentric steel frames and is located on the roof of the original structure.



Figure 2-1 Ocean View Building Configuration

2.2 As-Built Drawings & Documentation

Anchorage School District provided "as-built" documentation for review of the building's existing conditions. PND performed a detailed review of drawings that pertained to the original structure and structural modifications that were made after the original construction. The following is a list of drawings reviewed by PND:

- *Ocean View Elementary School, Anchorage Borough School District*, Kenneth Maynard Architect, 1980 September
- *Gymnasium Addition Ocean View Elementary School, Anchorage School District,* Alaska Architects, 1993 February 10
- *Ocean View Elementary School Renovation and Addition, Anchorage School District Anchorage Alaska,* Architects Alaska, 1999 July 29

2.3 Original Design Criteria and Design Codes

The following table includes both current and original design criteria. Original design criteria are based on provided record drawings.

Building Section	Original Building Code	Roof Snow	Wind	Seismic
1970 Original Building	1967 UBC	40 psf	q_s = 25 psf	Zone 3
1993 Gymnasium Addition	1991 UBC	40 psf + drift	100 mph, Exp. B, q_s = 26 psf, I_w = 1.0	Zone 4, Z = 0.4, R_w=6, I_e=1.25, C=2.75
1999 Addition	1997 UBC	40 psf + drift	100 mph, Exp. B, q_s = 25.6 psf, Iw = 1.15	Zone 4, Z = 0.4, Rw=6, Ie=1.25, C=2.75, V=0.23W, 1994 UBC
Current Code	2018 IBC (ASCE 7-16) Risk Cat. III	40 psf min plus drifting Is = 1.10	150 mph, Exp. B (LRFD), qz (ASD) = 30.36psf * 0.6 = 18.2 psf	S_s= 1.50g S_1= 0.677g SDC=D, I_e=1.25 R=5, V=0.25w

Table 1-1 Design Criteria

2.4 GEOTECHNICAL DATA

No geotechnical report of the site was available for review. The building is on the MOA-published Seismically Induced Ground Failure Susceptibility Map for Anchorage. Based on the map, this school is located in Zone 1 (Appendix D). Zone 1 is labeled as Lowest Ground Failure Susceptibility, with no risk of landslide. The structure appears to be performing well: neither distress nor settlement were detected during PND's inspection. PND does not believe that any further geotechnical investigation needs to be completed at this time.

2.5 BUILDING TYPE

Ocean View Elementary School is composed an original structure with 2 additions. The building type for the original structure and the gym addition is reinforced masonry shear walls. The second addition also consists mainly of reinforced masonry shear walls. There is a fan room on the roof of the original structure that is constructed with steel concentric braced frames. The checklists that pertain to this building are the type RM1 and RM2 and type S2 and S2a. RM1 & RM2 buildings have a lateral force resisting system composed of reinforced concrete masonry unit (CMU) shear walls. RM1 structures have flexible diaphragms where RM2 structures have stiff diaphragms. The diaphragms throughout the structure are typically flexible because the roof is composed of trusses or joists with steel decking. However, the deck is topped with concrete at the mechanical equipment rooms to provide a stiff diaphragm. Type S2 and S2a buildings are buildings that have a frame of steel columns beams and braces where the braces develop the resistance of the seismic forces by the bracing action of the diagonal members. The 1999 addition of that includes reinforced masonry (RM1) and Steel Braced frames (S2) is considered benchmark. Benchmark buildings are buildings that were designed after a time in which the code is considered to have provided adequate seismic resistance. The code does not require that checklists be completed for benchmark buildings, therefore no checklists for the 1999 additions will be completed.

2.6 SITE VISIT

PND Engineers performed an on-site evaluation of Ocean View Middle School on December 15th, 2021 at 11911 Johns Road in Anchorage. The purpose of the site evaluation was to confirm that "as-built" documents accurately represented the building practices used during construction. This visit was necessary for completion of Tier 1 checklists.

The additional focus of the December 15th inspection was to evaluate NS components for Tier 1 checklists, since these components will often change throughout the lifetime of the structure. The site visit only provides as snapshot of current NS components and their status.

3 SEISMIC EVALUATION RESULTS

Per ASCE 41-17 and ASD, the buildings were analyzed at the Limited Safety level of performance for the BSE-2E earthquake. This level of performance requires that the "Collapse Prevention" Checklists be used with a modification factor that is the average between Life Safety and Collapse prevention. The results from the required checklists are summarized below.

3.1 BASIC CONFIGURATION

The ASCE 41-17 basic configuration checklists was completed for the building. These checklists are titled "*Table 17-1. Very Low Seismicity Checklist*" and "*Table 17-2. Collapse Prevention Basic Configuration Checklist.*" The following items were marked Non-Compliant or Unknown. Non-Compliant or Unknown markings do not necessarily indicate deficiency, but that a higher level of analysis may need to be performed. This checklist was completed for the structure as a whole. The checklists for each building type were completed for each addition.

Of (16) Checklist items (ASCE 41-17 Table 17-1 and Table 17-2) items, no items were found Non-Compliant and (2) items were found to be Unknown.

3.1.1. TORSION; TABLE 17-2(09)

This item requires that the distance between the story center of mass and the story center of rigidity be less than 20% of the building width in either plan dimension. This item is marked as Unknown. This building does not have a regular shape in plan, and multiple additions that have been tied to the structure:- therefore, it is unknown if the center of mass is close enough to the center of gravity to be considered compliant. Determining the offset for torsion of a complex building requires building a computer model of the entire structure to determine the center of rigidity. This level of computer analysis and modeling is outside of the scope of a Tier 1 analysis and will require further analysis at Tier 2 or Tier 3 levels.

RECOMMENDATIONS

Further analysis should be conducted to determine the effects of torsion on the building's lateral force resisting system.

3.1.2 LIQUEFACTION; TABLE 17-2 (10)

The risk of liquefaction of the soils on site is Unknown. No existing geotechnical reports for the site were available for review. No soil studies were done as part of the scope of this project.

RECOMMENDATIONS

Further geotechnical study should be performed to verify that liquefaction is not a concern.

3.2 ORIGINAL CONSTRUCTION COLLAPSE PREVENTION STRUCTURAL CHECKLISTS

Structural evaluations were primarily conducted based on provided as-built documents. However, some structural observations were made during the on-site visit to verify the building was built in accordance with design documents and to clarify items noted during the evaluation that were not clearly indicated in the plans.

3.2.1 Collapse Prevention Structural Checklist for Building Type RM1 and RM2

The Collapse Prevention checklist was completed for the building. This checklist is titled "Table 17-34. Collapse Prevention Structural Checklist for Building Types RM1 and RM2". The following items were marked Non-Compliant or Unknown. Non-Compliant or Unknown markings do not necessarily indicate deficiency, but that a higher level of analysis may need to be performed.

Of (20) Checklist items (ASCE 41-17 Table 17-34) items, (1) item was found to be Non-Compliant. No items were found to be Unknown.

3.2.1.*1*. *Reinforcing Steel*; Table 17-34 (03)

This item requires that the vertical and horizontal reinforcing steel volume be greater than .002 of the total wall volume and be spaced at less than 48 inches O.C. Sheet S1 of the original structure details the CMU walls' reinforcement. The drawings show the 6-inch walls have horizontal reinforcing spaced at 56 inches on center. This is greater than the allowable 48-inch spacings. The 8-inch interior walls have a reinforcing ratio of less than 0.002; they are Non-Compliant. The 8-inch exterior walls were found to be Compliant. Therefore, this item is Non-Complaint as a whole.

Recommendations

The reinforcement is not up to the current standards. Each wall should be further analyzed to determine if it has the adequate strength to resist the seismic loads induced by the structure. If the wall does not have the required strength, additional reinforcement may need to be added. This may be done with reinforcing placed on the exterior of walls called Fiber Reinforced Polymer (FRP).

3.3 1993 Gymnasium Addition Collapse Prevention Structural Checklists

Structural evaluations were primarily conducted based on provided as-built documents. However, some structural observations were made during the on-site visit to verify the building was built in accordance with design documents and to clarify items noted during the evaluation that were not clearly indicated in the plans.

3.3.1 Collapse Prevention Structural Checklist for Building Type RM1 and RM2

The Collapse Prevention checklist was completed for this portion of the building. This checklist is titled "Table 17-34. Collapse Prevention Structural Checklist for Building Types RM1 and RM2". The following items were marked Non-Compliant or Unknown. Non-Compliant or Unknown markings do not necessarily indicate deficiency, but that a higher level of analysis may need to be performed.

Of (20) Checklist items (ASCE 41-17 Table 17-34) items, (1) item was Non-Compliant.

3.3.1.1. Shear Stress Check; Table 17-34 (02)

This Item requires that the shear stress in the reinforced masonry walls be less than 70 pounds per inch. The shear stress in the worst-case wall was found to be approximately 95 pounds per inch. Therefore, this item is Non-Compliant.

Recommendations

It is recommended that the lateral system be reviewed further to determine if the walls provide adequate resistance. If the walls are deficient, repairs may require adding additional shear resistance through new walls or adding reinforcement to the existing walls through Fiber Reinforced Polymer.

3.4 NONSTRUCTURAL CHECKLIST

At the request of ASD, PND completed non-structural Tier 1 evaluations. This checklist is titled "Table 17-38. Nonstructural Checklist". The following items were marked Non-Compliant or Unknown.

Of (83) Checklist items (ASCE 41-17 Table 17-1 and Table 17-2) items, (7) items were Non-Compliant and (1) Items were Unknown.

3.4.1 HAZARDOUS MATERIALS FLEXIBLE COUPLINGS; TABLE 17-38 (11)

This item requires that ductwork or piping that carries hazardous materials, such as natural gas, has flexible couplings. The gas line in Boiler Room 194 does not have flexible couplings, and is Non-Compliant. (APPENDIX B Figure B-1).

RECOMMENDATIONS

Flexible couplings shall be added to the pipes that carry natural gas or other hazardous materials.

3.4.2 EDGE CLEARANCE; TABLE 17-38 (22)

This item requires that the free edges of integrated suspended ceilings have clearances from the enclosing walls or partitions of at least ¾ inch in areas of heigh seismicity. No edge clearance was observed (APPENDIX B Figure B-2).

RECOMMENDATIONS

The ceiling grid system should be updated to include a ¾-inch clearance around the edges.

3.4.3 EDGE SUPPORT; TABLE 17-38 (24)

This item requires that the free edges of integrated suspended ceilings be supported by closure angles or channels no less than 2 inches wide. No 2-inch closure angles were observed (APPENDIX B Figure B-2).

RECOMMENDATIONS

The ceiling grid system should be updated to include 2-inch closure angles.

3.4.4 OVERHEAD GLAZING; TABLE 17-38 (36)

This item requires that window panes in curtain walls, as well as panes greater than 16 square feet, be laminated annealed or laminated heat-strengthened glass. Several windows throughout the building are larger than 16 square feet. This item is marked Unknown because PND was unable to determine the type of glass that was used. This is something that would require destructive testing or a site visit from an expert glazier to determine if this item is compliant. However, this is outside of the scope of this report and is left as Unknown.

RECOMMENDATIONS

The glazing shall be evaluated by a qualified glazing contractor to accurately determine its type. Any glass found not to be laminated annealed or laminated heat-strengthened glass shall be replaced.

3.4.5 TALL NARROW CONTENTS; TABLE 17-38 (54)

This item requires items that are over 6 feet tall with a width-to-depth ratio greater than 3:1 be anchored to the structure or each other. Items frequently considered tall narrow contents are tall bookshelves or

storage shelves. Several rooms contained Non-Compliant contents: rooms 191, 190, 189, 181, 159, 177, 173, 140, 145, 154, 130, 201 (APPENDIX B Figure B-3).

RECOMMENDATIONS

These shelves should be tied to their adjacent walls. Additionally, ASD should perform a thorough maintenance check to determine if any other shelves require restraint and provide it.

3.4.6 FALL-PRONE CONTENTS; TABLE 17-38 (55)

This item requires that items weighing more than 20 pounds and stored at a height of over 4 feet should be restrained from falling. Items that are potentially non-conforming to this requirement were found in Rooms 135, 116, and 112 (APPENDIX B Figure B-4).

RECOMMENDATIONS

Items weighing over 20 pounds should be moved to shelves lower than 4 feet above the floor.

3.4.7 PIPING FLEXIBLE COUPLINGS; TABLE 17-38 (68)

This item requires that ductwork or piping that carries fluid and gas has flexible couplings. The gas line in Boiler Room 194 does not have flexible couplings. Fluid piping in Mechanical Room 203 does not have flexible couplings. Therefore, this item in Non-Compliant (APPENDIX B Figure B-5).

RECOMMENDATIONS

Flexible couplings shall be added to the pipes that carry fluid or gas.

3.4.8 DUCT BRACING; TABLE 17-38 (72)

This item requires that ducts with cross sections larger than 6 square feet have transverse bracing at a minimum of 30 feet and longitudinal bracing at 60 feet. A section of duct work in Mechanical Room 205 does not appear to have transverse bracing. (APPENDIX B Figure B-6).

RECOMMENDATIONS

The bracing should be revised to provide resistance to transverse forces. This could involve adding a kicker to the existing hanger.

3.5 NON-CHECKLIST STRUCTURAL OBSERVATIONS

Beyond the scope of the ASCE 41-17 Tier 1 evaluations, engineers observed conditions for which the Tier 1 parameters did not apply but comments to ASD were justified. This condition assessment is based solely on engineering judgement. It identifies items not captured in the Tier 1 evaluation.

3.5.1 CMU CRACKING AT EXTERIOR WALLS

Extensive cracking is visible on the exterior of the CMU walls. This cracking is typical of the walls on the original structure (APPENDIX B Figure B-7 & B-8). This cracking is likely due to a lack of control joints. CMU walls should have control joints approximately every twenty to thirty feet. No control joints were visible in the original portions of the buildings. Control joints allow the walls to expand and contract throughout the life of the structure due to temperature changes. This cracking does not indicate any damage or diminished strength in the wall, so at this time no repairs are recommended.

APPENDIX A – ASD TIER 1 PRIORITY RANKINGS

TABLE A-1 RELATIVE PRIORITY RATING OF TIER 1 SCREENING DEFICIENCIES - STRUCTURAL ITEMS

Ocean View Elementary Ranked Deficiencies Jan-22
Relative Priority Rating of Tier 1 Screening Deficiencies - Structural Items
Ref Appendix 4 of ASD Seismic Evaluation & Retrofit Guide

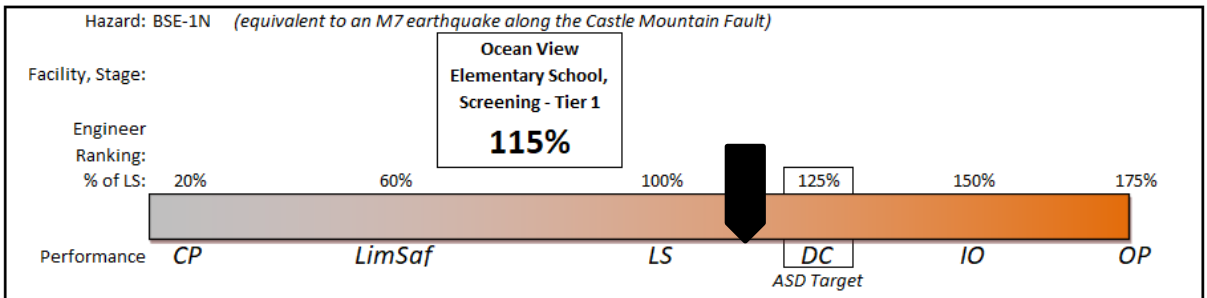
			(0-5)	(1-5)	(1-4)	
Area	Checklist	Item	Deficiency	Prevalence	Threat	Priority Rating
Structural Items						
Overall Building	17-2	09 - Torsion - **Unknown**	5	5	4	100
Overall Building	17-2	10 - Liquefaction - **Unknown**	5	5	4	100
Original Portion	17-34	03 - Reinforcing Steel	5	2	3	30
1993 Gym Addition	17-34	02 - Shear Stress Check	3	2	3	18

TABLE A-2 RELATIVE PRIORITY RATING OF TIER 1 SCREENING DEFICIENCIES - NON-STRUCTURAL ITEMS

Ocean View Elementary School 22-Jan
Relative Priority Rating of Tier 1 Screening Deficiencies - Non-Structural Items
Ref Appendix 5 of ASD Seismic Evaluation & Retrofit Guide

			(0,2,5)	(1-5)	(1,2,4)	
Area	Checklist	Item	Deficiency	Prevalence	Threat	Priority Rating
UNGROUPED / MISC / MAINTENANCE						
Non-Structural - All Sections	17-38	11 - Flexible Couplings - Hazardous Materials	5	4	4	80
Non-Structural - All Sections	17-38	36 -Overhead Glazing - **Unknown**	5	5	2	50
Non-Structural - All Sections	17-38	54 - Tall Narrow Contents	5	5	2	50
Non-Structural - All Sections	17-38	55 - Fall Prone Contents	5	3	2	30
Non-Structural - All Sections	17-38	22 - Edge Clearance	2	5	2	20
Non-Structural - All Sections	17-38	24 - Edge Support	2	5	2	20
Non-Structural - All Sections	17-38	68 - Flexible Couplings - Piping	5	1	4	20
Non-Structural - All Sections	17-38	72 - Duct Bracing	5	1	2	10

TABLE A-3 OVERALL BUILDING PERFORMANCE LEVEL



Notes:

1. CP = Collapse Prevention; LimSaf = Limited Safety; LS = Life Safety; DC = Damage Control; IO = Immediate Occupancy; OP = Operational.

2. The "Engineer Ranking" indicated above is a qualitative assessment based on the extent of noncompliant items identified in a Tier 1 Screening and the experience of the Engineer. No published standard for the quantitative assessment of existing buildings is used, other than ASCE-41. The assignment of CP=20%, LimSaf=60%, LS=100%, DC=125%, IO=150% and OP=175% is at the discretion of ASD. The target ranking of all ASD facilities is 125% (Damage Control at BSE-1N).

3. Engineer to adjust 'engineer ranking' row to place a percentage calculated for this facility, centered above the range where that percentage lies on the scale.

APPENDIX B – SITE VISIT PHOTOS



Figure B-1: Hazardous Material Piping without Flexible Couplings



Figure B-2: Ceiling System Without ¾” Edge Clearance or 2” Edge Support



Figure B-3: Example of Unrestrained Tall-Narrow Contents, Room 154



Figure B-4: Example of Fall Prone Contents, Room 116



Figure B-5: Pipe Carrying Fluid Without Flexible Couplings, Mech Room 205



Figure B-6: Duct with Improper Bracing, Mech Room 205



Figure B-7: Cracking in Exterior CMU Wall, Typical



Figure B-8: Cracking in Exterior CMU Wall, Typical

APPENDIX C – ASCE 41-17 TIER 1 CHECKLISTS

C-1 TABLE 17-1 & 17-2 ORIGINAL BUILDING COLLAPSE PREVENTION BASIC CONFIGURATION CHECKLIST

Table 17-1. Very Low Seismicity Checklist

	Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
	Structural Components			
01	C NC N/A U	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.	5.4.1.1	A.2.1.1
02	C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have adequate strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

Table 17-2. Collapse Prevention Basic Configuration Checklist

	Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
	Low Seismicity			
	Building System—General			
01	C NC N/A U	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.	5.4.1.1	A.2.1.1
02	C NC N/A U	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.	5.4.1.2	A.2.1.2
03	C NC N/A U	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3
	Building System—Building Configuration			
04	C NC N/A U	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.	5.4.2.1	A.2.2.2
05	C NC N/A U	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.	5.4.2.2	A.2.2.3
06	C NC N/A U	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4
07	C NC N/A U	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.	5.4.2.4	A.2.2.5
08	C NC N/A U	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.	5.4.2.5	A.2.2.6
09	C NC N/A U	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.	5.4.2.6	A.2.2.7

continues

Table 17-2 *(Continued)*. Collapse Prevention Basic Configuration Checklist

	Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
		Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)		
		Geologic Site Hazards		
10	**C NC N/A U**	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.	5.4.3.1	A.6.1.1
11	**C NC N/A U**	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.	5.4.3.1	A.6.1.2
12	**C NC N/A U**	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3
		High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)		
		Foundation Configuration		
13	**C NC N/A U**	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 $0.6S_a$.	5.4.3.3	A.6.2.1
14	**C NC N/A U**	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.	5.4.3.4	A.6.2.2

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

C-2 TABLE 17-34 BUILDING TYPE RM1 & RM2 COLLAPSE PREVENTION CHECKLIST – ORIGINAL STRUCTURE

	Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
	Low and Moderate Seismicity			
	Seismic-Force-Resisting System			
01	**C** NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
02	**C** NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
03	C **NC** N/A U	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2
04	**Stiff Diaphragms**			
	C NC **N/A** U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1
	Connections			
05	**C** NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
06	**C** NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2
07	**C** NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
08	C NC **N/A** U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
09	**C** NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5
10	**C** NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
	High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)			
	Stiff Diaphragms			
11	**C** NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
12	**C** NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
	Flexible Diaphragms			
13	**C** NC N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2
14	**C** NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
15	**C** NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
16	C NC **N/A** U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
17	C NC **N/A** U	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
18	C NC **N/A** U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
19	**C** NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
	Connections			
20	**C** NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

C-3 TABLE 17-34 BUILDING TYPE RM1 & RM2 COLLAPSE PREVENTION CHECKLIST – GYM ADDITION

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

	Status	Evaluation Statement	Tier 2 Reference	Commentary Reference
		Low and Moderate Seismicity		
		Seismic-Force-Resisting System		
01	C NC N/A U	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1
02	C NC N/A U	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1
03	C NC N/A U	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2
04		**Stiff Diaphragms**		
	C NC N/A U	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1
		Connections		
05	C NC N/A U	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1
06	C NC N/A U	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2
07	C NC N/A U	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1
08	C NC N/A U	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3
09	C NC N/A U	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5
10	C NC N/A U	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1
		High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)		
		Stiff Diaphragms		
11	C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
12	C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
		Flexible Diaphragms		
13	C NC N/A U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2
14	C NC N/A U	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4
15	C NC N/A U	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6
16	C NC N/A U	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1
17	C NC N/A U	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2
18	C NC N/A U	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3
19	C NC N/A U	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1
		Connections		
20	C NC N/A U	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4

Note: C = Compliant, NC = Noncompliant, N/A = Not Applicable, and U = Unknown.

C-5 TABLE 17-38 NON-STRUCTURAL CHECKLIST

Table 17-38. Nonstructural Checklist

	Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
	Life Safety Systems			
01	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13.	13.7.4	A.7.13.1
02	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13.	13.7.4	A.7.13.2
03	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced.	13.7.7	A.7.12.1
04	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints.	13.7.6	A.7.14.1
05	C NC N/A U	**HR—not required; LS—MH; PR—MH**. SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13.	13.7.4	A.7.13.3
06	C NC N/A U	**HR—not required; LS—not required; PR—LMH**. EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced.	13.7.9	A.7.3.1
	Hazardous Materials			
07	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers.	13.7.1	A.7.12.2
08	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods.	13.8.3	A.7.15.1
09	C NC N/A U	**HR—MH; LS—MH; PR—MH**. HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release.	13.7.3 13.7.5	A.7.13.4
10	C NC N/A U	**HR—MH; LS—MH; PR—MH**. SHUTOFF VALVES: Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks.	13.7.3 13.7.5	A.7.13.3
11	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings.	13.7.3 13.7.5	A.7.15.4
12	C NC N/A U	**HR—MH; LS—MH; PR—MH**. PIPING OR DUCTS CROSSING SEISMIC JOINTS: 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.	13.7.3 13.7.5 13.7.6	A.7.13.6
	Partitions			
13	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. UNREINFORCED MASONRY: 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.	13.6.2	A.7.1.1
14	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1
15	C NC N/A U	**HR—not required; LS—MH; PR—MH**. DRIFT: 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.	13.6.2	A.7.1.2
16	C NC N/A U	**HR—not required; LS—not required; PR—MH**. LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1
17	C NC N/A U	**HR—not required; LS—not required; PR—MH**. STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints.	13.6.2	A.7.1.3

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

	Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
18	C NC N/A U	**HR—not required; LS—not required; PR—MH.** TOPS: 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).	13.6.2	A.7.1.4
	Ceilings			
19	C NC N/A U	**HR—H; LS—MH; PR—LMH.** SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3
20	C NC N/A U	**HR—not required; LS—MH; PR—LMH.** SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3
21	C NC N/A U	**HR—not required; LS—not required; PR—MH.** INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) 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.	13.6.4	A.7.2.2
22	C NC N/A U	**HR—not required; LS—not required; PR—MH.** EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) 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).	13.6.4	A.7.2.4
23	C NC N/A U	**HR—not required; LS—not required; PR—MH.** CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures.	13.6.4	A.7.2.5
24	C NC N/A U	**HR—not required; LS—not required; PR—H.** EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) are supported by closure angles or channels not less than 2 in. (51 mm) wide.	13.6.4	A.7.2.6
25	C NC N/A U	**HR—not required; LS—not required; PR—H.** SEISMIC JOINTS: 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 ft^2 (232.3 m^2) and has a ratio of long-to-short dimension no more than 4-to-1.	13.6.4	A.7.2.7
	Light Fixtures			
26	C NC N/A U	**HR—not required; LS—MH; PR—MH.** INDEPENDENT SUPPORT: 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.	13.6.4 13.7.9	A.7.3.2
27	C NC N/A U	**HR—not required; LS—not required; PR—H.** PENDANT SUPPORTS: 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.	13.7.9	A.7.3.3
28	C NC N/A U	**HR—not required; LS—not required; PR—H.** LENS COVERS: Lens covers on light fixtures are attached with safety devices.	13.7.9	A.7.3.4
	Cladding and Glazing			
29	C NC N/A U	**HR—MH; LS—MH; PR—MH.** CLADDING ANCHORS: Cladding components weighing more than 10 lb/ft^2 (0.48 kN/m^2) 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)	13.6.1	A.7.4.1

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

	Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
30	C NC N/A U	**HR—not required; LS—MH; PR—MH**. CLADDING ISOLATION: 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.	13.6.1	A.7.4.3
31	C NC N/A U	**HR—MH; LS—MH; PR—MH**. MULTI-STORY PANELS: 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.	13.6.1	A.7.4.4
32	C NC N/A U	**HR—not required; LS—MH; PR—MH**. THREADED RODS: 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.	13.6.1	A.7.4.9
33	C NC N/A U	**HR—MH; LS—MH; PR—MH**. PANEL CONNECTIONS: 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.	13.6.1.4	A.7.4.5
34	C NC N/A U	**HR—MH; LS—MH; PR—MH**. BEARING CONNECTIONS: Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel.	13.6.1.4	A.7.4.6
35	C NC N/A U	**HR—MH; LS—MH; PR—MH**. INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel.	13.6.1.4	A.7.4.7
36	C NC N/A U	**HR—not required; LS—MH; PR—MH**. OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft^2 (1.5 m^2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked.	13.6.1.5	A.7.4.8
	Masonry Veneer			
37	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft^2 (0.25 m^2), 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).	13.6.1.2	A.7.5.1
38	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor.	13.6.1.2	A.7.5.2
39	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing.	13.6.1.2	A.7.5.3
40	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup.	13.6.1.1 13.6.1.2	A.7.7.2
41	C NC N/A U	**HR—not required; LS—MH; PR—MH**. STUD TRACKS: For veneer with cold-formed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center.	13.6.1.1 13.6.1.2	A.7.6.1

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

	Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
42	C NC N/A U	**HR—not required; LS—MH; PR—MH**. ANCHORAGE: 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.	13.6.1.1 13.6.1.2	A.7.7.1
43	C NC N/A U	**HR—not required; LS—not required; PR—MH**. WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing.	13.6.1.2	A.7.5.6
44	C NC N/A U	**HR—not required; LS—not required; PR—MH**. OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings.	13.6.1.1 13.6.1.2	A.7.6.2
	Parapets, Cornices, Ornamentation, and Appendages			
45	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thickness 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.	13.6.5	A.7.8.1
46	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. CANOPIES: 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).	13.6.6	A.7.8.2
47	C NC N/A U	**HR—H; LS—MH; PR—LMH**. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement.	13.6.5	A.7.8.3
48	C NC N/A U	**HR—MH; LS—MH; PR—LMH**. APPENDAGES: 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.	13.6.6	A.7.8.4
	Masonry Chimneys			
49	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. URM CHIMNEYS: 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.	13.6.7	A.7.9.1
50	C NC N/A U	**HR—LMH; LS—LMH; PR—LMH**. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof.	13.6.7	A.7.9.2
	Stairs			
51	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. STAIR ENCLOSURES: 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.	13.6.2 13.6.8	A.7.10.1
52	C NC N/A U	**HR—not required; LS—LMH; PR—LMH**. STAIR DETAILS: 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.	13.6.8	A.7.10.2
	Contents and Furnishings			
53	C NC N/A U	**HR—LMH; LS—MH; PR—MH**. INDUSTRIAL STORAGE RACKS: 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.	13.8.1	A.7.11.1

continues

Table 17-38 *(Continued)*. Nonstructural Checklist

	Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
54	C NC N/A U	**HR—not required; LS—H; PR—MH**. TALL NARROW CONTENTS: 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.	13.8.2	A.7.11.2
55	C NC N/A U	**HR—not required; LS—H; PR—H**. FALL-PRONE CONTENTS: 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.	13.8.2	A.7.11.3
56	C NC N/A U	**HR—not required; LS—not required; PR—MH**. ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced.	13.6.10	A.7.11.4
57	C NC N/A U	**HR—not required; LS—not required; PR—MH**. EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor.	13.7.7 13.6.10	A.7.11.5
58	C NC N/A U	**HR—not required; LS—not required; PR—H**. SUSPENDED CONTENTS: 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.	13.8.2	A.7.11.6
	Mechanical and Electrical Equipment			
59	C NC N/A U	**HR—not required; LS—H; PR—H**. FALL-PRONE EQUIPMENT: 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.	13.7.1 13.7.7	A.7.12.4
60	C NC N/A U	**HR—not required; LS—H; PR—H**. IN-LINE EQUIPMENT: 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.	13.7.1	A.7.12.5
61	C NC N/A U	**HR—not required; LS—H; PR—MH**. TALL NARROW EQUIPMENT: 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.	13.7.1 13.7.7	A.7.12.6
62	C NC N/A U	**HR—not required; LS—not required; PR—MH**. MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01.	13.6.9	A.7.12.7
63	C NC N/A U	**HR—not required; LS—not required; PR—H**. SUSPENDED EQUIPMENT: 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.	13.7.1 13.7.7	A.7.12.8
64	C NC N/A U	**HR—not required; LS—not required; PR—H**. VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning.	13.7.1	A.7.12.9
65	C NC N/A U	**HR—not required; LS—not required; PR—H**. HEAVY EQUIPMENT: Floor-supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure.	13.7.1 13.7.7	A.7.12.10
66	C NC N/A U	**HR—not required; LS—not required; PR—H**. ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure.	13.7.7	A.7.12.11
67	C NC N/A U	**HR—not required; LS—not required; PR—H**. CONDUIT COUPLINGS: 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.	13.7.8	A.7.12.12
	Piping			
68	C NC N/A U	**HR—not required; LS—not required; PR—H**. FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings.	13.7.3 13.7.5	A.7.13.2

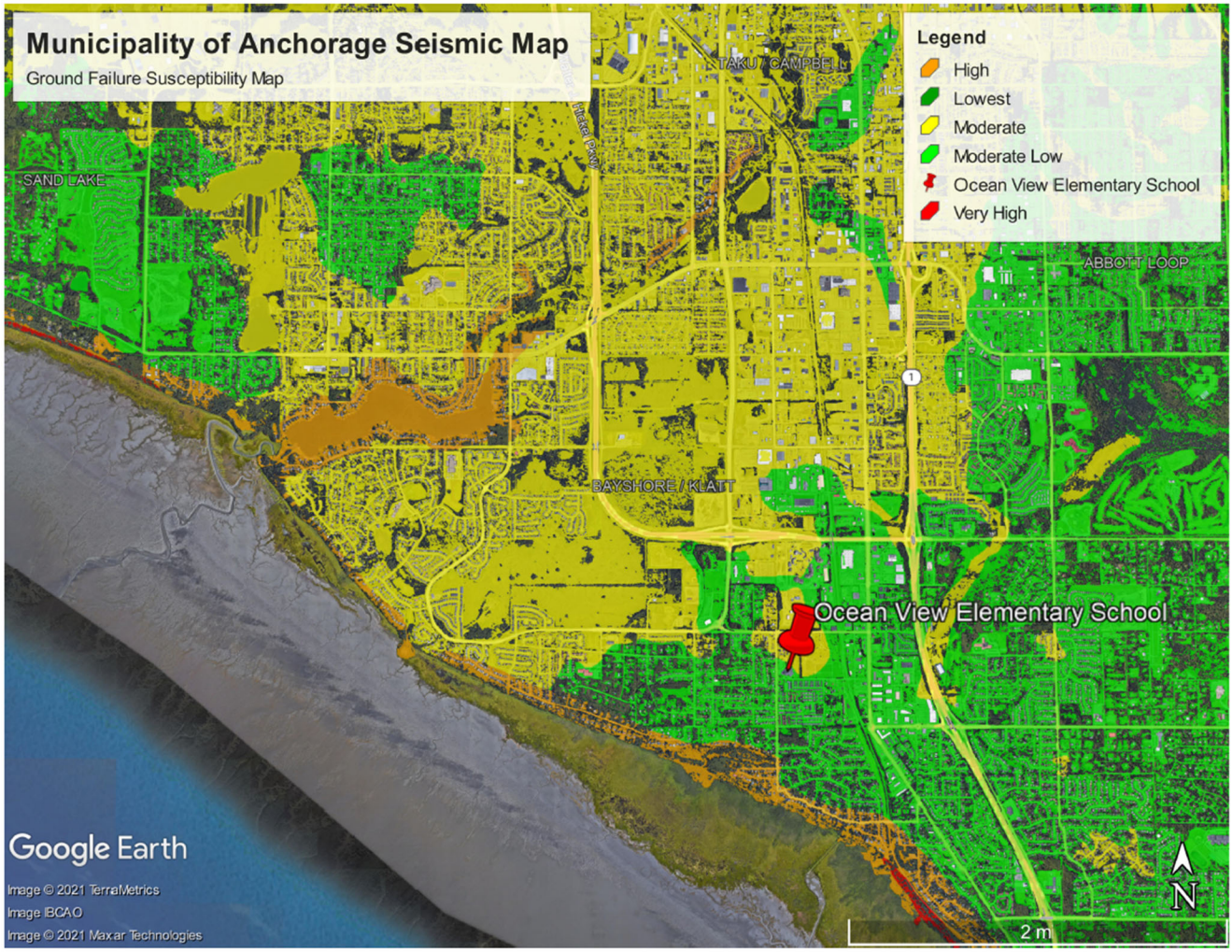
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Table 17-38 *(Continued)*. Nonstructural Checklist

	Status	Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference
69	C NC N/A U	**HR—not required; LS—not required; PR—H.** FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills or leaks.	13.7.3 13.7.5	A.7.13.4
70	C NC N/A U	**HR—not required; LS—not required; PR—H.** C-CLAMPS: One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained.	13.7.3 13.7.5	A.7.13.5
71	C NC N/A U	**HR—not required; LS—not required; PR—H.** PIPING CROSSING SEISMIC JOINTS: 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.	13.7.3 13.7.5	A.7.13.6
	Ducts			
72	C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCT BRACING: Rectangular ductwork larger than 6 ft^2 (0.56 m^2) 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).	13.7.6	A.7.14.2
73	C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCT SUPPORT: Ducts are not supported by piping or electrical conduit.	13.7.6	A.7.14.3
74	C NC N/A U	**HR—not required; LS—not required; PR—H.** DUCTS CROSSING SEISMIC JOINTS: 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.	13.7.6	A.7.14.4
	Elevators			
75	C NC N/A U	**HR—not required; LS—H; PR—H.** RETAINER GUARDS: Sheaves and drums have cable retainer guards.	13.7.11	A.7.16.1
76	C NC N/A U	**HR—not required; LS—H; PR—H.** RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight.	13.7.11	A.7.16.2
77	C NC N/A U	**HR—not required; LS—not required; PR—H.** ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored.	13.7.11	A.7.16.3
78	C NC N/A U	**HR—not required; LS—not required; PR—H.** SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min (0.30 m/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.	13.7.11	A.7.16.4
79	C NC N/A U	**HR—not required; LS—not required; PR—H.** SHAFT WALLS: Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking.	13.7.11	A.7.16.5
80	C NC N/A U	**HR—not required; LS—not required; PR—H.** COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1.	13.7.11	A.7.16.6
81	C NC N/A U	**HR—not required; LS—not required; PR—H.** BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1.	13.7.11	A.7.16.7
82	C NC N/A U	**HR—not required; LS—not required; PR—H.** SPREADER BRACKET: Spreader brackets are not used to resist seismic forces.	13.7.11	A.7.16.8
83	C NC N/A U	**HR—not required; LS—not required; PR—H.** GO-SLOW ELEVATORS: The building has a go-slow elevator system.	13.7.11	A.7.16.9

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

APPENDIX D – MUNICIPALITY OF ANCHORAGE SEISMIC MAP



APPENDIX E – SUPPLEMENTAL CALCULATIONS

7/28/2021 ATC Hazards by Location

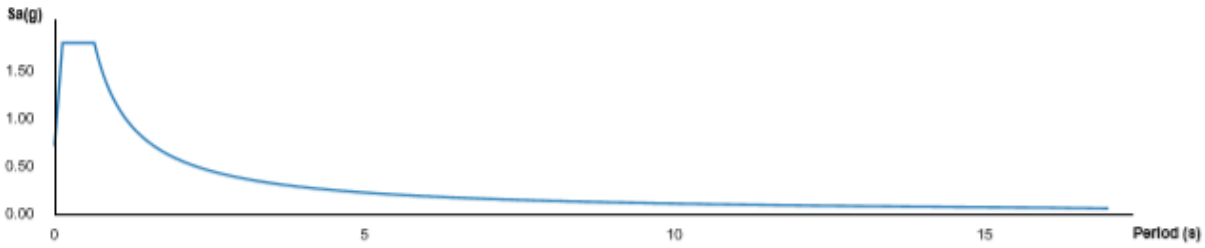
ATC Hazards by Location

Search Information

Address:	11911 Johns Rd, Anchorage, AK 99515, USA
Coordinates:	61.1127021, -149.8769157
Elevation:	160 ft
Timestamp:	2021-07-29T00:43:12.578Z
Hazard Type:	Seismic
Reference Document:	ASCE41-17
Site Class:	D-default
Custom Probability:	



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	1.701	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_S	1.11	Coefficient of risk (0.2s)
SsRT	1.889	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S_S	1.5	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.8	Site modified spectral response (0.2s)
S1UH	0.806	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_1	1.039	Coefficient of risk (1.0s)
S1RT	0.838	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.679	Factored deterministic acceleration value (1.0s)
S_1	0.679	MCE_R ground motion (period=1.0s)
F_v	1.7	Site amplification factor at 1.0s
S_{X1}	1.155	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S_{XS}	1.2	Site modified spectral response (0.2s)
S_{X1}	0.77	Site modified spectral response (1.0s)

Hazard Level BSE-2E

7/28/2021 ATC Hazards by Location

Name	Value	Description
S_S	1.301	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.561	Site modified spectral response (0.2s)
S_1	0.597	MCE_R ground motion (period=1.0s)
F_v	1.703	Site amplification factor at 1.0s
S_{X1}	1.017	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.784	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	0.941	Site modified spectral response (0.2s)
S_1	0.331	MCE_R ground motion (period=1.0s)
F_v	1.969	Site amplification factor at 1.0s
S_{X1}	0.652	Site modified spectral response (1.0s)

T_L Data

Name	Value	Description
T_L	16	Long-period transition period (s)

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fax 907.563.4220

Project: ASD Tier 1 Ocean View (211114.05)
Calculated by: EJS Date: 11.26.21
Checked by: Date:

Building Design Criteria

4.4.2.4 Period

Note: Highlight Indicates Input Is Required

$C_t := 0.02$ For Type "All other building types"

$\beta := 0.75$ For Type "All other Framing Systems"

$H_n := 20\ ft = 20\ ft$

$$T := C_t \cdot \left(\frac{H_n}{1\ ft}\right)^{\beta} = 0.189$$

4.4.2.3 Spectral Acceleration

$S_{x1} := 1.017$ $S_{xs} := 1.561$ $S_a := min\left(\frac{S_{x1}}{T}, S_{xs}\right) = 1.561$

4.4.2.1 Pseudo Seismic Force

Determine Effective Seismic Weight

Wing One of the Building

Loads:

Dead Roof Load: $DL_r := 25\ psf$

Snow Load Load: $SL := 0.2 \cdot 40\ psf = 8\ psf$

Dead Load CMU Walls:

$DL_{w6} := 33\ psf$

$DL_{w8} := 47\ psf$

$DL_{w12} := 133\ psf$

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Collapse Prevention Basic Configuration Checklist

Overturning - Item Number 13

$0.6 \cdot S_a = 0.937$

$Base := 82.67\ ft + 89.33\ ft + 96.67\ ft = 268.67\ ft$

$\frac{Base}{H_n} = 13.434 > 0.6 \cdot S_a = 0.937$ Therefore Okay

Wall Anchorage - Item Number 2

This item will be looked at in the checklists for each individual addition and building type, no calculations are shown here

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Original Structure

Collapse Prevention Building Type RM1 & RM2 Checklist

Shear Stress Check

The shear stress in a masonry wall is to be less than 70 psi

Per Quick Check 4.4.3.3

Worst Case Exterior Wall - Wall 1 - Grid 3

$A_t := 7200\ ft^2$ Area of DL tributary to typical classroom wall

Modification factor per Table 4-7

$C := 1.0$ For Flexible Diaphragm CMU Walls

$l_w := 44\ ft \cdot 2 + 2 \cdot 28\ ft$

$W_{cw} := (DL_r + SL) \cdot A_t + 6\ ft\ (DL_{w8}) \cdot l_w = 278.208\ kip$

$V := C \cdot W_{cw} \cdot S_a = 434\ kip$

$A_w := l_w \cdot 8\ in = 96\ ft^2$

$v_{ucr} := \frac{V}{A_w} = 31.415\ psi$

Grid 2 Walls

$A_t := 5800\ ft^2$ Area of DL tributary wall

Modification factor per Table 4-7

$C := 1.0$ For Flexible Diaphragm CMU Walls

$l_w := 44\ ft \cdot 2 + 25\ ft \cdot 2$

$W_{cw} := (DL_r + SL) \cdot A_t + 6\ ft\ DL_{w8} \cdot l_w = 230.316\ kip$

$V := C \cdot W_{cw} \cdot S_a = 360\ kip$

$A_w := l_w \cdot 8\ in = 92\ ft^2$

$v_{ucr} := \frac{V}{A_w} = 27.138\ psi$

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Wall with Addition Loads Loads - Wall 3

Area of DL tributary wall

$A_t := 5437\ ft^2$

$l_w := 47.33\ ft$

Modification factor per Table 4-7

$C := 1.0$ For Flexible Diaphragm CMU Walls

$W_{cw} := (DL_r + SL) \cdot A_t + 6\ ft\ DL_{w8} \cdot l_w = 192.768\ kip$

$V := C \cdot W_{cw} \cdot S_a = 301\ kip$

$A_w := l_w \cdot 8\ in = 31.553\ ft^2$

$v_{wcr} := \frac{V}{A_w} = 66.226\ psi$

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Reinforcing Steel Check

The total reinforcing steel ratio in reinforced masonry shear walls is greater than 0.002

Reinforcing size per wall details sheet S1 of original building drawings dated Sept 1970

$A_{no.5} := 0.31\ in^2$ $A_{no.4} := 0.2\ in^2$

Type 6" Thick Walls

CMU Thickness $t := 6\ in$

Horizontal Reinforcement $S_h := 56\ in$ $N_h := 1$

Vertical Reinforcement $S_v := 24\ in$ $N_v := 1$

Total Volume of Sections $V_t := t \cdot S_h \cdot S_v = 4.667\ ft^3$

Total Volume of Reinforcing $V_{rt} := N_h \cdot S_v \cdot A_{no.4} + S_h \cdot A_{no.4} \cdot N_v = 0.009\ ft^3$

Ratio of CMU to reinforcement

$$\frac{V_{rt}}{V_t} = 0.001984 \quad < 0.002 \text{ Therefore compliant}$$

Type 8" Thick Walls - Interior

CMU Thickness $t := 8\ in$

Horizontal Reinforcement $S_h := 48\ in$ $N_h := 1$

Vertical Reinforcement $S_v := 24\ in$ $N_v := 1$

Total Volume of Sections $V_t := t \cdot S_h \cdot S_v = 5.333\ ft^3$

Total Volume of Reinforcing $V_{rt} := N_h \cdot S_v \cdot A_{no.5} + S_h \cdot A_{no.4} \cdot N_v = 0.01\ ft^3$

Ratio of CMU to reinforcement

$$\frac{V_{rt}}{V_t} = 0.001849 \quad < 0.002 \text{ Therefore compliant}$$

Type 8" Thick Walls - Exterior

CMU Thickness $t := 8\ in$

Horizontal Reinforcement $S_h := 48\ in$ $N_h := 1$

Vertical Reinforcement $S_v := 32\ in$ $N_v := 1$

Total Volume of Sections $V_t := t \cdot S_h \cdot S_v = 7.111\ ft^3$

Total Volume of Reinforcing $V_{rt} := N_h \cdot S_v \cdot A_{no.5} + S_h \cdot A_{no.5} \cdot N_v = 0.014\ ft^3$

Ratio of CMU to reinforcement

$$\frac{V_{rt}}{V_t} = 0.002018 \quad < \text{Therefore Compliant}$$

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Checked by: Date:

Wall Anchorage Check

Wall Anchorage shall be able to resist connection forces per quick check 4.4.3.7

Wall anchor per details on sheet S4

Connection where the joists are parallels to the walls

$w_p := DL_{w8} = 47\ psf$ Unit Weight of Wall
$h := 16\ ft$ Height of Wall
$s := 16\ in$ Spacing between connections
$S_{xs} = 1.561$
$\psi := 1.15$ Factor: average of collapse prevention and life safety

$A_p := \frac{s \cdot h}{2} = 10.667\ ft^2$ Area Tributary to Connection

$T_c := \psi \cdot w_p \cdot S_{xs} \cdot A_p = 899.969\ lbf$ Force on Anchor

$w_p := DL_{w8} = 47\ psf$ Unit Weight of Wall
$h := 10\ ft$ Height of Wall
$s := 24\ in$ Spacing between connections
$S_{xs} = 1.561$
$\psi := 1.15$ Factor: average of collapse prevention and life safety

$A_p := \frac{s \cdot h}{2} = 10\ ft^2$ Area Tributary to Connection

$T_c := \psi \cdot w_p \cdot S_{xs} \cdot A_p = 843.721\ lbf$ Force on Anchor

Connection is a 3/4" Kwik bolt into the CMU Block

Table 22 — Allowable tensile loads for Hilti KB1 in the face of grout-filled concrete masonry unit (CMU) walls [1,3,4,5,6]

Nominal anchor diameter	Nominal embedment		Allowable tension capacity at s_{cr} and c_{cr}		Spacing				Edge Distance				
					Critical spacing, s_{cr}		Minimum spacing, s_{min} [2]		Load reduction factor at s_{min}	Critical edge distance, c_{cr}		Minimum edge distance, c_{min}		Load reduction factor at c_{min}
in.	in.	(mm)	lb	(kN)	in	(mm)	in	(mm)		in	(mm)	in	(mm)	
3/8	2-3/8	(60)	350	(1.6)	8	(203)	3	(76)	0.56					0.87
1/2	2-3/8	(60)	615	(2.7)	8	(203)	4	(102)	0.54					0.88
	3-5/8	(92)	1,055	(4.7)	13	(330)			0.48					0.94
5/8	3-1/4	(83)	965	(4.3)	11	(279)	5	(127)	0.62	12	(305)	4	(102)	0.86
	4-1/2	(114)	1,140	(5.1)	16	(406)			0.76					1.00
3/4	4	(102)	1,085	(4.8)	13	(330)	6	(152)	0.55					0.84
	5-1/2	(140)	1,130	(5.0)	19	(483)			0.69					0.75

Therefore the Connection is adequate.

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Connection where the joists are Perpendicular To Walls

joist seats are connected to the walls with (2) 3/8 x4" nelson studs per seat

$w_p := DL_{w8} = 47\ psf$ Unit Weight of Wall

$h := 16\ ft$ Height of Wall

$s := 48\ in$ Spacing between connections

$S_{xs} = 1.561$

$\psi := 1.15$ Factor: average of collapse prevention and life safety

$A_p := \frac{s \cdot h}{2} = 32\ ft^2$ Area Tributary to Connection

$T_c := \psi \cdot w_p \cdot S_{xs} \cdot A_p = 2.7\ kip$ Force on Anchor

Shear Strength of 3/8" ø Bolt is adequate
Capacity of Bolt in top of CMU

$l_b := 4\ in \quad t_w := 8\ in \quad A_{pv} := \frac{\pi \cdot \left(\frac{t_w}{2}\right)^2}{2\ (1\ in^2)} = 25.133 \quad f'_m := 1500 \quad A_b := \pi \cdot \frac{\left(\frac{3}{8}\ in\right)^2}{in^2}$

$f_y := 36000$

$A_{pt} := \frac{\pi \cdot l_b{}^2}{in^2} = 50.265$

Masonry failures conservatively based off of one anchor, connections spaced at 4' have two anchors

$V_b := 4 \cdot A_{pv} \cdot \sqrt{f'_m} \cdot 1\ lbf = 3.894\ kip$

$V_c := 1050^1 \cdot \sqrt[4]{f'_m \cdot A_b} \cdot 1\ lbf = 3.767\ kip$

$V_y := 2 \cdot 0.6 \cdot A_b \cdot f_y \cdot 1\ lbf = 4.771\ kip$ Per two Anchors

$V_{vpry} := 8 \cdot A_{pt} \cdot \sqrt{f'_m} \cdot 1\ lbf = 15.574\ kip$

Therefore Connection is adequate

$V_c = 3.767\ kip > T_c = 2.7\ kip$ Therefore Connection is Adequate

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Gym Addition

Collapse Prevention Building Type RM1 & RM2 Checklist

Shear Stress Check

The shear stress in a masonry wall is to be less than 70 psi

Per Quick Check 4.4.3.3

Worst case Short Gym Wall per sheet A2.6 and S1.4 of Drawings Dated 1999
With Loads from 1999 addition included

$A_t := 5620\ ft^2$ Area of DL tributary wall
$L_w := 33\ ft$ Length of each wall per sheet S1.4
$H_w := 23\ ft$ Height of Wall per sheet 4 of 1972 Drawing Set
$t_w := 12\ in$ Thickness of wall

Modification factor per Table 4-7

$C := 1.0$ For Flexible Diaphragm CMU Walls

$$W_{cw} := (DL_r + SL) \cdot A_t + \frac{H_w}{2} (DL_{w12}) \cdot L_w \cdot 2 = 286.407\ kip$$

$$V := C \cdot W_{cw} \cdot S_a = 447\ kip \qquad A_w := (L_w) \cdot t_w = 33\ ft^2$$

$$v_{ucr} := \frac{V}{A_w} = 94.083\ psi$$ Therefore inadequate

Worst case Long Gym Wall per sheet A2.6 and S1.4 of Drawings Dated 1999
With Loads from 1999 addition included

$A_t := 2800\ ft^2$ Area of DL tributary wall
$L_w := 31.4\ ft + 31.67\ ft$ Length of each wall per sheet S1.4
$H_w := 23\ ft$ Height of Wall per sheet 4 of 1972 Drawing Set
$t_w := 8\ in$ Thickness of wall

Modification factor per Table 4-7

$C := 1.0$ For Flexible Diaphragm CMU Walls

$$W_{cw} := (DL_r + SL) \cdot A_t + \frac{H_w}{2} (DL_{w8}) \cdot L_w \cdot 2 = 160.579\ kip$$

$$V := C \cdot W_{cw} \cdot S_a = 251\ kip \qquad A_w := (L_w) \cdot t_w = 42.047\ ft^2$$

$$v_{ucr} := \frac{V}{A_w} = 41.4\ psi$$ Therefore Adequate

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Reinforcing Steel Check

The total reinforcing steel ratio in reinforced masonry shear walls is greater than 0.002

Reinforcing size per wall sections sheet S1 of Addition drawings dated 1972

$A_{no.5} := 0.31\ in^2$ $A_{no.4} := 0.2\ in^2$

Type 6" Thick Walls

CMU Thickness $t := 6\ in$

Horizontal Reinforcement

$S_h := 48\ in$ $N_h := 1$

Vertical Reinforcement

$S_v := 32\ in$ $N_v := 1$

Total Volume of Sections

$V_t := t \cdot S_h \cdot S_v = 5.333\ ft^3$

Total Volume of Reinforcing

$V_{rt} := N_h \cdot S_v \cdot A_{no.5} + S_h \cdot A_{no.5} \cdot N_v = 0.014\ ft^3$

Ratio of CMU to reinforcement

$\frac{V_{rt}}{V_t} = 0.002691$ > 0.002 Therefore compliant

Type 8" Thick Walls

CMU Thickness $t := 8\ in$

Horizontal Reinforcement

$S_h := 48\ in$ $N_h := 1$

Vertical Reinforcement

$S_v := 32\ in$ $N_v := 1$

Total Volume of Sections

$V_t := t \cdot S_h \cdot S_v = 7.111\ ft^3$

Total Volume of Reinforcing

$V_{rt} := N_h \cdot S_v \cdot A_{no.5} + S_h \cdot A_{no.5} \cdot N_v = 0.014\ ft^3$

Ratio of CMU to reinforcement

$\frac{V_{rt}}{V_t} = 0.0020182$ > 0.002 Therefore compliant

Type 12" Thick Walls

CMU Thickness $t := 12\ in$

Horizontal Reinforcement

$S_h := 48\ in$ $N_h := 2$

Vertical Reinforcement

$S_v := 32\ in$ $N_v := 2$

Total Volume of Sections

$V_t := t \cdot S_h \cdot S_v = 10.667\ ft^3$

Total Volume of Reinforcing

$V_{rt} := N_h \cdot S_v \cdot A_{no.5} + S_h \cdot A_{no.5} \cdot N_v = 0.029\ ft^3$

Ratio of CMU to reinforcement

$\frac{V_{rt}}{V_t} = 0.002691$ > 0.002 Therefore compliant

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Wall Anchorage Check

Wall Anchorage shall be able to resist connection forces per quick check 4.4.3.7

Two anchors will be checked, by inspection these are the two worst case anchors. Per Detail 6 and 7 S6

Detail 6 at Welded stud in wall @ 16" O.C.

$DL_{w8} = 47\ psf$ Unit Weight of Wall

$w_p := DL_{w8} = 47\ psf$

$h := 23\ ft + 10\ ft$ Height of Wall

$s := 16\ in$ Spacing between connections

$S_{xs} = 1.561$

$\psi := 1.15$ Factor: average of collapse prevention and life safety

$A_p := \frac{s \cdot h}{2} = 22\ ft^2$ Area Tributary to Connection

$T_c := \psi \cdot w_p \cdot S_{xs} \cdot A_p = 1.856\ kip$ Force on Anchor

Tension Strength in 1" ø headed stud with 5" embed in wall

$l_b := 5\ in$ $A_{pt} := \frac{\pi \cdot l_b^{\,2}}{in^2} = 78.54$ $A_b := \pi \cdot \frac{\left(\frac{1\ in}{2}\right)^2}{in^2}$ $f_y := 36000$ $f'_m := 1500$

Allowable Tensile Load is the minimum of the following

$B_{vb} := 1.25 \cdot A_{pt} \cdot \sqrt{f'_m} \cdot 1\ lbf = 3.802\ kip$ $B_{as} := 0.6 \cdot A_b \cdot f_y \cdot 1\ lbf = 16.965\ kip$

$B_{vb} = 3.802\ kip > T_c = 1.856\ kip$ Therefore Connection is Adequate

Detail 7 at Welded stud in top of wall @ 24" O.C.

Shear Strength of 3/4" ø Bolt is adequate

Capacity of Bolt in top of CMU

$l_b := 6\ in$ $t_w := 8\ in$ $A_{pv} := \frac{\pi \cdot \left(\frac{t_w}{2}\right)^2}{2\ (1\ in^2)} = 25.133$ $f'_m := 1500$ $A_b := \pi \cdot \frac{\left(\frac{\frac{3}{4}\ in}{2}\right)^2}{in^2}$

$f_y := 36000$

$V_b := 4 \cdot A_{pv} \cdot \sqrt{f'_m} \cdot 1\ lbf = 3.894\ kip$ $A_{pt} := \frac{\pi \cdot l_b^{\,2}}{in^2} = 113.097$

$V_c := 1050^1 \cdot \sqrt[4]{f'_m \cdot A_b} \cdot 1\ lbf = 5.327\ kip$

$V_y := 0.6 \cdot A_b \cdot f_y \cdot 1\ lbf = 9.543\ kip$

$V_{vpry} := 8 \cdot A_{pt} \cdot \sqrt{f'_m} \cdot 1\ lbf = 35.042\ kip$

Therefore Connection is adequate

$V_b = 3.894\ kip > T_c = 1.856\ kip$ Therefore Connection is Adequate

ANCHORAGE SCHOOL DISTRICT SEISMIC EVALUATION: *WILLIWAW ELEMENTARY*

TIER – 1 REPORT

February 2022

Prepared for:

Anchorage School District
Educating All Students for Success in Life

Anchorage School District

Prepared by:

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APPENDICES

Appendix A – Relative Priority Ranking of Tier 1 Deficiencies
Appendix B – Tier – 1 Checklists
Appendix C – Structural Evaluation Calculations

ABBREVIATIONS

ACI	American Concrete Institute
ASCE	American Society of Civil Engineers
ASCE 41	Seismic Evaluation and Retrofit of Existing buildings
ASD	Anchorage School District
BGS	Below Ground Surface
CIP	Cast-in-Place
CMU	Concrete Masonry Unit
FEMA	Federal Emergency Management Agency
IBC	International Building Code
LFRS	Lateral Force Resisting System
MCEr	Maximum Considered Earthquake, Risk Targeted
MOA	Municipality of Anchorage
WF	Wide Flange
R	Force Reduction Factor (ASCE 7)
UBC	Uniform Building Code
TMS	The Masonry Society
TS	Tube Steel
VFRS	Vertical Force Resisting System

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EXECUTIVE SUMMARY

This report presents the findings of a seismic evaluation of Williwaw Elementary School. A Tier-1 evaluation per ASCE 41-17 was performed with the aim of identifying elements of the building which are not likely to achieve the desired seismic performance.

The evaluation criteria used are related to the magnitude and frequency of expected earthquakes and their resulting damage. The school was evaluated against the Basic Seismic Performance Objectives for Existing buildings *(BPOE)* for a risk category III building. The building is classified as representing a substantial risk hazard to human life, risk category III, because it is an educational facility with more than 250 occupants. The expectation for a building meeting these criteria is for the structure to sustain significant damage but have some margin against collapse during an earthquake which is expected to occur at-least once every 975 years. This represents the minimum acceptable seismic performance for existing buildings under the 2018 International Building Code *(IBC).*

The seismic evaluation began with a collection of all available information regarding the design and construction. A site visit was conducted to determine the as-built condition of the building and assess the condition of the lateral force resisting system *(LFRS)*. Finally, basic seismic calculations were performed and select elements of the LFRS were evaluated for conformance with the acceptance criteria per the ASCE 41 standard.

Multiple elements of the LFRS are not in conformance with the Tier – 1 criteria and are not expected to meet the minimum seismic performance goals. The non-conforming elements of the LFRS are detailed in this report. The elements of greatest concern are the anchorage of the exterior wood shear walls to the foundation and roof diaphragm, the adequacy of the pre-engineered building portal frame members and connections for seismic loading, and the connection of the East and West wing braces to the top of the mezzanine CMU walls.

The Tier – 1 procedure represents a rough analysis of the LFRS of the building. A Tier – 2 evaluation per ASCE 41 may be used to definitively determine if the building will meet the target seismic performance goals.

In addition to the LFRS evaluation, non-structural components were evaluated using the ASCE 41 Tier – 1 checklists. Non-conforming and unknown items are included in this report. In general, the mechanical and electrical non-structural components are not in conformance with the Tier -1 standards. Most floor mounted equipment is anchored to the concrete floor slab. Hanging and in-line equipment generally does not have adequate seismic bracing. Gas and liquid distribution systems, excluding fire suppression system, lack adequate bracing. A summary of all non-conforming non-structural elements is presented Table 23.

1 INTRODUCTION

This report presents the findings of a seismic performance evaluation and recommended seismic upgrades for Williwaw Elementary School, located at 1200 San Antonio Street, Anchorage, AK. Williwaw Elementary was originally constructed in 1994.



Figure 1 – Williwaw Elementary School, 3D rendering from Google Earth.

The evaluation is voluntary in nature and is not required by the adopted building code and conducted in accordance with the Tier – 1 procedure in per ASCE 41-17. The goal of this evaluation is to obtain a preliminary review of the building condition with a broad look at the structure for survivability during a major earthquake. The Tier-1 evaluation process involves:

- Defining of the seismic hazards & performance goals
- Conducting a high-level seismic analysis
- Evaluating the critical elements of the LFRS & Non-structural components
- Providing schematic retrofits where required
- Ranking deficiencies to prioritize retrofit work

The work being presented in this report represents the first step towards determining the seismic performance of the building and what, if any, retrofits are required to achieve the target seismic performance level.

2 BUILDING DESCRIPTION

Williwaw Elementary is composed of five structurally separate buildings attached with isolation joints at each intersection. The East and West wings of the building are primarily used for classrooms, while the Middle building hosts administrative facilities, the gym, multipurpose room, and music room.

Th school was constructed in 1994 and is constructed of reinforced masonry walls, wood shear walls, steel moment frames, and steel braced frames. The structure was designed by Engineering & Development Services (EDS), with steel portal and braced frame design by Midco Structural Systems (a pre-engineered metal building system). The structure was designed for the requirements of the 1991 UBC. No major additions or renovations have been documented since original construction and the facility has been in continuous use as a school for the Anchorage School District since construction. The school key plan is provided in Figure 2.

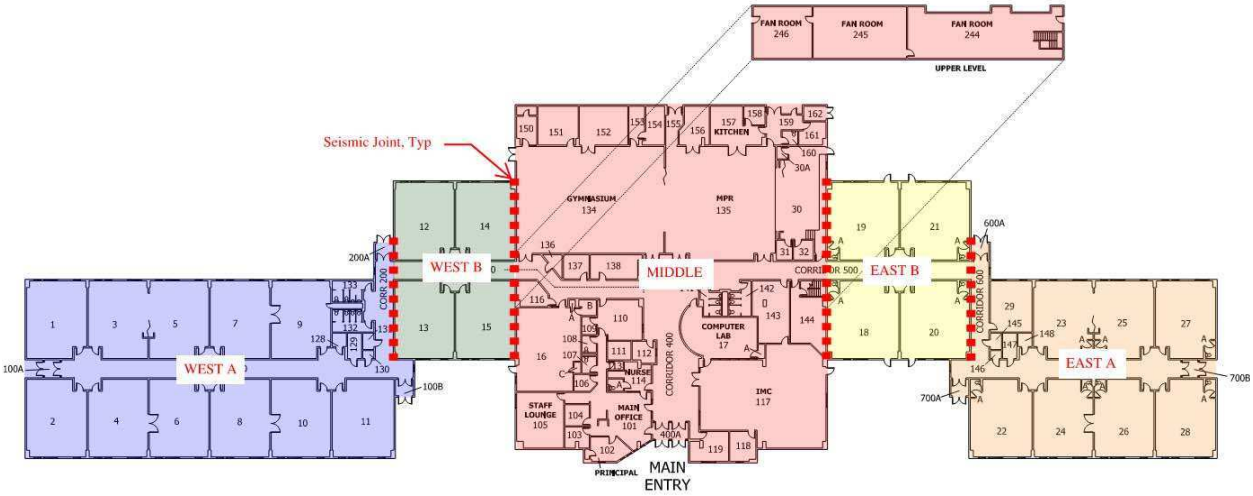


Figure 2 – Williwaw Elementary key plan.

The structural system can be broken down into two categories: the vertical force resisting system *(VFRS),* and the lateral force resisting system *(LFRS)*. The vertical force resisting system supports the weight of the building and occupant loading. The lateral force resisting system supports the building under the action of lateral loading from wind and earthquakes.

All buildings of the structure use similar structural systems, as summarized in Table 1 and Table 2. In sections 2.1 through 2.3 the specific VFRS and LFRS for each building area is discussed. A comparison between the seismic design loads required by the original building code and the 2018 IBC is made. In addition, a comparison of the occupancy, risk category, and snow loads is provided in Table 3 below, which are applicable to all building areas.

Table 1 – Vertical Force Resisting System summary.

Floor		Occupancy	Floor / Roof System	Vertical Supports
0	Ground Floor	Educational	4" concrete slab-on-grade	8" Reinforced CMU stem wall & reinforced concrete foundations
1	Mezzanine	Mechanical	5 ½" slab on 3" x 20 ga. steel deck. (East and West wings) 9" slab on 3" x 20 ga. steel deck. (Main building)	8" Reinforced CMU shear walls.
2	Roof	Un-occupied	3" x 20 ga. metal roof deck on steel purlins	Concrete columns, Steel tube columns, tapered wide flange columns, 8" reinforced CMU, and 2x wood walls.

Table 2 - Lateral Force Resisting System.

Roof / Floor		Diaphragm (Horizontal Elements)	LFRS (Vertical Elements)
1	Mezzanines	5 ½" slab on 3" x 20 ga. steel deck.	8" reinforced CMU shear walls
2	Roof	5 ½" slab on 3" x 20 ga. steel deck. (East and West wings) 9" slab on 3" x 20 ga. steel deck. (Main building)	Steel portal frames Steel tension-only braced frames Wood shear walls 8" reinforced CMU shear walls

Table 3 - Occupancy & snow comparisons between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Occupancy Rating	E1 (classrooms) A2.1 (Gym and multi-purpose room)	Record Drawings	Educational	Sec. 310
Risk Category	Not applicable		III	Table 1604.5
Importance Factor	1.15	Record Drawings	1.1	Table 1.5-2 ASCE 7-16
Roof Snow Load	40	Record Drawings	40	MOA Min.

a) Roof snow loads include effects of importance factor.

2.1 East A and West A Wings

Both the East A and West A wings are one-story wood shear wall and steel framed structures. A mezzanine used as a utilidor runs through the center of the buildings supported by reinforced masonry walls and a 5-1/2" slab on a 3" 20 ga. steel deck. The mezzanine is above corridors 600 and 700 in the East A wing (Figure 3) and above corridors 100 and 200 in the West A wing (Figure 4).

Both the East A and West A wings are structurally independent from their corresponding B wing by a seismic joint along the connecting corridors. The structural joint is evident by the directly adjacent pre-engineered portal frames at the ends of each wing, however there is no separation between structures.

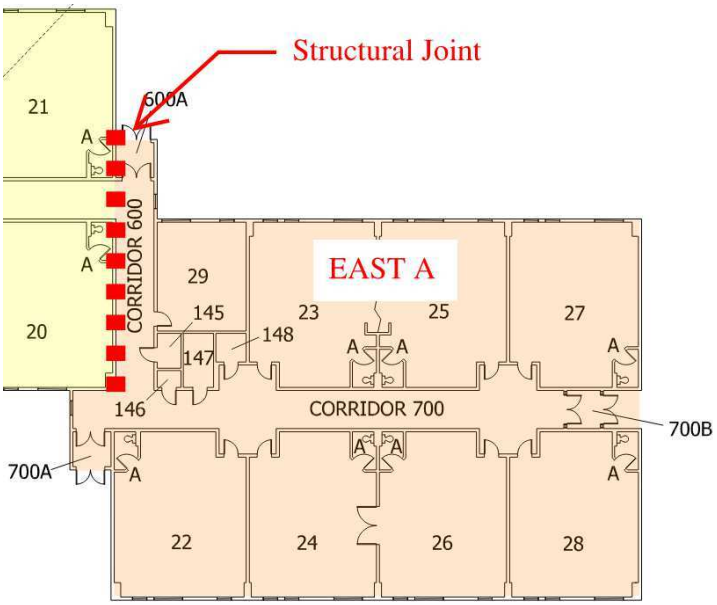


Figure 3 - Williwaw Elementary School key plan, East A wing (orange).

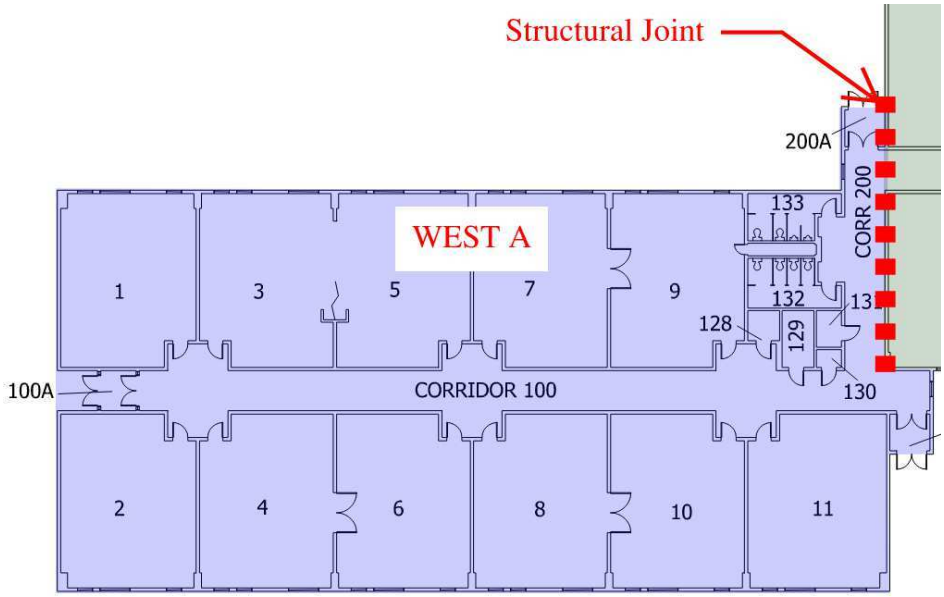


Figure 4 - Williwaw Elementary School key plan, West A wing (blue).

Lateral loads are resisted in the north-south direction by single-bay pre-engineered metal building tapered moment frames and in the east-west direction by a combination of exterior wood shear walls and interior steel channel braces tying the pre-engineered moment frames to the mezzanine reinforced masonry walls (Figure 5). A brief overview of the VFRS and LFRS is provided in Table 1 and Table 2.

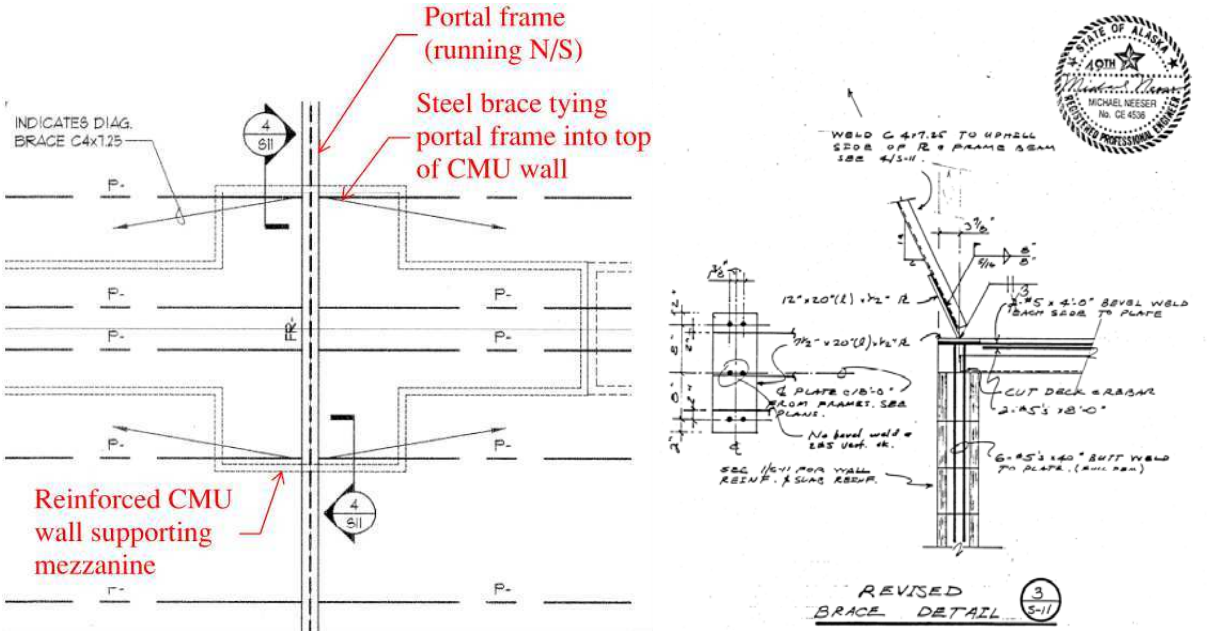


Figure 5 – (Left) Interior lateral force resisting systems (LFRS) at exterior wings. (Right) Connection of brace to reinforced masonry wall.

A comparison of the seismic and wind design forces from the codes in effect now with the codes in effect at the time of construction are provided in Table 4 and Table 5 for the East A wing and Table 6 and Table 7 for the West A wing. The seismic force required by the original code is significantly less than the 2018 IBC. This is primarily due to higher seismic accelerations, higher performance requirements for risk category III buildings, and a recognition that special detailing of the reinforced masonry shear walls is required to achieve higher force reduction factors, *R*.

Table 4 – East A wing seismic design force comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Importance Factor	1.25	Record Drawings	1.25	Table 1.5-2 ASCE 7-16
Seismic Acceleration	1.1 g	Record Drawings (Zone 4)	1.2 g	USGS seismic maps
Ductility R – Factor	R ~ 3.9		R = 2.0 Ordinary Reinforced Concrete Masonry	
Base Shear [a]	108 kip	Eq. 34-1	247 kip	Eq. 12.8-1

a) Base shear is calculated at ASD levels for comparison to legacy codes.

Table 5 – East A wing information and Code comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Wind Speed[a] (3-sec Gust)	100 MPH (Exp C, I=1.15)	Record Drawings	116 mph (150 mph LRFD)	MOA Wind Map
Wind Pressure [b]	41.5 psf	Eq. 16-1	26.3 psf	ASCE 7-16 *Part 2*

a) Wind calculated at ASD levels for comparison to legacy codes.
b) Pressure represents combined windward and leeward effects at interior zones. MWFRS wall pressures at ASD levels.

Table 6 – West A wing seismic design force comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Importance Factor	1.25	Record Drawings	1.25	Table 1.5-2 ASCE 7-16
Seismic Acceleration	1.1 g	Record Drawings (Zone 4)	1.2 g	USGS seismic maps
Ductility R – Factor	R ~ 3.9		R = 2.0 Ordinary Reinforced Concrete Masonry	
Base Shear [a]	146 kip	Eq. 34-1	335 kip	Eq. 12.8-1

b) Base shear is calculated at ASD levels for comparison to legacy codes.

Table 7 – West A wing building information and Code comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Wind Speed[a] (3-sec Gust)	100 MPH (Exp C, I=1.15)	Record Drawings	116 mph (150 mph LRFD)	MOA Wind Map
Wind Pressure [b]	41.5 psf	Eq. 16-1	28.2 psf	ASCE 7-16 *Part 2*

c) Wind calculated at ASD levels for comparison to legacy codes.
d) Pressure represents combined windward and leeward effects at interior zones. MWFRS wall pressures at ASD levels.

2.2 East B and West B Wings

Similar to the East A and West A wings, the B wings are one-story wood shear wall and steel framed structure with a reinforced CMU utilidor mezzanine at the center of the structure. The East B and West B wings are separated from corresponding A wings and middle building by structural joints between the pre-engineered moment frames on the east and west (Figure 6).

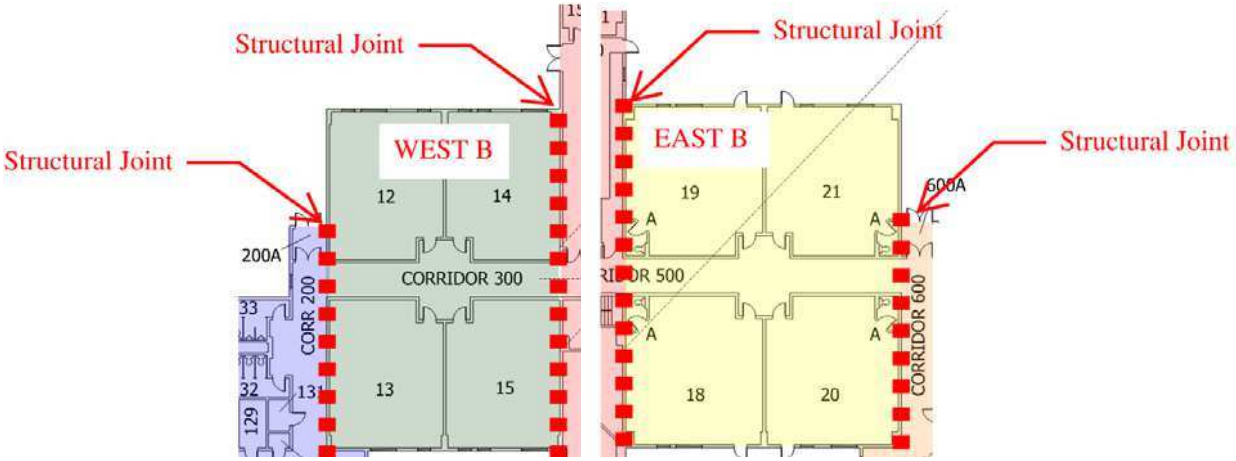


Figure 6 - Williwaw Elementary School key plan: (Left) West B wing in green; (Right) East B wing in yellow.

The lateral systems are nearly identical to the corresponding East A and West A wings with fewer tension-only steel braces tying the moment frames out-of-plane to the tops of the mezzanine reinforced CMU walls at the interior of the structure (total of four per wing). A comparison of the seismic and wind design forces from the 2018 IBC with the codes in effect at the time of construction are provided in Table 8 and Table 9 for the East B wing and Table 10 and Table 11 for the West B wing.

Table 8 – East B wing seismic design force comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Importance Factor	1.25	Record Drawings	1.25	Table 1.5-2 ASCE 7-16
Seismic Acceleration	1.1 g	Record Drawings (Zone 4)	1.2 g	USGS seismic maps
Ductility R – Factor	R ~ 3.9		R = 2.0 Ordinary Reinforced Concrete Masonry	
Base Shear [a]	54 kip	Eq. 34-1	123 kip	Eq. 12.8-1

c) Base shear is calculated at ASD levels for comparison to legacy codes.

Table 9 – East B wing information and Code comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Wind Speed[a] (3-sec Gust)	100 MPH (Exp C, I=1.15)	Record Drawings	116 mph (150 mph LRFD)	MOA Wind Map
Wind Pressure [b]	41.5 psf	Eq. 16-1	26.3 psf	ASCE 7-16 *Part 2*

e) Wind calculated at ASD levels for comparison to legacy codes.
f) Pressure represents combined windward and leeward effects at interior zones. MWFRS wall pressures at ASD levels.

Table 10 -West B wing seismic design force comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Importance Factor	1.25	Record Drawings	1.25	Table 1.5-2 ASCE 7-16
Seismic Acceleration	1.1 g	Record Drawings (Zone 4)	1.2 g	USGS seismic maps
Ductility R – Factor	R ~ 3.9		R = 2.0 Ordinary Reinforced Concrete Masonry	
Base Shear [a]	51 kip	Eq. 34-1	117 kip	Eq. 12.8-1

d) Base shear is calculated at ASD levels for comparison to legacy codes.

Table 11 – West B wing information and Code comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Wind Speed[a] (3-sec Gust)	100 MPH (Exp C, I=1.15)	Record Drawings	116 mph (150 mph LRFD)	MOA Wind Map
Wind Pressure [b]	41.5 psf	Eq. 16-1	26.3 psf	ASCE 7-16 *Part 2*

g) Wind calculated at ASD levels for comparison to legacy codes.
h) Pressure represents combined windward and leeward effects at interior zones. MWFRS wall pressures at ASD levels.

2.3 Main Building

The main building uses double-bay pre-engineered metal building portal frames to resist lateral forces in the north-south directions. The east-west direction lateral forces are resisted by a combination of reinforced CMU walls (at the north gym wall), two steel braced frames (interior), wood shear walls (at the far north and far south walls), and a single-bay pre-engineered metal building portal frame (along the south wall). Structural joints separate the main building from the East B and West B wings, between adjacent pre-engineered portal frames (Figure 7).

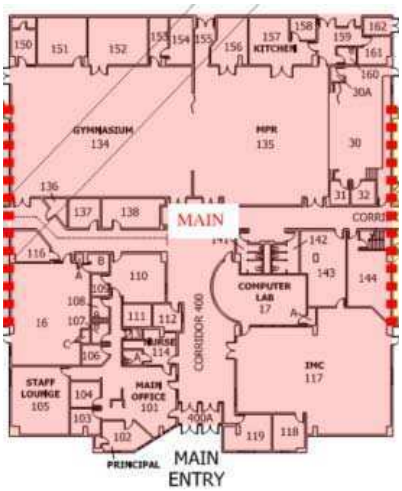


Figure 7 - Williwaw Elementary School key plan, Middle building (red).

Similar to the East and West wings, a mezzanine hosting the utilities is located near the center of the building and supported by reinforced CMU walls. This mezzanine differs from the East and West wings as the floor is a 9" concrete slab on 3" metal deck as well as one side has a reinforced CMU wall extending past the mezzanine floor, to the roof deck. Unlike the East and West wings, the middle building uses steel angle-braced frames on top of portal frames with braces (Figure 8).

A comparison of the seismic and wind design forces from the codes in effect now with the codes in effect at the time of construction are provided in Table 12 and Table 13.

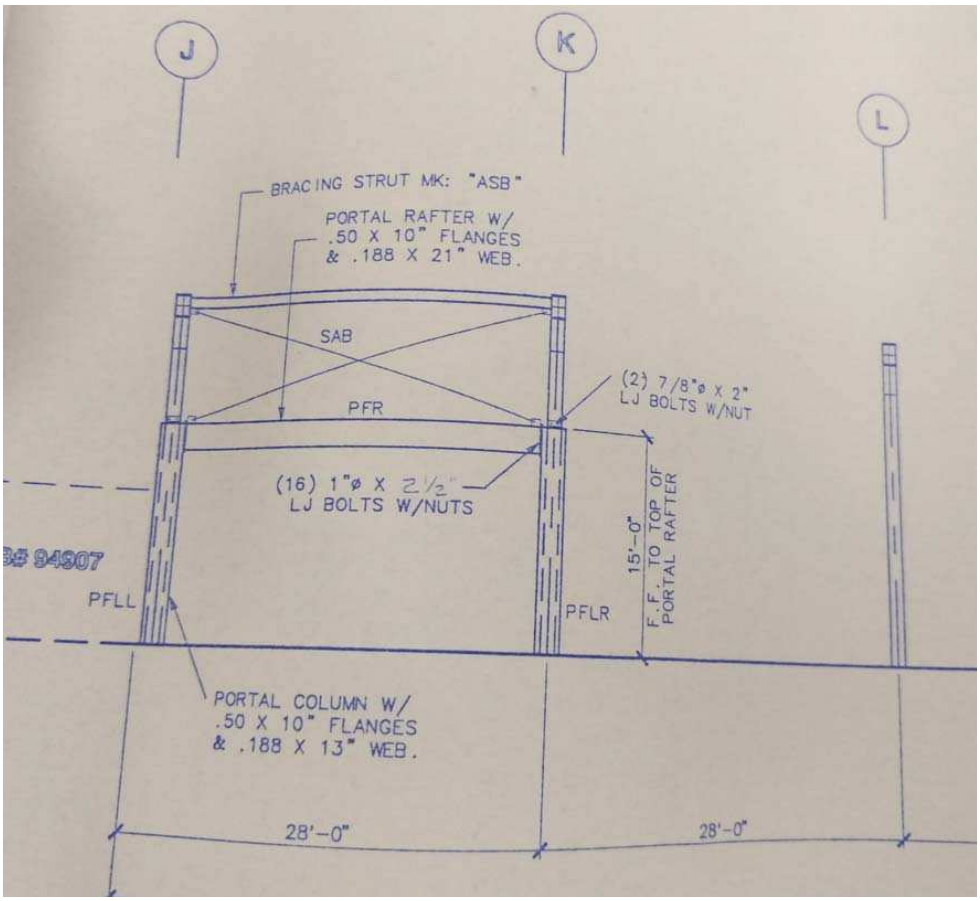


Figure 8 - Typical middle building steel braced frame along grid 5.1 (1994 Midco drawings, sheet S-7).

Table 12 - Seismic design force comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Importance Factor	1.25	Record Drawings	1.25	Table 1.5-2 ASCE 7-16
Seismic Acceleration	1.1 g	Record Drawings (Zone 4)	1.2 g	USGS seismic maps
Ductility R – Factor	R ~ 3.9		R = 2.0 Ordinary Reinforced Concrete Masonry	
Base Shear [a]	288 kip	Eq. 34-1	660 kip	Eq. 12.8-1

e) Base shear is calculated at ASD levels for comparison to legacy codes.

Table 13 - Building information and Code comparison between the original building code and the 2018 IBC.

Criteria	1991 UBC	Reference	2018 IBC	Reference
Wind Speed[a] (3-sec Gust)	100 MPH (Exp C, I=1.15)	Record Drawings	116 mph (150 mph LRFD)	MOA Wind Map
Wind Pressure [b]	43.1 psf	Eq. 16-1	29.2 psf	ASCE 7-16 *Part 2*

i) Wind calculated at ASD levels for comparison to legacy codes.
j) Pressure represents combined windward and leeward effects at interior zones. MWFRS wall pressures at ASD levels.

3 GEOLOGICAL HAZARDS

Williwaw Elementary is in zone three of the MOA Ground Failure Map, indicating moderate ground failure susceptibility, Figure 9. PDC reviewed the available soils information and the topography of the area. The geotechnical hazards and their likelihood at this site are summarized in Table 14.

Table 14 - Geotechnical hazard summary table.

Hazard	Likelihood of Occurrence	Source
Slope Stability Failure	Not Likely	No significant slopes present
Surface Fault Rupture	Not Likely	Alaska DGGS & USGS Fault Maps
Liquefaction	Low	MOAGIS Soil Boring Reports

Borehole logs available from the Municipality of Anchorage (MOA) reveal a relatively shallow groundwater table at the project site which was observed between 8 and 13 feet below the ground surface. The boreholes were advanced to a depth of approximately 25 feet below the ground surface. The materials identified beneath the water table generally consist of dense to very dense poorly-graded gravel with sand. Given the density of these materials and years of experience with local geologic conditions, the risk of liquefaction is considered low. The building falls within MOA Seismic Hazard Zone 3 (moderate ground failure susceptibility).



Figure 9 - Ground Failure Susceptibility Map, Municipality of Anchorage, 2006.

4 OVERVIEW OF EVALUATION PROCESS

Williwaw Elementary School is being evaluated for seismic performance as a risk category III structure. The intent of this voluntary seismic evaluation is to identify potential areas of concern so they may be retrofitted, improving the seismic performance of the building in future earthquakes. The evaluation procedure follows ASCE 41-17 *Seismic Evaluation and Retrofit of Existing Buildings*. A brief overview of the seismic evaluation process is outlined below:

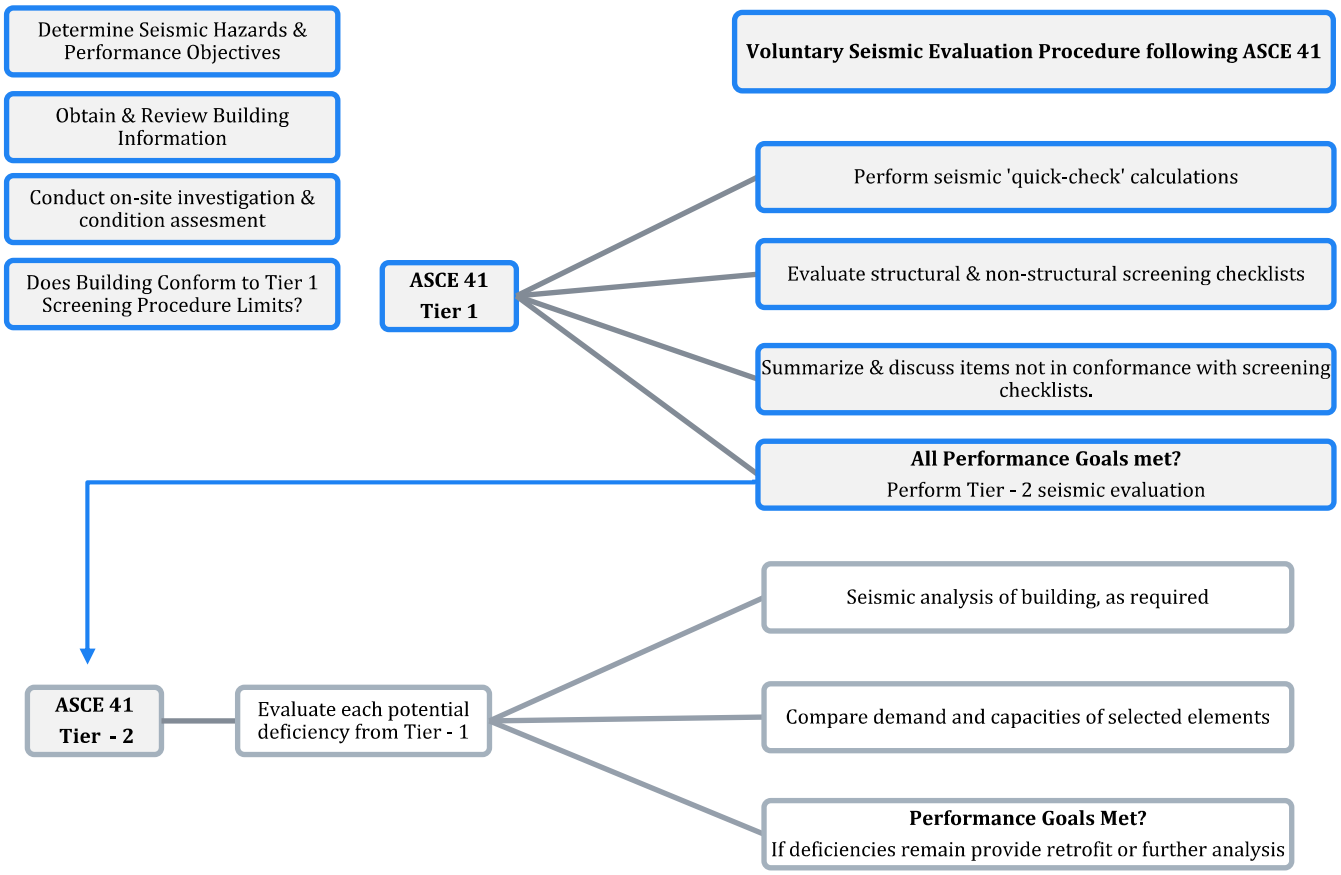


Figure 10 – Voluntary seismic evaluation procedure per ASCE 41, with Tier – 1 evaluation steps outlined in blue.

The Tier – 1 evaluation is a useful tool to quickly and efficiently identify aspects of the building which are not likely to meet the seismic performance goals. The process involves a basic seismic analysis of the structure and evaluation of critical components of the LFRS and non-structural components. The evaluation occurs in the form of a screening checklist categorizing building elements as being either in, conformance, non-conformance, or unknown. Any checklist items marked as unknown or non-conforming do not necessarily indicate that the component is deficient, only that it requires a more rigorous analysis to determine adequacy. This report will document the findings of the Tier -1 evaluation and make recommendations for further analysis.

Seismic Performance Objectives

The Tier – 1 evaluation procedure per ASCE 41 considers a seismic hazard level concurrent with the basic performance objectives for existing buildings *(BPOE)*. The *BPOE* objectives outline the minimum seismic performance that an existing building should achieve. These objectives were set considering the risk of a structural collapse, frequency, and magnitude of earthquakes at the building location, and financial limitations of a seismic retrofit. The required performance objectives to be met under a Tier - I seismic analysis are given in Table 15. Seismic hazards associated with the BPOE are detailed in the next section.

Table 15 – Seismic performance goals for a risk category III building under a Tier - 1 evaluation.

Hazard	Structural	Non-Structural
BSE-1E	Damage Control Performance (S-2)	Position Retention Non-structural performance (2-B)
BSE-2E [a]	Limited Safety Performance (S-4)	Not Considered

a) The Tier – 1 evaluation procedure only explicitly considers the BSE – 2E hazard and associated performance goals. The performance goals associated with the BSE - 1E hazards are implicitly checked.

Buildings which achieve the *BPOE* level of seismic performance can be expected to experience little damage from relatively frequent, moderate earthquakes, with significant damage and economic loss from severe and infrequent earthquakes. The expected seismic performance of an older building, even with seismic retrofits, is still expected to exhibit worse seismic performance than a modern building. Each level of seismic hazard has an associated level of acceptable damage. A limited description of each level of seismic performance is given in Figure 11. The required performance for the Williwaw Elementary building at each hazard level is outlined in blue.

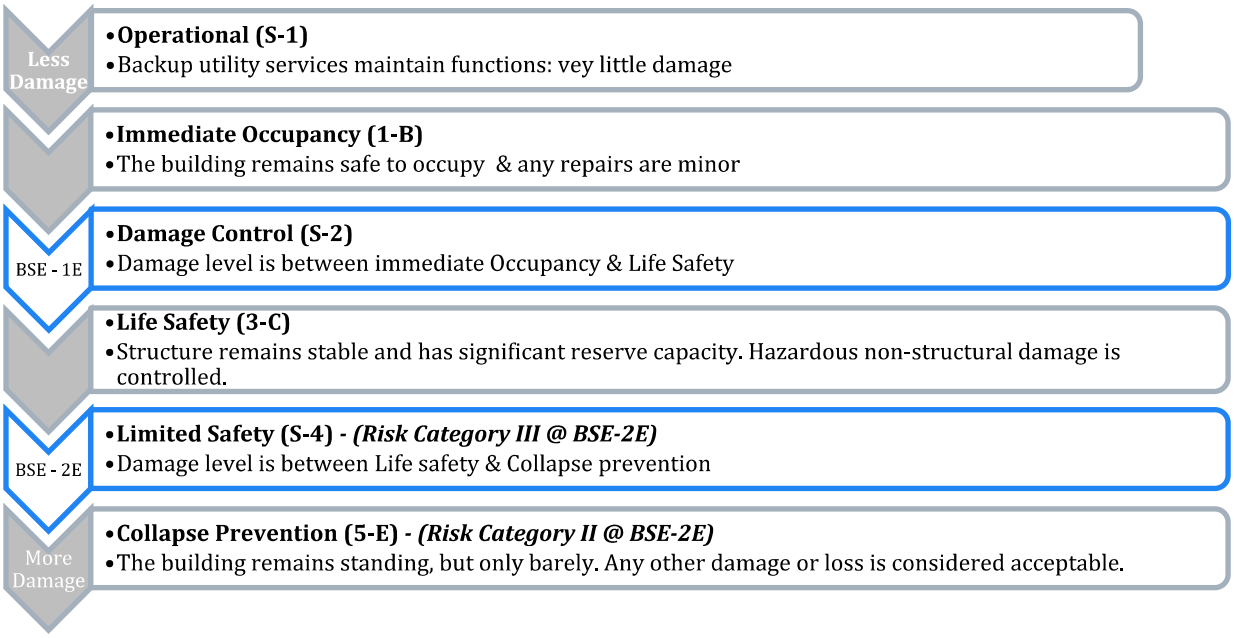


Figure 11 - Scale of target seismic performance objectives, ASCE 41.

Seismic Hazards

The Tier-1 evaluation utilizes the BSE-2E hazard to evaluate the acceptance criteria in the screening checklists. This represents an earthquake expected to occur at least once every 975 years. The seismic hazards selected for Williwaw Elementary School are outlined in Table 16.

Table 16 - Seismic hazards associated with the basic performance objectives for existing buildings.

BPOE Hazard	Probability of Exceedance	Recurrence Interval	Comparable Modern Seismic Hazard - ASCE 7
BSE-1E	20% in 50 years	225 years	2/3 of MCEr or (BSE – 1N)
BSE-2E [a]	5% in 50 years	975 years	MCEr or (BSE – 2N)

a) *The Tier-1 evaluation explicitly considers the BSE-2E seismic hazard only. A Tier – 2 or Tier – 3 evaluation considers both the BSE – 1E & 2E seismic hazards.*

Seismic hazards associated with the BPOE are intended to be less severe than that required for a modern building designed per ASCE 7. A comparison of the reduced seismic hazards associated with the BPOE to those of ASCE 7-16 are shown in Figure 12. The BPOE design spectral acceleration is approximately 79% of what is required by the currently adopted building code. Comparable response spectra values are shown with arrows below.

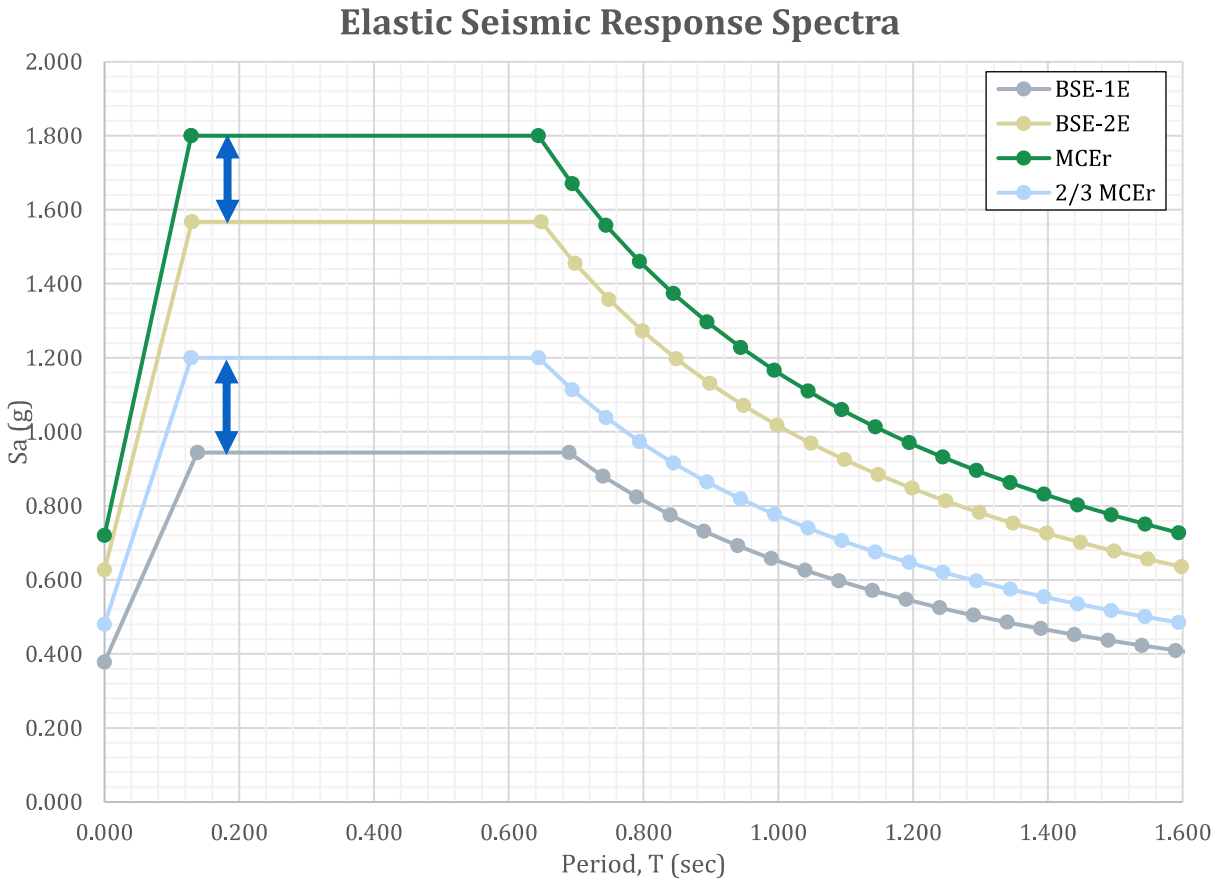


Figure 12 - Seismic response spectra comparison of modern standards to the seismic hazards associated with the BPOE. *Site Class D (Default) with Fv = 1.2 per ASCE 7-16 11.4.4.*

Available Building Information

ASCE 41 requires sufficient information about the building be gathered and reviewed. Available information included as-built drawings from 1994. No project specifications, geotechnical information, RFI records, or calculations were available. PDC obtained Midco pre-engineered portal frame design and shop drawings from the MOA permitting office, as well as record soil boring reports for the elementary school site from MOAGIS.

Document References

The 2018 International Building Code was used. The latest consensus documents available at the present time were used for this report. These primary references include:

- ASD Design Guide — Seismic Evaluation & Retrofit Guide (2021)
- IBC 2018 — International Building Code
- IEBC 2018 — International Existing Building Code
- 1991 UBC — Uniform Building Code
- ASCE/SEI 41-17 — Seismic Evaluation & Retrofit of Existing Buildings.
- ASCE/SEI 7-16 — Minimum Design Loads for Buildings & Other Structures
- ACI 318 – 14 — Building Code Requirements for Structural Concrete
- TMS 402-16 — Building Code Requirements and Specs. for Masonry Construction
- FEMA P-2006 — Example Application Guide for ASCE/SEI 41-17 Seismic Evaluation and Retrofit of Existing Buildings

5 SITE VISIT

Site visits were conducted by David Hoisington, PE, and Nathaniel Cox, EIT, on August 10th and 13th. The goals of the site visits were to:

- Evaluate the condition of the LFRS
- Verify the structure generally conforms with the design drawings
- Evaluate the non-structural components

The scope of the field investigation was limited to items that could be observed without removing or demolishing finishes. The exterior of the building, mechanical mezzanine, and selected rooms in each of the school wings were observed and documented for the purposes of the Tier 1 inspection items. Generally, the LFRS was in fair condition with no major damage observed. Some deterioration/damage was noted in several locations of the mechanical mezzanine. No damage was observed outside of the mechanical mezzanine.

As also noted in the 2019 post-earthquake assessment by Reid Middleton, cracks were observed in the concrete slab-on-deck in the mezzanine between the main building and East B and West B wings (Figure 26). It is likely these cracks occurred due to the lack of an isolation joint occurring at the mezzanine despite structural joints occurring in the LRFS of the adjacent buildings. Damage was also observed in the gypsum wall board at the corner of a doorway between fan rooms 244 and 245 (Figure 27). Deterioration of elements along the hydronic systems were documented in the mezzanine (Figure 28) as well as several units with loose or damaged anchor bolts (Figure 29).

CFS partition walls are anchored to roof diaphragms by use of double top runner tracks instead of slotted tracks (Figure 13, Figure 31, and Figure 32). Studs without full attachment to the top runner track with use of slotted tracks could bend the lip of the channel and fail. Additional analysis outside the scope of a Tier 1 evaluation will be required to ensure the connections are adequate.

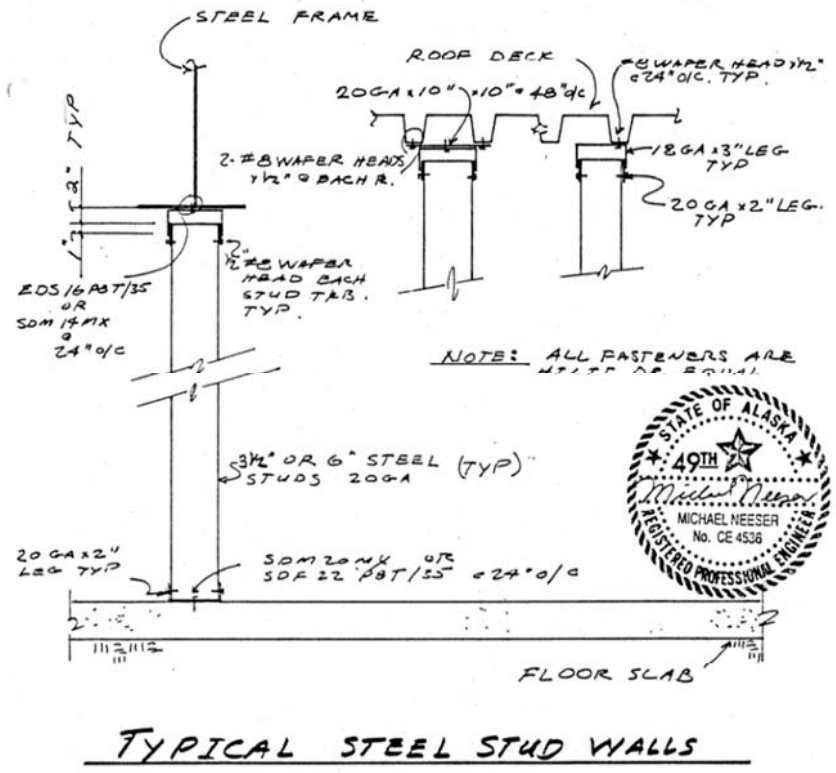


Figure 13 - Typical CFS partition wall connections to roof deck. RS-13 from 1994 as-built record drawings.

6 TIER – 1 SEISMIC EVALUATION

The seismic evaluation was conducted in accordance with the Tier - 1 method of ASCE 41. The evaluation process consists of a set of screening checklists which aim to evaluate the seismic performance of the buildings. The main purpose of the screening checklists is to efficiently identify elements of the *LFRS* that may not be adequate. The following structural and non-structural screening checklists were completed for each building:

17.1.2	*Basic Configuration Checklist*
17.2	*Structural Checklist for Building Types W2*
17.12	*Structural Checklist for Building Types S3 and S3a*
17.5	*Structural Checklist for Building Types S2 and S2a*
17.17	*Structural Checklist for Building Types RM1 and RM2*
17.19	*Non-Structural Checklist*

To properly evaluate the Tier-1 checklists for a damage control limit state the quick-checks utilize reduced *m*-values, which represent the expected ductility demands. The above checklists represent a lower bound acceptance criteria. An element of the LFRS which fails to meet the checklist criteria is not necessarily deficient. However, such elements must be investigated further to determine the overall seismic performance of the building. All non-conforming elements of the LFRS for each building are detailed in the sections 6.1 through 6.3. The completed checklists can be found in full in Appendix – B.

Seismic Performance Assessment: ASD Scale

The seismic performance of Williwaw Elementary School, at the BSE-1N hazard level is estimated to be below the ASD target of damage control and is also below the limited safety level. This assessment should be considered approximate as it is based on engineering judgement and Tier 1 screening checklists.

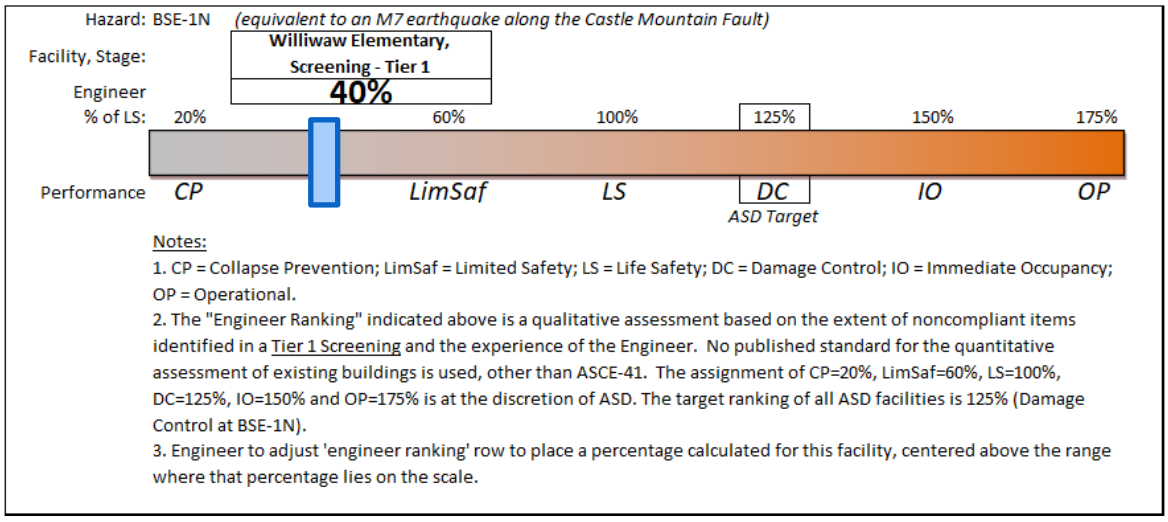


Figure 14 - Seismic Performance Assessment Scale at BSE-1N per ASD Design Guide Appendix 3.

The Tier – 1 screening checklists were evaluated at the BSE-2E hazard level for the performance goal of Limited Safety. To provide ASD with a seismic performance assessment at the BSE-1N hazard level the performance assessment score at the BSE-2E hazard level was divided by the ratio of the BSE-1N to BSE-2E seismic accelerations, a factor of 0.76. The assessment given should be considered approximate as it is based on engineering judgement and Tier 1 screening checklists.

Nonstructural Components

The aim of the non-structural checklist is to identify any non-structural components that are likely to fail or malfunction during an earthquake which could cause harm to the building occupants. All non-conforming or unknown aspects of this checklist are given in Table 23.

6.1 East A and West A Wings

All nonconforming items of the East A and West A wing LFRS are provided in Table 17.

Table 17 - East and West A Wings - Components of the LFRS not in conformance with Tier 1 screening checklists.

17.1.2 – Basic Configuration Checklist	
Checklist Description	Non - Conforming Elements
Load Path (A.2.1.1)	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
Adjacent Buildings (A.2.1.1)	Structurally separated wings are directly adjacent with no seismic separation distance.
17.2 – Building Types W2 and W2a - Wood Frames	
Wood Sill Bolts (A.5.3.7)	Per 1/S-10 of 1994 record drawings, anchors are spaced 8' OC at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragm Continuity (A.4.1.1)	Diaphragm is discontinuous at high roof edge.
Roof Chord Continuity (A.4.1.3)	Diaphragm is discontinuous at high roof.
17.4 – Building Types S3 and S3a - Steel Light Frames	
Moment-Resisting Connections (A.3.1.3.4)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 110% of the expected yield of the joining members. Further analysis per Tier 2 inspection is recommended.
Compact Members (A.3.1.3.8)	Moment frame members do not meet the requiremetns for moderately ductile members.
17.5 – Building Types S2 and S2a - Steel Braced Frames	
Connection Strength (A.3.3.15)	Brace connections cannot develop the yield capacity of the brace members.

6.2 East B and West B Wings

All nonconforming items of the East and West B wing LFRS are provided in Table 18.

Table 18 - East and West B Wings - Components of the LFRS not in conformance with Tier 1 screening checklists.

17.1.2 – Basic Configuration Checklist	
Checklist Description	Non - Conforming Elements
Load Path (A.2.1.1)	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
Adjacent Buildings (A.2.1.1)	Structurally separated wings are directly adjacent with no clear distance.
17.2 – Building Types W2 and W2a - Wood Frames	
Wood Sill Bolts (A.5.3.7)	Per 1/S-10 of 1994 record drawings, anchors are spaced 8' OC at walls shorter than 10'-4".
17.4 – Building Types S3 and S3a - Steel Light Frames	
Moment-Resisting Connections (A.3.1.3.4)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is recommended.
Compact Members (A.3.1.3.8)	Moment frame members do not meet the requirements for moderately ductile members.
17.5 – Building Types S2 and S2a - Steel Braced Frames	
Connection Strength (A.3.3.15)	Brace connections cannot develop the yield capacity of the brace members.
Redundancy (A.3.3.1.1)	Single braced bay.

6.3 Main Building

All nonconforming items of the Main building LFRS are provided in Table 19.

Table 19 – Main Building - Components of the LFRS not in conformance with Tier 1 screening checklists.

17.1.2 – Basic Configuration Checklist	
Checklist Description	Non - Conforming Elements
Load Path (A.2.1.1)	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
Adjacent Buildings (A.2.1.1)	Structurally separated wings are directly adjacent with no seismic separation distance.
17.2 – Building Types W2 and W2a - Wood Frames	
Wood Sill Bolts (A.5.3.7)	Per 1/S-10 of 1994 record drawings, anchors are spaced 8' OC at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragm Continuity (A.4.1.1)	Diaphragm is discontinuous between gridlines 5 & 7 (see details 8 & 11 / S-11 of 1994 record drawings).
17.4 – Building Types S3 and S3a - Steel Light Frames	
Moment-Resisting Connections (A.3.1.3.4)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 110% of the expected yield of the joining members. Further analysis per Tier 2 inspection is recommended.
Compact Members (A.3.1.3.8)	Moment frame members do not meet the requirements for moderately ductile members.
17.5 – Building Types S2 and S2a - Steel Braced Frames	
Redundancy (A.3.3.1.1)	Only one line of braced frames and total of (2) braced bays.
Compact Members (A.3.3.1.5)	Braces do not meet the requiremetns of AISC 341, Table D1.1.

7 SUMMARY OF FINDINGS

The evaluation process consists of a set of screening checklists which aim to evaluate the seismic performance of the building. The LFRS of the building was evaluated against the structural checklists for the damage control performance goals. The non-structural components, e.g. architectural, mechanical, and electrical equipment, were evaluated against the non-structural checklist for the position retention performance goal.

Structural Components

Based on the site visit by PDC, the LFRS does not appear to have significant damage or deterioration. However, elements of the LFRS are considered incomplete or lacking for a complete seismic load path with several additional items considered non-conforming with Tier 1 checklists guidance. A summary of the non-conforming items, severity, and schematic retrofits are detailed per building in Table 20 through Table 22.

Exterior wood shear walls in all buildings of the school are considered incomplete elements of the LFRS as they lack hold-downs at posts to resist overturning. They also lack standard sill bolt anchorage. Additional analysis into the mechanical anchors (Hilti SDM72) used to attach the shear walls sill plates to the foundation is also recommended as no design literature was available and may not be considered adequate for anchorage in seismic zones.

Steel braced frames in the East and West wings were found to have inadequate connection strength into the tops of mezzanine CMU walls to develop the full yielding strength of the braces. The lack of strength of the connections indicates the braces will be unable to provide the necessary ductility expected from these lateral resisting elements and abrupt rupture could occur at the CMU wall connections.

The pre-engineered metal building frames used throughout the school require additional analysis outside the scope of a Tier 1 evaluation to determine adequacy for a design seismic event. Several checklist items were found to be in non-conformance including panel zone shear strength and adequate compactness of frame members.

Non - Structural Components

The sprinkler system appeared to be braced appropriately, however there was inadequate clearance around the sprinkler heads where they penetrate the ceiling grid. All other distribution systems lack adequate bracing and support to meet the conformance requirements of the Tier - 1 checklists. The emergency lighting, and classroom projectors were generally not in conformance. Several components in the fan rooms were found to be improperly or inadequately restrained. A summary of the non-conforming items, severity, and schematic retrofits are detailed in Table 23.

8 RECOMMENDATIONS & FURTHER ANALYSIS

The seismic evaluation revealed multiple elements of the LFRS that are not expected to achieve the target seismic performance. Recommendations for retrofit and or further analysis are provided for each building area in sections 0 through 8.3.

A Tier – 2 evaluation per ASCE 41 may be used to definitively determine if the building will meet the target seismic performance goals. This evaluation involves a detailed analysis of all components of the building's lateral force resisting system which failed the Tier-1 screening criteria. This level of analysis is required by ASCE 41 in-order to determine level of seismic performance. The results of this analysis may be directly used to develop a cost effective seismic retrofit plan.

8.1 East A and West A Wings:

1. *Perform a detailed Tier – 2 seismic evaluation focusing on:*
    a. *Evaluation of demand loading for exterior wood shear wall hold-downs and sill plate anchors.*
    b. *Evaluation of the adequacy of pre-engineered metal building portal frames and connections for seismic loading and ductility requirements.*
    c. *Evaluation of the braced frame connections for necessary brace ductility and demand loading.*
    d. *Evaluation of discontinuous diaphragms and chords.*
2. *Perform an additional site visit to view all Tier-1 non-conforming elements. This will require selective demolition of architectural finishes at covered elements and access points.*
3. Develop & implement a seismic retrofit plan, as required.

8.2 East B and West B Wings:

1. *Perform a detailed Tier – 2 seismic evaluation focusing on:*
    a. *Evaluation of demand loading for exterior wood shear wall hold-downs and sill plate anchors.*
    b. *Evaluation of the adequacy of pre-engineered metal building portal frames and connections for seismic loading and ductility requirements.*
    c. *Evaluation of the braced frame connections for necessary brace ductility and demand loading.*
2. *Perform an additional site visit to view all Tier-1 non-conforming elements. This will require selective demolition of architectural finishes at covered elements and access points.*
3. *Develop & implement a seismic retrofit plan, as required.*

8.3 Middle Building:

1. *Perform a detailed Tier – 2 seismic evaluation focusing on:*
    a. *Evaluation of demand loading for exterior wood shear wall hold-downs and sill plate anchors.*
    b. *Evaluation of the adequacy of pre-engineered metal building portal frames and connections for seismic loading and ductility requirements.*
    c. *Evaluation of the braced frame connections for necessary brace ductility and demand loading.*
    d. *Evaluation of discontinuous diaphragms and chords.*
2. *Perform an additional site visit to view all Tier-1 non-conforming elements. This will require selective demolition of architectural finishes at covered elements and access points.*
3. *Develop & implement a seismic retrofit plan, as required.*

Table 20 – East A and West A Wings: Summary of LFRS elements not in conformance with the Tier - 1 checklists.

Number	Problem	Location	Description	Potential Consequences	Schematic Retrofit [a]	Further Evaluation Required? [b]	Priority Ranking [c]
1	**Load Path**	Exterior Walls	Exterior wood shear walls missing hold-down anchors. Diaphragm collector connection and connector is unknown and likely deficient.	Exterior wood shear walls will be susceptible to overturning during lateral loading, dramatically reducing capacity. Failure of the exterior shear walls could cause partial or complete collapse of the building.	Removal of interior gypsum wallboard at select locations and install post-installed hold-downs. Possibly installing additional wood elements for compression post loads.	**Yes**	**100**
2	**Wood Sill Bolts**	Exterior Walls	Exterior wood shear wall sill anchors do not meet minimum spacing. Additionally, sill anchorage is specified as shot pin fasteners which will not provide strengths necessary to resist shear wall loads.	Failure of the wood shear walls at the sill plate to foundation connection. Loss of the exterior wall systems will cause excessive drift to the exterior of the building and could overload the bracing system.	Removal of interior gypsum wallboard at select intervals and installing post-installed anchor bolts through sill plate into foundation.	**Yes**	**80**
3	**Moment-Resisting Connections**	Moment Frame Joints	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required to determine the connection capacity.	Moment frames with connections unable to develop the expected yield stress of adjoining members or panel zones may undergo brittle failure of the connection causing a sudden, non-ductile, collapse.	Addition of flange cover plates, vertical stiffeners, or doubler plates to increase the capacity of the connection. If the connection is adequate for lateral loads, beam capacities could be reduced by beam flange material to cause a plastic-hinge to form away from the connection.	**Yes**	**80**
4	**Adjacent Buildings**	Structural Joints	No gap between independent structural systems (Figure 30).	Lateral loading in East-West direction may cause structures to act out-of-phase and impact, causing greater, and more localized, loading than expected by analysis.	Retrofits are not recommended.	**Yes**	**75**
5	**Braced Frame Connection Strength**	Mezzanine CMU Walls	Brace attachment to tops of CMU walls is inadequate to resist full yielding of braces. Failure of the brace system will cause a brittle rupture of the CMU wall connection instead of a ductile yielding of the brace.	Rupture of the CMU walls potentially causing heavy falling hazards, Loss of the bracing system could cause overload of the diaphragm and exterior wood shear wall systems causing further failures and damage.	Install additional braces with ductile connections.	**Yes**	**75**
6	**Diaphragm Continuity**	High Roof	Diaphragm is discontinuous at high roof edge.	Localized collapse of corridor / entry is likely to impede egress.	Reconfigure roof so that discontinuity no longer exists.	**Yes**	**20**
7	**Roof Chord Continuity**	High Roof	Diaphragm is discontinuous at high roof edge. Chord at ridge is noncompliant.	See item (8).	See item (8).	**Yes**	**20**
8	**Moment Frame – Compact Members**	Moment Frames	Moment frame members do not meet the requirements of AISC 341, Table D1.1, for moderately ductile members.	Members that do not meet the requirements for moderately ductility may undergo localized yielding reducing the expected flexural capacity and ductility. The LFRS overall may have a reduced capacity, potentially causing collapse of the structure if overloaded.	Addition of stiffener plates to regions of the non-compact element prone to localized buckling. Adding additional bracing elements to the LFRS to reduce the demand on the non-compact members. Similar upgrades would need to be performed on the column as well to satisfy strong column-weak beam. Retrofits are not recommended.	**Yes**	**10**
9	**Braced Frame Redundancy**	Braced Frames	All lines of braced frames are two bays or less.	An additional bay will not be able to resist lateral loading if the first bay fails for any reason.	Retrofits are not recommended.	**No**	**0**

a) Schematic retrofits are conceptual and approximate.
b) A Tier 2 or 3 analysis is required to determine if the element in question is sufficient or not.
c) For a full derivation of the priority ranking, see Appendix A.

Table 21 – East B and West B Wings: Summary of LFRS elements not in conformance with the Tier - 1 checklists.

Number	Problem	Location	Description	Potential Consequences	Schematic Retrofit [a]	Further Evaluation Required? [b]	Priority Ranking [c]
1	**Load Path**	Exterior Walls	Exterior wood shear walls missing hold-down anchors. Diaphragm collector connection and connector is unknown and likely deficient.	Exterior wood shear walls will be susceptible to overturning during lateral loading, dramatically reducing capacity. Failure of the exterior shear walls could cause partial or complete collapse of the building.	Removal of interior gypsum wallboard at select locations and install post-installed hold-downs. Possibly installing additional wood elements for compression post loads.	**Yes**	**100**
2	**Wood Sill Bolts**	Exterior Walls	Exterior wood shear wall sill anchors do not meet minimum spacing. Additionally, sill anchorage is specified as shot pin fasteners which will not provide strengths necessary to resist shear wall loads.	Failure of the wood shear walls at the sill plate to foundation connection. Loss of the exterior wall systems will cause excessive drift to the exterior of the building and could overload the bracing system.	Removal of interior gypsum wallboard at select intervals and installing post-installed anchor bolts through sill plate into foundation.	**Yes**	**80**
3	**Moment-Resisting Connections**	Moment Frame Joints	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required to determine the connection capacity.	Moment frames with connections unable to develop the expected yield stress of adjoining members or panel zones may undergo brittle failure of the connection causing a sudden, non-ductile, collapse.	Addition of flange cover plates, vertical stiffeners, or doubler plates to increase the capacity of the connection. If the connection is adequate for lateral loads, beam capacities could be reduced by beam flange material to cause a plastic-hinge to form away from the connection.	**Yes**	**80**
4	**Adjacent Buildings**	Structural Joints	No gap between independent structural systems.	Lateral loading in East-West direction may cause structures to act out-of-phase and impact, causing greater, and more localized, loading than expected by analysis.	Retrofits are not recommended.	**Yes**	**75**
5	**Braced Frame Connection Strength**	Mezzanine CMU Walls	Brace attachment to tops of CMU walls is inadequate to resist full yielding of braces. Failure of the brace system will cause a brittle rupture of the CMU wall connection instead of a ductile yielding of the brace.	Rupture of the CMU walls potentially causing heavy falling hazards, Loss of the bracing system could cause overload of the diaphragm and exterior wood shear wall systems causing further failures and damage.	Install additional braces with ductile connections.	**Yes**	**75**
6	**Moment Frame – Compact Members**	Moment Frames	Moment frame members do not meet the requirements of AISC 341, Table D1.1, for moderately ductile members.	Members that do not meet the requirements for moderately ductility may undergo localized yielding reducing the expected flexural capacity and ductility. The LFRS overall may have a reduced capacity, potentially causing collapse of the structure if overloaded.	Addition of stiffener plates to regions of the non-compact element prone to localized buckling. Adding additional bracing elements to the LFRS to reduce the demand on the non-compact members. Similar upgrades would need to be performed on the column as well to satisfy strong column-weak beam. Retrofits are not recommended.	**Yes**	**10**
7	**Braced Frame - Redundancy**	Braced Frames	All lines of braced frames are two bays or less.	An additional bay will not be able to resist lateral loading if the first bay fails for any reason.	Retrofits are not recommended.	**No**	**0**

d) Schematic retrofits are conceptual and approximate.
e) A Tier 2 or 3 analysis is required to determine if the element in question is sufficient or not.
f) For a full derivation of the priority ranking, see Appendix A.

Table 22 – Main Building: Summary of LFRS elements not in conformance with the Tier - 1 checklists.

Number	Problem	Location	Description	Potential Consequences	Schematic Retrofit [a]	Further Evaluation Required? [b]	Priority Ranking [c]
1	**Load Path**	Exterior Walls	Exterior wood shear walls missing hold-down anchors. Diaphragm collector connection and connector is unknown and likely deficient.	Exterior wood shear walls will be susceptible to overturning during lateral loading, dramatically reducing capacity. Failure of the exterior shear walls could cause partial or complete collapse of the building.	Removal of interior gypsum wallboard at select locations and install post-installed hold-downs. Possibly installing additional wood elements for compression post loads.	**Yes**	**100**
2	**Wood Sill Bolts**	Exterior Walls	Exterior wood shear wall sill anchors do not meet minimum spacing. Additionally, sill anchorage is specified as shot pin fasteners which will not provide strengths necessary to resist shear wall loads.	Failure of the wood shear walls at the sill plate to foundation connection. Loss of the exterior wall systems will cause excessive drift to the exterior of the building and could overload the bracing system.	Removal of interior gypsum wallboard at select intervals and installing post-installed anchor bolts through sill plate into foundation.	**Yes**	**80**
3	**Moment-Resisting Connections**	Moment Frame Joints	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required to determine the connection capacity.	Moment frames with connections unable to develop the expected yield stress of adjoining members or panel zones may undergo brittle failure of the connection causing a sudden, non-ductile, collapse.	Addition of flange cover plates, vertical stiffeners, or doubler plates to increase the capacity of the connection. If the connection is adequate for lateral loads, beam capacities could be reduced by beam flange material to cause a plastic-hinge to form away from the connection.	**Yes**	**80**
4	**Adjacent Buildings**	Structural Joints	No gap between independent structural systems.	Lateral loading in East-West direction may cause structures to act out-of-phase and impact, causing greater, and more localized, loading than expected by analysis.	Retrofits are not recommended.	**Yes**	**75**
5	**Brace Axial Stress Check**	Grid 5.1	Axial strength in the braces is greater than half the yield strength of the elements.	Overloading of braces from tributary shear. Yielded braced frames could cause overloading of the diaphragm, portal frame at grid 1, and north gym CMU shear wall.	Install additional braces with ductile connections.	**Yes**	**45**
6	**Flexural Stress Check**	Grid 1	Flexural yield strength of beams and columns in moment frame is less than demand forces.	Yielding of beams and columns causing instability and collapse.	See item (3) retrofits.	**Yes**	**12**
7	**Moment Frame – Compact Members**	Moment Frames	Moment frame members do not meet the requirements of AISC 341, Table D1.1, for moderately ductile members.	Members that do not meet the requirements for moderately ductility may undergo localized yielding reducing the expected flexural capacity and ductility. The LFRS overall may have a reduced capacity, potentially causing collapse of the structure if overloaded.	Addition of stiffener plates to regions of the non-compact element prone to localized buckling. Adding additional bracing elements to the LFRS to reduce the demand on the non-compact members. Similar upgrades would need to be performed on the column as well to satisfy strong column-weak beam. Retrofits are not recommended.	**Yes**	**10**
8	**Braced Frame – Compact Members**	Grid 5.1	Braced frame members do not meet the requirements of AISC 341, Table D1.1, for moderately ductile members.	Members that do not meet the requirements for moderately ductility may undergo localized yielding reducing the expected capacity and ductility. The LFRS overall may have a reduced capacity, potentially causing collapse of the structure if overloaded.	Addition of stiffener plates to regions of the non-compact element prone to localized buckling. Adding additional bracing elements to the LFRS to reduce the demand on the non-compact members. Retrofits are not recommended.	**Yes**	**10**
9	**Diaphragm Continuity**	At grids 5 & 7.	Diaphragm is detailed to be discontinuous at grids 5 & 7 per details 8 & 11 / S-11 of record drawings.	Localized yielding of the metal roof deck, rupture of the roof membrane and water penetration into the building.	Retrofits are not recommended.	**Yes**	**0**
13	**Braced Frame - Redundancy**	Grid 5.1	All braced frames of the structure are two-bays or less.	An additional bay will not be able to resist lateral loading if the first bay fails for any reason.	Retrofits are not recommended.	**No**	**0**

g) Schematic retrofits are conceptual and approximate.
h) A Tier 2 or 3 analysis is required to determine if the element in question is sufficient or not.
i) For a full derivation of the priority ranking, see Appendix A.

Table 23 - Summary of Non-Structural elements not in conformance with the Tier - 1 checklists.

Number	Problem	Location	Description	Potential Consequences	Schematic Retrofit [d]	Priority Ranking [e]
1	**Fluid and Gas Piping Bracing**	Systemic	Gas is braced in one location in Fan Room 245 (Figure 33). Hydronic piping is not braced.	Lack of bracing may cause piping to fail, especially at joints, causing leaks.	Add bracing to piping in accordance with NFPA and ASCE requirements.	100
2	**Emergency Lighting**	Systemic	Emergency lights in ceiling grid were only attached to grid and not structure (Figure 42).	Emergency lights could become loose from ceiling grids and become ceiling hazards. Failure of the emergency lighting system could become an egress issue.	Brace and support emergency lighting to primary structure.	40
3	**Hazardous Materials Flexible Couplings**	Fan Room 245	Natural gas piping does not have flexible couplings.	Lack of flexible couplings may cause piping to fail, especially at joints, causing leaks.	Add flexible couplings to piping at joints.	40
4	**Crossing Seismic Joints**	All structural joints	Hydronic lines do not have couplings to accommodate relative seismic displacements.	Lack of flexible couplings may cause piping to fail, especially at joints, causing leaks.	Add flexible couplings to piping at seismic joints.	40
5	**Heavy Partitions Supported by Ceilings**	Corridor 400	CMU walls at grids L and M are laterally supported only by integrated ceiling system. See 5 / A7-1 of 1994 record drawings.	CMU walls could fail out-of-plane becoming heavy falling hazards and or egress issues.	Add braces between CMU walls and primary structure for out-of-plane support.	40
6	**Piping – Flexible Couplings**	Boiler and fan rooms	Neither fluid nor natural gas have flexible couplings.	Lack of flexible couplings may cause piping to fail, especially at joints, causing leaks.	Add flexible couplings to piping at joints.	40
7	**Tall Narrow Contents**	Room 144 and room 14	Storage shelves in room 144 and room 14 not anchored to the structure (Figure 38).	Equipment may break and or fall causing egress issues or systems to break and not function properly following a seismic event. Equipment in the ceiling spaces could fall on building occupants.	Brace all unbraced equipment by use of Unistrut, Cold Formed Steel, or mechanically attaching to the building structure.	20
8	**Fall-Prone Contents**	Room 144 and room 14	Contents weighting more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level are unbraced (Figure 39).	See item 7.	See item 7.	20
9	**Sprinkler Ceiling Clearance**	Systemic	Neither clearance nor flexible connections are provided for sprinkler heads at ceiling penetrations.	Could cause sprinklers heads to break causing water damage and obstruction or slippery floors making egress obstructed.	Enlarge or adjust sprinkler head openings in ceiling elements.	20
10	**Structural Separations**	All structural joints	Partitions that cross structural separations do not have seismic or control joints (See 2 / A9-2).	Partitions may undergo excessive deformations with anchorage failing, causing falling hazards.	Provide seismic or control joints in partition walls at structural separations.	20
11	**Edge Clearance**	Systemic	Free edge clearances of integrated suspended ceilings are less than ¾".	Pounding of ceiling elements and walls with potential for falling ceiling tiles.	This item will be resolved by the schematic retrofit for Item 13.	20
12	**Continuity Across Structure Joints**	All structural joints	Ceiling is continuous across seismic joints.	Potential for ceiling tiles to fall out of the grid.	Create joint in integrated ceiling system with edge supports at structural joint.	20
13	**Edge Support**	Systemic	Closure angles of integrated suspended ceilings are less than 2" wide.	Potential for ceiling tiles to fall out of the grid.	Replace existing edge track with 2" edge angles.	20
14	**Ceiling Seismic Joints**	All structural joints	Ceilings in corridors cross seismic joints and have a ratio of long-to-shorter dimension greater than 4-to-1.	See Item 11.	See Item 11.	20
15	**Pendant Supports**	Fan rooms, corridor 400 and various classrooms.	Projector in room 14 (Figure 38), pendant lights in corridor 400 (Figure 36) and pendant lights in fan rooms (Figure 37) are unbraced and will contact adjacent components during swinging.	Equipment may break and or damage other nearby objects causing fall hazards or egress issues.	Brace all unbraced equipment by use of Unistrut, Cold Formed Steel, or mechanically attaching to the building structure.	20
16	**Lens Covers**	Fan rooms and mezzanine corridors.	Several lights are missing lens covers (Figure 37). Clips for other light lens covers may not be seismically approved.	Lens covers could fall during a seismic event. Pendant lights without lens covers could shatter creating fall hazards.	Add lens covers to lights without. Replace lens cover clips with seismically rated clips.	20
17	**Suspended Contents**	Fan rooms, corridor 400 and various classrooms.	See item 15.	See item 15.	See item 15.	20
18	**Fall-Prone Equipment**	Fan rooms, corridor 400 and various classrooms.	See item 15.	See item 15.	See item 15.	20

19	**Suspended Equipment**	Fan rooms, corridor 400 and various classrooms.	See item 15.	See item 15.	See item 15.	20
20	**Electrical Equipment Bracing**	Fan rooms, corridor 400 and various classrooms.	See item 15.	See item 15.	See item 15.	20
21	**Hazardous Material Distribution**	Fan Room 245	Natural gas piping is not adequately braced.	Lack of bracing may cause piping to fail, especially at joints, causing leaks of gas.	Add bracing to piping in accordance with NFPA and ASCE requirements.	16
22	**Cementitious Partitions Drift**	Gym East and West walls.	CMU wall out-of-plane connections to moment frames at East and West gym walls are not detailed for drift (9 / S-12 of 1994 record drawings).	Connections could become overloaded due to excessive deformation causing masonry blow-out. Damaged masonry could become a falling hazard.	Replace out-of-plane anchorage connections from CMU to moment frames with connections detailed to accommodate drift.	16
23	**In-line Equipment**	Fan rooms	Large air separators (Figure 34) and in-line pumps (Figure **28**) which appear to weigh more than 75 lb are unbraced independent of the piping system.	Equipment may break or cause systems to break and not function properly following a seismic event.	Brace all unbraced equipment by use of Unistrut, Cold Formed Steel, or mechanically attaching to the building structure.	10
24	**Conduit Flexible Couplings**	Fan rooms	Conduit in fan rooms is installed without flexible couplings.	Conduit could be damaged due to excessive deformation, causing power issues or potential for fire.	Replace conduit couplings with flexible couplings.	10
25	**C-Clamps**	Fan rooms and mezzanine corridors	C-clamps without seismic straps supporting piping (Figure 40) observed at two locations.	Clamps may slip off during seismic event.	Add seismic straps to clamps.	8
26	**Hazardous Material Storage**	Fan Room 245	Glycol makeup tank is not braced or anchored (Figure 35).	Glycol tank could overturn and spill causing damage.	Anchor and brace tank to primary structure.	5
27	**Stair Details**	Mezzanine stairs	Mezzanine stairs are not detailed to accommodate drift from moment-frame LFRS.	Stairs may be damaged potentially causing egress issues.	Replace stair connections with connections detailed to accommodate drift.	4
28	**Heavy Equipment**	Fan Room 245	Boilers are anchored with damaged or untightened fasteners (Figure 29).	Fasteners could be overloaded causing sliding or overturning of heavy equipment and potentially damage to other components.	Tighten all anchors to meet manufacturers specifications. Replace damaged anchors.	4
29	**Tops of Partitions**	Systemic	The tops of ceiling-high partitions have continuous but possibly inadequate lateral bracing to the roof deck. CFS walls are restrained by use of double top runner tracks instead of slotted tracks (Figure 13 and Figure 31).	Studs without full attachment to the top runner track with use of slotted tracks could bend the lip of the channel and lose out-of-plane bracing.	Replace top track with slotted track.	0
30	**(U) Suspended Gypsum Board**	Systemic	Attachment of suspended gypsum board ceiling not observable from site visit nor details from record drawings.	Suspended gypsum board ceilings could fall and cause injuries and or become an egress issue.	Determine if current anchorage is adequate and add additional anchorage if necessary.	0
31	**(U) Glazing is laminated annealed.**	Above school entrance doors.	Details from record drawings do not state if stained glass above doors at entrance school is laminated annealed or laminated heat-strengthened glass (Figure 41).	Non-laminated glass could shatter causing injuries and or become an egress issue.	Determine if current glazing is adequate and replace if necessary.	0

j) Schematic retrofits are conceptual and approximate.
k) For a full derivation of the priority ranking, see Appendix A.
l) (U) indicates that the component is unknown

9 SITE VISIT PHOTOS



Figure 15 – Main entrance to the school, Northwest elevation (Main building).



Figure 16 - Northeast elevation (West A wing gable).



Figure 17 - Southeast elevation of West A wing.



Figure 18 - Southeast elevation of West A and West B wings.



Figure 19 - South elevation of Main building.



Figure 20 - Southwest elevation of East A and B wings.



Figure 21 - South elevation of East A wing.



Figure 22 - West elevation of East A wing.



Figure 23 - Middle building flat roof.



Figure 24 - West A wing roof and ridge.



Figure 25 - East B wing (right) to Main building (left) diaphragm interface.



Figure 26 – Typical cracking in concrete slab-on-deck floor in mezzanine between Main building and East B and West B wings.



Figure 27 - Gypsum wall board damage at doorway between Fan Rooms 244 and 245.

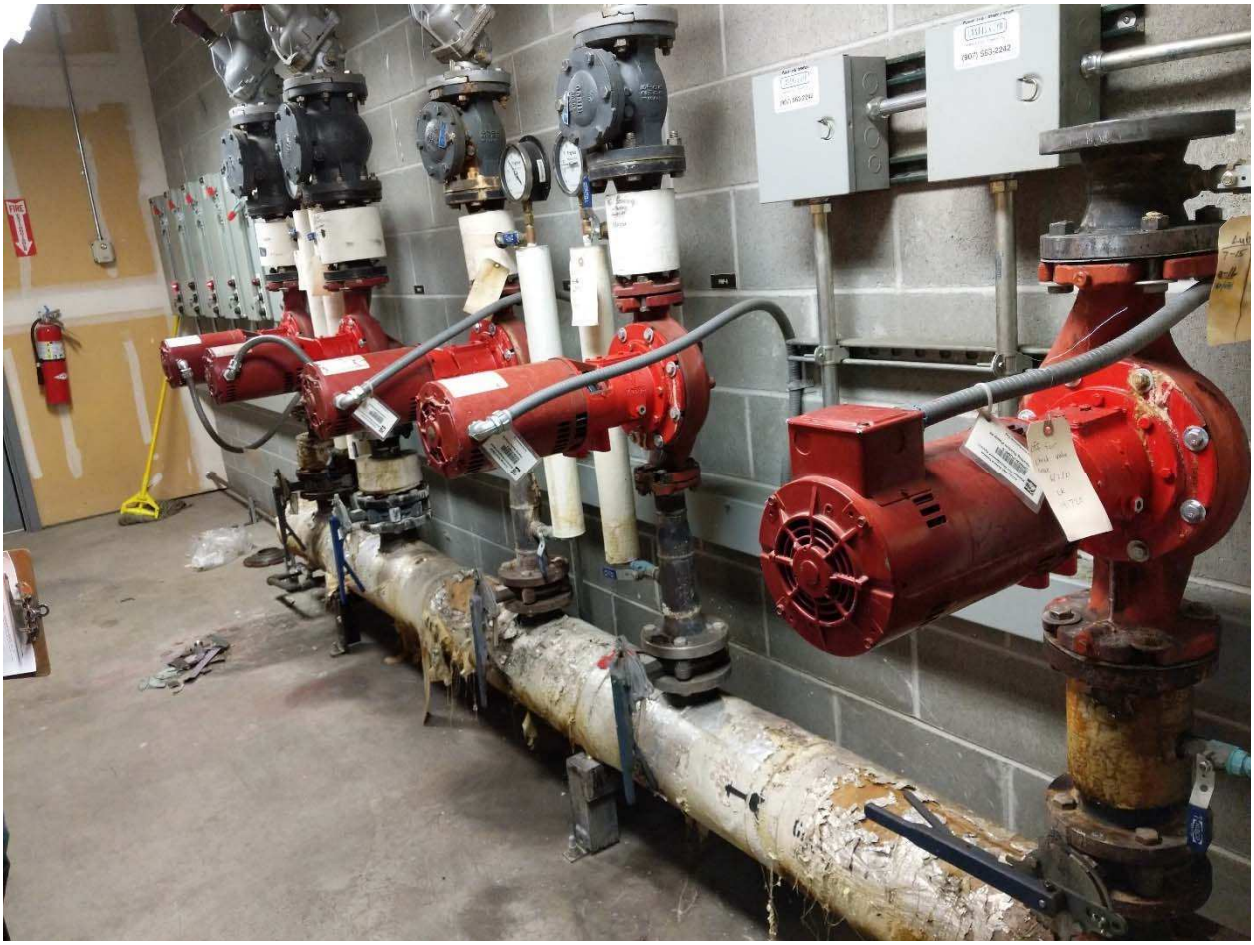


Figure 28 – Unbraced pumps and water damaged piping insulation in Fan Rooms.



Figure 29 - Boiler with untightened anchor bolt in mezzanine.

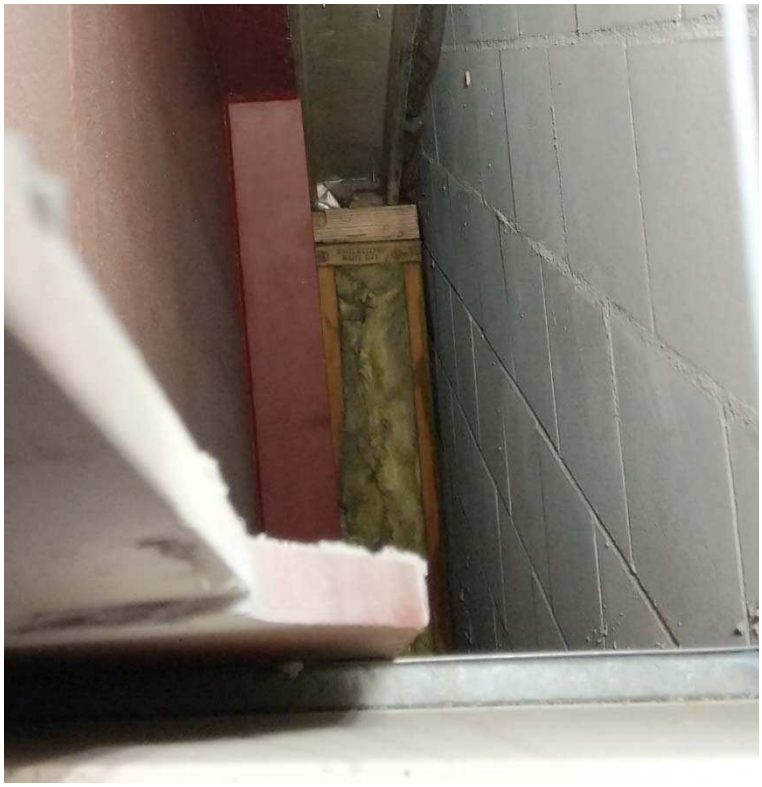


Figure 30 - Typical exterior shear wall at structural joint without isolation gap. Observed above ceiling in Room 14 of the West B wing.

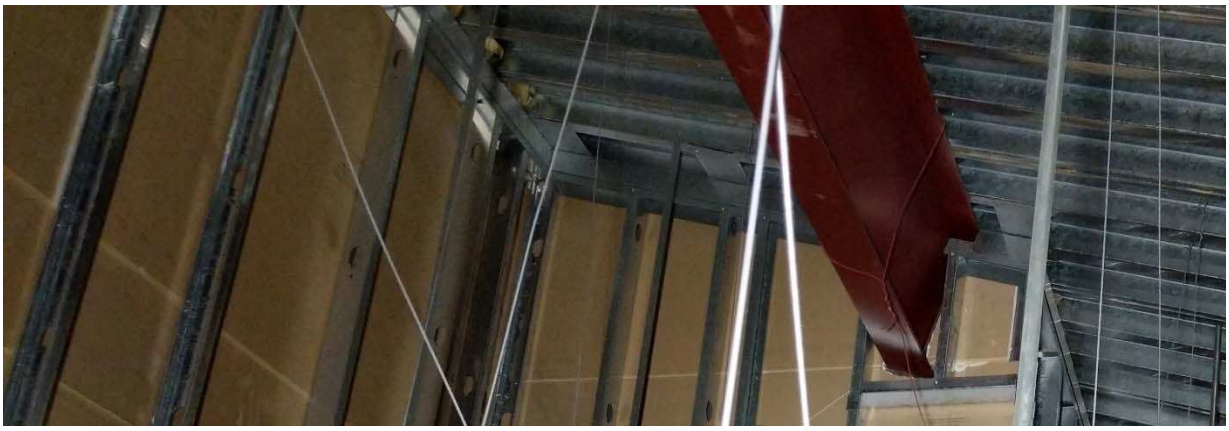


Figure 31 - Typical top of CFS partition wall connections to roof deck. Observed above ceiling in Room 14 of the West B wing.



Figure 32- Typical top of CFS partition wall connections to roof deck, with a double top track.

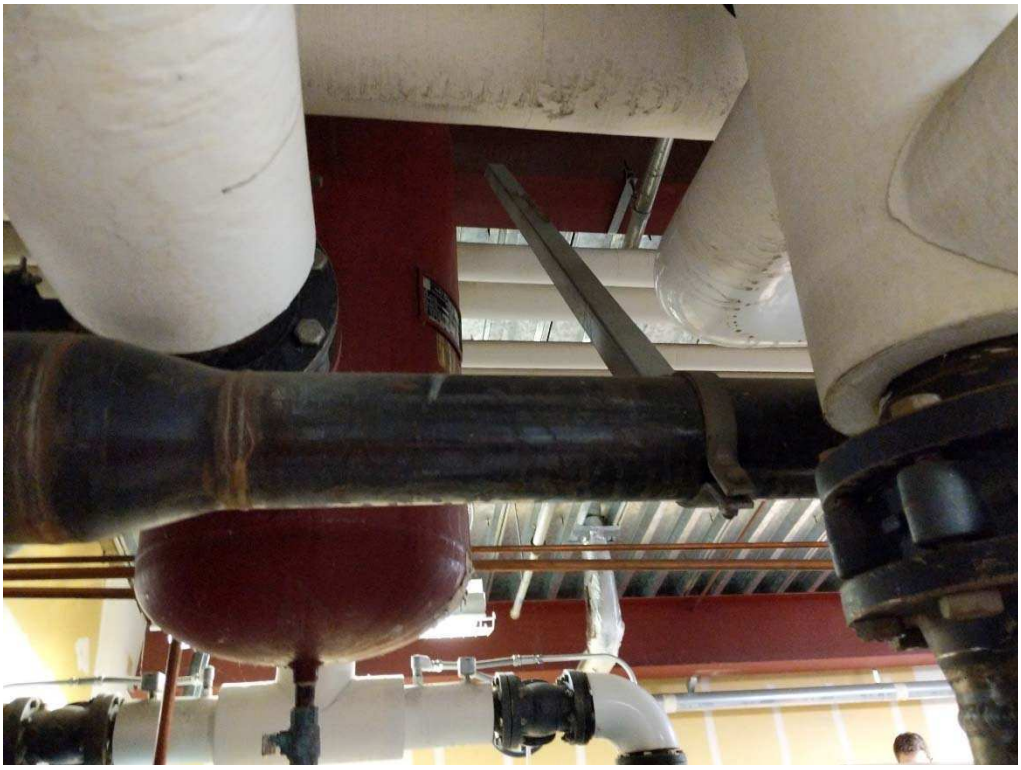


Figure 33 - Single brace observed for gas piping in Fan Room 245.

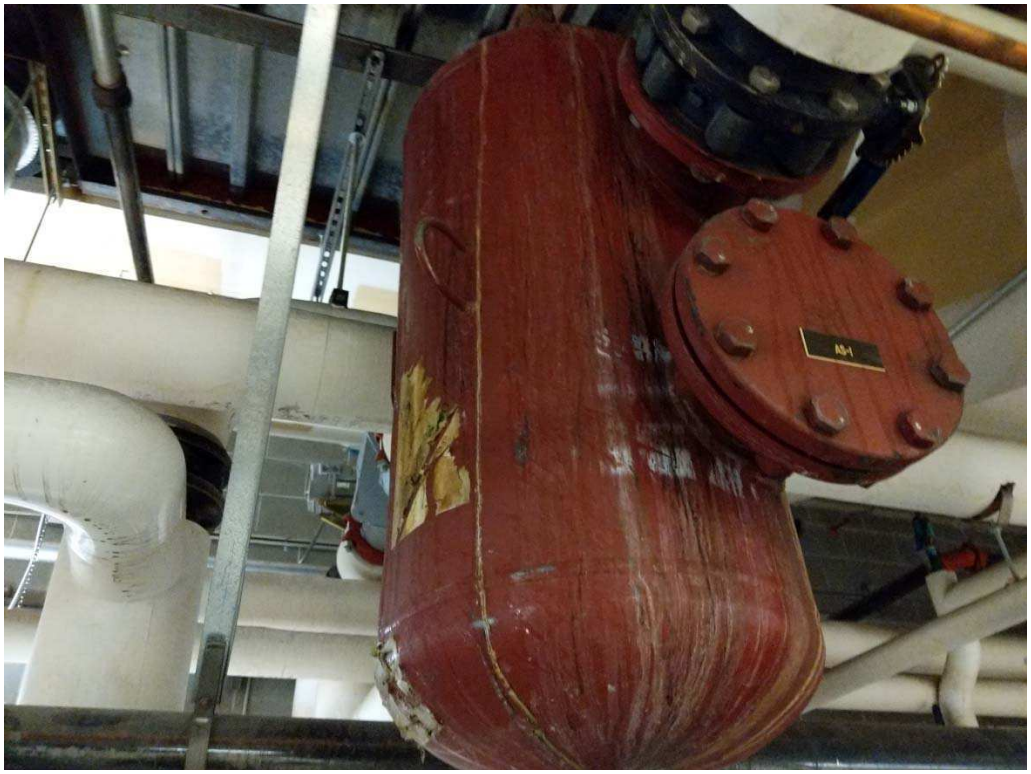


Figure 34 - Unbraced in-line air separator in Fan Room 245.



Figure 35 - Unanchored Glycol Makeup Tank in Fan Room 245.



Figure 36 - Unbraced pendant light in Corridor 400.



Figure 37 - Unbraced pendant light, missing lens cover, in Fan Rooms.



Figure 38 - Unbraced shelves and cabinets in Room 144.



Figure 39 - Fall-prone contents in Room 14.



Figure 40 - C-clamp missing seismic restraint, in Fan Room.

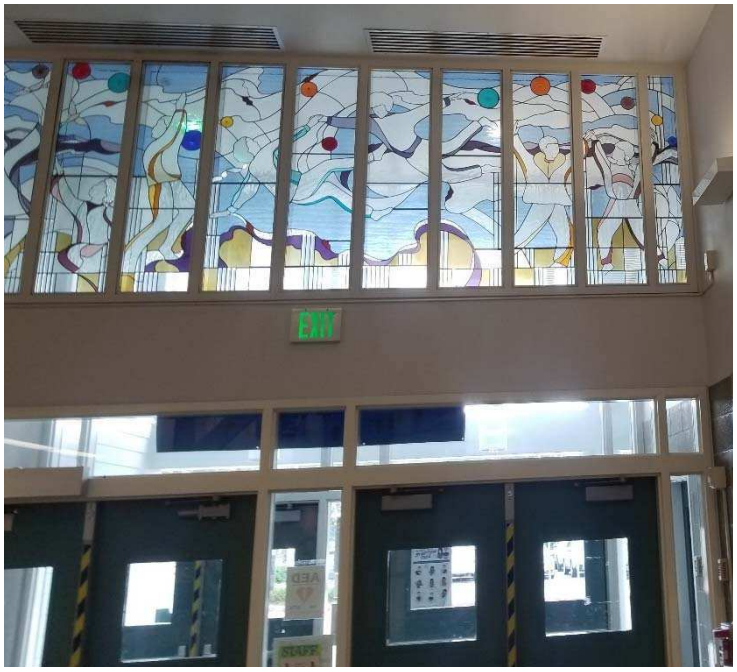


Figure 41 - Stained glass over school entrance.



Figure 42 - Emergency light in Room 14 ceiling braced only by ceiling grid.

APPENDIX A

RELATIVE PRIORITY RANKING OF TIER 1 DEFICIENCIES

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Williwaw Elementary School - East and West A Wings **2/18/2022**

Relative Priority Rating of Tier 1 Screening Deficiencies - Structural Items

Ref Appendix 4 of ASD Seismic Evaluation & Retrofit Guide

			(0-5)	(1-5)	(1-4)	
Area	**Checklist**	**Item**	**Deficiency**	**Prevalence**	**Threat**	**Priority Rating**
Exterior walls	17.1.2	Load Path	5	5	4	100
Exterior walls	17.3	Wood Sill Bolts	5	4	4	80
Systemic	17.12	Moment-resisting connections	4	5	4	80
Structural Joints	17.1.2	Adjacent Buildings	5	5	3	75
Mezzanine CMU walls	17.5	Connection Strength	5	5	3	75
High roof	17.3	Diaphragm Continuity	5	1	4	20
High roof	17.3	Roof Chord Continuity	5	1	4	20
Systemic	17.12	Compact Members	1	5	2	10
Braced frames	17.5	Redundancy	0	5	1	0

Williwaw Elementary School - East & West B Wings

Relative Priority Rating of Tier 1 Screening Deficiencies - Structural Items

Ref Appendix 4 of ASD Seismic Evaluation & Retrofit Guide

			(0-5)	(1-5)	(1-4)	
Area	**Checklist**	**Item**	**Deficiency**	**Prevalence**	**Threat**	**Priority Rating**
Exterior walls	17.1.2	Load Path	5	5	4	100
Exterior walls	17.3	Wood Sill Bolts	5	4	4	80
Systemic	17.12	Moment-resisting connections	4	5	4	80
Structural Joints	17.1.2	Adjacent Buildings	5	5	3	75
Mezzanine CMU walls	17.5	Connection Strength	5	5	3	75
Systemic	17.12	Compact Members	1	5	2	10
Systemic	17.5	Redundancy	0	5	1	0

Williwaw Elementary School - Middle Building

Relative Priority Rating of Tier 1 Screening Deficiencies - Structural Items

Ref Appendix 4 of ASD Seismic Evaluation & Retrofit Guide

			(0-5)	(1-5)	(1-4)	
Area	**Checklist**	**Item**	**Deficiency**	**Prevalence**	**Threat**	**Priority Rating**
Exterior walls	17.1.2	Load Path	5	5	4	100
Exterior walls	17.3	Wood Sill Bolts	5	4	4	80
Systemic	17.12	Moment-Resisting Connections	4	5	4	80
Structural Joints	17.1.2	Adjacent Buildings	5	5	3	75
Grid 5.1	17.5 & 17.12	Brace Axial Stress Check	5	3	3	45
Systemic	17.12	Compact Members	1	5	2	10
Grid 5.1	17.5	Compact Members	1	5	2	10
Between gridlines 5&7	17.3	Diaphragm Continuity	1	1	2	2
Grid 5.1	17.5	Redundancy	0	2	1	0

Appendix 4 – Structural Deficiency Priority Ranking

The Priority Ranking is a way to help determine the order in which deficiencies should be addressed. All elements with a rating above zero should be addressed, but this will allow the retrofit to be prioritized. Structural deficiencies should be rated in the following three categories: degree of deficiency, prevalence, and degree of threat.

Degree of Deficiency

The percent of nonconformance should be taken into consideration when prioritizing the deficiencies. Anything considered "code deficient" should be ranked a 5. Use the following six-point scale to rate the degree of deficiency.

0 – Elements loaded less than or equal to member capacity (<100%).
1 – Elements loaded less than 10% above member capacity (<110%).
2 – Elements loaded less than 20% above member capacity (<120%).
3 – Elements loaded less than 35% above member capacity (<135%).
4 – Elements loaded less than 50% above member capacity (<150%).
5 – Elements loaded greater than 50% of member capacity or deemed "code deficient".

Prevalence

It is important to recognize how many times this element or connection is repeated throughout the building. Prevalence allows the priority rating to include the amount of the structure that has the element problem described. Use the following five-point scale to rate the prevalence of all deficient elements.

1 – Present in 0-10% of the building.
2 – Present in 10-25% of the building.
3 – Present in 25-50% of the building.
4 – Present in 50-80% of the building.
5 – Present in 80-100% of the building.

Degree of Threat

Allowing for engineering judgment, the degree of threat is for including what would happen should this member fail. The threat or hazard to structural integrity should this element fail should be rated on the following four-point scale.

1 – The problem is not critical to structural integrity.
2 – The problem will create minor problems nearby but does not affect structural integrity.
3 – The problem will create problems nearby and will affect structural integrity.
4 – The problem will create major problems and affect structural integrity of many other members and the system.

By taking the product of the three categories above (deficiency X prevalence X threat), each noncompliant item will be rated on a scale of 0 to 100, creating a Priority Ranking for each element. See an example on the following page.

Williwaw Elementary School

Relative Priority Rating of Tier 1 Screening Deficiencies - Non-Structural Items

Ref Appendix 5 of ASD Seismic Evaluation & Retrofit Guide

				(0,2,5)	(1-5)	(1,2,4)	
Area	**Checklist**	**Number**	**Item**	**Deficiency**	**Prevalence**	**Threat**	**Priority Rating**
Systemic	17.19	30	Fluid and Gas Piping	5	5	4	100
Systemic	17.19	2	Emergency Lighting	2	5	4	40
Boiler Room	17.19	5	Hazardous Flexible Couplings	5	2	4	40
All structural joints	17.19	6	Pipe & Ducts Crossing Seismic Joints	2	5	4	40
Middle building commons (corridor 400)	17.19	7	Heavy Partitions Supported by Ceilings	5	2	4	40
Boiler room and fan rooms	17.19	29	Piping - Flexible Couplings	2	5	4	40
Room 144, various classrooms	17.19	20	Tall Narrow Contents	5	2	2	20
Room 144, various classrooms	17.19	21	Fall-Prone Contents	5	2	2	20
Systemic	17.19	1	Sprinkler Ceiling Clearance	2	5	2	20
All structural joints	17.19	9	Structural Separations	2	5	2	20
Systemic	17.19	12	Edge Clearance	2	5	2	20
All structural joints	17.19	13	Continuity across structure joints	2	5	2	20
Systemic	17.19	14	Edge Support	2	5	2	20
All structural joints	17.19	15	Ceiling Seismic Joints	2	5	2	20
Fan rooms, corridor 400, class rooms.	17.19	16	Pendant Supports	2	5	2	20
Fan rooms and mezzanine corridors	17.19	17	Lens covers	2	5	2	20
Fan rooms, corridor 400, class rooms.	17.19	22	Suspended Contents	2	5	2	20
Fan rooms, various classrooms	17.19	23	Fall-Prone Equipment	2	5	2	20
Fan rooms, corridor 400, class rooms.	17.19	25	Suspended Equipment	2	5	2	20
Fan rooms, corridor 400, class rooms.	17.19	27	Electrical Equipment Bracing	2	5	2	20
Boiler Room	17.19	4	Hazardous Material Distribution	2	2	4	16
Gym E & W walls	17.19	8	Cementitious Partitions Drift	2	2	4	16
Fan rooms	17.19	24	In-line Equipment	2	5	1	10
Fan rooms	17.19	28	Conduit Couplings	2	5	1	10
Fan rooms	17.19	31	C-clamps	2	2	2	8
Boiler Room	17.19	3	Hazardous Material Storage	5	1	1	5
Mezzanine Stairs	17.19	19	Stair Details	2	1	2	4
Boiler Room	17.19	26	Heavy Equipment	2	2	1	4
Systemic	17.19	10	Tops of Partitions	0	5	1	0
Systemic	17.19	11	(Unknown) Suspended Gypsum Board	0	0	0	0
Above school entrance doors.	17.19	18	(Unknown) Glazing	0	0	0	0

Appendix 5 – Nonstructural Deficiency Priority Ranking

The Priority Ranking is a way to help determine the order in which deficiencies should be addressed. All elements with a rating above zero should be addressed, but this will allow the retrofit to be prioritized. Nonstructural deficiencies should be rated in the following three categories: degree of deficiency, prevalence, and degree of threat.

Degree of Deficiency

The percent of nonconformance should be taken into consideration when prioritizing the deficiencies. Anything considered "code deficient" should be ranked a 5. Use the following scale to rate the degree of deficiency.

0 – Elements connected and connection appears to be adequate for seismic and gravity loads.
2 – Element connected, but connection is deficient.
5 – Elements not connected to the structure to resist seismic loads.

Prevalence

It is important to recognize how many of this element is in the building. Use the following five-point scale to rate the prevalence of all deficient items.

1 – One piece of equipment, or one location, is deficient.
2 – Two pieces of equipment or locations are deficient.
3 – Three pieces of equipment or locations are deficient.
4 – Four pieces of equipment or locations are deficient.
5 – More than four pieces of equipment or locations are deficient.

Degree of Threat

Allowing for engineering judgment, the degree of threat is for including what would happen should this member fail. The threat or hazard to the occupants of the building should this element fail should be rated on the following four-point scale.

1 – The problem is not critical and will not create a falling hazard or impede egress.
2 – The problem will create a minor falling hazard but will not impeded egress nearby.
4 – The problem will create major problems and/or will impede egress from the building.

By taking the product of the three categories above (deficiency X prevalence X threat), each noncompliant item will be rated on a scale of 0 to 100, creating a Priority Ranking for each element. See an example on the following page.

APPENDIX B

TIER 1 CHECKLISTS

Table of Contents

1.0 East A Wing Checklists B-01

2.0 West A Wing Checklists B-17

3.0 East B Wing Checklists B-33

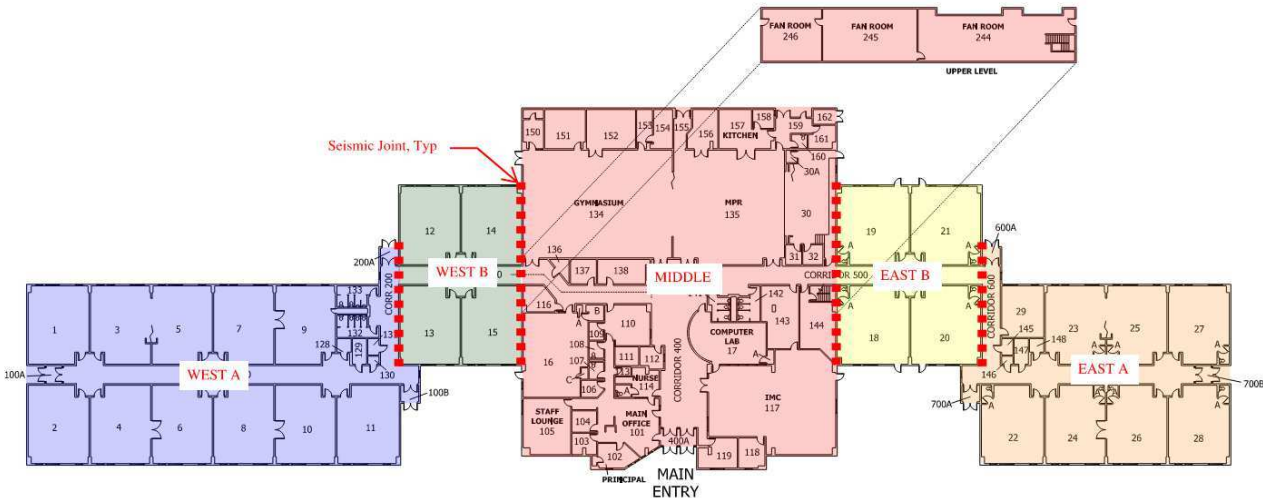
4.0 West B Wing Checklists B-49

5.0 Middle Building Checklists B-65

6.0 Nonstructural Checklist B-81

ASCE 41-17 Tier 1 Checklists

FIRM:	PDC Engineers
PROJECT NAME:	ASD Tier 1 Seismic Evaluations
SEISMICITY LEVEL:	High
PROJECT NUMBER:	21156AN
COMPLETED BY:	NIC
DATE COMPLETED:	11/17/21
REVIEWED BY:	WH
REVIEW DATE:	11/23/21



Key Plan

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

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Project Name ASD Tier 1 Seis Evals
Project Number 21156AN
East A Wing

Appendix C: Summary Data Sheet

BUILDING DATA

Building Name: Williwaw Elementary School - East A Date: 11/11/2021
Building Address: 1200 San Antonio St, Anchorage, AK
Latitude: 61° 12' 40" N Longitude: 149° 47' 50" W By: NIC

Year Built: 1994 Year(s) Remodeled: None Original Design Code: UBC 1991
Area [ft² (m²)]: 9,460 Length [ft (m)]: 111.3 Width [ft (m)]: 80
No. of Stories: 1 Story Height: 16.7ft Total Height: 22.5 ft (ridge)

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☑ Educational ☐ Other: _____

CONSTRUCTION DATA

Gravity Load Structural System: Wood bearing walls, reinforced CMU, pre-engineered portal frames
Exterior Transverse Walls: Wood / CMU shear walls Openings? Doors / Windows
Exterior Longitudinal Walls: Wood shear walls Openings? Doors / Windows
Roof Materials/Framing: 3" x 20ga steel decking and plywood. Steel purlins.
Intermediate Floors/Framing: 2 1/2" Slab-on-deck
Ground Floor: 4" concrete slab-on-grade
Columns: Steel pre-engineered portal frame and tubes Foundation: Concrete ftgs & CMU stem walls
General Condition of Structure: Good
Levels Below Grade? None
Special Features and Comments: Tension-only braces acting out-of-plane from pre-engineered portal frames.

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Steel Braces, Wood/CMU shearwalls	Pre-engineered portal frames
Vertical Elements:	Wood&CMU brg walls/Steel columns	Steel columns
Diaphragms:	3" Steel deck, 2 1/2" Slab-on-deck	3" Steel deck, 2 1/2" Slab-on-deck
Connections:	Bolted and welded	Bolted and welded

EVALUATION DATA

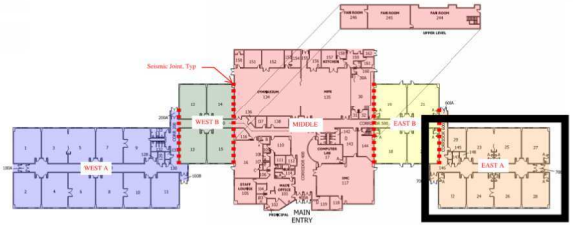
BSE-1N Spectral Response Accelerations: S_{DS} = 1.2 S_{D1} = 0.771
Soil Factors: Class = D, Default F_a = 1.2 F_v = 1.7
BSE-2E Spectral Response Accelerations: S_{XS} = 1.567 S_{X1} = 1.016
Level of Seismicity: High Performance Level: Limited Safety
Building Period: T = 0.16
Spectral Acceleration: S_a = 1.567
Modification Factor: $C_m C_1 C_2$ = 1.4 Building Weight: W = 471 kip
Pseudolateral Force: $V = C_m C_1 C_2 S_a W$ = 1033 kip

BUILDING CLASSIFICATION: Educational

REQUIRED TIER 1 CHECKLISTS

	Yes	No
Basic Configuration Checklist	☑	☐
Building Type S3, S2, RM1, W1 Structural Checklists	☑	☐
Nonstructural Component Checklist	☑	☐

FURTHER EVALUATION REQUIREMENT: Yes



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Project Name ASD Tier 1 Seis Evals
Project Number 21156AN
East A Wing

17.1.2CP Basic Configuration Checklist

Table 17-2. Collapse Prevention Basic Configuration Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Building System—General							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.1	A.2.1.1	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.2	A.2.1.2	Structurally separated wings are directly adjacent with no clear distance.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	
Building System—Building Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.1	A.2.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.2	A.2.2.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	

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C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.4	A.2.2.5	
☒	☐	☐	☐	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.	5.4.2.5	A.2.2.6	
☒	☐	☐	☐	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.	5.4.2.6	A.2.2.7	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Geologic Site Hazards							
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.1	Low risk of liquefaction
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.2	
☒	☐	☐	☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)							
Foundation Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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 $0.6S_a$.	5.4.3.3	A.6.2.1	0.6*1.567 = 0.94 80ft / 16.7ft = 4.79
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.3.4	A.6.2.2	

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17.3CP Structural Checklist for Building Type W2: Wood Frames, Commercial and Industrial

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	Shear walls resist only in EW direction.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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	5.5.3.1.1	A.3.2.7.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.5.3.6.1	A.3.2.7.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	No observed wood shear walls above first floor.
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	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.	5.5.3.6.3	A.3.2.7.6	

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C	NC	N/A	U				
☐	☐	☒	☐	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.5.3.6.5	A.3.2.7.8	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	No wood posts.
C	NC	N/A	U				
☒	☐	☐	☐	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	Sills are mechanically anchored to the foundation. Anchor capacities are unknown/appear to be discontinued.
C	NC	N/A	U				
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Connections							
C	NC	N/A	U				
☐	☒	☐	☐	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.	5.7.3.3	A.5.3.7	Per 1/S-10, anchors are spaced 8' oc at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragms							
C	NC	N/A	U				
☐	☒	☐	☐	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	Diaphragm is discontinuous at high roof edge.
C	NC	N/A	U				
☐	☒	☐	☐	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	Diaphragm is discontinuous at high roof edge. Chord at ridge is non compliant.

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C	NC	N/A	U				
☐	☐	☒	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	
C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Effective diaphragm is metal decking.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	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.	5.6.2	A.4.2.3	

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17.17CP Structural Checklist for Building Types RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms and RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

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

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2	
Stiff Diaphragms							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1	No precast concrete.
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2	

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C	NC	N/A	U				
☒	☐	☐	☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3	No precast concrete elements.
C	NC	N/A	U				
☒	☐	☐	☐	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5	
C	NC	N/A	U				
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Stiff Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	
Flexible Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Effective diaphragm is metal decking.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4	CMU walls do not connect to wood diaphragms.

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17-12. Collapse Prevention Structural Checklist for Building Type S3

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Low and Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	
C	NC	N/A	U		
☒	☐	☐	☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

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High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required.
C	NC	N/A	U		
☐	☒	☐	☐	COMPACT MEMBERS: All frame elements shall meet compact section requirements set forth by AISC 360, Table B4.1. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4)	No moment frame members meet the requirements for moderately ductile members.
C	NC	N/A	U		
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	ROOF PANELS: *Metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. (Commentary: Sec. A.5.5.1. Tier 2: Sec. 5.7.5) **Where considered as diaphragm elements for lateral resistance...*	

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C	NC	N/A	U		
☒	☐	☐	☐	WALL PANELS:*Metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. (Commentary: Sec. A.5.5.2. Tier 2: Sec. 5.7.5) **Where considered as shear elements for lateral resistance...*	

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17.5CP Structural Checklist for Building Types S2: Steel Braced Frames with Stiff Diaphragms and S2a: Steel Braced Frames with Flexible Diaphragms

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1	Braced frames only resist lateral forces in one principal direction.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2	
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Seismic-Force-Resisting System							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1	Number of braced bays is equal to two.
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Braces are tension-only.

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C ☒	NC ☐	N/A ☐	U ☐	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.4	A.3.3.1.7	
C ☒	NC ☐	N/A ☐	U ☐	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1	
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Seismic-Force-Resisting System							
C ☐	NC ☐	N/A ☒	U ☐	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3	No column splice observed.
C ☐	NC ☐	N/A ☒	U ☐	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200.	5.5.4.3	A.3.3.1.4	Braces are tension-only.
C ☐	NC ☒	N/A ☐	U ☐	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Brace connections cannot develop the yield capacity of the diagonals.
C ☒	NC ☐	N/A ☐	U ☐	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.4	A.3.3.1.7	
C ☐	NC ☐	N/A ☒	U ☐	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3	No chevron bracing.
C ☐	NC ☐	N/A ☒	U ☐	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4	Braces frame into beams and into tops of CMU walls. Braces do not frame into beam-column joints.
Diaphragms (Stiff or Flexible)							
C ☒	NC ☐	N/A ☐	U ☐	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5	
Flexible Diaphragms							
C ☒	NC ☐	N/A ☐	U ☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Effective diaphragm is metal decking.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	

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Project Name ASD Tier 1 Seis Evals
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Appendix C: Summary Data Sheet

BUILDING DATA

Building Name: Williwaw Elementary School - West A — Date: 11/11/2021
Building Address: 1200 San Antonio St, Anchorage, AK
Latitude: 61° 12' 40" N — Longitude: 149° 47' 50" W — By: NIC

Year Built: 1994 — Year(s) Remodeled: None — Original Design Code: UBC 1991
Area [ft² (m²)]: 13967 — Length [ft (m)]: 164.3 — Width [ft (m)]: 80
No. of Stories: 1 — Story Height: 16.7ft — Total Height: 22.5 ft (ridge)

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☑ Educational ☐ Other: _____

CONSTRUCTION DATA

Gravity Load Structural System: Wood bearing walls, reinforced CMU, pre-engineered portal frames
Exterior Transverse Walls: Wood / CMU shear walls — Openings? Doors / Windows
Exterior Longitudinal Walls: Wood shear walls — Openings? Doors / Windows
Roof Materials/Framing: 3" x 20ga steel decking and plywood. Steel purlins.
Intermediate Floors/Framing: 2 1/2" Slab-on-deck
Ground Floor: 4" concrete slab-on-grade
Columns: Steel pre-engineered portal frame and tubes — Foundation: Concrete ftgs & CMU stem walls
General Condition of Structure: Good
Levels Below Grade? None
Special Features and Comments: Tension-only braces acting out-of-plane from pre-engineered portal frames.

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Steel Braces, Wood/CMU shearwalls	Pre-engineered portal frames
Vertical Elements:	Wood&CMU brg walls/Steel columns	Steel columns
Diaphragms:	3" Steel deck, 2 1/2" Slab-on-deck	3" Steel deck, 2 1/2" Slab-on-deck
Connections:	Bolted and welded	Bolted and welded

EVALUATION DATA

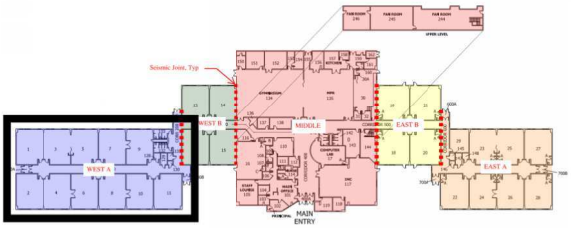
BSE-1N Spectral Response Accelerations: S_{DS} = 1.2 — S_{D1} = 0.771
Soil Factors: Class = D, Default — F_a = 1.2 — F_v = 1.7
BSE-2E Spectral Response Accelerations: S_{XS} = 1.567 — S_{X1} = 1.016
Level of Seismicity: High — Performance Level: Limited Safety
Building Period: T = 0.16
Spectral Acceleration: S_a = 1.567
Modification Factor: $C_m C_1 C_2$ = 1.4 — Building Weight: W = 639 kip
Pseudolateral Force: $V = C_m C_1 C_2 S_a W$ = 1403 kip

BUILDING CLASSIFICATION: Educational

REQUIRED TIER 1 CHECKLISTS

	Yes	No
Basic Configuration Checklist	☑	☐
Building Type S3, S2, RM1, W1 Structural Checklists	☑	☐
Nonstructural Component Checklist	☑	☐

FURTHER EVALUATION REQUIREMENT: Yes



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17.1.2CP Basic Configuration Checklist

Table 17-2. Collapse Prevention Basic Configuration Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Building System—General							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.1	A.2.1.1	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.2	A.2.1.2	Structurally separated wings are directly adjacent with no clear distance.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	
Building System—Building Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.1	A.2.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.2	A.2.2.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	

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C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.4	A.2.2.5	
☒	☐	☐	☐	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.	5.4.2.5	A.2.2.6	
☒	☐	☐	☐	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.	5.4.2.6	A.2.2.7	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Geologic Site Hazards							
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.1	Low risk of liquefaction.
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.2	
☒	☐	☐	☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)							
Foundation Configuration							
C	**NC**	**N/A**	**U**	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 $0.6S_a$.	5.4.3.3	A.6.2.1	0.6*1.567 = 0.94 80 ft / 16.7ft = 4.79
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	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.	5.4.3.4	A.6.2.2	
☒	☐	☐	☐				

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Project Name ASD Tier 1 Seis Evals
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17.3CP Structural Checklist for Building Type W2: Wood Frames, Commercial and Industrial

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	Shear walls resist only in EW direction.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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	5.5.3.1.1	A.3.2.7.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.5.3.6.1	A.3.2.7.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	No observed wood shear walls above first floor.
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	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.	5.5.3.6.3	A.3.2.7.6	

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C	NC	N/A	U				
☐	☐	☒	☐	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.5.3.6.5	A.3.2.7.8	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	No wood posts.
C	NC	N/A	U				
☒	☐	☐	☐	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	Sills are mechanically anchored to the foundation. Anchor capacities are unknown/appear to be discontinued.
C	NC	N/A	U				
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Connections							
C	NC	N/A	U				
☐	☒	☐	☐	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.	5.7.3.3	A.5.3.7	Per 1/S-10, anchors are spaced 8' oc at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragms							
C	NC	N/A	U				
☐	☒	☐	☐	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	Diaphragm is discontinuous at high roof edge.
C	NC	N/A	U				
☐	☒	☐	☐	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	Diaphragm is discontinuous at high roof edge. Chord at ridge is non compliant.

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C	NC	N/A	U				
☐	☐	☐	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	
C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Effective diaphragm is metal decking.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	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.	5.6.2	A.4.2.3	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

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17.17CP Structural Checklist for Building Types RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms and RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

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

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2	
Stiff Diaphragms							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1	No precast concrete.
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2	

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C	NC	N/A	U		Tier 2 Reference	Commentary Reference	Comments
☒	☐	☐	☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	
☐	☐	☒	☐	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3	No precast concrete elements.
☒	☐	☐	☐	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5	
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Stiff Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	
Flexible Diaphragms							
☒	☐	☐	☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Effective diaphragm is metal decking.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4	CMU walls do not connect to wood diaphragms.

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17-12. Collapse Prevention Structural Checklist for Building Type S3

Project Name 21156AN
Project Number West A Wing

Low and Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	
C	NC	N/A	U		
☒	☐	☐	☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

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High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required.
C	NC	N/A	U		
☐	☒	☐	☐	COMPACT MEMBERS: All frame elements shall meet compact section requirements set forth by AISC 360, Table B4.1. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4)	No moment frame members meet the requirements for moderately ductile members.
C	NC	N/A	U		
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	ROOF PANELS: *Metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. (Commentary: Sec. A.5.5.1. Tier 2: Sec. 5.7.5) **Where considered as diaphragm elements for lateral resistance...*	

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C	NC	N/A	U		
☒	☐	☐	☐	WALL PANELS: *Metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. (Commentary: Sec. A.5.5.2. Tier 2: Sec. 5.7.5) **Where considered as shear elements for lateral resistance...*	

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17.5CP Structural Checklist for Building Types S2: Steel Braced Frames with Stiff Diaphragms and S2a: Steel Braced Frames with Flexible Diaphragms

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Seismic-Force-Resisting System							
C	NC	N/A	U	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1	Braced frames only resist lateral forces in one principal direction.
☒	☐	☐	☐				
C	NC	N/A	U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2	
☒	☐	☐	☐				
C	NC	N/A	U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2	
☒	☐	☐	☐				
Connections							
C	NC	N/A	U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2	
☒	☐	☐	☐				
C	NC	N/A	U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1	
☒	☐	☐	☐				

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Seismic-Force-Resisting System							
C	NC	N/A	U	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1	Number of braced bays is equal to two.
☐	☒	☐	☐				
C	NC	N/A	U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Braces are tension-only.
☐	☐	☒	☐				

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C ☒	NC ☐	N/A ☐	U ☐	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.4	A.3.3.1.7	
C ☒	NC ☐	N/A ☐	U ☐	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1	
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Seismic-Force-Resisting System							
C ☐	NC ☐	N/A ☒	U ☐	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3	No column splice observed.
C ☐	NC ☐	N/A ☒	U ☐	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200.	5.5.4.3	A.3.3.1.4	Braces are tension-only.
C ☐	NC ☒	N/A ☐	U ☐	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Brace connections cannot develop the yield capacity of the diagonals.
C ☒	NC ☐	N/A ☐	U ☐	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.4	A.3.3.1.7	
C ☐	NC ☐	N/A ☒	U ☐	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3	No chevron bracing.
C ☐	NC ☐	N/A ☒	U ☐	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4	Braces frame into beams and into tops of CMU walls. Braces do not frame into beam-column joints.
Diaphragms (Stiff or Flexible)							
C ☒	NC ☐	N/A ☐	U ☐	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5	
Flexible Diaphragms							
C ☒	NC ☐	N/A ☐	U ☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Effective diaphragm is metal decking.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	

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Appendix C: Summary Data Sheet

BUILDING DATA

Building Name: Williwaw Elementary School - East B Date: 11/11/2021
Building Address: 1200 San Antonio St, Anchorage, AK
Latitude: 61° 12' 40" N Longitude: 149° 47' 50" W By: NIC

Year Built: 1994 Year(s) Remodeled: None Original Design Code: UBC 1991
Area [ft² (m²)]: 5,457 Length [ft (m)]: 80 Width [ft (m)]: 63.4
No. of Stories: 1 Story Height: 16.7ft Total Height: 22.5 ft (ridge)

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☑ Educational ☐ Other: _____

CONSTRUCTION DATA

Gravity Load Structural System: Wood bearing walls, reinforced CMU, pre-engineered portal frames
Exterior Transverse Walls: Wood / CMU shear walls Openings? Doors / Windows
Exterior Longitudinal Walls: Wood shear walls Openings? Doors / Windows
Roof Materials/Framing: 3" x 20ga steel decking and plywood. Steel purlins.
Intermediate Floors/Framing: 2 1/2" Slab-on-deck
Ground Floor: 4" concrete slab-on-grade
Columns: Steel pre-engineered portal frame and tubes Foundation: Concrete ftgs & CMU stem walls
General Condition of Structure: Good
Levels Below Grade? None
Special Features and Comments: Tension-only braces acting out-of-plane from pre-engineered portal frames.

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Steel Braces, Wood/CMU shearwalls	Pre-engineered portal frames
Vertical Elements:	Wood&CMU brg walls/Steel columns	Steel columns
Diaphragms:	3" Steel deck, 2 1/2" Slab-on-deck	3" Steel deck, 2 1/2" Slab-on-deck
Connections:	Bolted and welded	Bolted and welded

EVALUATION DATA

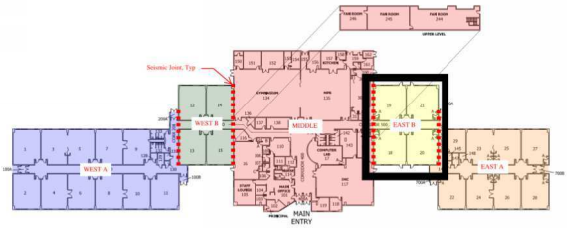
BSE-1N Spectral Response Accelerations: S_{DS} = 1.2 S_{D1} = 0.771
Soil Factors: Class = D, Default F_a = 1.2 F_v = 1.7
BSE-2E Spectral Response Accelerations: S_{XS} = 1.567 S_{X1} = 1.016
Level of Seismicity: High Performance Level: Limited Safety
Building Period: T = 0.16
Spectral Acceleration: S_a = 1.567
Modification Factor: $C_m C_1 C_2$ = 1.4 Building Weight: W = 234 kip
Pseudolateral Force: $V = C_m C_1 C_2 S_a W$ = 513 kip

BUILDING CLASSIFICATION: Educational

REQUIRED TIER 1 CHECKLISTS

	Yes	No
Basic Configuration Checklist	☑	☐
Building Type S1, S2, RM1, W1 Structural Checklists	☑	☐
Nonstructural Component Checklist	☑	☐

FURTHER EVALUATION REQUIREMENT: Yes



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17.1.2CP Basic Configuration Checklist

Table 17-2. Collapse Prevention Basic Configuration Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Building System—General							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.1	A.2.1.1	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.2	A.2.1.2	Structurally separated wings are directly adjacent with no clear distance.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	
Building System—Building Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.1	A.2.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.2	A.2.2.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	

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C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.4	A.2.2.5	
C	**NC**	**N/A**	**U**	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.	5.4.2.5	A.2.2.6	
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	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.	5.4.2.6	A.2.2.7	
☒	☐	☐	☐				

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Geologic Site Hazards							
C	**NC**	**N/A**	**U**	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.	5.4.3.1	A.6.1.1	Low risk of liquefaction.
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	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.	5.4.3.1	A.6.1.2	
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	
☒	☐	☐	☐				

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)							
Foundation Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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 $0.6S_a$.	5.4.3.3	A.6.2.1	0.6*1.567 = 0.94 63.4ft / 16.7ft = 3.79
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.3.4	A.6.2.2	

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Project Name ASD Tier 1 Seis Evals
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17.3CP Structural Checklist for Building Type W2: Wood Frames, Commercial and Industrial

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	NC ☐	N/A ☐	U ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	Shear walls resist only in EW direction.
C ☒	NC ☐	N/A ☐	U ☐	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	5.5.3.1.1	A.3.2.7.1	
C ☒	NC ☐	N/A ☐	U ☐	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	
C ☒	NC ☐	N/A ☐	U ☐	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.	5.5.3.6.1	A.3.2.7.3	
C ☒	NC ☐	N/A ☐	U ☐	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	
C ☐	NC ☐	N/A ☒	U ☐	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	No observed wood shear walls above first floor.
C ☐	NC ☐	N/A ☒	U ☐	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.	5.5.3.6.3	A.3.2.7.6	

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C	NC	N/A	U				
☐	☐	☒	☐	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	
☒	☐	☐	☐	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.	5.5.3.6.5	A.3.2.7.8	
Connections							
☐	☐	☒	☐	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	No wood posts.
☒	☐	☐	☐	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	Sills are mechanically anchored to the foundation. Anchor capacities are unknown/appear to be discontinued.
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Connections							
☐	☒	☐	☐	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.	5.7.3.3	A.5.3.7	Per 1/S-10, anchors are spaced 8' oc at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragms							
☒	☐	☐	☐	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	
☒	☐	☐	☐	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	

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C	NC	N/A	U				
☐	☐	☒	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	
C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	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.	5.6.2	A.4.2.3	

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17.17CP Structural Checklist for Building Types RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms and RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

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

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2	
Stiff Diaphragms							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1	No precast concrete.
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2	

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C	NC	N/A	U				
☒	☐	☐	☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	
☐	☐	☒	☐	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3	No precast concrete elements.
☒	☐	☐	☐	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5	
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Stiff Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	
Flexible Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4	CMU walls do not connect to wood diaphragms.

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17-12. Collapse Prevention Structural Checklist for Building Type S3

Project Name 21156AN
Project Number East B Wing

Low and Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	
C	NC	N/A	U		
☒	☐	☐	☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

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High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required.
C	NC	N/A	U		
☐	☒	☐	☐	COMPACT MEMBERS: All frame elements shall meet compact section requirements set forth by AISC 360, Table B4.1. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4)	No moment frame members meet the requirements for moderately ductile members.
C	NC	N/A	U		
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	ROOF PANELS: *Metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. (Commentary: Sec. A.5.5.1. Tier 2: Sec. 5.7.5) **Where considered as diaphragm elements for lateral resistance...*	

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C	NC	N/A	U		
☒	☐	☐	☐	WALL PANELS:*Metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. (Commentary: Sec. A.5.5.2. Tier 2: Sec. 5.7.5) **Where considered as shear elements for lateral resistance...*	

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17.5CP Structural Checklist for Building Types S2: Steel Braced Frames with Stiff Diaphragms and S2a: Steel Braced Frames with Flexible Diaphragms

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Seismic-Force-Resisting System							
C	NC	N/A	U	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1	Braced frames only resist lateral forces in one principal direction.
☒	☐	☐	☐				
C	NC	N/A	U	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2	
☒	☐	☐	☐				
C	NC	N/A	U	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2	
☒	☐	☐	☐				
Connections							
C	NC	N/A	U	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2	
☒	☐	☐	☐				
C	NC	N/A	U	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1	
☒	☐	☐	☐				

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Seismic-Force-Resisting System							
C	NC	N/A	U	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1	Number of braced bays is equal to one.
☐	☒	☐	☐				
C	NC	N/A	U	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Braces are tension-only.
☐	☐	☒	☐				

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C	NC	N/A	U	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.4	A.3.3.1.7	
C	NC	N/A	U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1	
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Seismic-Force-Resisting System							
C	NC	N/A	U	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3	No column splice observed.
C	NC	N/A	U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200.	5.5.4.3	A.3.3.1.4	Braces are tension-only.
C	NC	N/A	U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5	
C	NC	N/A	U	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.4	A.3.3.1.7	
C	NC	N/A	U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3	No chevron bracing.
C	NC	N/A	U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4	Braces frame into beams and into tops of CMU walls. Braces do not frame into beam-column joints.
Diaphragms (Stiff or Flexible)							
C	NC	N/A	U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5	
Flexible Diaphragms							
C	NC	N/A	U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	

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West B Wing

Appendix C: Summary Data Sheet

BUILDING DATA

Building Name: Williwaw Elementary School - West B Date: 11/11/2021
Building Address: 1200 San Antonio St, Anchorage, AK
Latitude: 61° 12' 40" N Longitude: 149° 47' 50" W By: NIC

Year Built: 1994 Year(s) Remodeled: None Original Design Code: UBC 1991
Area [ft² (m²)]: 4730 Length [ft (m)]: 80 Width [ft (m)]: 54.7
No. of Stories: 1 Story Height: 16.7ft Total Height: 22.5 ft (ridge)

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☑ Educational ☐ Other: _____

CONSTRUCTION DATA

Gravity Load Structural System: Wood bearing walls, reinforced CMU, pre-engineered portal frames
Exterior Transverse Walls: Wood / CMU shear walls Openings? Doors / Windows
Exterior Longitudinal Walls: Wood shear walls Openings? Doors / Windows
Roof Materials/Framing: 3" x 20ga steel decking and plywood. Steel purlins.
Intermediate Floors/Framing: 2 1/2" Slab-on-deck
Ground Floor: 4" concrete slab-on-grade
Columns: Steel pre-engineered portal frame and tubes Foundation: Concrete ftgs & CMU stem walls
General Condition of Structure: Good
Levels Below Grade? None
Special Features and Comments: Tension-only braces acting out-of-plane from pre-engineered portal frames.

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Steel Braces, Wood/CMU shearwalls	Pre-engineered portal frames
Vertical Elements:	Wood&CMU brg walls/Steel columns	Steel columns
Diaphragms:	3" Steel deck, 2 1/2" Slab-on-deck	3" Steel deck, 2 1/2" Slab-on-deck
Connections:	Bolted and welded	Bolted and welded

EVALUATION DATA

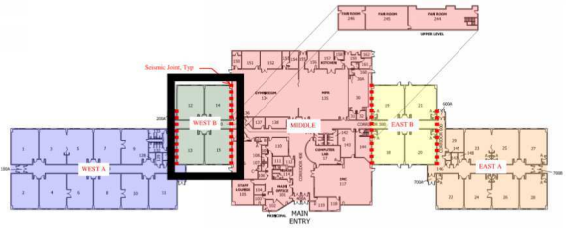
BSE-1N Spectral Response Accelerations: S_{DS} = 1.2 S_{D1} = 0.771
Soil Factors: Class = D, Default F_a = 1.2 F_v = 1.7
BSE-2E Spectral Response Accelerations: S_{XS} = 1.567 S_{X1} = 1.016
Level of Seismicity: High Performance Level: Limited Safety
Building Period: T = 0.16
Spectral Acceleration: S_a = 1.567
Modification Factor: $C_m C_1 C_2$ = 1.4 Building Weight: W = 222 kip
Pseudolateral Force: $V = C_m C_1 C_2 S_a W$ = 487 kip

BUILDING CLASSIFICATION: Educational

REQUIRED TIER 1 CHECKLISTS

	Yes	No
Basic Configuration Checklist	☑	☐
Building Type S3, S2, RM1, W1 Structural Checklists	☑	☐
Nonstructural Component Checklist	☑	☐

FURTHER EVALUATION REQUIREMENT: Yes



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17.1.2CP Basic Configuration Checklist

Table 17-2. Collapse Prevention Basic Configuration Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Building System—General							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.1	A.2.1.1	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.2	A.2.1.2	Structurally separated wings are directly adjacent with no clear distance.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	
Building System—Building Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.1	A.2.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.2	A.2.2.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	

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C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.4	A.2.2.5	
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.5	A.2.2.6	
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.6	A.2.2.7	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Geologic Site Hazards							
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.1	Low risk of liquefaction.
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.2	
C	NC	N/A	U				
☒	☐	☐	☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)							
Foundation Configuration							
C	**NC**	**N/A**	**U**	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 $0.6S_a$.	5.4.3.3	A.6.2.1	0.6*1.567 = 0.94 54.7ft / 16.6ft = 3.29
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	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.	5.4.3.4	A.6.2.2	
☒	☐	☐	☐				

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17.3CP Structural Checklist for Building Type W2: Wood Frames, Commercial and Industrial

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	Shear walls resist only in EW direction.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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	5.5.3.1.1	A.3.2.7.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.5.3.6.1	A.3.2.7.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	No observed wood shear walls above first floor.
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	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.	5.5.3.6.3	A.3.2.7.6	

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C	NC	N/A	U				
☐	☐	☒	☐	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	
☒	☐	☐	☐	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.	5.5.3.6.5	A.3.2.7.8	
Connections							
☐	☐	☒	☐	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	No wood posts.
☒	☐	☐	☐	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	Sills are mechanically anchored to the foundation. Anchor capacities are unknown / appear to be discontinued
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Connections							
☐	☒	☐	☐	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.	5.7.3.3	A.5.3.7	Per 1/S-10, anchors are spaced 8' oc at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragms							
☒	☐	☐	☐	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	
☒	☐	☐	☐	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	

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C	NC	N/A	U				
☐	☐	☐	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	
C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	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.	5.6.2	A.4.2.3	

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17.17CP Structural Checklist for Building Types RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms and RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

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

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2	
Stiff Diaphragms							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1	No precast concrete.
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2	

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C	NC	N/A	U				
☒	☐	☐	☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3	No precast concrete elements.
C	NC	N/A	U				
☒	☐	☐	☐	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5	
C	NC	N/A	U				
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Stiff Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	
Flexible Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4	CMU walls do not connect to wood diaphragms.

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17-12. Collapse Prevention Structural Checklist for Building Type S3

Project Name ASD Tier 1 Seis Evals
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Low and Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	
C	NC	N/A	U		
☒	☐	☐	☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

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High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required.
C	NC	N/A	U		
☐	☒	☐	☐	COMPACT MEMBERS: All frame elements shall meet compact section requirements set forth by AISC 360, Table B4.1. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4)	No moment frame members meet the requirements for moderately ductile members.
C	NC	N/A	U		
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	ROOF PANELS: *Metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. (Commentary: Sec. A.5.5.1. Tier 2: Sec. 5.7.5) **Where considered as diaphragm elements for lateral resistance...*	

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C	NC	N/A	U		
☒	☐	☐	☐	WALL PANELS:*Metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. (Commentary: Sec. A.5.5.2. Tier 2: Sec. 5.7.5) **Where considered as shear elements for lateral resistance...*	

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17.5CP Structural Checklist for Building Types S2: Steel Braced Frames with Stiff Diaphragms and S2a: Steel Braced Frames with Flexible Diaphragms

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1	Braced frames only resist lateral forces in one principal direction.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2	
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Seismic-Force-Resisting System							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1	Number of braced bays is equal to one.
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Braces are tension-only.

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C	NC	N/A	U	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.4	A.3.3.1.7	
C	NC	N/A	U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1	
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Seismic-Force-Resisting System							
C	NC	N/A	U	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3	No column splice observed.
C	NC	N/A	U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200.	5.5.4.3	A.3.3.1.4	Braces are tension-only.
C	NC	N/A	U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5	
C	NC	N/A	U	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.4	A.3.3.1.7	
C	NC	N/A	U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3	No chevron bracing.
C	NC	N/A	U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4	Braces frame into beams and into tops of CMU walls. Braces do not frame into beam-column joints.
Diaphragms (Stiff or Flexible)							
C	NC	N/A	U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5	
Flexible Diaphragms							
C	NC	N/A	U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	

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Appendix C: Summary Data Sheet

BUILDING DATA

Building Name: Williwaw Elementary School - Middle Buildling Date: 11/11/2021
Building Address: 1200 San Antonio St, Anchorage, AK
Latitude: 61° 12' 40" N Longitude: 149° 47' 50" W By: NIC

Year Built: 1994 Year(s) Remodeled: None Original Design Code: UBC 1991
Area [ft² (m²)]: 22,321 Length [ft (m)]: 140 Width [ft (m)]: 162
No. of Stories: 1 Story Height: 19.77 ft Total Height: 28.9 ft (ridge)

USE ☐ Industrial ☐ Office ☐ Warehouse ☐ Hospital ☐ Residential ☑ Educational ☐ Other: _____

CONSTRUCTION DATA

Gravity Load Structural System: Wood bearing walls, reinforced CMU, pre-engineered portal frames
Exterior Transverse Walls: Wood / CMU shear walls Openings? Doors / Windows
Exterior Longitudinal Walls: Wood shear walls Openings? Doors / Windows
Roof Materials/Framing: 3" x 20ga steel decking and plywood. Steel purlins.
Intermediate Floors/Framing: 6" Slab-on-deck
Ground Floor: 4" concrete slab-on-grade
Columns: Steel pre-engineered portal frame and tubes Foundation: Concrete ftgs & CMU stem walls
General Condition of Structure: Good
Levels Below Grade? None
Special Features and Comments:

LATERAL-FORCE-RESISTING SYSTEM

	Longitudinal	Transverse
System:	Steel Braces, Wood/CMU shearwalls	Pre-engineered portal frames
Vertical Elements:	Wood&CMU brg walls/Steel columns	Steel columns
Diaphragms:	3" Steel deck, 2 1/2" Slab-on-deck	3" Steel deck, 2 1/2" Slab-on-deck
Connections:	Bolted and welded	Bolted and welded

EVALUATION DATA

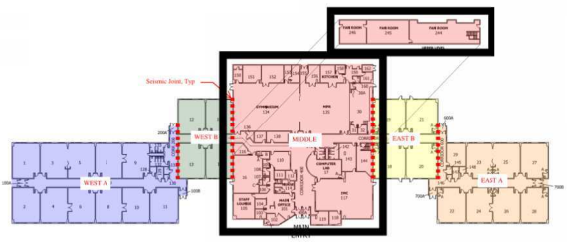
BSE-1N Spectral Response Accelerations: S_{DS} = 1.2 S_{D1} = 0.771
Soil Factors: Class = D, Default F_a = 1.2 F_v = 1.7
BSE-2E Spectral Response Accelerations: S_{XS} = 1.567 S_{X1} = 1.016
Level of Seismicity: High Performance Level: Limited Safety
Building Period: T = 0.19
Spectral Acceleration: S_a = 1.567
Modification Factor: $C_m C_1 C_2$ = 1.4 Building Weight: W = 1,257 kip
Pseudolateral Force: $V = C_m C_1 C_2 S_a W$ = 2.758 kip

BUILDING CLASSIFICATION: Educational

REQUIRED TIER 1 CHECKLISTS

	Yes	No
Basic Configuration Checklist	☑	☐
Building Type S3, S2, RM1, W1 Structural Checklists	☑	☐
Nonstructural Component Checklist	☑	☐

FURTHER EVALUATION REQUIREMENT: Yes



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17.1.2CP Basic Configuration Checklist

Table 17-2. Collapse Prevention Basic Configuration Checklist

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Building System—General							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.1	A.2.1.1	Exterior wood shear walls are not detailed for lateral resistance, most notably with missing hold-downs. Lateral system in E/W direction is incomplete.
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	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.	5.4.1.2	A.2.1.2	Structurally separated wings are directly adjacent with no clear distance.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure.	5.4.1.3	A.2.1.3	
Building System—Building Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.1	A.2.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.2.2	A.2.2.3	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation.	5.4.2.3	A.2.2.4	

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C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.2.4	A.2.2.5	
☒	☐	☐	☐	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.	5.4.2.5	A.2.2.6	
☒	☐	☐	☐	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.	5.4.2.6	A.2.2.7	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Geologic Site Hazards							
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.1	Low risk of liquefaction.
☒	☐	☐	☐	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.	5.4.3.1	A.6.1.2	
☒	☐	☐	☐	SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated.	5.4.3.1	A.6.1.3	

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Moderate Seismicity)							
Foundation Configuration							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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 $0.6S_a$.	5.4.3.3	A.6.2.1	0.6*1.567 = 0.94 140ft / 19.8 ft = 7.1
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	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.	5.4.3.4	A.6.2.2	

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Project Name ASD Tier 1 Seis Evals
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17.3CP Structural Checklist for Building Type W2: Wood Frames, Commercial and Industrial

Table 17-6. Collapse Prevention Structural Checklist for Building Type W2

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	NC ☐	N/A ☐	U ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	Shear walls resist only in EW direction.
C ☒	NC ☐	N/A ☐	U ☐	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	5.5.3.1.1	A.3.2.7.1	
C ☒	NC ☐	N/A ☐	U ☐	STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multi-story buildings do not rely on exterior stucco walls as the primary seismic-force-resisting system.	5.5.3.6.1	A.3.2.7.2	
C ☒	NC ☐	N/A ☐	U ☐	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.	5.5.3.6.1	A.3.2.7.3	
C ☒	NC ☐	N/A ☐	U ☐	NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2-to-1 are not used to resist seismic forces.	5.5.3.6.1	A.3.2.7.4	
C ☐	NC ☐	N/A ☒	U ☐	WALLS CONNECTED THROUGH FLOORS: Shear walls have an interconnection between stories to transfer overturning and shear forces through the floor.	5.5.3.6.2	A.3.2.7.5	No observed wood shear walls above first floor.
C ☐	NC ☐	N/A ☒	U ☐	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.	5.5.3.6.3	A.3.2.7.6	

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C	NC	N/A	U				
☐	☐	☒	☐	CRIPPLE WALLS: Cripple walls below first-floor-level shear walls are braced to the foundation with wood structural panels.	5.5.3.6.4	A.3.2.7.7	
C	NC	N/A	U				
☒	☐	☐	☐	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.	5.5.3.6.5	A.3.2.7.8	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	WOOD POSTS: There is a positive connection of wood posts to the foundation.	5.7.3.3	A.5.3.3	No wood posts.
C	NC	N/A	U				
☒	☐	☐	☐	WOOD SILLS: All wood sills are bolted to the foundation.	5.7.3.3	A.5.3.4	Sills are mechanically anchored to the foundation. Anchor capacities are unknown / appear to be discontinued
C	NC	N/A	U				
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Connections							
C	NC	N/A	U				
☐	☒	☐	☐	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.	5.7.3.3	A.5.3.7	Per 1/S-10, anchors are spaced 8' oc at walls shorter than 10'-4". All exterior shear walls are 10'-4" or less.
Diaphragms							
C	NC	N/A	U				
☐	☒	☐	☐	DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints.	5.6.1.1	A.4.1.1	Diaphragm is discontinuous between gridlines 5 & 7 (see details 8 & 11 / S 11).
C	NC	N/A	U				
☒	☐	☐	☐	ROOF CHORD CONTINUITY: All chord elements are continuous, regardless of changes in roof elevation.	5.6.1.1	A.4.1.3	Diaphragm is discontinuous at high roof edge. Chord at ridge is non compliant.

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C	NC	N/A	U				
☐	☐	☒	☐	DIAPHRAGM REINFORCEMENT AT OPENINGS: There is reinforcing around all diaphragm openings larger than 50% of the building width in either major plan dimension.	5.6.1.5	A.4.1.8	
C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Metal deck is effective diaphragm.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	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.	5.6.2	A.4.2.3	

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17.17CP Structural Checklist for Building Types RM1: Reinforced Masonry Bearing Walls with Flexible Diaphragms and RM2: Reinforced Masonry Bearing Walls with Stiff Diaphragms

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

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low and Moderate Seismicity							
Seismic-Force-Resisting System							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.2.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 4.4.3.3, is less than 70 lb/in.^{2} (0.48 MPa).	5.5.3.1.1	A.3.2.4.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls is greater than 0.002 of the wall with the minimum of 0.0007 in either of the two directions; the spacing of reinforcing steel is less than 48 in. (1220 mm), and all vertical bars extend to the top of the walls.	5.5.3.1.3	A.3.2.4.2	
Stiff Diaphragms							
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	TOPPING SLAB: Precast concrete diaphragm elements are interconnected by a continuous reinforced concrete topping slab.	5.6.4	A.4.5.1	No precast concrete.
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WALL ANCHORAGE: Exterior concrete or masonry walls that are dependent on the diaphragm for lateral support are anchored for out-of-plane forces at each diaphragm level with steel anchors, reinforcing dowels, or straps that are developed into the diaphragm. Connections have strength to resist the connection force calculated in the Quick Check procedure of Section 4.4.3.7.	5.7.1.1	A.5.1.1	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	WOOD LEDGERS: The connection between the wall panels and the diaphragm does not induce cross-grain bending or tension in the wood ledgers.	5.7.1.3	A.5.1.2	

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C	NC	N/A	U		Tier 2 Reference	Commentary Reference	Comments
☒	☐	☐	☐	TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls.	5.7.2	A.5.2.1	
☐	☐	☒	☐	TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements are doweled for transfer of forces into the shear wall or frame elements.	5.7.2	A.5.2.3	No precast concrete elements.
☒	☐	☐	☐	FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation.	5.7.3.4	A.5.3.5	
☒	☐	☐	☐	GIRDER–COLUMN CONNECTION: There is a positive connection using plates, connection hardware, or straps between the girder and the column support.	5.7.4.1	A.5.4.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Stiff Diaphragms							
C	NC	N/A	U				
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	
Flexible Diaphragms							
☒	☐	☐	☐	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	
☒	☐	☐	☐	OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls are less than 25% of the wall length.	5.6.1.3	A.4.1.4	
☒	☐	☐	☐	OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls are not greater than 8 ft (2.4 m) long.	5.6.1.3	A.4.1.6	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Metal deck is effective diaphragm.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	
Connections							
C	NC	N/A	U				
☐	☐	☒	☐	STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements are installed taut and are stiff enough to limit the relative movement between the wall and the diaphragm to no greater than 1/8 in. (3 mm) before engagement of the anchors.	5.7.1.2	A.5.1.4	CMU walls do not connect to wood diaphragms.

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17-12. Collapse Prevention Structural Checklist for Building Type S3

Project Name 21156AN
Project Number Middle Building

Low and Moderate Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4 is less than $0.50F_y$. (Commentary: Sec. A.3.3.1.2. Tier 2: Sec. 5.5.4.1)	Brace is overstressed, see quick check

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames. (Commentary: Sec. A.5.2.2. Tier 2: Sec. 5.7.2)	
C	NC	N/A	U		
☒	☐	☐	☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation. (Commentary: Sec. A.5.3.1. Tier 2: Sec. 5.7.3.1)	

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Project Name ASD Tier 1 Seis Evals
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High Seismicity

Seismic-Force-Resisting System

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☐	☒	☐	☐	MOMENT-RESISTING CONNECTIONS: All moment connections are able to develop the elastic moment (F_yS) of the adjoining members. (Commentary: Sec. A.3.1.3.4. Tier 2: Sec. 5.5.2.2.1)	Due to the type of construction (pre-engineered metal building), it is unlikely the connections are designed for 100% of the expected yield of the joining members. Further analysis per Tier 2 inspection is required.
C	NC	N/A	U		
☐	☒	☐	☐	COMPACT MEMBERS: All frame elements shall meet compact section requirements set forth by AISC 360, Table B4.1. (Commentary: Sec. A.3.1.3.8. Tier 2: Sec. 5.5.2.2.4)	No moment frame members meet the requirements for moderately ductile members.
C	NC	N/A	U		
☒	☐	☐	☐	OTHER DIAPHRAGMS: The diaphragm does not consist of a system other than wood, metal deck, concrete, or horizontal bracing. (Commentary: Sec. A.4.7.1. Tier 2: Sec. 5.6.5)	

Connections

RATING				DESCRIPTION	COMMENTS
C	NC	N/A	U		
☒	☐	☐	☐	ROOF PANELS: *Metal, plastic, or cementitious roof panels are positively attached to the roof framing to resist seismic forces. (Commentary: Sec. A.5.5.1. Tier 2: Sec. 5.7.5) **Where considered as diaphragm elements for lateral resistance...*	

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C	NC	N/A	U		
☒	☐	☐	☐	WALL PANELS:*Metal, fiberglass, or cementitious wall panels are positively attached to the framing and foundation to resist seismic forces. (Commentary: Sec. A.5.5.2. Tier 2: Sec. 5.7.5) **Where considered as shear elements for lateral resistance...*	

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Project Name ASD Tier 1 Seis Evals
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17.5CP Structural Checklist for Building Types S2: Steel Braced Frames with Stiff Diaphragms and S2a: Steel Braced Frames with Flexible Diaphragms

Table 17-10. Collapse Prevention Structural Checklist for Building Types S2 and S2a

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Low Seismicity							
Seismic-Force-Resisting System							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	REDUNDANCY: The number of lines of braced frames in each principal direction is greater than or equal to 2.	5.5.1.1	A.3.3.1.1	Only one line of braced frames.
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	COLUMN AXIAL STRESS CHECK: The axial stress caused by gravity loads in columns subjected to overturning forces is less than $0.10F_y$. Alternatively, the axial stress caused by overturning forces alone, calculated using the Quick Check procedure of Section 4.4.3.6, is less than $0.30F_y$.	5.5.2.1.3	A.3.1.3.2	
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	BRACE AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 4.4.3.4, is less than $0.50F_y$.	5.5.4.1	A.3.3.1.2	Brace is overstressed, see quick check
Connections							
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	TRANSFER TO STEEL FRAMES: Diaphragms are connected for transfer of seismic forces to the steel frames.	5.7.2	A.5.2.2	
C ☒	**NC** ☐	**N/A** ☐	**U** ☐	STEEL COLUMNS: The columns in seismic-force-resisting frames are anchored to the building foundation.	5.7.3.1	A.5.3.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
Moderate Seismicity (Complete the Following Items in Addition to the Items for Low Seismicity)							
Seismic-Force-Resisting System							
C ☐	**NC** ☒	**N/A** ☐	**U** ☐	REDUNDANCY: The number of braced bays in each line is greater than 2.	5.5.1.1	A.3.3.1.1	Number of braced bays is equal to 2.
C ☐	**NC** ☐	**N/A** ☒	**U** ☐	CONNECTION STRENGTH: All the brace connections develop the buckling capacity of the diagonals.	5.5.4.4	A.3.3.1.5	Braces are tension-only.

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Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
C	NC	N/A	U	COMPACT MEMBERS: All brace elements meet compact section requirements in accordance with AISC 360, Table B4.1.	5.5.4	A.3.3.1.7	See high seismicity check.
C	NC	N/A	U	K-BRACING: The bracing system does not include K-braced bays.	5.5.4.6	A.3.3.2.1	

Status				Evaluation Statement	Tier 2 Reference	Commentary Reference	Comments
High Seismicity (Complete the Following Items in Addition to the Items for Low and Moderate Seismicity)							
Seismic-Force-Resisting System							
C	NC	N/A	U	COLUMN SPLICES: All column splice details located in braced frames develop 50% of the tensile strength of the column.	5.5.4.2	A.3.3.1.3	
C	NC	N/A	U	SLENDERNESS OF DIAGONALS: All diagonal elements required to carry compression have *Kl/r* ratios less than 200.	5.5.4.3	A.3.3.1.4	Braces are tension-only.
C	NC	N/A	U	CONNECTION STRENGTH: All the brace connections develop the yield capacity of the diagonals.	5.5.4.4	A.3.3.1.5	
C	NC	N/A	U	COMPACT MEMBERS: All brace elements meet section requirements in accordance with AISC 341, Table D1.1, for moderately ductile members.	5.5.4	A.3.3.1.7	Braces do not meet requirements of AISC 341, Table D1.1.
C	NC	N/A	U	CHEVRON BRACING: Beams in chevron, or V-braced, bays are capable of resisting the vertical load resulting from the simultaneous yielding and buckling of the brace pairs.	5.5.4.6	A.3.3.2.3	No chevron braces.
C	NC	N/A	U	CONCENTRICALLY BRACED FRAME JOINTS: All the diagonal braces frame into the beam–column joints concentrically.	5.5.4.8	A.3.3.2.4	
Diaphragms (Stiff or Flexible)							
C	NC	N/A	U	OPENINGS AT FRAMES: Diaphragm openings immediately adjacent to the braced frames extend less than 25% of the frame length.	5.6.1.3	A.4.1.5	
Flexible Diaphragms							
C	NC	N/A	U	CROSS TIES: There are continuous cross ties between diaphragm chords.	5.6.1.2	A.4.1.2	

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C	NC	N/A	U				
☐	☐	☒	☐	STRAIGHT SHEATHING: All straight-sheathed diaphragms have aspect ratios less than 2-to-1 in the direction being considered.	5.6.2	A.4.2.1	Metal deck is effective diaphragm.
C	NC	N/A	U				
☐	☐	☒	☐	SPANS: All wood diaphragms with spans greater than 24 ft (7.3 m) consist of wood structural panels or diagonal sheathing.	5.6.2	A.4.2.2	
C	NC	N/A	U				
☐	☐	☒	☐	DIAGONALLY SHEATHED AND UNBLOCKED DIAPHRAGMS: All diagonally sheathed or unblocked wood structural panel diaphragms have horizontal spans less than 40 ft (12.2 m) and aspect ratios less than or equal to 4-to-1.	5.6.2	A.4.2.3	
C	NC	N/A	U				
☒	☐	☐	☐	OTHER DIAPHRAGMS: Diaphragms do not consist of a system other than wood, metal deck, concrete, or horizontal bracing.	5.6.5	A.4.7.1	

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17.19 Nonstructural Checklist

Table 17-38. Nonstructural Checklist

Status				Evaluation Statement[a,b]	Tier 2 Reference	Commentary Reference	Comments
Life Safety Systems							
C	**NC**	**N/A**	**U**	**HR—not required; LS—LMH; PR—LMH**. FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13.	13.7.4	A.7.13.1	Mains are braced. Branches are not braced.
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	**HR—not required; LS—LMH; PR—LMH**. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13.	13.7.4	A.7.13.2	
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	**HR—not required; LS—LMH; PR—LMH**. EMERGENCY POWER: Equipment used to power or control Life Safety systems is anchored or braced.	13.7.7	A.7.12.1	
☐	☐	☒	☐				
C	**NC**	**N/A**	**U**	**HR—not required; LS—LMH; PR—LMH**. STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints.	13.7.6	A.7.14.1	
☐	☐	☒	☐				
C	**NC**	**N/A**	**U**	**HR—not required; LS—MH; PR—MH**. SPRINKLER CEILING CLEARANCE: Penetrations through panelized ceilings for fire suppression devices provide clearances in accordance with NFPA-13.	13.7.4	A.7.13.3	Neither clearance nor flexible connections provided.
☐	☒	☐	☐				
C	**NC**	**N/A**	**U**	**HR—not required; LS—not required; PR—LMH**. EMERGENCY LIGHTING: Emergency and egress lighting equipment is anchored or braced.	13.7.9	A.7.3.1	Lights in ceiling grid were only attached to grid and not structure.
☐	☒	☐	☐				
Hazardous Materials							
C	**NC**	**N/A**	**U**	**HR—LMH; LS—LMH; PR—LMH**. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers.	13.7.1	A.7.12.2	
☐	☐	☒	☐				
C	**NC**	**N/A**	**U**	**HR—LMH; LS—LMH; PR—LMH**. HAZARDOUS MATERIAL STORAGE: Breakable containers that hold hazardous material, including gas cylinders, are restrained by latched doors, shelf lips, wires, or other methods.	13.8.3	A.7.15.1	Glycol makeup tank is not braced.
☐	☒	☐	☐				
C	**NC**	**N/A**	**U**	**HR—MH; LS—MH; PR—MH**. HAZARDOUS MATERIAL DISTRIBUTION: Piping or ductwork conveying hazardous materials is braced or otherwise protected from damage that would allow hazardous material release.	13.7.3 13.7.5	A.7.13.4	Natural gas piping is not adequately braced.
☐	☒	☐	☐				
C	**NC**	**N/A**	**U**	**HR—MH; LS—MH; PR—MH**. SHUTOFF VALVES: Piping containing hazardous material, including natural gas, has shutoff valves or other devices to limit spills or leaks.	13.7.3 13.7.5	A.7.13.3	Exterior seismic shutoff observed.
☒	☐	☐	☐				
C	**NC**	**N/A**	**U**	**HR—LMH; LS—LMH; PR—LMH**. FLEXIBLE COUPLINGS: Hazardous material ductwork and piping, including natural gas piping, have flexible couplings.	13.7.3 13.7.5	A.7.15.4	Natural gas piping does not have flex couplings.
☐	☒	☐	☐				

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C	NC	N/A	U				
☐	☒	☐	☐	**HR—MH; LS—MH; PR—MH**. PIPING OR DUCTS CROSSING SEISMIC JOINTS: 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.	13.7.3 13.7.5 13.7.6	A.7.13.6	Hydronic and gas lines do not have couplings to accommodate relative seismic displacements.
Partitions							
C	**NC**	**N/A**	**U**				
☐	☐	☒	☐	**HR—LMH; LS—LMH; PR—LMH**. UNREINFORCED MASONRY: 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.	13.6.2	A.7.1.1	No unreinforced masonry.
C	**NC**	**N/A**	**U**				
☐	☒	☐	☐	**HR—LMH; LS—LMH; PR—LMH**. HEAVY PARTITIONS SUPPORTED BY CEILINGS: The tops of masonry or hollow-clay tile partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1	CMU walls at grids L and M. See 5 / A7-1 of 1994 record drawings.
C	**NC**	**N/A**	**U**				
☐	☒	☐	☐	**HR—not required; LS—MH; PR—MH**. DRIFT: 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.	13.6.2	A.7.1.2	CMU wall out of plane connections at E & W gym are not detailed for drift (9 / S-12 of 1994 dwgs).
C	**NC**	**N/A**	**U**				
☒	☐	☐	☐	**HR—not required; LS—not required; PR—MH**. LIGHT PARTITIONS SUPPORTED BY CEILINGS: The tops of gypsum board partitions are not laterally supported by an integrated ceiling system.	13.6.2	A.7.2.1	Light partition (CFS) walls extend to roof deck w/ track.
C	**NC**	**N/A**	**U**				
☐	☒	☐	☐	**HR—not required; LS—not required; PR—MH**. STRUCTURAL SEPARATIONS: Partitions that cross structural separations have seismic or control joints.	13.6.2	A.7.1.3	No structural joints. See 2 / A9-2 of 1994 DWGs.
C	**NC**	**N/A**	**U**				
☐	☒	☐	☐	**HR—not required; LS—not required; PR—MH**. TOPS: 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).	13.6.2	A.7.1.4	See RS-13 of 1994 DWGs. Partitions are restrained but likely not adequately.
Ceilings							
C	**NC**	**N/A**	**U**				
☐	☐	☒	☐	**HR—H; LS—MH; PR—LMH**. SUSPENDED LATH AND PLASTER: Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3	
C	**NC**	**N/A**	**U**				
☐	☐	☐	☒	**HR—not required; LS—MH; PR—LMH**. SUSPENDED GYPSUM BOARD: Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 ft^2 (1.1 m^2) of area.	13.6.4	A.7.2.3	Attachment not observable from site visit nor drawings.

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C	NC	N/A	U				
☒	☐	☐	☐	**HR—not required; LS—not required; PR—MH**. INTEGRATED CEILINGS: Integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) 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.	13.6.4	A.7.2.2	
☐	☒	☐	☐	**HR—not required; LS—not required; PR—MH**. EDGE CLEARANCE: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) 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).	13.6.4	A.7.2.4	Edge clearance does not meet requirements
☐	☒	☐	☐	**HR—not required; LS—not required; PR—MH**. CONTINUITY ACROSS STRUCTURE JOINTS: The ceiling system does not cross any seismic joint and is not attached to multiple independent structures.	13.6.4	A.7.2.5	Ceiling is continuous across seismic joints.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H**. EDGE SUPPORT: The free edges of integrated suspended ceilings with continuous areas greater than 144 ft^2 (13.4 m^2) are supported by closure angles or channels not less than 2 in. (51 mm) wide.	13.6.4	A.7.2.6	Closure angles do not meet width.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H**. SEISMIC JOINTS: 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 ft^2 (232.3 m^2) and has a ratio of long-to-short dimension no more than 4-to-1.	13.6.4	A.7.2.7	Ceiling in corridor crosses seismic joints and has a ratio greater than 4:1.
Light Fixtures							
☒	☐	☐	☐	**HR—not required; LS—MH; PR—MH**. INDEPENDENT SUPPORT: 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.	13.6.4 13.7.9	A.7.3.2	

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C	NC	N/A	U				
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** PENDANT SUPPORTS: 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.	13.7.9	A.7.3.3	Projector in room 14. Pendant lights in corridor 400 Pendant light in fan rooms.
C	NC	N/A	U				
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H**. LENS COVERS: Lens covers on light fixtures are attached with safety devices.	13.7.9	A.7.3.4	
Cladding and Glazing							
C	NC	N/A	U				
☒	☐	☐	☐	**HR—MH; LS—MH; PR—MH**. CLADDING ANCHORS: Cladding components weighing more than 10 lb/ft^2 (0.48 kN/m^2) 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)	13.6.1	A.7.4.1	Exterior Siding likely less than 10 psf, anchors spaced approximately 1'-0" OC max.
C	NC	N/A	U				
☒	☐	☐	☐	**HR—not required; LS—MH; PR—MH**. CLADDING ISOLATION: 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.	13.6.1	A.7.4.3	Cladding is exposed cedar siding nailed to plywood sheathing. Narrow siding is not vulnerable to drift failure.
C	NC	N/A	U				
☐	☐	☒	☐	**HR—MH; LS—MH; PR—MH**. MULTI-STORY PANELS: 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.	13.6.1	A.7.4.4	Multi-story panels not observed.

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C	NC	N/A	U				
☐	☐	☒	☐	**HR—not required; LS—MH; PR—MH**. THREADED RODS: 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.	13.6.1	A.7.4.9	Threaded rods not observed.
☒	☐	☐	☐	**HR—MH; LS—MH; PR—MH**. PANEL CONNECTIONS: 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.	13.6.1.4	A.7.4.5	
☐	☐	☒	☐	**HR—MH; LS—MH; PR—MH**. BEARING CONNECTIONS: Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel.	13.6.1.4	A.7.4.6	
☐	☐	☒	☐	**HR—MH; LS—MH; PR—MH**. INSERTS: Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel.	13.6.1.4	A.7.4.7	
☐	☐	☐	☒	**HR—not required; LS—MH; PR—MH**. OVERHEAD GLAZING: Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 ft^2 (1.5 m^2) in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked.	13.6.1.5	A.7.4.8	Unknown if stained glass above doors at entrance of school meets requirements.
Masonry Veneer							
☐	☐	☒	☐	**HR—not required; LS—LMH; PR—LMH**. TIES: Masonry veneer is connected to the backup with corrosion-resistant ties. There is a minimum of one tie for every 2-2/3 ft^2 (0.25 m^2), 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).	13.6.1.2	A.7.5.1	.
☐	☐	☒	☐	**HR—not required; LS—LMH; PR—LMH**. SHELF ANGLES: Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor.	13.6.1.2	A.7.5.2	
☐	☐	☒	☐	**HR—not required; LS—LMH; PR—LMH**. WEAKENED PLANES: Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing.	13.6.1.2	A.7.5.3	

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C	NC	N/A	U				
☒	☐	☐	☐	**HR—LMH; LS—LMH; PR—LMH**. UNREINFORCED MASONRY BACKUP: There is no unreinforced masonry backup.	13.6.1.1 13.6.1.2	A.7.7.2	
☐	☐	☒	☐	**HR—not required; LS—MH; PR—MH**. STUD TRACKS: For veneer with cold-formed steel stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 in. (610 mm) on center.	13.6.1.1 13.6.1.2	A.7.6.1	
☐	☐	☒	☐	**HR—not required; LS—MH; PR—MH**. ANCHORAGE: 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.	13.6.1.1 13.6.1.2	A.7.7.1	
☐	☐	☒	☐	**HR—not required; LS—not required; PR—MH**. WEEP HOLES: In veneer anchored to stud walls, the veneer has functioning weep holes and base flashing.	13.6.1.2	A.7.5.6	
☐	☐	☒	☐	**HR—not required; LS—not required; PR—MH**. OPENINGS: For veneer with cold-formed-steel stud backup, steel studs frame window and door openings.	13.6.1.1 13.6.1.2	A.7.6.2	
Parapets, Cornices, Ornamentation, and Appendages							
☐	☐	☒	☐	**HR—LMH; LS—LMH; PR—LMH**. URM PARAPETS OR CORNICES: Laterally unsupported unreinforced masonry parapets or cornices have height-to-thickness 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.	13.6.5	A.7.8.1	
☒	☐	☐	☐	**HR—not required; LS—LMH; PR—LMH**. CANOPIES: 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).	13.6.6	A.7.8.2	
☐	☐	☒	☐	**HR—H; LS—MH; PR—LMH**. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement.	13.6.5	A.7.8.3	No concrete parapets.
☒	☐	☐	☐	**HR—MH; LS—MH; PR—LMH**. APPENDAGES: 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.	13.6.6	A.7.8.4	

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C	NC	N/A	U				
Masonry Chimneys							
☐	☐	☒	☐	**HR—LMH; LS—LMH; PR—LMH**. URM CHIMNEYS: 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.	13.6.7	A.7.9.1	
☐	☐	☒	☐	**HR—LMH; LS—LMH; PR—LMH**. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof.	13.6.7	A.7.9.2	
Stairs							
☐	☐	☒	☐	**HR—not required; LS—LMH; PR—LMH**. STAIR ENCLOSURES: 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.	13.6.2 13.6.8	A.7.10.1	
☐	☒	☐	☐	**HR—not required; LS—LMH; PR—LMH**. STAIR DETAILS: 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.	13.6.8	A.7.10.2	Stairs are not detailed to accommodate drift for moment-frame.
Contents and Furnishings							
☐	☐	☒	☐	**HR—LMH; LS—MH; PR—MH**. INDUSTRIAL STORAGE RACKS: 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.	13.8.1	A.7.11.1	Not observed.
☐	☒	☐	☐	**HR—not required; LS—H; PR—MH**. TALL NARROW CONTENTS: 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.	13.8.2	A.7.11.2	Storage shelves in room 144 are not anchored to the structure. Similar in various classrooms.
☐	☒	☐	☐	**HR—not required; LS—H; PR—H**. FALL-PRONE CONTENTS: 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.	13.8.2	A.7.11.3	Room 144 and various classrooms stored items.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

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Project Name ASD Tier 1 Seis Evals
Project Number 21156AN
Nonstructural

C	NC	N/A	U				
☐	☐	☒	☐	**HR—not required; LS—not required; PR—MH.** ACCESS FLOORS: Access floors more than 9 in. (229 mm) high are braced.	13.6.10	A.7.11.4	No access floors observed.
☐	☐	☒	☐	**HR—not required; LS—not required; PR—MH.** EQUIPMENT ON ACCESS FLOORS: Equipment and other contents supported by access floor systems are anchored or braced to the structure independent of the access floor.	13.7.7 13.6.10	A.7.11.5	No access floors observed.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** SUSPENDED CONTENTS: 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.	13.8.2	A.7.11.6	Several pendant items will impact adjacent elements.
Mechanical and Electrical Equipment							
☐	☒	☐	☐	**HR—not required; LS—H; PR—H.** FALL-PRONE EQUIPMENT: 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.	13.7.1 13.7.7	A.7.12.4	Unit heaters are unbraced. Several projectors observed in classrooms without bracing.
☐	☒	☐	☐	**HR—not required; LS—H; PR—H.** IN-LINE EQUIPMENT: 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.	13.7.1	A.7.12.5	Large air separators and in-line pumps unbraced.
☒	☐	☐	☐	**HR—not required; LS—H; PR—MH.** TALL NARROW EQUIPMENT: 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.	13.7.1 13.7.7	A.7.12.6	
☐	☐	☒	☐	**HR—not required; LS—not required; PR—MH.** MECHANICAL DOORS: Mechanically operated doors are detailed to operate at a story drift ratio of 0.01.	13.6.9	A.7.12.7	Mechanically operated doors not observed.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** SUSPENDED EQUIPMENT: 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.	13.7.1 13.7.7	A.7.12.8	Pendant lights in fan rooms and corridor 400.
☒	☐	☐	☐	**HR—not required; LS—not required; PR—H.** VIBRATION ISOLATORS: Equipment mounted on vibration isolators is equipped with horizontal restraints or snubbers and with vertical restraints to resist overturning.	13.7.1	A.7.12.9	Unit heaters were observed to use isolators and are adequately restrained for overturning.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** HEAVY EQUIPMENT: Floor-supported or platform-supported equipment weighing more than 400 lb (181.4 kg) is anchored to the structure.	13.7.1 13.7.7	A.7.12.10	Boilers have anchors poorly fastened (damaged or loose)

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

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Project Name ASD Tier 1 Seis Evals
Project Number 21156AN
Nonstructural

C	NC	N/A	U				
☐	☐	☐	☐	**HR—not required; LS—not required; PR—H.** ELECTRICAL EQUIPMENT: Electrical equipment is laterally braced to the structure.	13.7.7	A.7.12.11	Projectors in classrooms, pendant lights
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** CONDUIT COUPLINGS: 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.	13.7.8	A.7.12.12	Conduit in fan rooms installed without flexible couplings.
Piping							
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** FLEXIBLE COUPLINGS: Fluid and gas piping has flexible couplings.	13.7.3 13.7.5	A.7.13.2	Neither fluid nor natural gas have flex couplings.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** FLUID AND GAS PIPING: Fluid and gas piping is anchored and braced to the structure to limit spills or leaks.	13.7.3 13.7.5	A.7.13.4	Gas braced in one location. Fluid not braced.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** C-CLAMPS: One-sided C-clamps that support piping larger than 2.5 in. (64 mm) in diameter are restrained.	13.7.3 13.7.5	A.7.13.5	Two locations without straps.
☐	☒	☐	☐	**HR—not required; LS—not required; PR—H.** PIPING CROSSING SEISMIC JOINTS: 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.	13.7.3 13.7.5	A.7.13.6	
Ducts							
☒	☐	☐	☐	**HR—not required; LS—not required; PR—H.** DUCT BRACING: Rectangular ductwork larger than 6 ft^2 (0.56 m^2) 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).	13.7.6	A.7.14.2	
☒	☐	☐	☐	**HR—not required; LS—not required; PR—H.** DUCT SUPPORT: Ducts are not supported by piping or electrical conduit.	13.7.6	A.7.14.3	
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** DUCTS CROSSING SEISMIC JOINTS: 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.	13.7.6	A.7.14.4	
Elevators							
☐	☐	☒	☐	**HR—not required; LS—H; PR—H.** RETAINER GUARDS: Sheaves and drums have cable retainer guards.	13.7.11	A.7.16.1	
☐	☐	☒	☐	**HR—not required; LS—H; PR—H.** RETAINER PLATE: A retainer plate is present at the top and bottom of both car and counterweight.	13.7.11	A.7.16.2	

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

Project Name ASD Tier 1 Seis Evals
Project Number 21156AN
Nonstructural

C	NC	N/A	U			
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** ELEVATOR EQUIPMENT: Equipment, piping, and other components that are part of the elevator system are anchored.	13.7.11	A.7.16.3
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** SEISMIC SWITCH: Elevators capable of operating at speeds of 150 ft/min (0.30 m/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.	13.7.11	A.7.16.4
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** SHAFT WALLS: Elevator shaft walls are anchored and reinforced to prevent toppling into the shaft during strong shaking.	13.7.11	A.7.16.5
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** COUNTERWEIGHT RAILS: All counterweight rails and divider beams are sized in accordance with ASME A17.1.	13.7.11	A.7.16.6
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** BRACKETS: The brackets that tie the car rails and the counterweight rail to the structure are sized in accordance with ASME A17.1.	13.7.11	A.7.16.7
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** SPREADER BRACKET: Spreader brackets are not used to resist seismic forces.	13.7.11	A.7.16.8
☐	☐	☒	☐	**HR—not required; LS—not required; PR—H.** GO-SLOW ELEVATORS: The building has a go-slow elevator system.	13.7.11	A.7.16.9

[a] Performance Level: HR = Hazards Reduced, LS = Life Safety, and PR = Position Retention.

[b] Level of Seismicity: L = Low, M = Moderate, and H = High.

Legend: C = Compliant, NC = Noncompliant, N/A = Not Applicable, U = Unknown

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APPENDIX C

STRUCTURAL EVALUATION CALCULATIONS

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East A Wing

1.0 – SEISMIC LOADING:

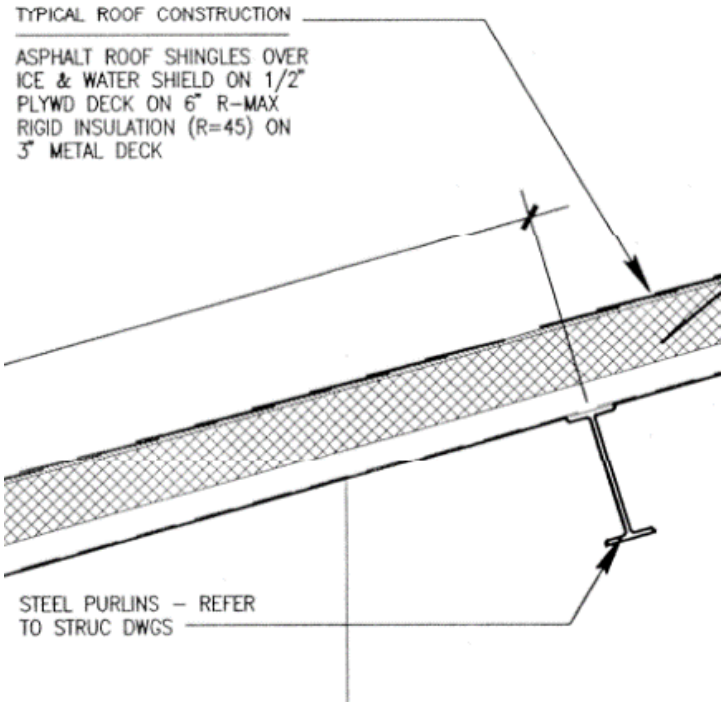
1.1 Building Weights
1.2 Seismic Hazard: ASCE 41
1.3 Seismic Forces
1.4 Base Shear Comparison

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

1.0 Typical Sloped Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Shingles	2.50	
Dead	Membrane	0.30	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.50	6" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**13.10**	**Summary**



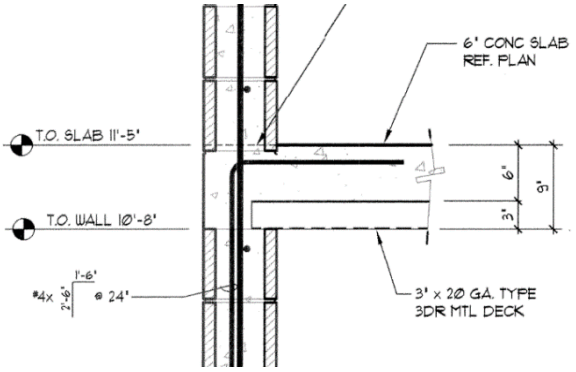
Above - 1 / A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

2.0 Boiler and Fan Room Floors - 6" SOD

Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab on deck	90.65	9" Total, 6" slab on PLW3 Verco deck + 3" 145pcf concrete
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**94.95**	**Summary**



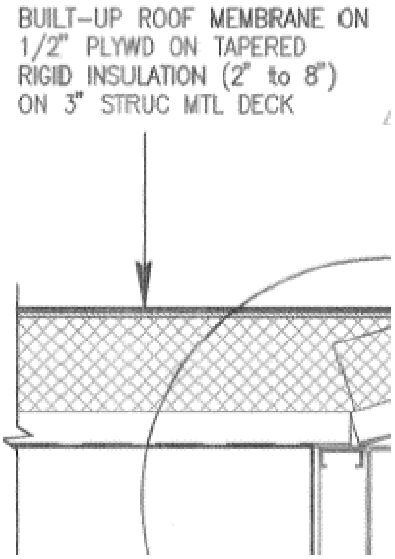
Above - 12 / S-11 of 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

3.0 Typical Built-Up Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Built-up roof membrane	5.50	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.25	5" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**15.55**	**Summary**



Above - 2 / A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Fan Room Corridor Floors - 2 1/2" SOD

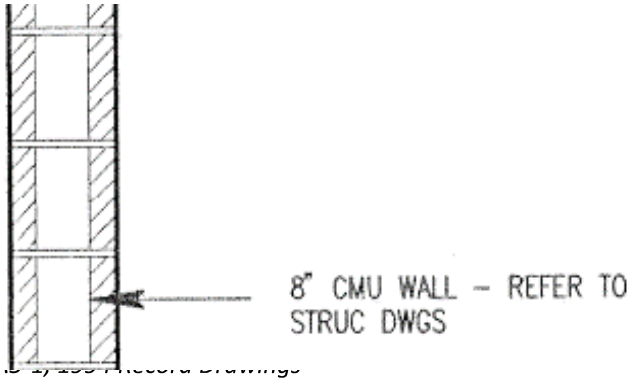
Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab	48.30	5 1/2" total, Verco catalog
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**52.60**	**Summary**

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Typical 8" CMU Single Wythe Corridor Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	8" CMU	86.00	135 pcf, fully grouted
	Multiplier	1.00	
Dead	**Total**	**86.00**	

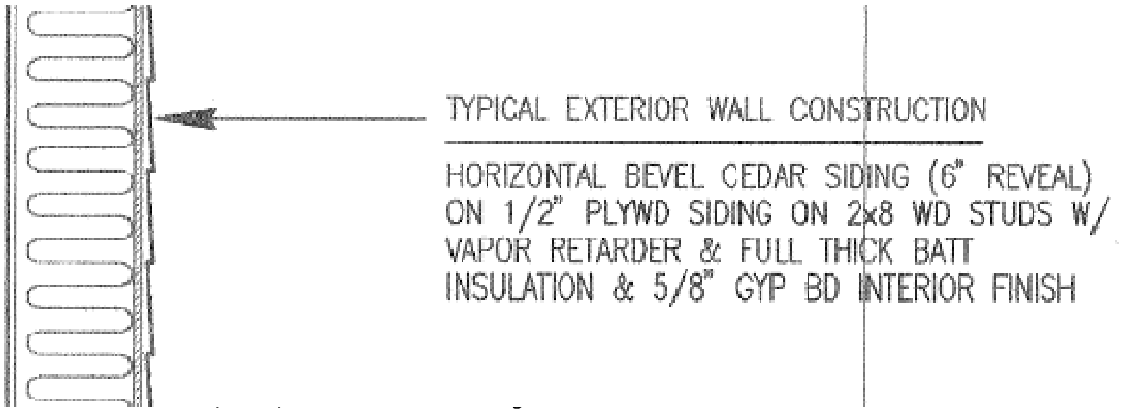


Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

5.0 Exterior Wall

Load Category	Item	Weight	Comment
		(psf)	
Dead	Cedar Siding	2.00	
Dead	1/2" plywood	1.5	
Dead	(2) 2x8 studs @ 16" OC	5.00	
Dead	Batt insulation	0.80	
Dead	5/8" Gyp	2.00	
	Multiplier	1.00	
Dead	**Total**	**11.30**	



Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

6.0 Typical CFS Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	3 1/2" CFS Studs	0.59	Spaced 16" OC per 11 / S-11, 1994 Drawings
Dead	(2) layers 5/8" GWB	4.00	
Dead			
Dead			
Dead			
Dead	Multiplier	1.00	
Dead	**Total**	**4.59**	

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

1.0 - Floor & Roof Dead Weights

Floor	Sub Area	Trib. Area		Typ. Weight	Weight	Comments
(#)	(#)	(sf)		(psf)	(kip)	
(1) Mezzanine	*2 1/2" SoD*	1625		53	85	
	Total	**1625**			**85**	
(2) Roof	*Sloped Roof*	9460		13.1	124	
	Total	**9460**			**124**	
∑ Floors	>>>>

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

3.0 - Wall Dead Weights - Tributary to Floor

Floor		Trib. Height	Length	Typ. Weight	Weight	Comments
(#)		(ft)	(#)	(psf)	(kip)	
(1) Mezzanine	***Total***				***174***	***Total weight of walls trib to floor***
		5.8	*344*	*86.0*	*170*	*8" CMU - First Floor*
		2.6	*344*	*4.6*	*4*	*CFS - Second Floor*
(2) Roof	***Total***				***12***	***Total weight of walls trib to roof***
		8.3	*352*	*11.3*	*33*	*Wood - Full Height*
		8.3	*201*	*4.6*	*8*	*CFS - Full Height*
		2.6	*344*	*4.6*	*4*	*CFS - Second Floor*

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

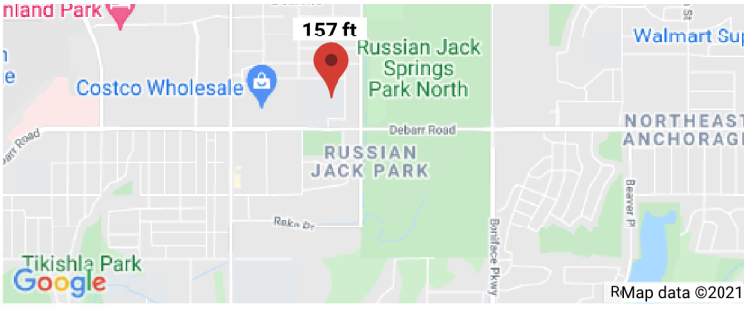
4.0 - Seismic Weights Tributary To Story

Floor (#)	Wall Weight (kip)	Floor Weight (kip)	20% Snow Weight (kip)		Seismic Weight (kip)	Comments
0						*Ground floor*
1	*174*	*85*	*0*		*259*	*Mezzanine*
2	*12*	*124*	*76*		*211*	*Roof*
∑ Floors	>>>>

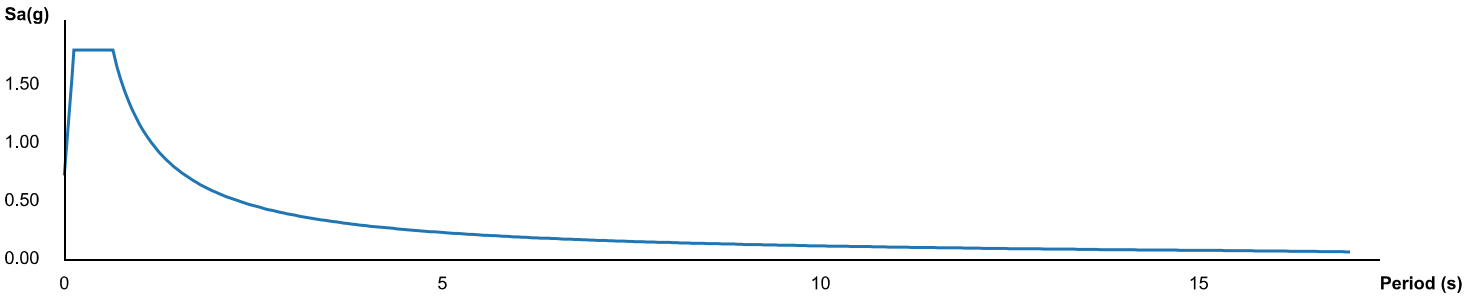
Hazards by Location

Search Information

Address:	williwaw elementary anchorage ak
Coordinates:	61.21115649999999, -149.7970792
Elevation:	157 ft
Timestamp:	2021-10-20T21:29:10.115Z
Hazard Type:	Seismic
Reference Document:	ASCE41-17
Site Class:	D-default
Custom Probability:	



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	1.707	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_S	1.111	Coefficient of risk (0.2s)
SsRT	1.897	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S_S	1.5	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.8	Site modified spectral response (0.2s)
S1UH	0.809	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_1	1.036	Coefficient of risk (1.0s)
S1RT	0.839	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.68	Factored deterministic acceleration value (1.0s)
S_1	0.68	MCE_R ground motion (period=1.0s)
F_v	1.7	Site amplification factor at 1.0s
S_{X1}	1.156	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S_{XS}	1.2	Site modified spectral response (0.2s)
S_{X1}	0.771	Site modified spectral response (1.0s)

Hazard Level BSE-2E

Name	Value	Description
S_S	1.306	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.567	Site modified spectral response (0.2s)
S_1	0.597	MCE_R ground motion (period=1.0s)
F_v	1.703	Site amplification factor at 1.0s
S_{X1}	1.016	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.787	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	0.944	Site modified spectral response (0.2s)
S_1	0.33	MCE_R ground motion (period=1.0s)
F_v	1.97	Site amplification factor at 1.0s
S_{X1}	0.651	Site modified spectral response (1.0s)

T_L Data

Name	Value	Description
T_L	16	Long-period transition period (s)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

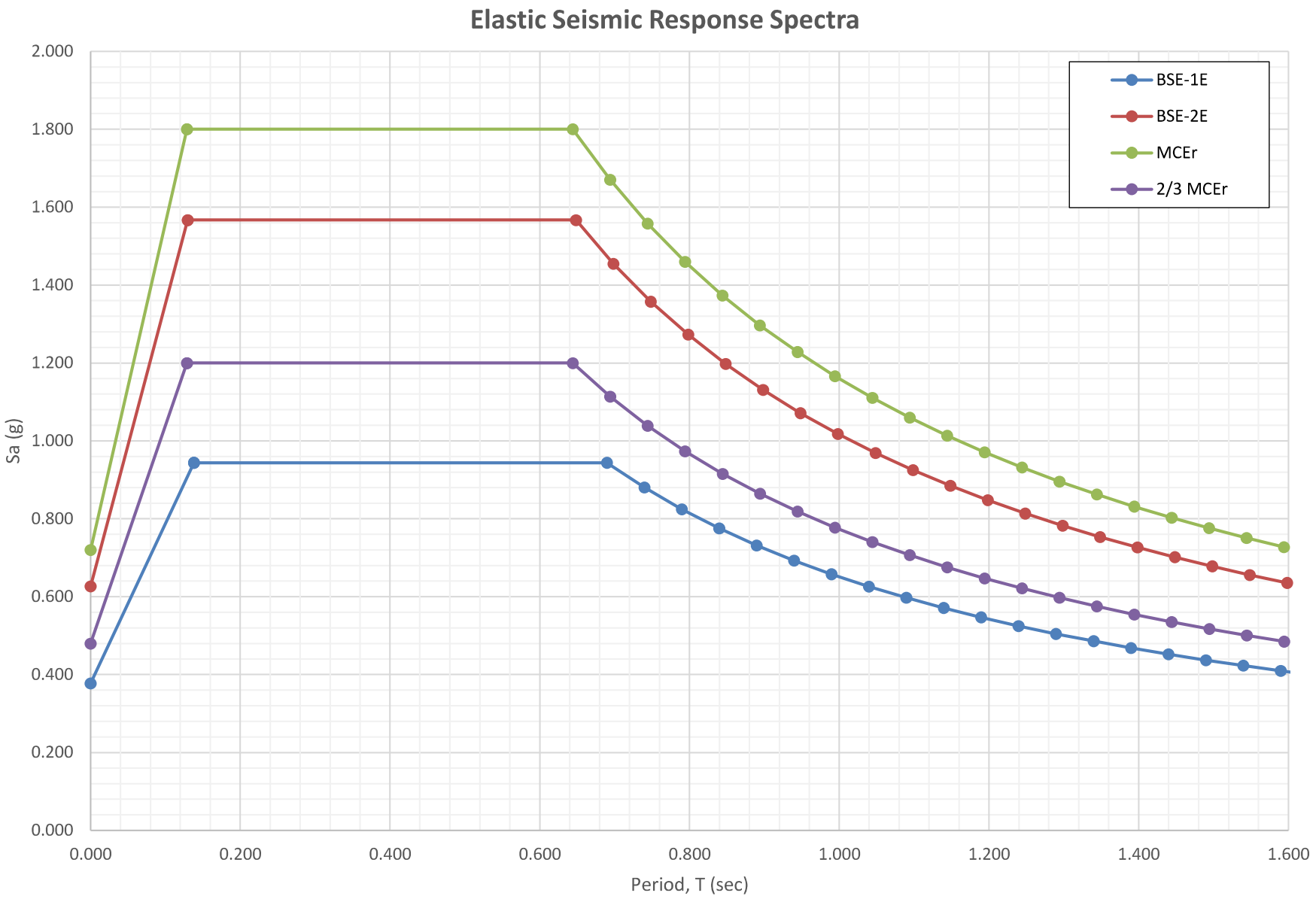
Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Project:
21156AN - ASD Tier 1
Seismic Response Spectra - Site Class D

C-014
Name: NIC
Date: 11/10/2021



Anchorage School District Seismic Evaluation: Williwaw Elementary Tier – 1 Report (February 2022)
Attachment E

Professional Services Ocean View and Williwaw Elementary Schools Tier 2/3 Seismic Evaluation
RFP Number 2026-603

1 - Seismic Base Shear: ASCE 41-17 Tier I Procedure

Notes: *1. Seismic Forces calculated following the Tier - III procedure of ASCE 41-17. Analysis Method used is the LSP*

Seismic Response Spectra Inputs			
BSE-1E	S_{x1}	0.651	(g)
	S_{xs}	0.944	(g)
	S_a	0.944	(g)
BSE-2E	S_{x1}	1.016	(g)
	S_{xs}	1.567	(g)
	S_a	1.567	(g)
Period	T	0.16	(sec)

Seismic Base Shears			
Weight	W	523	(kip)
BSE - 1E	V_{1E}	691	(kip)
BSE - 2E	V_{2E}	1147	(kip)

Comments:

$$S_a = \frac{S_{X1}}{T} < S_{XS} \quad Eq. 4-3$$

$$T = C_t H_n^{\beta} \quad \text{Eq. 4–4}$$

$$V = CS_aW \quad \text{Eq. 4-1}$$

$$C_{vx} = \frac{w_x h_x^k}{\sum w_i h_i^k} \quad \text{Eq. 4-2a}$$

$$F_i = C_{vx}V \quad \text{Eq. 4-2a}$$

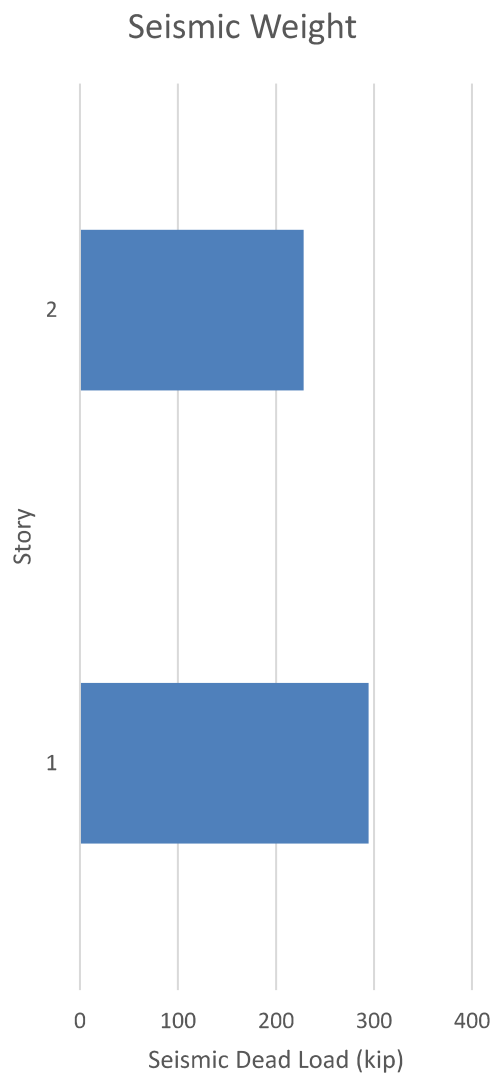
Seismic Base Shear - Tier 1 Method		
C	1.4	ASCE 41-17, Table 4-7
k	1.00	ASCE 41-17 Section 7.4.1.3.2

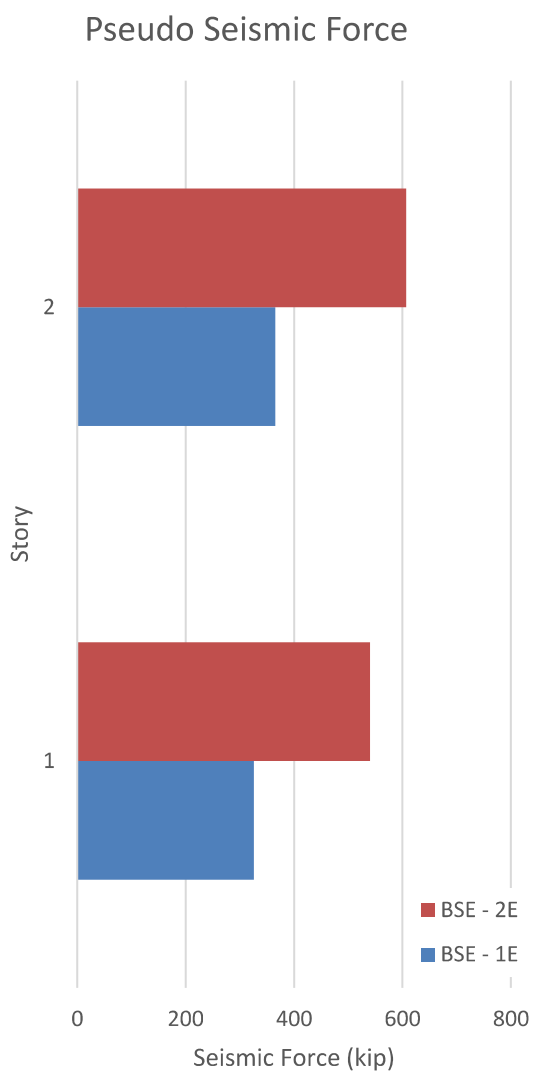
Approx. Structural Period (Method-2 Emperical)		
C_t	0.02	ASCE 41-17 Section 4.4.2.3
β	0.75	ASCE 41-17 Section 4.4.2.3
h_n	16.66	(ft) - Structural Height

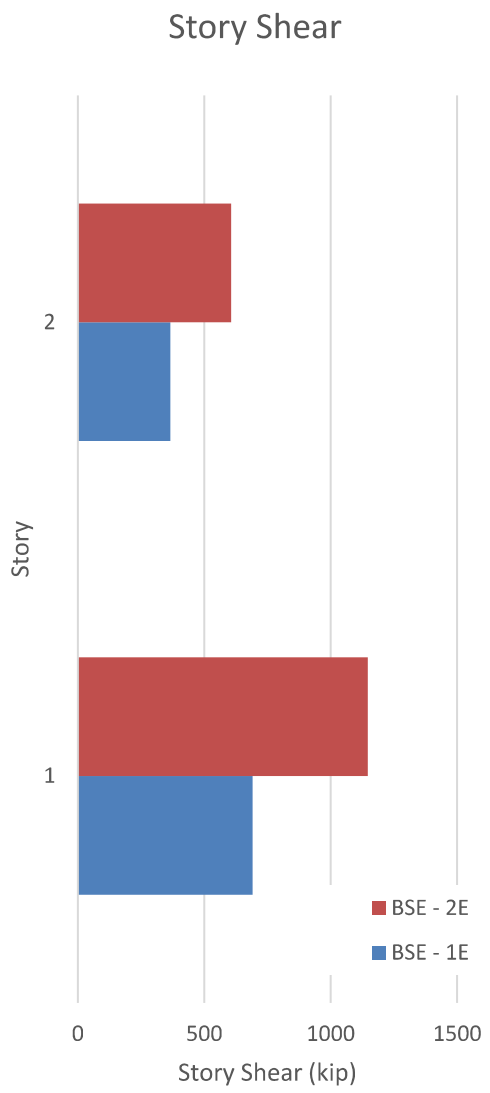
2 - Pseudo Seismic Forces Story Forces

				Seismic Weights Tributary:				BSE - 1E		BSE -2E	
			Story Height	Tot. Story	Diaphragm			Story Force	Story Shear	Story Force	Story Shear
	Floor	Elevation	h_{ix}	W_x	N-S W_{px}	E-W W_{px}	$w_x h_x^k$	F_x	V_x	F_x	V_x
		(ft)	(ft)	(kip)	(kip)	(kip)		(kip)	(kip)	(kip)	(kip)
Ground	0	0	0					-	-	-	-
EW Loading - Mezzanine	1	11.50	11.50	295			3387	326	691	540	1147
EW Loading - Roof	2	16.66	5.16	228			3802	365	365	607	607
NS Loading - Mezzanine	1	11.50	11.50	295				389	389	646	646
NS Loading - Roof	2	16.66	5.16	228				302	302	501	501
		Totals ->>	**16.7**	**523**			**7,190**	**691**	**691**	**1,147**	**1,147**

3 - Pseudo Seismic Forces Story Forces & Story Shear Plots:







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Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/10/2021
By: NIC

Base Shear Comparision (1 of 2)

- **Notes:**
  1. IBC 2018 / ASCE 7-16 vs. 1991 UBC
  2. For derivation of building seismic weight see seismic load calculations.

- **Building Properties:**

$W_b := 523 \cdot kip$ — Building seismic weight, total

$h_n := 16.67 \cdot ft$ — Height of roof

- **Base Shear: 1991 UBC**

$Z := 0.4$ — Zone 4 - Record drawings

$I_s := 1.25$ — Importance factor - Record Drawings

$R_w := 6.0$ — System Performance Factor, Record drawings

$C := 2.75$ — Record drawings

$$T_s := 0.035 \cdot \left(\frac{h_n}{ft}\right)^{0.75} \cdot s = 0.29\,s$$ — Eq 34-3 UBC

$$V_{s1} := \frac{Z \cdot I_s \cdot C}{R_w} \cdot W_b = 119.85 \cdot kip$$ — 1991 UBC Eq. 34-1 Base shear

$s_{a_UBC} := Z \cdot C = 1.1$ — Effective seismic acceleration

$$R_{eq} := \frac{R_w}{1.54} = 3.9$$ — Equivalent force reduction factor, "Ductile Design of Steel Structures", Burneau, Equation 7.53

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Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/10/2021
By: NIC

Base Shear Comparision (2 of 2)

- **Base Shear: 2018 IBC & ASCE 7-16**

$c_t := 0.02$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$x := 0.75$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$T_a := (sec) \cdot c_t \cdot \left(\frac{h_n}{ft}\right)^x = 0.16\,s$ — ASCE 7-16 Eq. 12.8-7 Approximate fundamental period

$I_e := 1.25$ — ASCE 7-16 Table 1.5-2 Importance factor, type III building

$S_{ds} := 1.2$

$S_{d1} := 0.773$ — Design spectral response acceleration, site class - D default

$R' := 2$ — Response modification coefficient, ASCE 7-16 Table 12.2.1 Ordinary Reinforced Masonry Walls

$C_s := \frac{S_{ds}}{\left(\frac{R'}{I_e}\right)} = 0.75$ — ASCE 7-16 Eq. 12.8-2, Seismic response coefficient

$V_{s2} := 0.7 C_s \cdot (W_b) = 274.57 \cdot kip$ — Seismic Base Shear, ASCE 7-16 Eq. 12.8-1

- **ASD - Seismic Base Shear Comparision**

$\frac{V_{s2}}{V_{s1}} = 229.09 \cdot \%$ — Increase in equivalent lateral force between original building code & 2018 IBC

$\frac{S_{ds}}{s_{a_UBC}} = 109.09 \cdot \%$ — Increase in seismic acceleration between original building code & 2018 IBC

$\frac{R'}{R_{eq}} = 51.33 \cdot \%$ — Decrease in percieved ductility between original building code & 2018 IBC

East A Wing

2.0 – QUICK-CHECKS:

2.1 Wood Frames (W2) Quick-Checks
2.2 Reinforced Masonry (RM1) Quick-Checks
2.3 Steel Light Frames (S3) Quick-Checks
2.4 Steel Braced Frame (S2) Quick-Checks

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Length *(ft)*	E-W SW Length *(ft)*	Max Stress *(plf)*	Comments
All	224	96	-	621.1	EW Loading - 40% Roof
Maximum Stress (psi)				**621.1**	< 1000 plf (Plywood), ASCE 41-17, A3.2.7.1

System Modification Factor, Ms 3.75 Average of LS and CP

1 - Shear Wall Properties & Area

Type	Description	Area	X-Dir Tot. Area	Y-Dir Tot. Area
Wx		in^2/ft	in^2	in^2
W1	8" CMU	91.5	14503	6977
		Total	14503	6977

2 - Shear Wall Areas: Mezzanine Interior Walls

Length X- Dir: (East - West)							Length Y- Dir: (North - South)						
W1							W1						
ft							ft						
158.5							76.25						
158.5						<< Total >>	76.25						
14503						<< Area >>	6977						

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Area *(in^2)*	N-S SW Area *(in^2)*	Max Stress *(psi)*	Comments
All	809	14503	-	14.9	EW Loading - 60% Roof and Full Mezzanine
All	569	-	6977	21.7	NS Loading - Mezzanine Loading
Maximum Stress (psi)				**21.7**	**< 70 psi, ASCE 41-17, A.3.2.4.1**

System Modification Factor, Ms 3.75 Average of LS and CP

2.0 Reinforcement Ratio Checks

Wall Type	Net Area (in2/ft)	Vertical Bars				Horizontal Bars				Total Ratio	Comments
		Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio	Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio		
W1	91.5	5	16	0.23010	0.00251	4	32.0	0.07363	0.00080	0.00332	8", fully grouted. 4,5,10/S-10
W2	91.5	5	24	0.15340	0.00168	4	32.0	0.07363	0.00080	0.00248	8", fully grouted. 9,15/S-10

Minimum total reinforcing steel ratio: 0.00248
Minimum reinforcing steel ratio in either direction: 0.00080
Maximum reinforcing spacing (in): 32

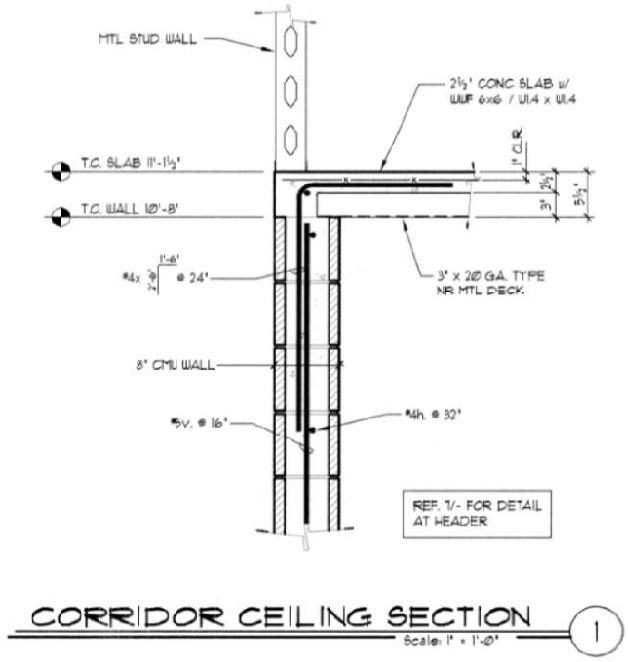
Project:
21156AN - ASD Tier 1
Quick-Checks

C-024
Name: NIC
Date: 11/10/2021

Inputs		
Ψ	1.15	Average of CP and LS
Sxs	1.567	BSE-2E

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C1	Mezzanine	All corridors	86	2	5.5	1705	5400	8" CMU, fully grouted

C1 connections are compliant with quick check calculation.



CORRIDOR CEILING SECTION 1
Scale: 1" = 1'-0"

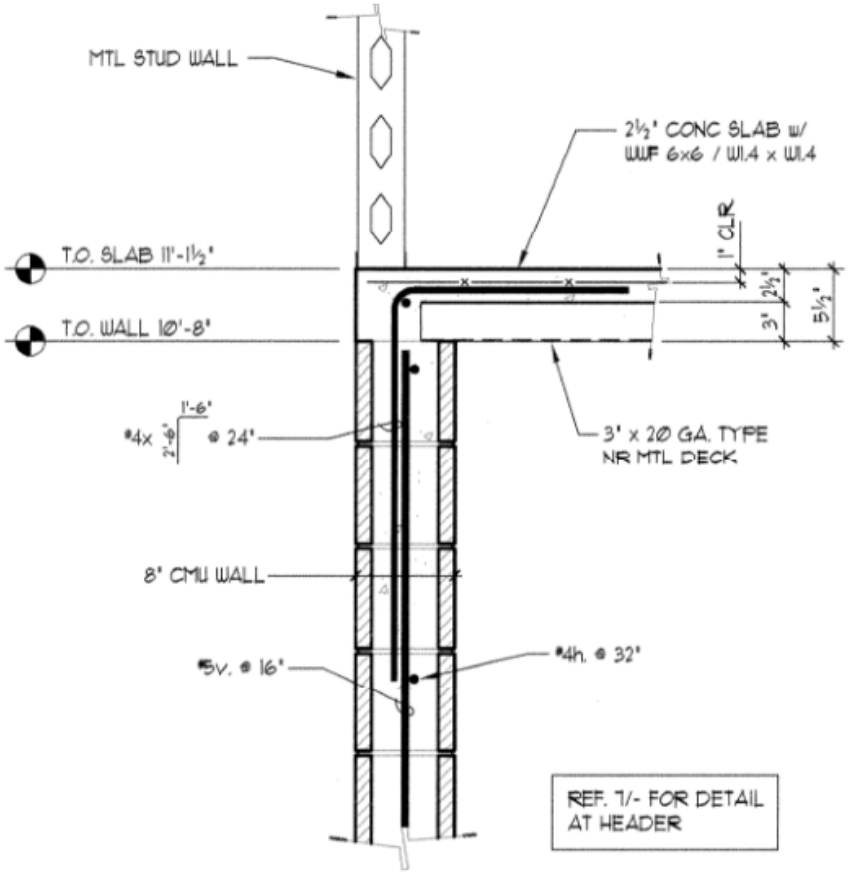
1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

ASCE 41-17 Quick-Checks:

Exterior CMU Out-of-Plane Connection Capacity

Connection - C1:



CORRIDOR CEILING SECTION 1
Scale: 1" = 1'-0"

1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

Connection Strengths and Geometry

Concrete and Reinforcement

$f'_c := 4000psi$ — Concrete compressive strength
1994 Record Drawings, S-1

$c_c := 1in$ — Clear concrete cover

$f_{yr} := 60ksi$ — Reinforcement yield strength

$d_{br} := \frac{4in}{8} = 0.5 \cdot in$ — Diameter of reinforcing bars

Reinforcement Development into Slab-on-Deck

$\psi_t := 1.0 \quad \psi_e := 1.0 \quad \psi_g := 1.0 \quad \lambda := 1.0$ — *ACI 318-19 Table 25.4.2.5*

$$l_d := \frac{\frac{f_{yr}}{psi} \cdot \psi_t \cdot \psi_e \cdot \psi_g}{25\lambda \cdot \sqrt{\frac{f'_c}{psi}}} \cdot d_{br} = 18.97 \cdot in$$

ACI 318-19 Table 25.4.2.3

Detail shows 18" leg for bent bar. Consider bar fully developed.

Shear Yielding of Reinforcement

$$\phi R_n := 1.0 \cdot 0.6 \cdot f_{yr} \cdot \left(\frac{\pi}{4} \cdot d_{br}^{\,2} \right) = 7.07 \cdot kip$$

AISC 360-16 (J4-3)

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/10/2021

S3 Quick-Checks
Column Axial Stress Check

Geometry and Material Properties

Building

Moment frames on grid lines "S" and "U" have the greatest tributary width for the East A wing:

$b_t := \frac{28ft + 27.333ft}{2} = 27.67\,ft$ Tributary width of frame

$L_r := \frac{80ft}{2} = 40\,ft$ Length of tributary roof

Column

Strength

$F_y := 50ksi$ *Midco Drawings 8/94, C-1*

Outer Flange

$b_{fo} := 10in$

$t_{fo} := 0.5in$

$A_1 := b_{fo} \cdot t_{fo} = 5 \cdot in^2$

Inner Flange

$b_{fi} := 12in$

$t_{fi} := 0.625in$

$A_2 := b_{fi} \cdot t_{fi} = 7.5 \cdot in^2$

Web

$h := 18.08in$ Minimum web depth

$t_w := 0.3125in$ Thickness of web

$A_3 := h \cdot t_w = 5.65 \cdot in^2$

Section

$A_{tot} := \sum A = 18.15 \cdot in^2$

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Loads

Pressures

$p_d := 13.1psf$ — Roof dead load pressure

$p_s := 40psf$ — Roof snow load pressure

Point Loads

$P_d := p_d \cdot b_t \cdot L_r = 14.5 \cdot kip$ — Roof dead load point load

$P_s := p_s \cdot b_t \cdot L_r = 44.27 \cdot kip$ — Roof snow load point load

$P_g := 1.1 \cdot \left(P_d + P_s \right) = 64.64 \cdot kip$ — Total gravity loads
ASCE 41-17
(7-1)

Analysis

$$U := \frac{P_g}{F_y \cdot A_{tot}} = 7.12 \cdot \% \quad < 10\%, \text{per ASCE 41-17, A.3.1.3.2}$$

Columns are **compliant** with quick-check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

S3 Quick-Checks
Flexural Stress Check

Loads

$V_{tot} := 501kip$ — Total shear resisted in principal direction
Seismic Loading Spreadsheet

Representative Sections

Smallest beam and column sections of frame are used as a upper bound for the flexural stress:

Beam Properties

$Z_{bm} := 117.81in^3$ — Beam plastic section modulus
RISA3D

Column Properties

$Z_{col} := 137.04in^3$ — Column plastic section modulus
RISA3D

Frame Properties

$F_y := 50ksi$ — Beam and column yield strength
Midco 8/94 Drawings
C-1

$n_f := 5$ — Number of frames resisting shear

$n_c := 2 \cdot n_f = 10$ — Number of frame columns

$h := 16.66ft$ — Story height

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$$\phi R_{n_1} := 0.9 \cdot 0.6 \cdot F_y \cdot d_{c_1} \cdot t_{w_1} \cdot \left(1 + \frac{3 \cdot b_{cf} \cdot t_{cf}^2}{d_{bm_1} \cdot d_{c_1} \cdot t_{w_1}} \right) = 293.54 \cdot kip$$

Factored Panel Zone Shear Capacities
AISC 360-16 (J10-11)

$$\phi R_{n_2} := 0.9 \cdot 0.6 \cdot F_y \cdot d_{c_2} \cdot t_{w_2} \cdot \left(1 + \frac{3 \cdot b_{cf} \cdot t_{cf}^2}{d_{bm_2} \cdot d_{c_2} \cdot t_{w_2}} \right) = 310.2 \cdot kip$$

$$U_1 := 0.8 \cdot \frac{V_{max_1}}{\phi R_{n_1}} = 113.41 \cdot \%$$

$$U_2 := 0.8 \cdot \frac{V_{max_2}}{\phi R_{n_2}} = 111.28 \cdot \%$$

Panel zones are **non-compliant** for the quick-check calculation.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

S3 Quick-Checks
Compact Members

$E := 29000ksi$ — Steel modulus of elasticity

$F_y := 50ksi$ — A-572, A-570 or A-529 Plate
C-1
MIDCO Permit Drawings

$R_y := 1.1$ — *AISC 341-16*
Table A3.1

Limiting Width-to-Thickness Ratios

Flanges of I-shaped sections

$$\lambda_{md_f} := 0.4 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 9.18$$

AISC 341-16
Table D1.1

Webs of rolled or built-up I-shaped sections

$$C_a = \frac{P_u}{\phi_c \cdot P_y}$$

AISC 341-16
Table D1.1

$$\lambda_{md_w}(C_a) := \begin{cases} 3.96\left(1 - 3.04 \cdot C_a\right) \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{if } C_a \le 0.114 \\ \max\left[1.29 \cdot \left(2.12 - C_a\right), 1.57\right] \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{otherwise} \end{cases}$$

AISC 341-16
Table D1.1

$\lambda_{md_w_max} := \lambda_{md_w}(0) = 90.93$ — Minimum limiting web ratio (Pu = 0)

$\lambda_{md_w_min} := \lambda_{md_w}(1) = 36.05$ — Minimum limiting web ratio (Pu = ϕPn)

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Frame Properties

Grid Lines "T" - "V"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (32 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 32)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 8 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 8 \quad 9.6)$ Width-to-thickness ratios of inside flanges

Width-to-thickness ratios of webs

$\lambda_w := \frac{h_{max}}{t_w}^T = (102.4 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 102.4)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

4 / 8 members fail to meet slenderness ratio for inside flange.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Frame Properties

Grid Line "S"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 14 \quad 8 \quad 8 \quad 8 \quad 8 \quad 14 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (34 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 34)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 9.33 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 9.33 \quad 9.6)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (108.8 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 108.8)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

6 / 8 members fail to meet slenderness ratio for inside flange.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Frame Properties

Grid Line "R.1"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 14 \quad 8 \quad 8 \quad 8 \quad 8 \quad 14 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (34 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 34)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 9.33 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 9.33 \quad 9.6)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (108.8 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 108.8)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

6 / 8 members fail to meet slenderness ratio for inside flange.

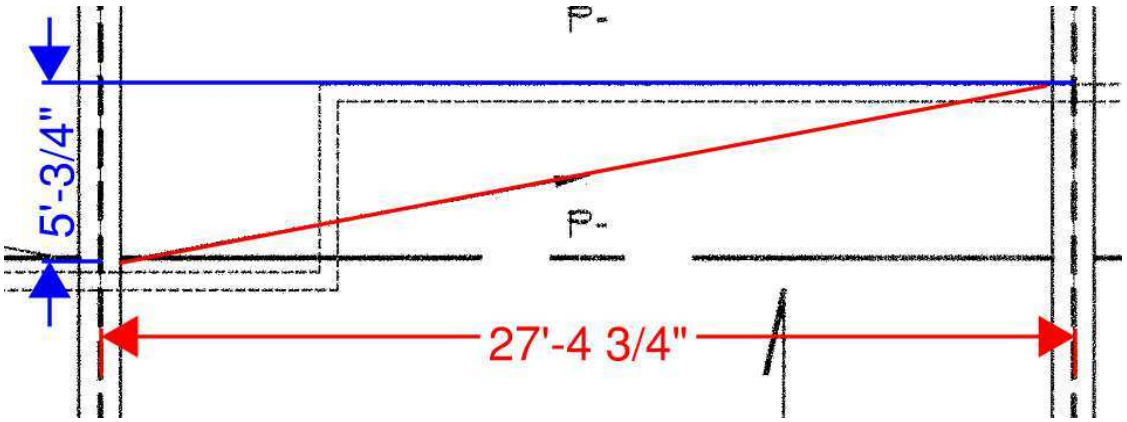
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Design Sheet

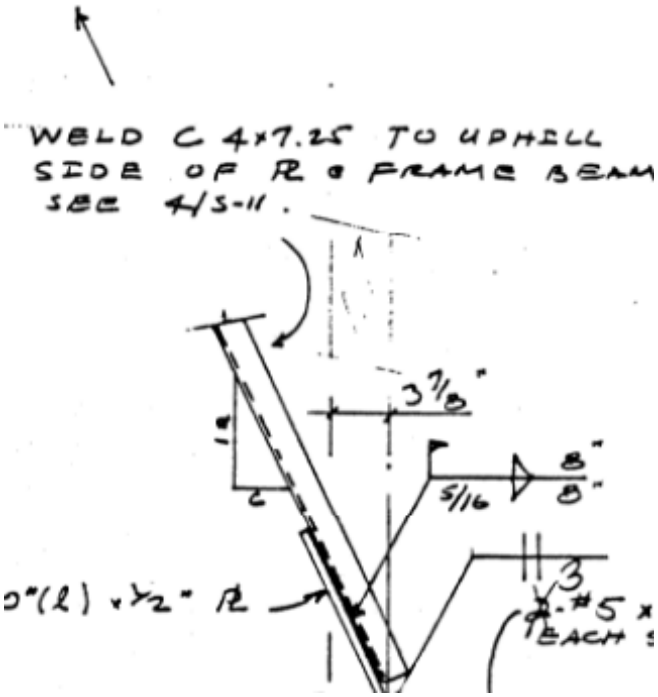
PROJECT: 21156AN - ASD Tier 1
(1 of 3)

Date: 11/10/2021
By: NIC

ASCE 41-17 Quick-Checks: Brace Axial Stress



Brace plan dimensions per S-5 of record drawings



Brace vertical slope per RS-7 of record drawings

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Design Sheet

PROJECT: 21156AN - ASD Tier 1
(2 of 3)

Date: 11/10/2021
By: NIC

- **Notes:**
  1. *Reference ASCE 41-17 4.4.3.4*
  2. *Record drawings, 1999*

- **Brace Axial Stress - Braces: C4x7.25**

$F_y := 36ksi$ — *Record Drawings, 1994 S0.1*

$F_{ye} := 1.25 \cdot F_y = 45 \cdot ksi$ — Expected yield strength, per ASCE 41-17 Table 4-9 Footnotes

$M_s := \frac{3.5 + 2.5}{2} = 3$ — "Tension only" members modification factor, damage control limit state @ BSE-2E *ASCE Table 4-9*

$s_{avg} := \frac{28ft + 27.33ft}{2}$ — Average effective span, all braced frames

$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (27.66 \quad 5 \quad 10)$ — Vector of brace direction, note resisting shear is along first index

$u := u^T$

$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 29.84\,ft$ — Average length of braces

$L_{br} = 29.84\,ft$

$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.93 \\ 0.17 \\ 0.34 \end{pmatrix}$ — Unit vector of brace direction

PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN - ASD Tier 1
(3 of 3)

Date: 11/10/2021
By: NIC

$A_{br} := 2.13in^2$ Average x-sectional area of a diagonal brace

$V_{2E} := 0.6 \cdot 559kip = 335.4 \cdot kip$ Story shear at BSE-2E

$n_{br} := 2 \cdot 2$ Number of braced frames acting per direction (two braces per end of MF)

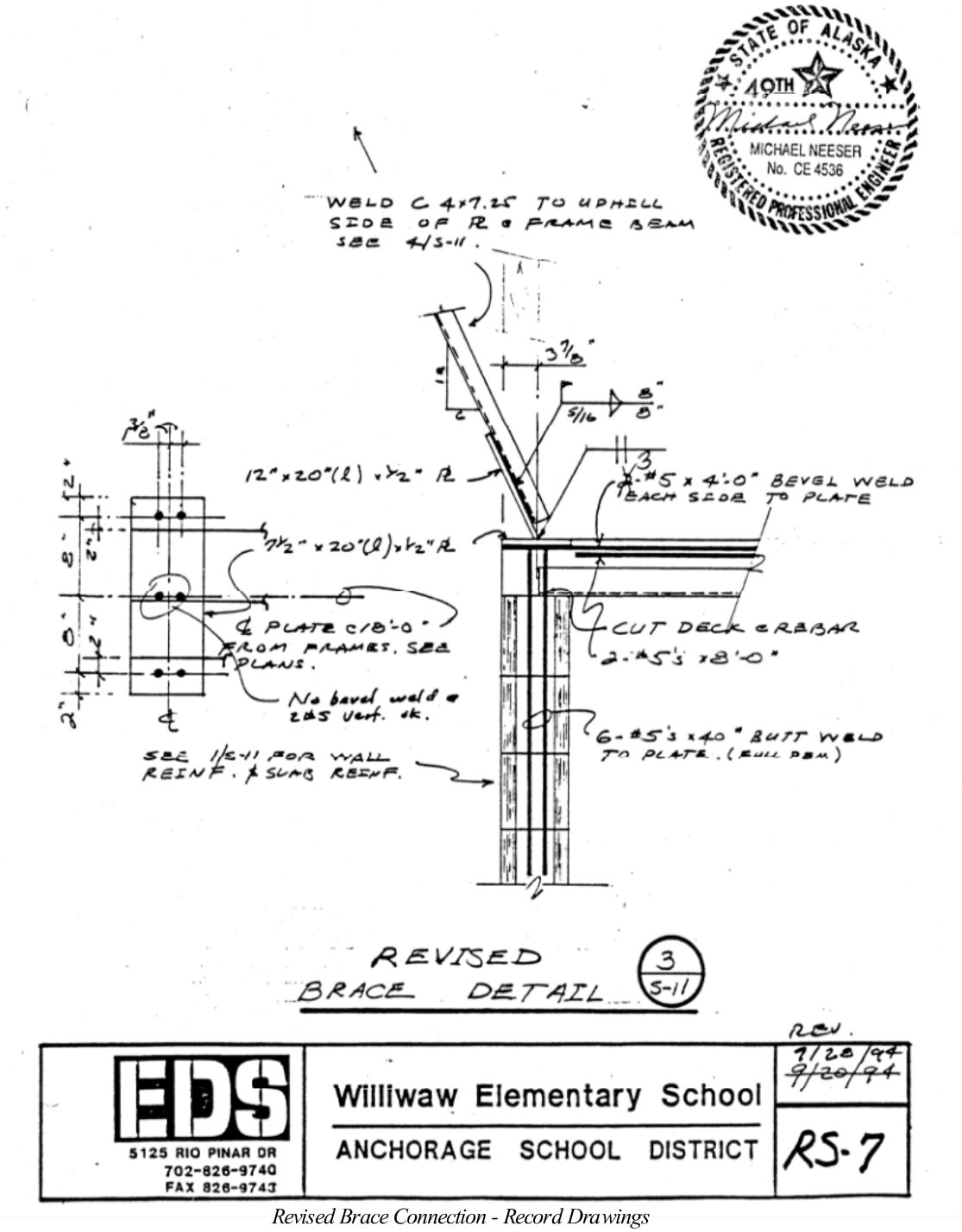
$T := \frac{V_{2E}}{u'_1} = 361.75 \cdot kip$ Tension component along brace from demand shear direction

$f_1 := \frac{1}{M_s} \cdot \left(\frac{T}{s_{avg} \cdot n_{br}} \right) \cdot \left(\frac{L_{br}}{A_{br}} \right) = 15.27 \cdot ksi$ Brace axial stress - Eq. 4-9

$DCR_1 := \frac{f_1}{0.5 \cdot (F_y)} = 84.81 \cdot \%$

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

S3 Quick-Checks
Connection Strength



Revised Brace Connection - Record Drawings

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

Demand Loads

Brace Unit Vector

$$s_{avg} := \frac{2 \cdot 28ft + 4 \cdot 27.33ft}{6} = 27.55\,ft$$

Average effective span, all braced frames

$$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (27.55 \quad 5 \quad 10)$$

Vector of brace direction, note resisting shear is along first index

$$u := u^T$$

$$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 29.74\,ft$$

Average length of braces

$$L_{br} = 29.74\,ft$$

$$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.93 \\ 0.17 \\ 0.34 \end{pmatrix}$$

Unit vector of brace direction

Yield Force of Brace

$$F_y := 36ksi$$

Brace yield strength
1994 Record Drawings, S-1

$$A_{br} := 2.13in^2$$

$$T_{br} := F_y \cdot A_{br} = 76.68 \cdot kip$$

Average tension per brace

Vertical Force

$$F_{vert} := T_{br} \cdot u'_3 = 25.79 \cdot kip$$

Vertical force per brace connection

Force Perpedicular to Wall

$$F_{perp} := T_{br} \cdot u'_2 = 12.89 \cdot kip$$

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

Connection Capacity and Utilization

Welds to brace

$$\phi R_n := 2 \cdot 1.392 \cdot 5 \cdot 8in \cdot kpi = 111.36 \cdot kip$$

Fillet Weld Strength
AISC SCM 15th
(8-2a)

$$U := \frac{T_{br}}{\phi R_n} = 0.69$$

check = "OK"

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CMU Shear Breakout - Parallel to CMU Wall

Connection Properties

$s_{rb} := 2 \cdot (1.375in) = 2.75 \cdot in$ — Separation between reinforcement - perpendicular to CMU wall

$d_b := \frac{5}{8}in = 0.63 \cdot in$ — Diameter of reinforcement

$A_b := \pi \cdot \frac{d_b^2}{4} = 0.31 \cdot in^2$

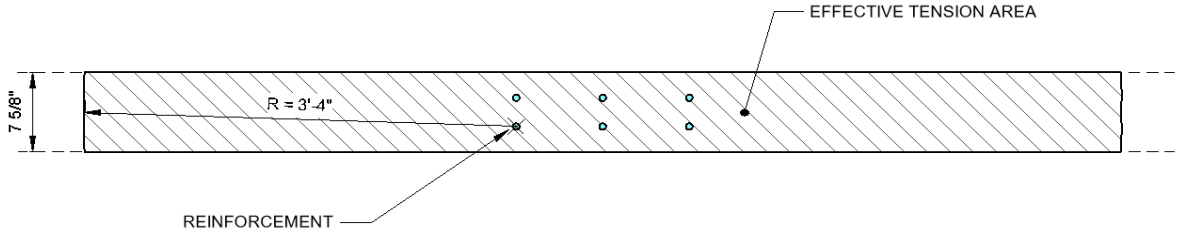
$l_e := \frac{7.625in}{2} - 1.375in = 2.44 \cdot in$ — Edge distance of reinforcement

$l_b := 40in$ — Reinforcement length of embedment

$n_b := 6$ — Total number of anchors per connection

$F_y := 60ksi$ — Yield strength of reinforcement

$f'_m := 1500psi$ — *1994 Record Drawings S-1*



$A'_{pt} := 5.08ft^2 = 731.52 \cdot in^2$

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Shear Breakout

Brace connections appear far from free edges - assume shear breakout does not occur.

Masonry Shear Crushing

$$\phi B_{vnc} := n_b \cdot 0.5 \cdot 1050 \cdot \left(f'_m \cdot A_b \right)^{\frac{1}{4}} \cdot lbf^{\frac{3}{4}} = 14.59 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Shear Pryout

$$\phi B_{vnpry} := 0.5 \cdot 8 \cdot A'_{pt} \cdot \sqrt{f'_m \cdot \frac{1}{psi}} \cdot psi = 113.33 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Yielding

$$\phi B_{vns} := n_b \cdot 0.9 \cdot 0.6 \cdot A_b \cdot F_y = 59.64 \cdot kip$$

TMS 402-16 (Equation 9-8)

Limiting Capacity Per Anchor Group

$$\phi B_{nv} := \min\left(\phi B_{vnc}, \phi B_{vnpry}, \phi B_{vns} \right) = 14.59 \cdot kip$$

$$U := \frac{T_{br}}{\phi B_{nv}} = 5.26$$

check = "NG"

The brace connection is **non-compliant** with the check.

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ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

S2 Quick-Checks
Connection Strength

Brace Properties
C4x7.25

Geometry

Flange

$t_f := 0.296in$

$b_f := 1.72in$

$\lambda_f := \frac{b_f}{t_f} = 5.81$

Web

$d := 4in$

$k := 0.75in$

$t_w := 0.321in$

$h := d - 2 \cdot k = 2.5 \cdot in$

$\lambda_w := \frac{h}{t_w} = 7.79$

Material

$F_y := 36ksi$ — Yield Strength
Record Drawings, S-1

$R_y := 1.5$ — *AISC 341-16 Table A3.1*

$E := 29000ksi$ — Steel MoE

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Ductility Requirement

Flange

$$\lambda_{md} := 0.40 \sqrt{\frac{E}{R_y \cdot F_y}} = 9.27$$

$$U := \frac{\lambda_f}{\lambda_{md}} = 62.69 \cdot \%$$

check = "OK"

Web

$$\lambda_{md} := 1.57 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 36.38$$

$$U := \frac{\lambda_w}{\lambda_{md}} = 21.41 \cdot \%$$

check = "OK"

The brace connection is **compliant** with the check.

West A Wing

1.0 – SEISMIC LOADING:

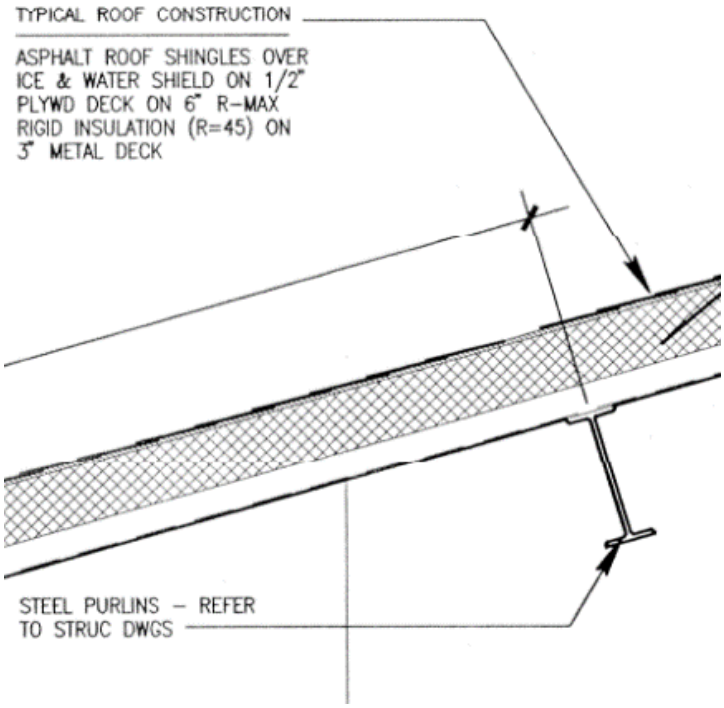
1.1 Building Weights
1.2 Seismic Hazard: ASCE 41
1.3 Seismic Forces
1.4 Base Shear Comparison

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

1.0 Typical Sloped Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Shingles	2.50	
Dead	Membrane	0.30	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.50	6" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**13.10**	**Summary**



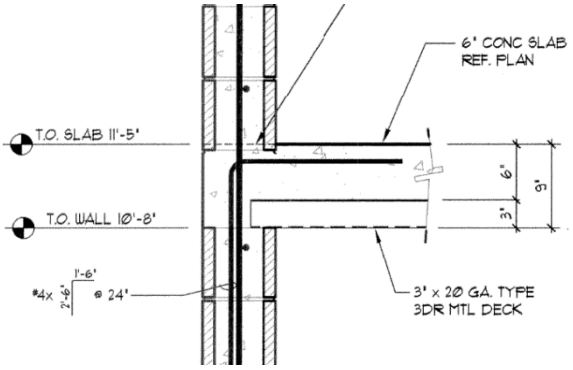
Above - 1 / A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

2.0 Boiler and Fan Room Floors - 6" SOD

Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab on deck	90.65	9" Total, 6" slab on PLW3 Verco deck + 3" 145pcf concrete
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**94.95**	**Summary**



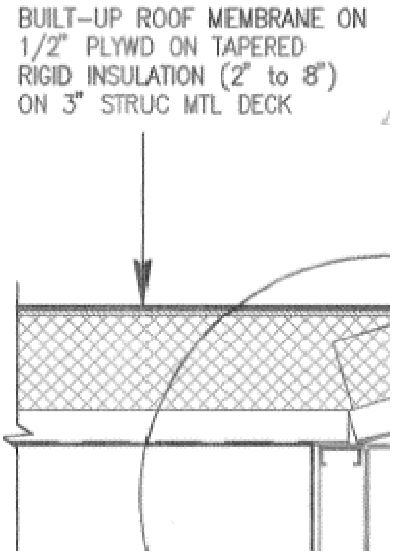
Above - 12 / S-11 of 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

3.0 Typical Built-Up Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Built-up roof membrane	5.50	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.25	5" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**15.55**	**Summary**



Above - 2 / A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Fan Room Corridor Floors - 2 1/2" SOD

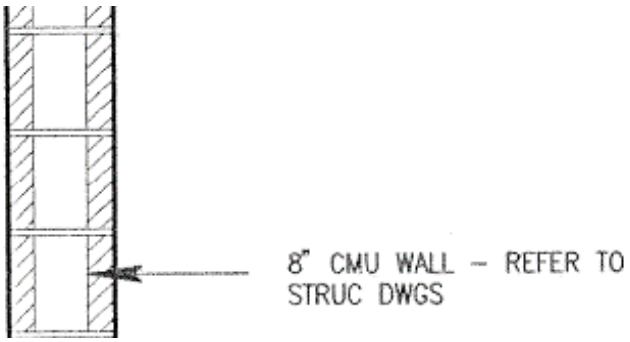
Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab	48.30	5 1/2" total, Verco catalog
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**52.60**	**Summary**

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Typical 8" CMU Single Wythe Corridor Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	8" CMU	86.00	135 pcf, fully grouted
	Multiplier	1.00	
Dead	**Total**	**86.00**	



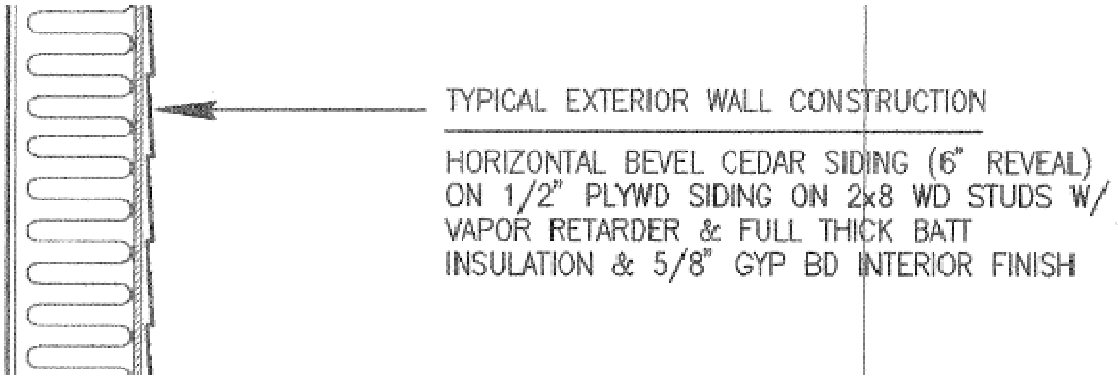
Above - 2/A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

5.0 Exterior Wall

Load Category	Item	Weight	Comment
		(psf)	
Dead	Cedar Siding	2.00	
Dead	1/2" plywood	1.5	
Dead	(2) 2x8 studs @ 16" OC	5.00	
Dead	Batt insulation	0.80	
Dead	5/8" Gyp	2.00	
	Multiplier	1.00	
Dead	**Total**	**11.30**	



Above - 4/A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

6.0 Typical CFS Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	3 1/2" CFS Studs	0.59	Spaced 16" OC per 11 / S-11, 1994 Drawings
Dead	(2) layers 5/8" GWB	4.00	
Dead			
Dead			
Dead			
Dead	Multiplier	1.00	
Dead	**Total**	**4.59**	

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

1.0 - Floor & Roof Dead Weights

Floor	Sub Area	Trib. Area		Typ. Weight	Weight	Comments
(#)		(sf)		(psf)	(kip)	
(1) Mezzanine	*2 1/2" SoD*	2130		53	112	
	Total	**2130**			**112**	
(2) Roof	*Sloped Roof*	13970		13.1	183	
	Total	**13970**			**183**	
∑ Floors	>>>>

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

3.0 - Wall Dead Weights - Tributary to Floor

Floor		Trib. Height	Length	Typ. Weight	Weight	Comments
(#)		(ft)		(psf)	(kip)	
(1) Mezzanine	***Total***				***213***	***Total weight of walls trib to floor***
		5.8	*421*	*86.0*	*208*	*8" CMU - First Floor*
		2.6	*421*	*4.6*	*5*	*CFS - Second Floor*
(2) Roof	***Total***				***20***	***Total weight of walls trib to roof***
		8.3	*460*	*11.3*	*43*	*Wood - Full Height*
		8.3	*383*	*4.6*	*15*	*CFS - Full Height*
		2.6	*421*	*4.6*	*5*	*CFS - Second Floor*

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

4.0 - Seismic Weights Tributary To Story

Floor (#)	Wall Weight (kip)	Floor Weight (kip)	20% Snow Weight (kip)		Seismic Weight (kip)	Comments
0						*Ground floor*
1	*213*	*112*	*0*		*325*	*Mezzanine*
2	*20*	*183*	*112*		*314*	*Roof*
∑ Floors	>>>>

Hazards by Location

Search Information

Address: williwaw elementary anchorage ak

Coordinates: 61.21115649999999, -149.7970792

Elevation: 157 ft

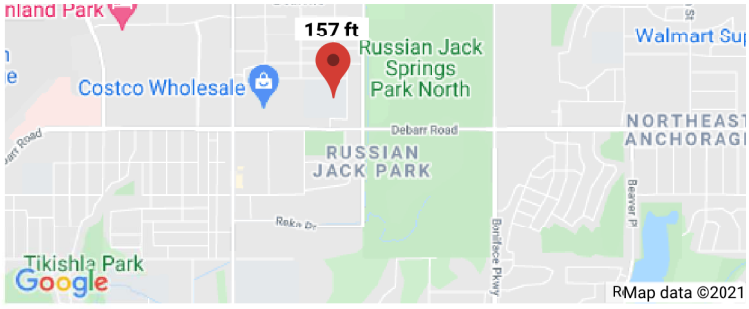
Timestamp: 2021-10-20T21:29:10.115Z

Hazard Type: Seismic

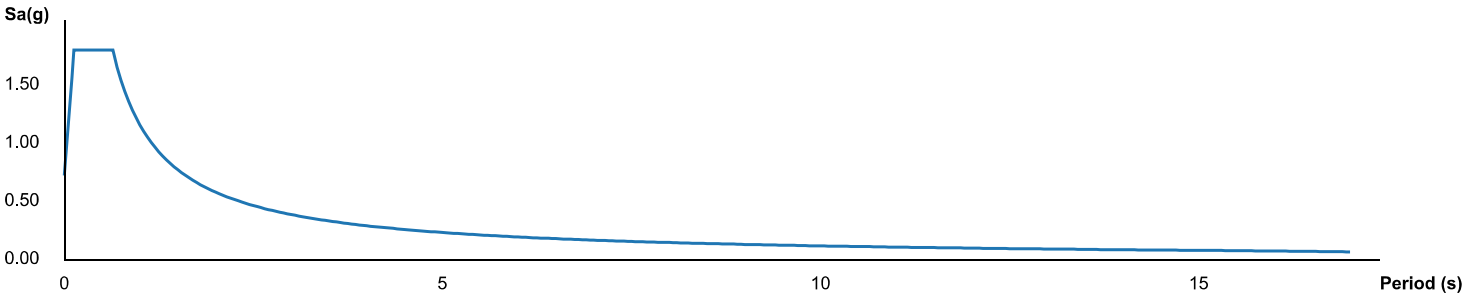
Reference Document: ASCE41-17

Site Class: D-default

Custom Probability:



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	1.707	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_S	1.111	Coefficient of risk (0.2s)
SsRT	1.897	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S_S	1.5	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.8	Site modified spectral response (0.2s)
S1UH	0.809	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_1	1.036	Coefficient of risk (1.0s)
S1RT	0.839	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.68	Factored deterministic acceleration value (1.0s)
S_1	0.68	MCE_R ground motion (period=1.0s)
F_v	1.7	Site amplification factor at 1.0s
S_{X1}	1.156	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S_{XS}	1.2	Site modified spectral response (0.2s)
S_{X1}	0.771	Site modified spectral response (1.0s)

Hazard Level BSE-2E

Name	Value	Description
S_S	1.306	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.567	Site modified spectral response (0.2s)
S_1	0.597	MCE_R ground motion (period=1.0s)
F_v	1.703	Site amplification factor at 1.0s
S_{X1}	1.016	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.787	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	0.944	Site modified spectral response (0.2s)
S_1	0.33	MCE_R ground motion (period=1.0s)
F_v	1.97	Site amplification factor at 1.0s
S_{X1}	0.651	Site modified spectral response (1.0s)

T_L Data

Name	Value	Description
T_L	16	Long-period transition period (s)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

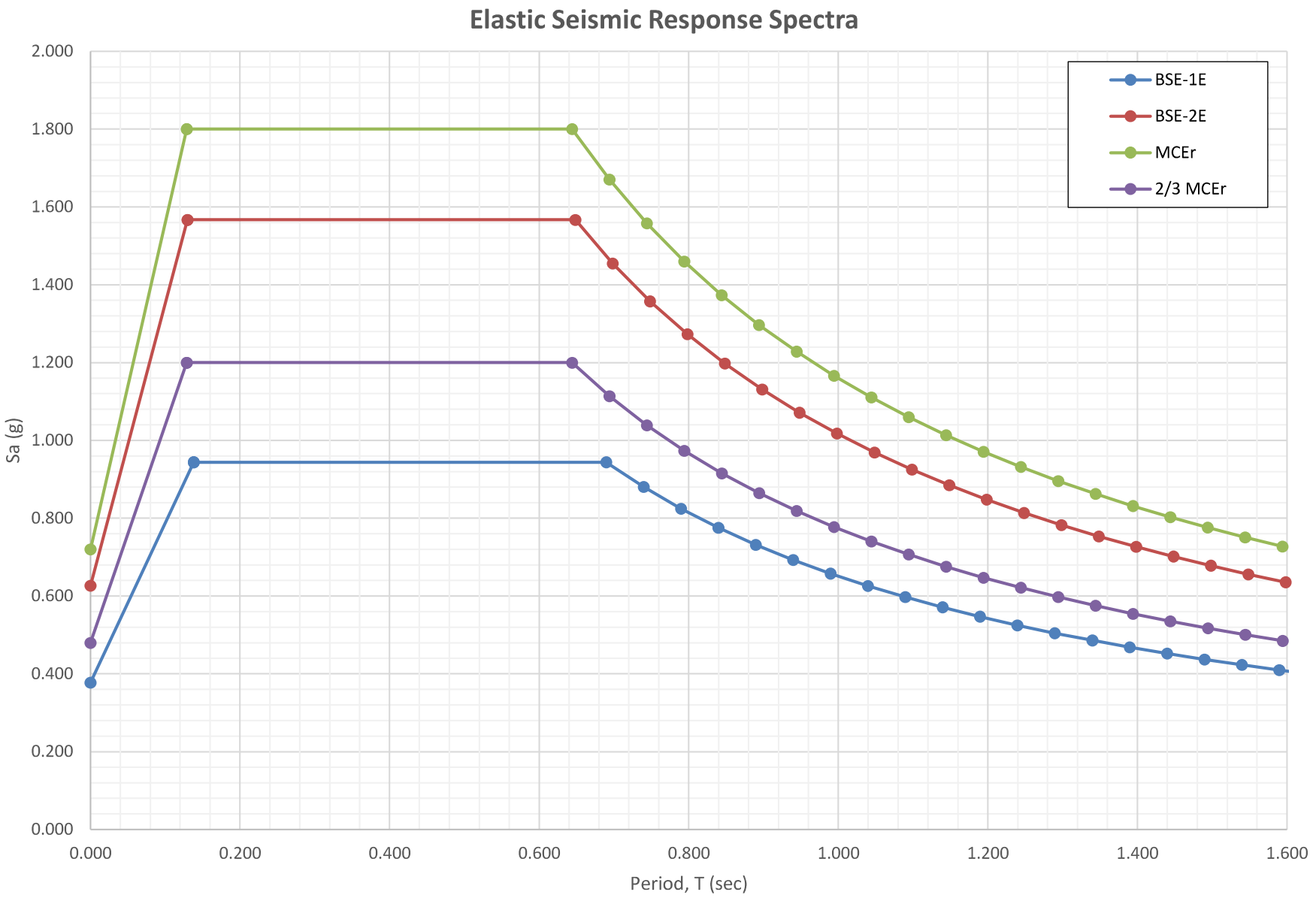
Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Project:
21156AN - ASD Tier 1
Seismic Response Spectra - Site Class D

C-059
Name: NIC
Date: 11/10/2021



Anchorage School District Seismic Evaluation: Williwaw Elementary Tier – 1 Report (February 2022)
Attachment E

Professional Services Ocean View and Williwaw Elementary Schools Tier 2/3 Seismic Evaluation
RFP Number 2026-603

1 - Seismic Base Shear: ASCE 41-17 Tier I Procedure

Notes: *1. Seismic Forces calculated following the Tier - III procedure of ASCE 41-17. Analysis Method used is the LSP*

Seismic Response Spectra Inputs			
BSE-1E	S_{x1}	0.651	(g)
	S_{xs}	0.944	(g)
	S_a	0.944	(g)
BSE-2E	S_{x1}	1.016	(g)
	S_{xs}	1.567	(g)
	S_a	1.567	(g)
Period	T	0.16	(sec)

Seismic Base Shears			
Weight	W	711	(kip)
BSE - 1E	V_{1E}	940	(kip)
BSE - 2E	V_{2E}	1560	(kip)

Comments:

$$S_a = \frac{S_{X1}}{T} < S_{XS} \quad Eq. 4-3$$

$$T = C_t H_n^{\beta} \quad \text{Eq. 4–4}$$

$$V = C S_a W \quad \text{Eq. 4-1}$$

$$C_{vx} = \frac{w_x h_x^k}{\sum w_i h_i^k} \quad \text{Eq. 4-2a}$$

$$F_i = C_{vx} V \quad \text{Eq. 4-2a}$$

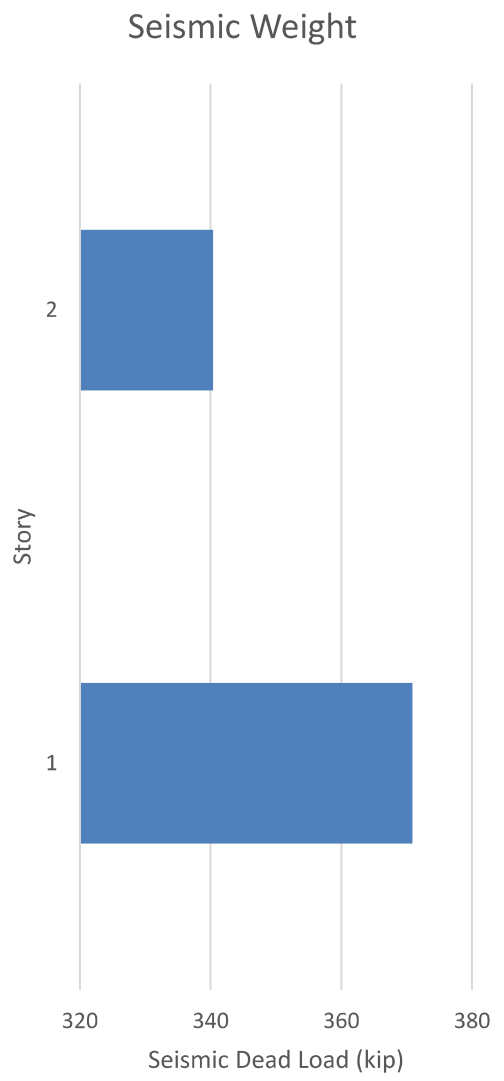
Seismic Base Shear - Tier 1 Method		
C	1.4	ASCE 41-17, Table 4-7
k	1.00	ASCE 41-17 Section 7.4.1.3.2

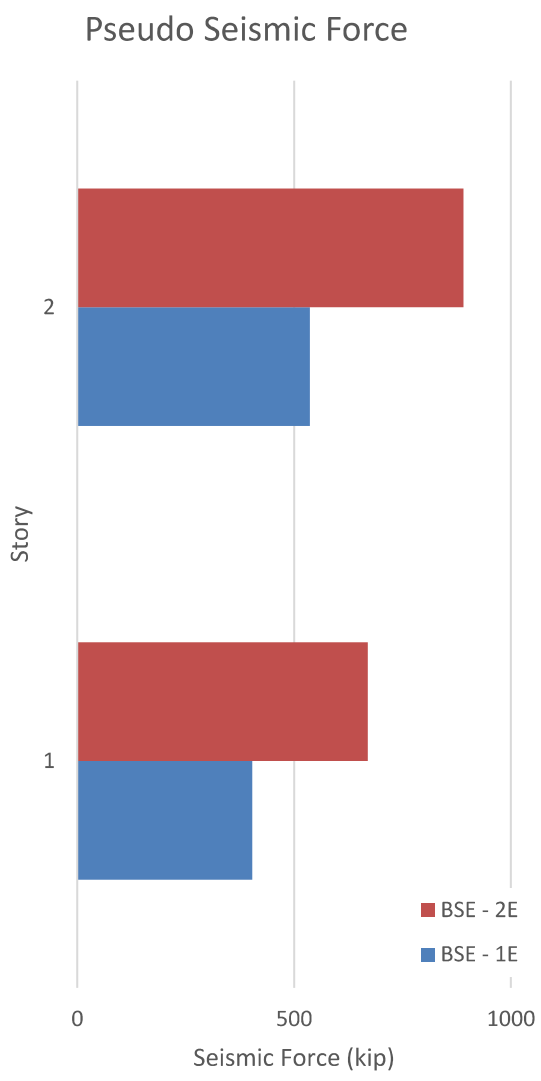
Approx. Structural Period (Method-2 Emperical)		
C_t	0.02	ASCE 41-17 Section 4.4.2.3
β	0.75	ASCE 41-17 Section 4.4.2.3
h_n	16.66	(ft) - Structural Height

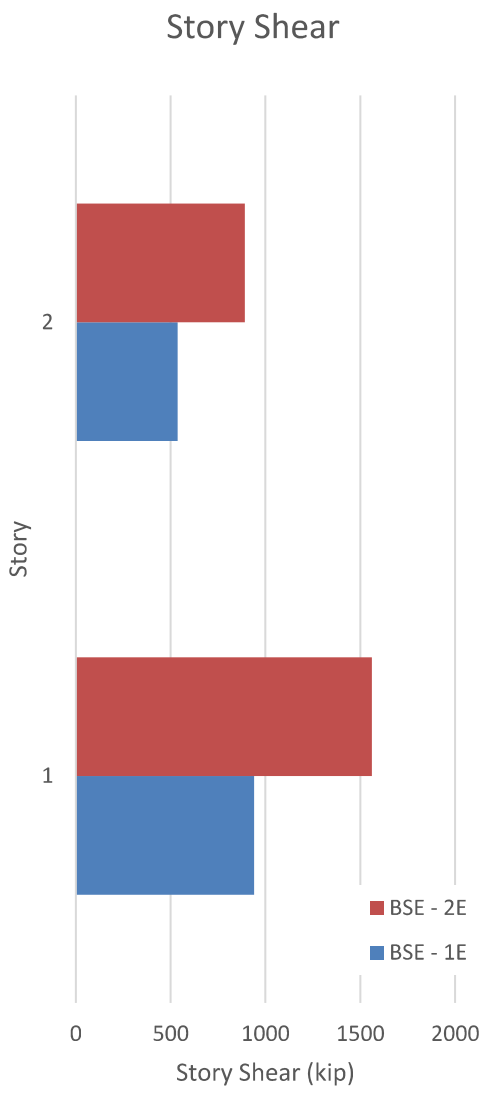
2 - Pseudo Seismic Forces Story Forces

				Seismic Weights Tributary:				BSE - 1E		BSE -2E	
			Story Height	Tot. Story	Diaphragm			Story Force	Story Shear	Story Force	Story Shear
	Floor	Elevation	h_{ix}	W_x	N-S W_{px}	E-W W_{px}	$w_x h_x^k$	F_x	V_x	F_x	V_x
		(ft)	(ft)	(kip)	(kip)	(kip)		(kip)	(kip)	(kip)	(kip)
Ground	0	0	0					-	-	-	-
EW Loading - Mezzanine	1	11.50	11.50	371			4265	403	940	670	1560
EW Loading - Roof	2	16.66	5.16	340			5671	537	537	891	891
NS Loading - Mezzanine	1	11.50	11.50	371				490	490	814	814
NS Loading - Roof	2	16.66	5.16	340				450	450	747	747
		Totals ->>	**16.7**	**711**			**9,936**	**940**	**940**	**1,560**	**1,560**

3 - Pseudo Seismic Forces Story Forces & Story Shear Plots:







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Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/8/2021
By: NIC

Base Shear Comparision (1 of 2)

- **Notes:**
  1. IBC 2018 / ASCE 7-16 vs. 1991 UBC
  2. For derivation of building seismic weight see seismic load calculations.

- **Building Properties:**

$W_b := 711 \cdot kip$ — Building seismic weight, total

$h_n := 16.66 \cdot ft$ — Height of roof

- **Base Shear: 1991 UBC**

$Z := 0.4$ — Zone 4 - Record drawings

$I_s := 1.25$ — Importance factor - Record Drawings

$R_w := 6.0$ — System Performance Factor, Record drawings

$C := 2.75$ — Record drawings

$$T_s := 0.035 \cdot \left(\frac{h_n}{ft}\right)^{0.75} \cdot s = 0.29\,s$$ — Eq 34-3 UBC

$$V_{s1} := \frac{Z \cdot I_s \cdot C}{R_w} \cdot W_b = 162.94 \cdot kip$$ — 1991 UBC Eq. 34-1 Base shear

$s_{a_UBC} := Z \cdot C = 1.1$ — Effective seismic acceleration

$$R_{eq} := \frac{R_w}{1.54} = 3.9$$ — Equivalent force reduction factor, "Ductile Design of Steel Structures", Burneau, Equation 7.53

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Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/8/2021
By: NIC

Base Shear Comparision (2 of 2)

- **Base Shear: 2018 IBC & ASCE 7-16**

$c_t := 0.02$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$x := 0.75$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$T_a := (sec) \cdot c_t \cdot \left(\frac{h_n}{ft}\right)^x = 0.16\,s$ — ASCE 7-16 Eq. 12.8-7 Approximate fundamental period

$I_e := 1.25$ — ASCE 7-16 Table 1.5-2 Importance factor, type III building

$S_{ds} := 1.2$

$S_{d1} := 0.773$ — Design spectral response acceleration, site class - D default

$R' := 2$ — Response modification coefficient, ASCE 7-16 Table 12.2.1 Ordinary Reinforced Masonry Walls

$C_s := \frac{S_{ds}}{\left(\frac{R'}{I_e}\right)} = 0.75$ — ASCE 7-16 Eq. 12.8-2, Seismic response coefficient

$V_{s2} := 0.7 C_s \cdot (W_b) = 373.27 \cdot kip$ — Seismic Base Shear, ASCE 7-16 Eq. 12.8-1

- **ASD - Seismic Base Shear Comparision**

$\frac{V_{s2}}{V_{s1}} = 229.09 \cdot \%$ — Increase in equivalent lateral force between original building code & 2018 IBC

$\frac{S_{ds}}{s_{a_UBC}} = 109.09 \cdot \%$ — Increase in seismic acceleration between original building code & 2018 IBC

$\frac{R'}{R_{eq}} = 51.33 \cdot \%$ — Decrease in percieved ductility between original building code & 2018 IBC

West A Wing

2.0 – QUICK-CHECKS:

2.1 Wood Frames (W2) Quick-Checks
2.2 Reinforced Masonry (RM1) Quick-Checks
2.3 Steel Light Frames (S3) Quick-Checks
2.4 Steel Braced Frame (S2) Quick-Checks

Project:
21156AN - ASD Tier 1
W1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Length *(ft)*	N-S SW Length *(ft)*	Max Stress *(plf)*	Comments
All	327	176	-	495.2	EW Loading - 40% Roof
Maximum Stress (psi)				**495.2**	< 1000 plf (Plywood), ASCE 41-17, A3.2.7.1

System Modification Factor, Ms 3.75 Average of LS and CP

1 - Shear Wall Properties & Area

Type	Description	Area	X-Dir Tot. Area	Y-Dir Tot. Area
Wx		in^2/ft	in^2	in^2
W1	8" CMU, Fully grouted	91.5	29829	9333
		Total	29829	9333

2 - Shear Wall Areas: Mezzanine Interior Walls

Length X- Dir: (East - West)							Length Y- Dir: (North - South)						
W1							W1						
ft							ft						
326							102						
326						<< Total >>	102						
29829						<< Area >>	9333						

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Area *(in^2)*	N-S SW Area *(in^2)*	Max Stress *(psi)*	Comments
All	1075	29829	-	9.6	EW Loading - 60% Roof and Full Mezzanine
All	713	-	9333	20.4	NS Loading - Mezzanine Loading
Maximum Stress (psi)				**20.4**	**< 70 psi, ASCE 41-17, A.3.2.4.1**

System Modification Factor, Ms 3.75 Average of LS and CP

2.0 Reinforcement Ratio Checks

Wall Type	Net Area (in2/ft)	Vertical Bars				Horizontal Bars				Total Ratio	Comments
		Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio	Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio		
W1	91.5	5	16	0.23010	0.00251	4	32.0	0.07363	0.00080	0.00332	8", fully grouted. 4,5,10/S-10
W2	91.5	5	24	0.15340	0.00168	4	32.0	0.07363	0.00080	0.00248	8", fully grouted. 9,15/S-10

Minimum total reinforcing steel ratio: 0.00248
Minimum reinforcing steel ratio in either direction: 0.00080
Maximum reinforcing spacing (in): 32

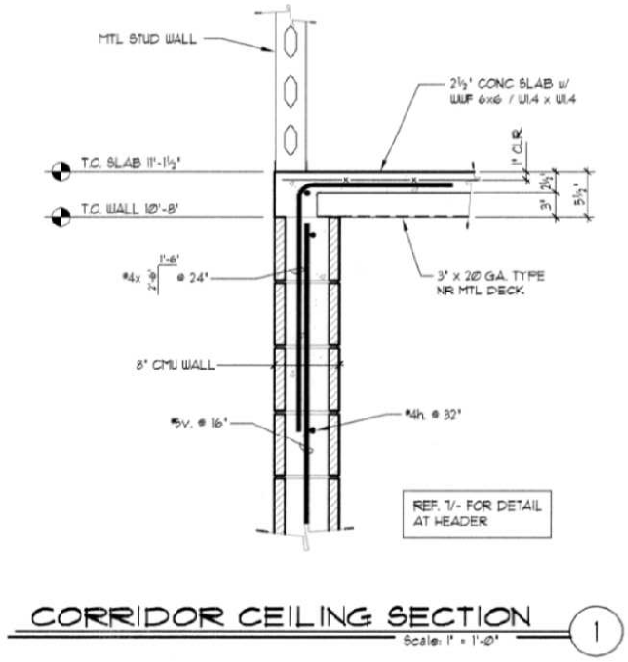
Project:
21156AN - ASD Tier 1
Quick-Checks

C-069
Name: NIC
Date: 11/9/2021

Inputs		
Ψ	1.15	Average of CP and LS
Sxs	1.567	BSE-2E

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C1	Mezzanine	All corridors	86	2	5.5	1705	5400	8" CMU, fully grouted

C1 connections are compliant with quick check calculation.

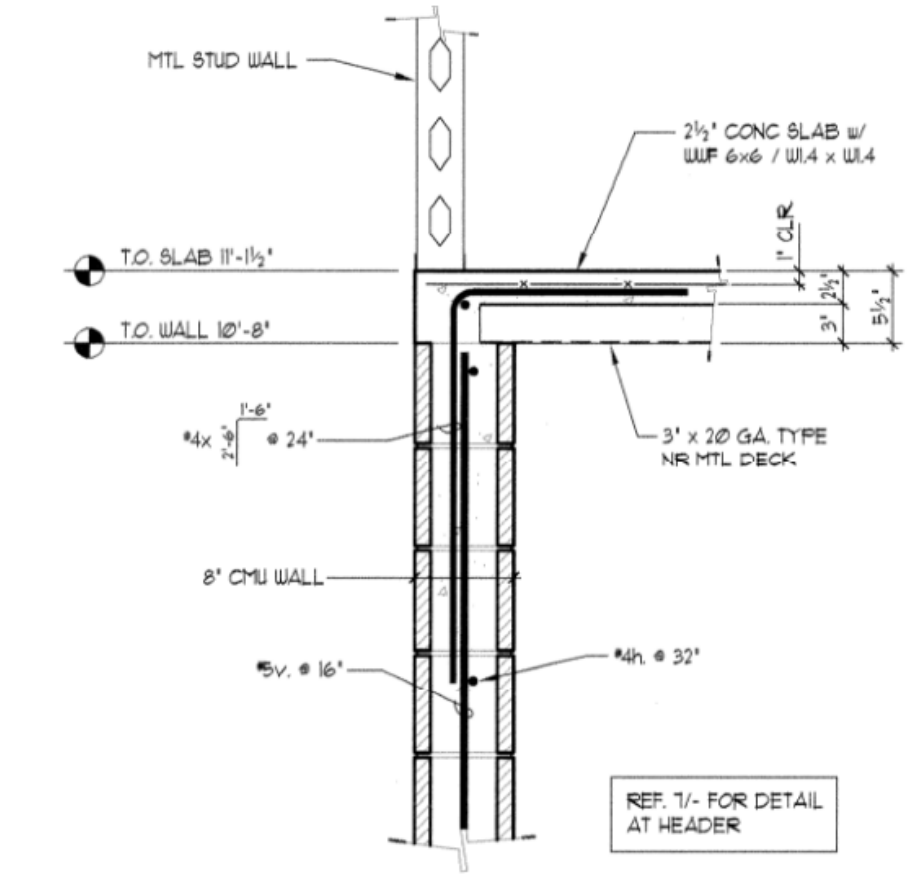


1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

ASCE 41-17 Quick-Checks:
Exterior CMU Out-of-Plane Connection Capacity

Connection - C1:



CORRIDOR CEILING SECTION 1
Scale: 1" = 1'-0"

1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

Connection Strengths and Geometry

Concrete and Reinforcement

$f'_c := 4000psi$ — Concrete compressive strength
1994 Record Drawings, S-1

$c_c := 1in$ — Clear concrete cover

$f_{yr} := 60ksi$ — Reinforcement yield strength

$d_{br} := \frac{4in}{8} = 0.5 \cdot in$ — Diameter of reinforcing bars

Reinforcement Development into Slab-on-Deck

$\psi_t := 1.0 \quad \psi_e := 1.0 \quad \psi_g := 1.0 \quad \lambda := 1.0$ — *ACI 318-19 Table 25.4.2.5*

$$l_d := \frac{\frac{f_{yr}}{psi} \cdot \psi_t \cdot \psi_e \cdot \psi_g}{25\lambda \cdot \sqrt{\frac{f'_c}{psi}}} \cdot d_{br} = 18.97 \cdot in$$

ACI 318-19 Table 25.4.2.3

Detail shows 18" leg for bent bar. Consider bar fully developed.

Shear Yielding of Reinforcement

$$\phi R_n := 1.0 \cdot 0.6 \cdot f_{yr} \cdot \left(\frac{\pi}{4} \cdot d_{br}^{\,2} \right) = 7.07 \cdot kip$$

AISC 360-16 (J4-3)

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/10/2021

S3 Quick-Checks
Column Axial Stress Check

Geometry and Material Properties

Building

Moment frame on grid line "B" has the greatest tributary width for the West A wing:

$b_t := \frac{28ft + 27.333ft}{2} = 27.67\,ft$ Tributary width of frame

$L_r := \frac{80ft}{2} = 40\,ft$ Length of tributary roof

Column

Strength

$F_y := 50ksi$ *Midco Drawings 8/94, C-1*

Outer Flange

$b_{fo} := 10in$

$t_{fo} := 0.5in$

$A_1 := b_{fo} \cdot t_{fo} = 5 \cdot in^2$

Inner Flange

$b_{fi} := 12in$

$t_{fi} := 0.625in$

$A_2 := b_{fi} \cdot t_{fi} = 7.5 \cdot in^2$

Web

$h := 18.08in$ Minimum web depth

$t_w := 0.3125in$ Thickness of web

$A_3 := h \cdot t_w = 5.65 \cdot in^2$

Section

$A_{tot} := \sum A = 18.15 \cdot in^2$

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Loads

Pressures

$p_d := 13.1psf$ — Roof dead load pressure

$p_s := 40psf$ — Roof snow load pressure

Point Loads

$P_d := p_d \cdot b_t \cdot L_r = 14.5 \cdot kip$ — Roof dead load point load

$P_s := p_s \cdot b_t \cdot L_r = 44.27 \cdot kip$ — Roof snow load point load

$P_g := 1.1 \cdot \left(P_d + P_s \right) = 64.64 \cdot kip$ — Total gravity loads
ASCE 41-17
(7-1)

Analysis

$$U := \frac{P_g}{F_y \cdot A_{tot}} = 7.12 \cdot \% \quad < 10\%, \text{per ASCE 41-17, A.3.1.3.2}$$

Columns are **compliant** with quick-check.

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S3 Quick-Checks
Flexural Stress Check

Loads

$V_{tot} := 747kip$ — Total shear resisted in principal direction
Seismic Loading Spreadsheet

Representative Sections

Smallest beam and column sections of frame are used as a upper bound for the flexural stress:

Beam Properties

$Z_{bm} := 117.81in^3$ — Beam plastic section modulus
RISA3D

Column Properties

$Z_{col} := 137.04in^3$ — Column plastic section modulus
RISA3D

Frame Properties

$F_y := 50ksi$ — Beam and column yield strength
Midco 8/94 Drawings
C-1

$n_f := 7$ — Number of frames resisting shear

$n_c := 2 \cdot n_f = 14$ — Number of frame columns

$h := 16.66ft$ — Story height

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Average Flexural Stress

$$M_s := \frac{9 + 6}{2}$$

Average of LS and CP

Beams

$$Z := 2 \cdot n_f \cdot Z_{bm} = 1649.34 \cdot in^3$$

Sum of plastic moduli for beams (2x due to both ends moment connections)

$$f_{avg_bm} := V_{tot} \cdot \frac{1}{M_s} \cdot \left(\frac{n_c}{n_c - n_f} \right) \cdot \left(\frac{h}{2} \right) \cdot \frac{1}{Z} = 12.07 \cdot ksi$$

ASCE 41-17 (4-14)

Columns

$$Z := n_c \cdot Z_{col} = 1918.56 \cdot in^3$$

Sum of plastic moduli for columns

$$f_{avg_col} := V_{tot} \cdot \frac{1}{M_s} \cdot \left(\frac{n_c}{n_c - n_f} \right) \cdot \left(\frac{h}{2} \right) \cdot \frac{1}{Z} = 10.38 \cdot ksi$$

ASCE 41-17 (4-14)

Utilization

$$U := \frac{\max\left(f_{avg_col}, f_{avg_bm} \right)}{F_y} = 24.15 \cdot \%$$

The above analysis is conservative as the smallest beam and column sections were used for representative frame elements.

The moment frames are compliant with the flexural stress quick-check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

Column Properties at Beam-to-Column Joint

Properties per Midco Frame Drawings:

Outside Flange

$b_{fo} := 10in$ — Flange width

$t_{fo} := 0.50in$ — Flange thickness

Inside Flange

$b_{fi} := 12in$ — Flange width

$t_{fi} := 0.625in$ — Flange thickness

Web

$t_w := 0.3125in$ — Web thickness

$h_w := 32.034in$ — Web depth at joint

$d := h_w + t_{fo} + t_{fi} = 33.16 \cdot in$ — Total depth of member

Flexural Capacity

$\phi M_{n_col} := 1020kip \cdot ft$ — Factored Flexural Capacity

RISA3D

Column-to-Beam Flexural Strength Ratio

$$r_{col_bm} := \frac{\phi M_{n_col}}{\phi M_{n_bm}} = 0.85$$

Beam has greater flexural capacity than column.

Moment frames are **non-compliant** with check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

S3 Quick-Checks
Compact Members

$E := 29000ksi$ — Steel modulus of elasticity

$F_y := 50ksi$ — A-572, A-570 or A-529 Plate
C-1
MIDCO Permit Drawings

$R_y := 1.1$ — *AISC 341-16*
Table A3.1

Limiting Width-to-Thickness Ratios

Flanges of I-shaped sections

$$\lambda_{md_f} := 0.4 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 9.18$$

AISC 341-16
Table D1.1

Webs of rolled or built-up I-shaped sections

$$C_a = \frac{P_u}{\phi_c \cdot P_y}$$

AISC 341-16
Table D1.1

$$\lambda_{md_w}(C_a) := \begin{cases} 3.96\left(1 - 3.04 \cdot C_a\right) \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{if } C_a \le 0.114 \\ \max\left[1.29 \cdot \left(2.12 - C_a\right), 1.57\right] \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{otherwise} \end{cases}$$

AISC 341-16
Table D1.1

$\lambda_{md_w_max} := \lambda_{md_w}(0) = 90.93$ — Minimum limiting web ratio (Pu = 0)

$\lambda_{md_w_min} := \lambda_{md_w}(1) = 36.05$ — Minimum limiting web ratio (Pu = ϕPn)

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Frame Properties

Grid Lines "A"-"E"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (32 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 32)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 8 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 8 \quad 9.6)$ Width-to-thickness ratios of inside flanges

Width-to-thickness ratios of webs

$\lambda_w := \frac{h_{max}}{t_w}^T = (102.4 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 102.4)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

4 / 8 members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Line "F"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 14 \quad 8 \quad 8 \quad 8 \quad 8 \quad 14 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (34 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 34)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 9.33 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 9.33 \quad 9.6)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (108.8 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 108.8)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

6 / 8 members fail to meet slenderness ratio for inside flange.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

Frame Properties

Grid Line "F.2"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 14 \quad 8 \quad 8 \quad 8 \quad 8 \quad 14 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (34 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 34)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 9.33 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 9.33 \quad 9.6)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (108.8 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 108.8)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

6 / 8 members fail to meet slenderness ratio for inside flange.

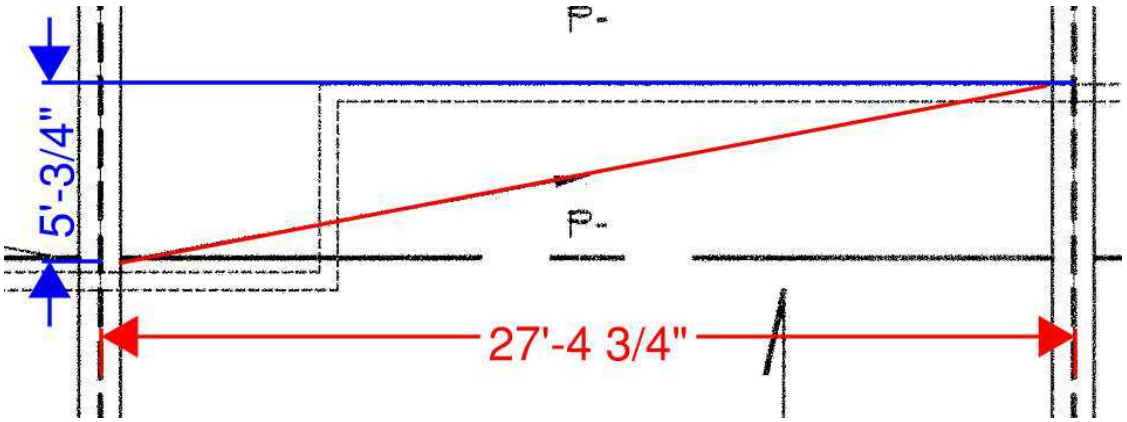
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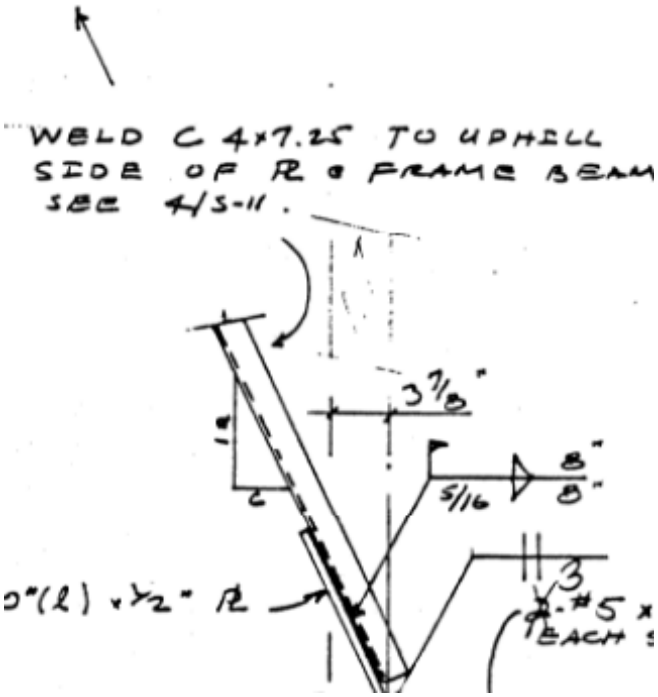
PROJECT: 21156AN - ASD Tier 1
(1 of 3)

Date: 11/10/2021
By: NIC

ASCE 41-17 Quick-Checks: Brace Axial Stress



Brace plan dimensions per S-5 of record drawings



Brace vertical slope per RS-7 of record drawings

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Design Sheet

PROJECT: 21156AN - ASD Tier 1
(2 of 3)

Date: 11/10/2021
By: NIC

- **Notes:**
  1. *Reference ASCE 41-17 4.4.3.4*
  2. *Record drawings, 1999*

- **Brace Axial Stress - Braces: C4x7.25**

$F_y := 36ksi$ — *Record Drawings, 1994 S0.1*

$F_{ye} := 1.25 \cdot F_y = 45 \cdot ksi$ — Expected yield strength, per ASCE 41-17 Table 4-9 Footnotes

$M_s := \frac{3.5 + 2.5}{2} = 3$ — "Tension only" members modification factor, damage control limit state @ BSE-2E *ASCE Table 4-9*

$s_{avg} := \frac{2 \cdot 28ft + 4 \cdot 27.33ft}{6} = 27.55\,ft$ — Average effective span, all braced frames

$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (27.55 \quad 5 \quad 10)$ — Vector of brace direction, note resisting shear is along first index

$u := u^T$

$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 29.74\,ft$ — Average length of braces

$L_{br} = 29.74\,ft$

$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.93 \\ 0.17 \\ 0.34 \end{pmatrix}$ — Unit vector of brace direction

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Design Sheet

PROJECT: 21156AN - ASD Tier 1
(3 of 3)

Date: 11/10/2021
By: NIC

$A_{br} := 2.13in^2$ Average x-sectional area of a diagonal brace

$V_{2E} := 0.6 \cdot 819kip = 491.4 \cdot kip$ Story shear at BSE-2E

$n_{br} := 2 \cdot 3$ Number of braced frames acting per direction (two braces per end of MF)

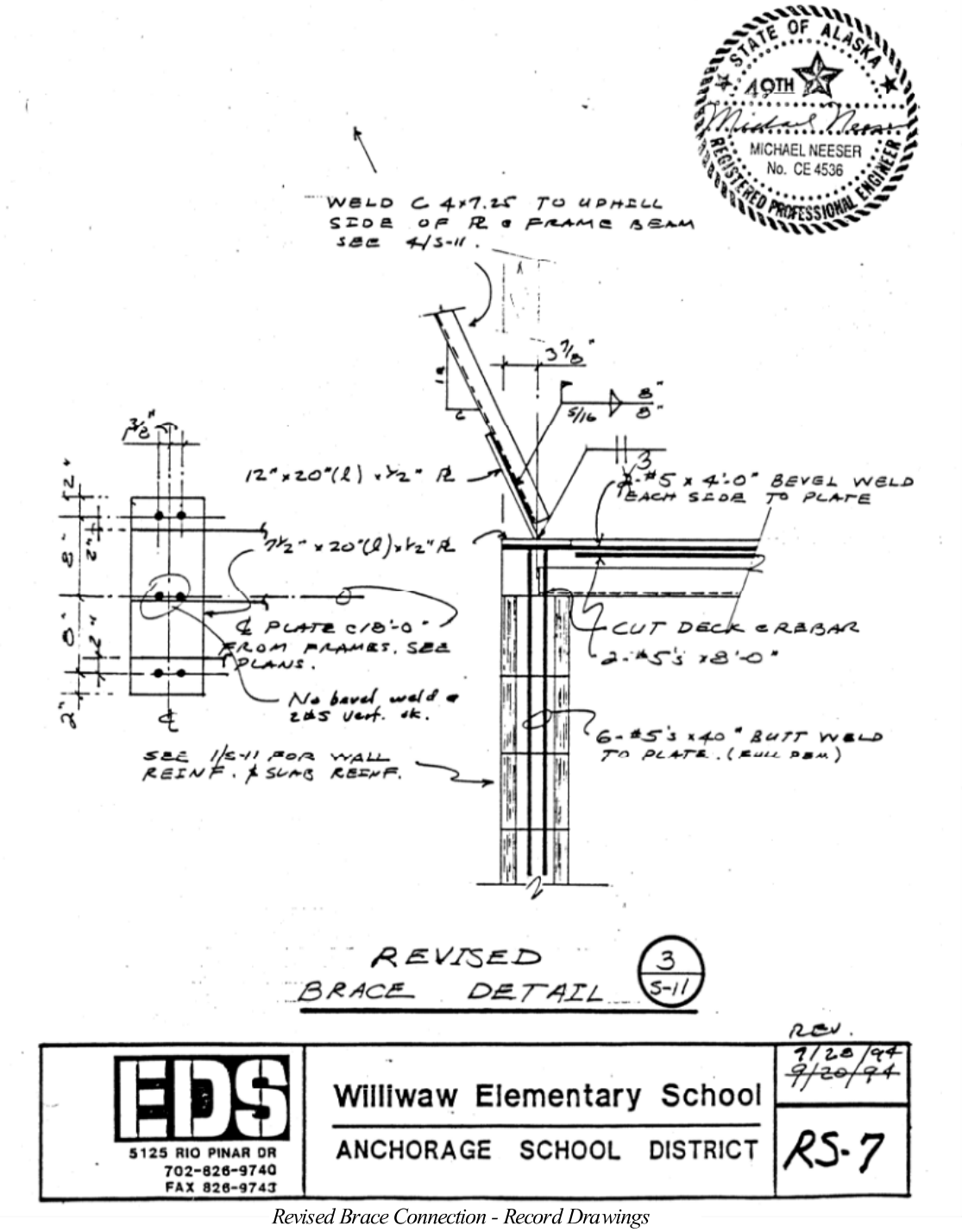
$T := \frac{V_{2E}}{u'_1} = 530.31 \cdot kip$ Tension component along brace from demand shear direction

$f_1 := \frac{1}{M_s} \cdot \left(\frac{T}{s_{avg} \cdot n_{br}} \right) \cdot \left(\frac{L_{br}}{A_{br}} \right) = 14.93 \cdot ksi$ Brace axial stress - Eq. 4-9

$DCR_1 := \frac{f_1}{0.5 \cdot (F_y)} = 82.93 \cdot \%$

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S2 Quick-Checks
Connection Strength



Revised Brace Connection - Record Drawings

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Demand Loads

Brace Unit Vector

$$s_{avg} := \frac{2 \cdot 28ft + 4 \cdot 27.33ft}{6} = 27.55\,ft$$

Average effective span, all braced frames

$$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (27.55 \quad 5 \quad 10)$$

Vector of brace direction, note resisting shear is along first index

$$u := u^T$$

$$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 29.74\,ft$$

Average length of braces

$$L_{br} = 29.74\,ft$$

$$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.93 \\ 0.17 \\ 0.34 \end{pmatrix}$$

Unit vector of brace direction

Yield Force of Brace

$$F_y := 36ksi$$

Brace yield strength
1994 Record Drawings, S-1

$$A_{br} := 2.13in^2$$

$$T_{br} := F_y \cdot A_{br} = 76.68 \cdot kip$$

Average tension per brace

Vertical Force

$$F_{vert} := T_{br} \cdot u'_3 = 25.79 \cdot kip$$

Vertical force per brace connection

Force Perpedicular to Wall

$$F_{perp} := T_{br} \cdot u'_2 = 12.89 \cdot kip$$

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Connection Capacity and Utilization

Welds to brace

$$\phi R_n := 2 \cdot 1.392 \cdot 5 \cdot 8in \cdot kpi = 111.36 \cdot kip$$

Fillet Weld Strength
AISC SCM 15th
(8-2a)

$$U := \frac{T_{br}}{\phi R_n} = 0.69$$

check = "OK"

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CMU Shear Breakout - Parallel to CMU Wall

Connection Properties

$s_{rb} := 2 \cdot (1.375in) = 2.75 \cdot in$ — Separation between reinforcement - perpendicular to CMU wall

$d_b := \frac{5}{8}in = 0.63 \cdot in$ — Diameter of reinforcement

$A_b := \pi \cdot \frac{d_b^2}{4} = 0.31 \cdot in^2$

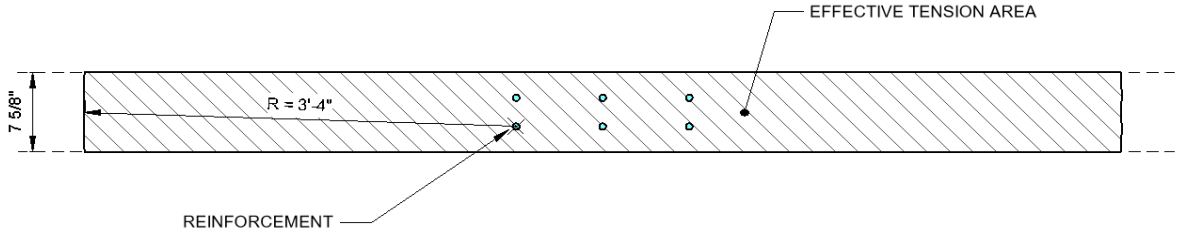
$l_e := \frac{7.625in}{2} - 1.375in = 2.44 \cdot in$ — Edge distance of reinforcement

$l_b := 40in$ — Reinforcement length of embedment

$n_b := 6$ — Total number of anchors per connection

$F_y := 60ksi$ — Yield strength of reinforcement

$f'_m := 1500psi$ — *1994 Record Drawings S-1*



$A'_{pt} := 5.08ft^2 = 731.52 \cdot in^2$

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Shear Breakout

Brace connections appear far from free edges - assume shear breakout does not occur.

Masonry Shear Crushing

$$\phi B_{vnc} := n_b \cdot 0.5 \cdot 1050 \cdot \left(f'_m \cdot A_b \right)^{\frac{1}{4}} \cdot lbf^{\frac{3}{4}} = 14.59 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Shear Pryout

$$\phi B_{vnpry} := 0.5 \cdot 8 \cdot A'_{pt} \cdot \sqrt{f'_m \cdot \frac{1}{psi}} \cdot psi = 113.33 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Yielding

$$\phi B_{vns} := n_b \cdot 0.9 \cdot 0.6 \cdot A_b \cdot F_y = 59.64 \cdot kip$$

TMS 402-16 (Equation 9-8)

Limiting Capacity Per Anchor Group

$$\phi B_{nv} := \min\left(\phi B_{vnc}, \phi B_{vnpry}, \phi B_{vns} \right) = 14.59 \cdot kip$$

$$U := \frac{T_{br}}{\phi B_{nv}} = 5.26$$

check = "NG"

The brace connection is **non-compliant** with the check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

S2 Quick-Checks
Connection Strength

Brace Properties
C4x7.25

Geometry

Flange

$t_f := 0.296in$

$b_f := 1.72in$

$\lambda_f := \frac{b_f}{t_f} = 5.81$

Web

$d := 4in$

$k := 0.75in$

$t_w := 0.321in$

$h := d - 2 \cdot k = 2.5 \cdot in$

$\lambda_w := \frac{h}{t_w} = 7.79$

Material

$F_y := 36ksi$ — Yield Strength
Record Drawings, S-1

$R_y := 1.5$ — *AISC 341-16 Table A3.1*

$E := 29000ksi$ — Steel MoE

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Ductility Requirement

Flange

$$\lambda_{md} := 0.40 \sqrt{\frac{E}{R_y \cdot F_y}} = 9.27$$

$$U := \frac{\lambda_f}{\lambda_{md}} = 62.69 \cdot \%$$

check = "OK"

Web

$$\lambda_{md} := 1.57 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 36.38$$

$$U := \frac{\lambda_w}{\lambda_{md}} = 21.41 \cdot \%$$

check = "OK"

The brace connection is **compliant** with the check.

East B Wing

1.0 – SEISMIC LOADING:

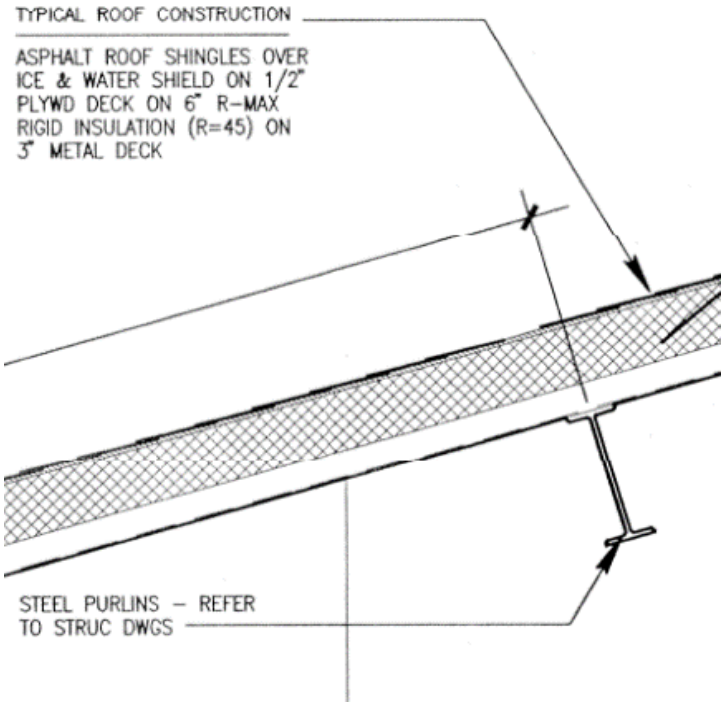
1.1 Building Weights
1.2 Seismic Hazard: ASCE 41
1.3 Seismic Forces
1.4 Base Shear Comparison

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

1.0 Typical Sloped Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Shingles	2.50	
Dead	Membrane	0.30	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.50	6" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**13.10**	**Summary**



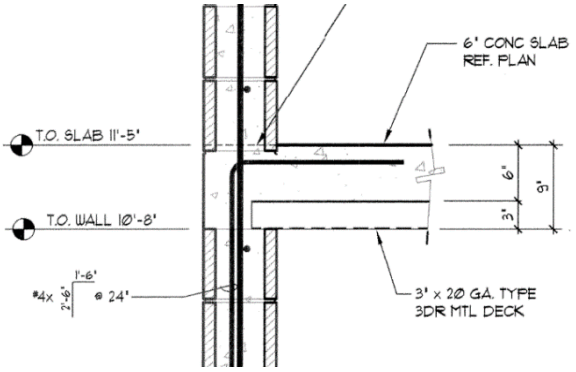
Above - 1 / A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

2.0 Boiler and Fan Room Floors - 6" SOD

Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab on deck	90.65	9" Total, 6" slab on PLW3 Verco deck + 3" 145pcf concrete
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**94.95**	**Summary**



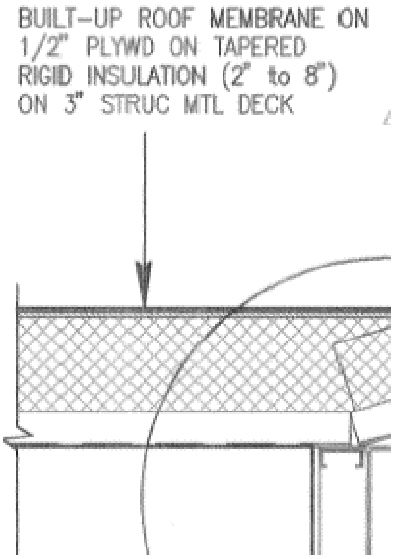
Above - 12 / S-11 of 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

3.0 Typical Built-Up Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Built-up roof membrane	5.50	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.25	5" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**15.55**	**Summary**



Above - 2 / A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Fan Room Corridor Floors - 2 1/2" SOD

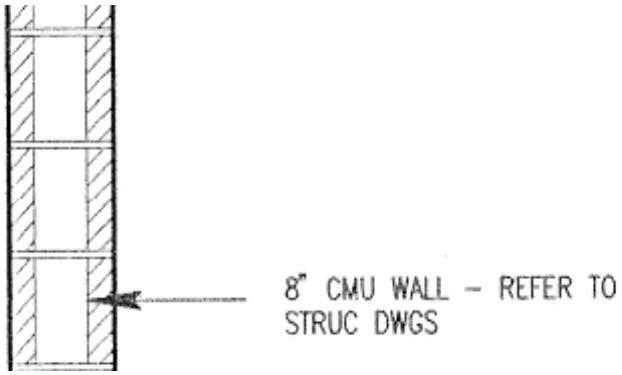
Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab	48.30	5 1/2" total, Verco catalog
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**52.60**	**Summary**

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Typical 8" CMU Single Wythe Corridor Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	8" CMU	86.00	135 pcf, fully grouted
	Multiplier	1.00	
Dead	**Total**	**86.00**	



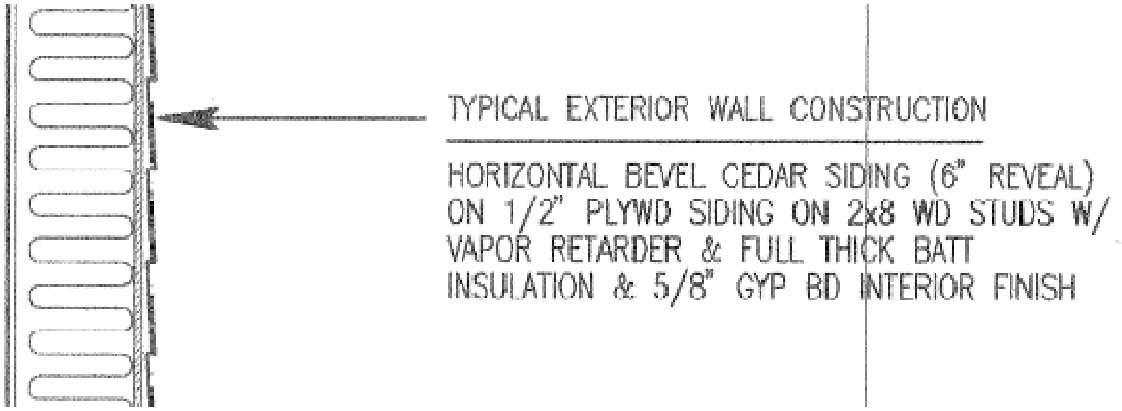
Above - 2/A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

5.0 Exterior Wall

Load Category	Item	Weight	Comment
		(psf)	
Dead	Cedar Siding	2.00	
Dead	1/2" plywood	1.5	
Dead	(2) 2x8 studs @ 16" OC	5.00	
Dead	Batt insulation	0.80	
Dead	5/8" Gyp	2.00	
	Multiplier	1.00	
Dead	**Total**	**11.30**	



Above - 4/A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

6.0 Typical CFS Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	3 1/2" CFS Studs	0.59	Spaced 16" OC per 11 / S-11, 1994 Drawings
Dead	(2) layers 5/8" GWB	4.00	
Dead			
Dead			
Dead			
Dead	Multiplier	1.00	
Dead	**Total**	**4.59**	

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

1.0 - Floor & Roof Dead Weights

Floor	Sub Area	Trib. Area		Typ. Weight	Weight	Comments
(#)		(sf)		(psf)	(kip)	
(1) Mezzanine	*2 1/2" SoD*	739		53	39	
	Total	**738.67**			**39**	
(2) Roof	*Sloped Roof*	5457		13.1	71	
	Total	**5457**			**71**	
∑ Floors	>>>>

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

3.0 - Wall Dead Weights - Tributary to Floor

Floor		Trib. Height	Length	Typ. Weight	Weight	Comments
(#)		(ft)	(ft)	(psf)	(kip)	
(1) Mezzanine	***Total***				***76***	***Total weight of walls trib to floor***
		5.8	*150*	*86.0*	*74*	*8" CMU - First Floor*
		2.6	*150*	*4.6*	*2*	*CFS - Second Floor*
(2) Roof	***Total***				***4***	***Total weight of walls trib to roof***
		8.3	*119*	*11.3*	*11*	*Wood - Full Height*
		8.3	*68*	*4.6*	*3*	*CFS - Full Height*
		2.6	*150*	*4.6*	*2*	*CFS - Second Floor*

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

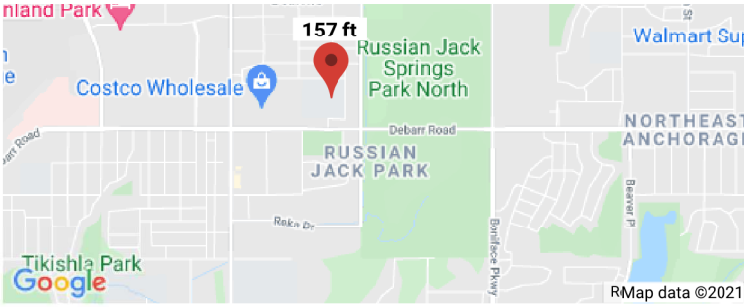
4.0 - Seismic Weights Tributary To Story

Floor (#)	Wall Weight (kip)	Floor Weight (kip)	20% Snow Weight (kip)		Seismic Weight (kip)	Comments
0						*Ground floor*
1	*76*	*39*	*0*		*115*	*Mezzanine*
2	*4*	*71*	*44*		*119*	*Roof*
∑ Floors	>>>>

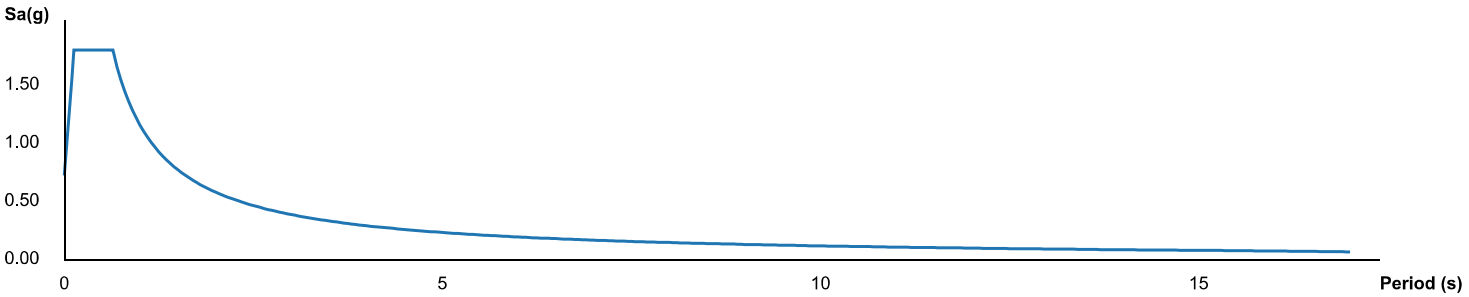
Hazards by Location

Search Information

Address:	williwaw elementary anchorage ak
Coordinates:	61.21115649999999, -149.7970792
Elevation:	157 ft
Timestamp:	2021-10-20T21:29:10.115Z
Hazard Type:	Seismic
Reference Document:	ASCE41-17
Site Class:	D-default
Custom Probability:	



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	1.707	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_S	1.111	Coefficient of risk (0.2s)
SsRT	1.897	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S_S	1.5	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.8	Site modified spectral response (0.2s)
S1UH	0.809	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_1	1.036	Coefficient of risk (1.0s)
S1RT	0.839	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.68	Factored deterministic acceleration value (1.0s)
S_1	0.68	MCE_R ground motion (period=1.0s)
F_v	1.7	Site amplification factor at 1.0s
S_{X1}	1.156	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S_{XS}	1.2	Site modified spectral response (0.2s)
S_{X1}	0.771	Site modified spectral response (1.0s)

Hazard Level BSE-2E

Name	Value	Description
S_S	1.306	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.567	Site modified spectral response (0.2s)
S_1	0.597	MCE_R ground motion (period=1.0s)
F_v	1.703	Site amplification factor at 1.0s
S_{X1}	1.016	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.787	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	0.944	Site modified spectral response (0.2s)
S_1	0.33	MCE_R ground motion (period=1.0s)
F_v	1.97	Site amplification factor at 1.0s
S_{X1}	0.651	Site modified spectral response (1.0s)

T_L Data

Name	Value	Description
T_L	16	Long-period transition period (s)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

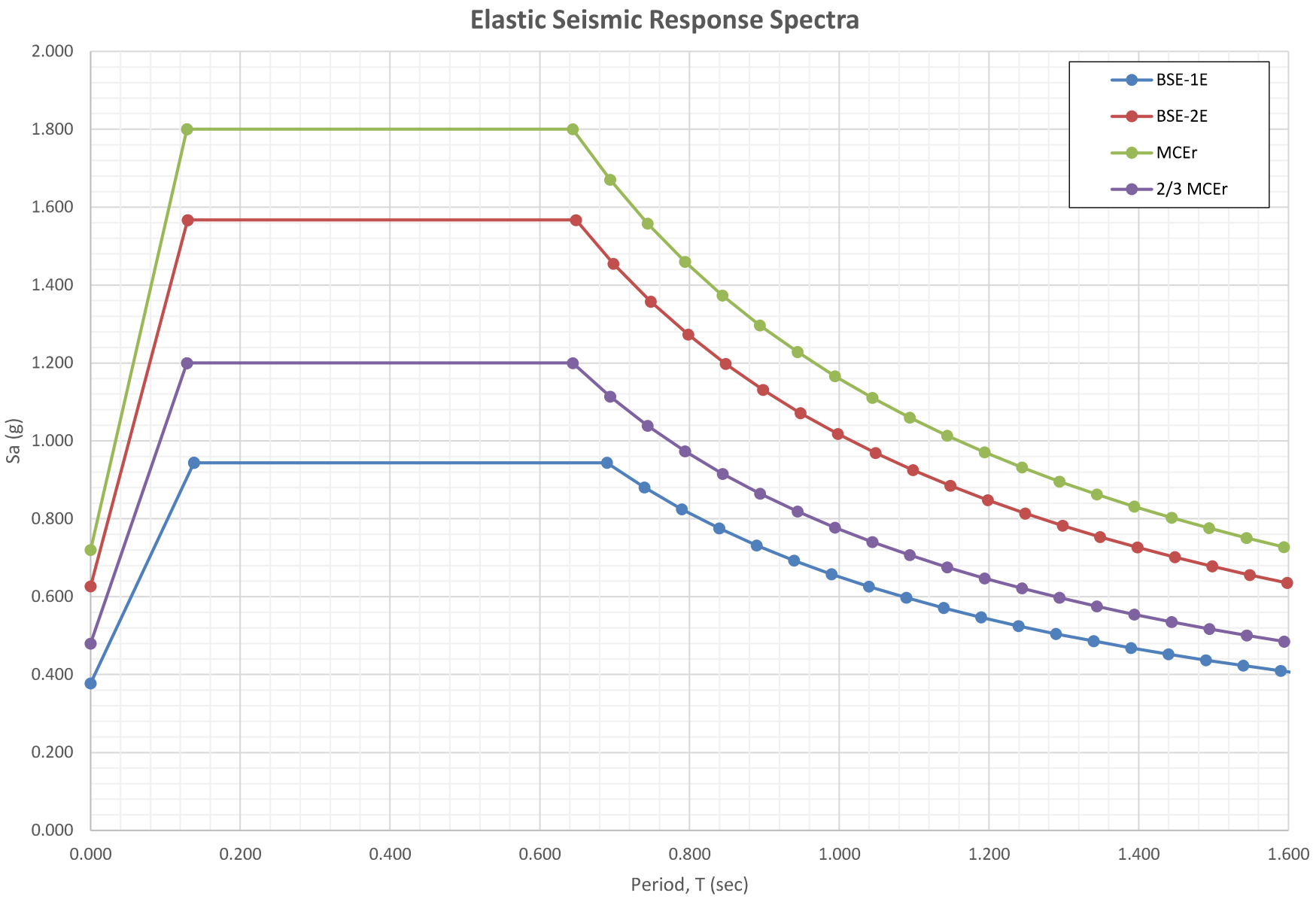
Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Project:
21156AN - ASD Tier 1
Seismic Response Spectra - Site Class D

C-104
Name: NIC
Date: 11/10/2021



1 - Seismic Base Shear: ASCE 41-17 Tier I Procedure

Notes: *1. Seismic Forces calculated following the Tier - III procedure of ASCE 41-17. Analysis Method used is the LSP*

Seismic Response Spectra Inputs			
BSE-1E	S_{x1}	0.651	(g)
	S_{xs}	0.944	(g)
	S_a	0.944	(g)
BSE-2E	S_{x1}	1.016	(g)
	S_{xs}	1.567	(g)
	S_a	1.567	(g)
Period	T	0.16	(sec)

Seismic Base Shears			
Weight	W	259	(kip)
BSE - 1E	V_{1E}	342	(kip)
BSE - 2E	V_{2E}	567	(kip)

Comments:

$S_a = \frac{S_{X1}}{T} < S_{XS}$ $Eq. 4-3$

$T = C_t H_n^{\beta}$ Eq. 4–4

$V = CS_aW$ Eq. 4-1

$C_{vx} = \frac{w_x h_x^k}{\sum w_i h_i^k}$ Eq. 4-2a

$F_i = C_{vx} V$ Eq. 4-2a

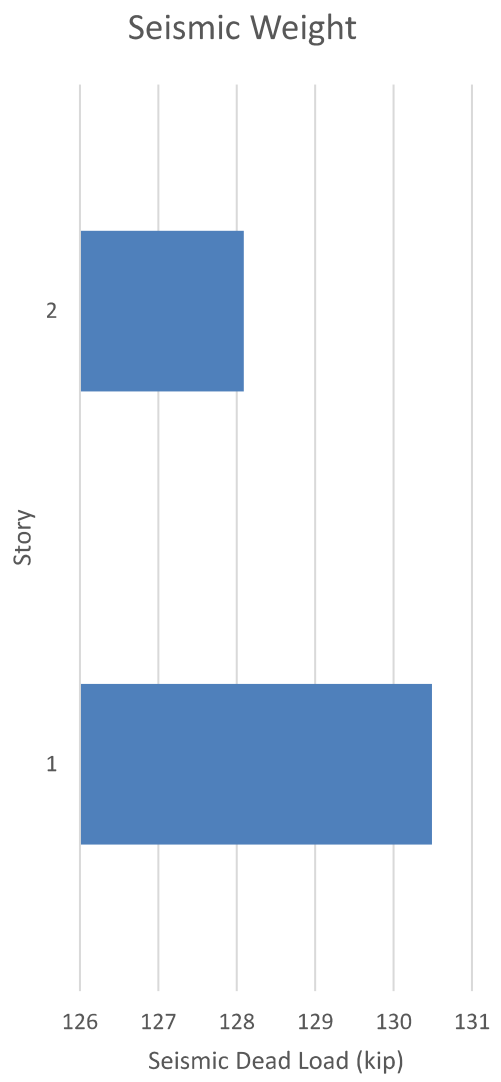
Seismic Base Shear - Tier 1 Method		
C	1.4	ASCE 41-17, Table 4-7
k	1.00	ASCE 41-17 Section 7.4.1.3.2

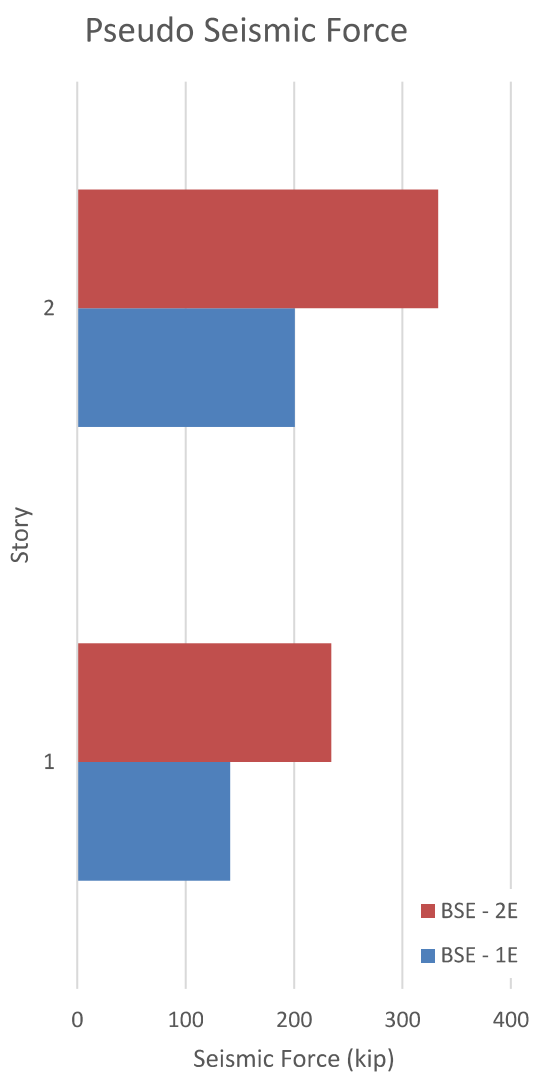
Approx. Structural Period (Method-2 Emperical)		
C_t	0.02	ASCE 41-17 Section 4.4.2.3
β	0.75	ASCE 41-17 Section 4.4.2.3
h_n	16.66	(ft) - Structural Height

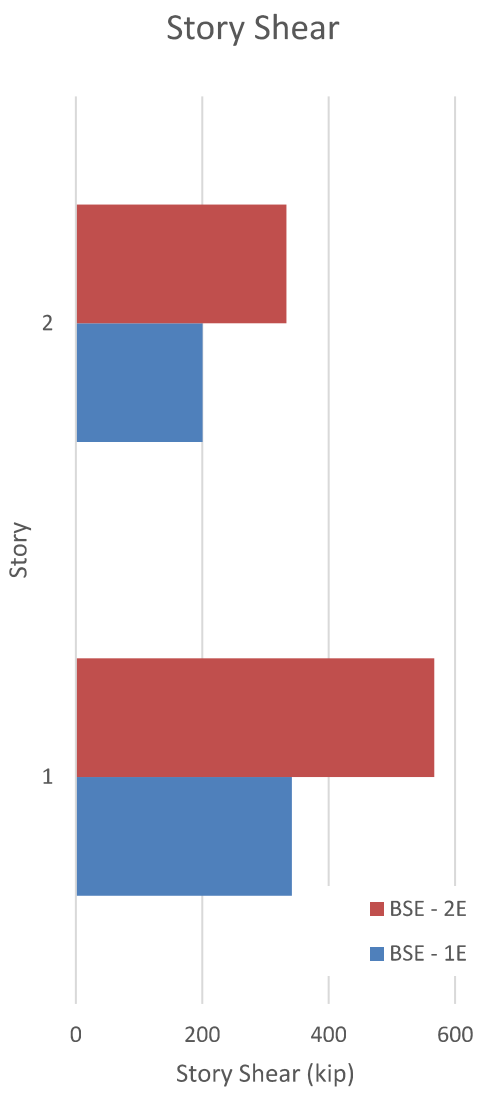
2 - Pseudo Seismic Forces Story Forces

				Seismic Weights Tributary:				BSE - 1E		BSE -2E	
			Story Height	Tot. Story	Diaphragm			Story	Story	Story	Story
	Floor	Elevation	h_{ix}	W_x	N-S W_{px}	E-W W_{px}	$w_x h_x^k$	Force	Shear	Force	Shear
		(ft)	*(ft)*	(kip)	(kip)	(kip)		F_x (kip)	V_x (kip)	F_x (kip)	V_x (kip)
Ground	0	0	0					-	-	-	-
EW Loading - Mezzanine	1	11.50	11.50	130			1501	141	342	234	567
EW Loading - Roof	2	16.66	5.16	128			2134	201	201	333	333
NS Loading - Mezzanine	1	11.50	11.50	130				172	172	286	286
NS Loading - Roof	2	16.66	5.16	128				169	169	281	281
		Totals ->>	**16.7**	**259**			**3,635**	**342**	**342**	**567**	**567**

3 - Pseudo Seismic Forces Story Forces & Story Shear Plots:







PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/8/2021
By: NIC

Base Shear Comparision (1 of 2)

- **Notes:**
  1. IBC 2018 / ASCE 7-16 vs. 1991 UBC
  2. For derivation of building seismic weight see seismic load calculations.

- **Building Properties:**

$W_b := 259 \cdot kip$ — Building seismic weight, total

$h_n := 16.66 \cdot ft$ — Height of roof

- **Base Shear: 1991 UBC**

$Z := 0.4$ — Zone 4 - Record drawings

$I_s := 1.25$ — Importance factor - Record Drawings

$R_w := 6.0$ — System Performance Factor, Record drawings

$C := 2.75$ — Record drawings

$$T_s := 0.035 \cdot \left(\frac{h_n}{ft}\right)^{0.75} \cdot s = 0.29\,s$$ — Eq 34-3 UBC

$$V_{s1} := \frac{Z \cdot I_s \cdot C}{R_w} \cdot W_b = 59.35 \cdot kip$$ — 1991 UBC Eq. 34-1 Base shear

$s_{a_UBC} := Z \cdot C = 1.1$ — Effective seismic acceleration

$$R_{eq} := \frac{R_w}{1.54} = 3.9$$ — Equivalent force reduction factor, "Ductile Design of Steel Structures", Burneau, Equation 7.53

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Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/8/2021
By: NIC

Base Shear Comparision (2 of 2)

- **Base Shear: 2018 IBC & ASCE 7-16**

$c_t := 0.02$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$x := 0.75$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$T_a := (\text{sec}) \cdot c_t \cdot \left(\frac{h_n}{\text{ft}}\right)^x = 0.16\,\text{s}$ — ASCE 7-16 Eq. 12.8-7 Approximate fundamental period

$I_e := 1.25$ — ASCE 7-16 Table 1.5-2 Importance factor, type III building

$S_{ds} := 1.2$

$S_{d1} := 0.773$ — Design spectral response acceleration, site class - D default

$R' := 2$ — Response modification coefficient, ASCE 7-16 Table 12.2.1 Ordinary Reinforced Masonry Walls

$C_s := \frac{S_{ds}}{\left(\frac{R'}{I_e}\right)} = 0.75$ — ASCE 7-16 Eq. 12.8-2, Seismic response coefficient

$V_{s2} := 0.7 C_s \cdot (W_b) = 135.97 \cdot \text{kip}$ — Seismic Base Shear, ASCE 7-16 Eq. 12.8-1

- **ASD - Seismic Base Shear Comparision**

$\frac{V_{s2}}{V_{s1}} = 229.09 \cdot \%$ — Increase in equivalent lateral force between original building code & 2018 IBC

$\frac{S_{ds}}{s_{a_UBC}} = 109.09 \cdot \%$ — Increase in seismic acceleration between original building code & 2018 IBC

$\frac{R'}{R_{eq}} = 51.33 \cdot \%$ — Decrease in percieved ductility between original building code & 2018 IBC

East B Wing

2.0 – QUICK-CHECKS:

2.1 Wood Frames (W2) Quick-Checks
2.2 Reinforced Masonry (RM1) Quick-Checks
2.3 Steel Light Frames (S3) Quick-Checks
2.4 Steel Braced Frame (S2) Quick-Checks

Project:
21156AN - ASD Tier 1
W1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Length *(ft)*	E-W SW Length *(ft)*	Max Stress *(plf)*	Comments
All	124	69	-	477.7	EW Loading - 40% Roof
Maximum Stress (psi)				**477.7**	< 1000 plf (Plywood), ASCE 41-17, A3.2.7.1

System Modification Factor, Ms 3.75 Average of LS and CP

1 - Shear Wall Properties & Area

Type	Description	Area	X-Dir Tot. Area	Y-Dir Tot. Area
Wx		in^2/ft	in^2	in^2
W1	8" CMU, Fully grouted	91.5	10157	2150
	Total		10157	2150

2 - Shear Wall Areas: Mezzanine Interior Walls

Length X- Dir: (East - West)							Length Y- Dir: (North - South)						
W1							W1						
ft							ft						
111							23.5						
111						<< Total >>	23.5						
10157						<< Area >>	2150						

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Area *(in^2)*	N-S SW Area *(in^2)*	Max Stress *(psi)*	Comments
All	389	10157	-	10.2	EW Loading - 60% Roof and Full Mezzanine
All	251	-	2150	31.1	NW Loading - Mezzanine Loading
Maximum Stress (psi)				**31.1**	**< 70 psi, ASCE 41-17, A.3.2.4.1**

System Modification Factor, Ms 3.75 Average of LS and CP

2.0 Reinforcement Ratio Checks

Wall Type	Net Area (in2/ft)	Vertical Bars				Horizontal Bars				Total Ratio	Comments
		Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio	Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio		
W1	91.5	5	16	0.23010	0.00251	4	32.0	0.07363	0.00080	0.00332	8", fully grouted. 4,5,10/S-10
W2	91.5	5	24	0.15340	0.00168	4	32.0	0.07363	0.00080	0.00248	8", fully grouted. 9,15/S-10

Minimum total reinforcing steel ratio: 0.00248
Minimum reinforcing steel ratio in either direction: 0.00080
Maximum reinforcing spacing (in): 32

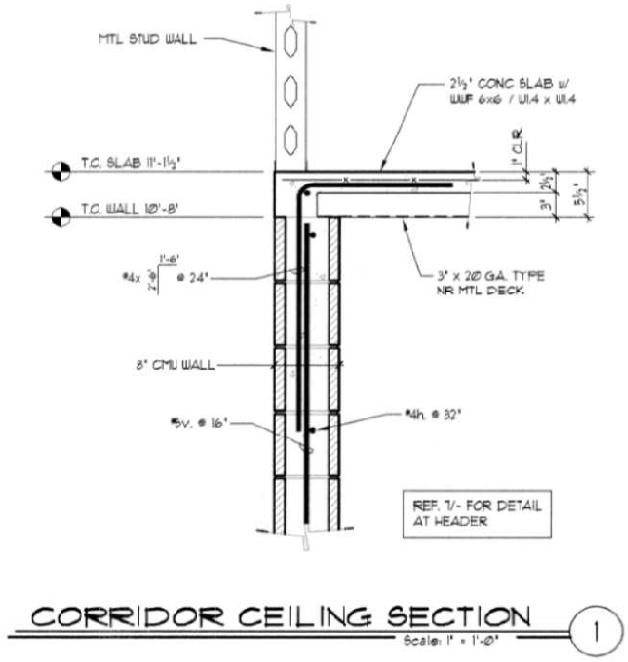
Project:
21156AN - ASD Tier 1
Quick-Checks

C-114
Name: NIC
Date: 11/10/2021

Inputs		
Ψ	1.15	Average of CP and LS
Sxs	1.567	BSE-2E

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C1	Mezzanine	All corridors	86	2	5.5	1705	5400	8" CMU, fully grouted

C1 connections are compliant with quick check calculation.

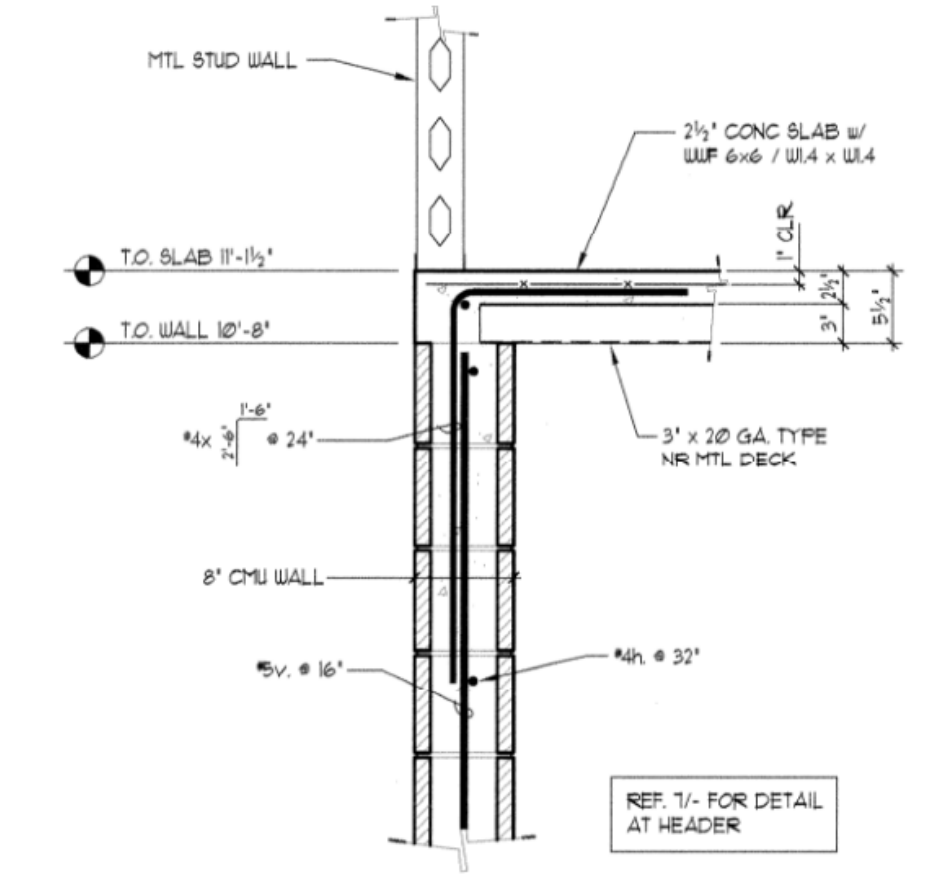


1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

ASCE 41-17 Quick-Checks:
Exterior CMU Out-of-Plane Connection Capacity

Connection - C1:



CORRIDOR CEILING SECTION 1
Scale: 1" = 1'-0"

1 / S-11, 1994 Record Drawings

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Connection Strengths and Geometry

Concrete and Reinforcement

$f'_c := 4000psi$ — Concrete compressive strength
1994 Record Drawings, S-1

$c_c := 1in$ — Clear concrete cover

$f_{yr} := 60ksi$ — Reinforcement yield strength

$d_{br} := \frac{4in}{8} = 0.5 \cdot in$ — Diameter of reinforcing bars

Reinforcement Development into Slab-on-Deck

$\psi_t := 1.0 \quad \psi_e := 1.0 \quad \psi_g := 1.0 \quad \lambda := 1.0$ — *ACI 318-19 Table 25.4.2.5*

$$l_d := \frac{\frac{f_{yr}}{psi} \cdot \psi_t \cdot \psi_e \cdot \psi_g}{25\lambda \cdot \sqrt{\frac{f'_c}{psi}}} \cdot d_{br} = 18.97 \cdot in$$

ACI 318-19 Table 25.4.2.3

Detail shows 18" leg for bent bar. Consider bar fully developed.

Shear Yielding of Reinforcement

$$\phi R_n := 1.0 \cdot 0.6 \cdot f_{yr} \cdot \left(\frac{\pi}{4} \cdot d_{br}^{\,2} \right) = 7.07 \cdot kip$$

AISC 360-16 (J4-3)

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S3 Quick-Checks
Column Axial Stress Check

Geometry and Material Properties

Building

Moment frame on grid line "Q" has the greatest tributary width for the East B wing:

$b_t := 32ft$ — Tributary width of frame

$L_r := \frac{83ft}{2} = 41.5\,ft$ — Length of tributary roof

Column

Strength

$F_y := 50ksi$ — *Midco Drawings 8/94, C-1*

Outer Flange

$b_{fo} := 12in$

$t_{fo} := 0.5in$

$A_1 := b_{fo} \cdot t_{fo} = 6 \cdot in^2$

Inner Flange

$b_{fi} := 12in$

$t_{fi} := 0.75in$

$A_2 := b_{fi} \cdot t_{fi} = 9 \cdot in^2$

Web

$h := 18.08in$ — Minimum web depth

$t_w := 0.3125in$ — Thickness of web

$A_3 := h \cdot t_w = 5.65 \cdot in^2$

Section

$A_{tot} := \sum A = 20.65 \cdot in^2$

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Loads

Pressures

$p_d := 13.1psf$ — Roof dead load pressure

$p_s := 40psf$ — Roof snow load pressure

Point Loads

$P_d := p_d \cdot b_t \cdot L_r = 17.4 \cdot kip$ — Roof dead load point load

$P_s := p_s \cdot b_t \cdot L_r = 53.12 \cdot kip$ — Roof snow load point load

$P_g := 1.1 \cdot \left(P_d + P_s \right) = 77.57 \cdot kip$ — Total gravity loads
ASCE 41-17
(7-1)

Analysis

$$U := \frac{P_g}{F_y \cdot A_{tot}} = 7.51 \cdot \% \quad < 10\%, \text{per ASCE 41-17, A.3.1.3.2}$$

Columns are **compliant** with quick-check.

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S3 Quick-Checks
Flexural Stress Check

Loads

$V_{tot} := 281kip$ — Total shear resisted in principal direction
Seismic Loading Spreadsheet

Representative Sections

Smallest beam and column sections of frame are used as a upper bound for the flexural stress:

Beam Properties

$Z_{bm} := \min(155.55, 155.55, 117.81)\,in^3 = 117.81 \cdot in^3$ — Beam plastic section modulus
RISA3D

Column Properties

$Z_{col} := \min(136.55, 165.65, 136.55)\,in^3 = 136.55 \cdot in^3$ — Column plastic section modulus
RISA3D

Frame Properties

$F_y := 50ksi$ — Beam and column yield strength
Midco 8/94 Drawings
C-1

$n_f := 3$ — Number of frames resisting shear

$n_c := 2 \cdot n_f = 6$ — Number of frame columns

$h := 16.66ft$ — Story height

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Average Flexural Stress

$$M_s := \frac{9 + 6}{2}$$

Average of LS and CP

Beams

$$Z := 2 \cdot n_f \cdot Z_{bm} = 706.86 \cdot in^3$$

Sum of plastic moduli for beams (2x due to both ends moment connections)

$$f_{avg_bm} := V_{tot} \cdot \frac{1}{M_s} \cdot \left(\frac{n_c}{n_c - n_f} \right) \cdot \left(\frac{h}{2} \right) \cdot \frac{1}{Z} = 10.6 \cdot ksi$$

ASCE 41-17 (4-14)

Columns

$$Z := n_c \cdot Z_{col} = 819.3 \cdot in^3$$

Sum of plastic moduli for columns

$$f_{avg_col} := V_{tot} \cdot \frac{1}{M_s} \cdot \left(\frac{n_c}{n_c - n_f} \right) \cdot \left(\frac{h}{2} \right) \cdot \frac{1}{Z} = 9.14 \cdot ksi$$

ASCE 41-17 (4-14)

Utilization

$$U := \frac{\max\left(f_{avg_col}, f_{avg_bm} \right)}{F_y} = 21.19 \cdot \%$$

The above analysis is conservative as the smallest beam and column sections were used for representative frame elements.

The moment frames are compliant with the flexural stress quick-check.

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S3 Quick-Checks
Compact Members

$E := 29000ksi$ — Steel modulus of elasticity

$F_y := 50ksi$ — A-572, A-570 or A-529 Plate
C-1
MIDCO Permit Drawings

$R_y := 1.1$ — *AISC 341-16*
Table A3.1

Limiting Width-to-Thickness Ratios

Flanges of I-shaped sections

$$\lambda_{md_f} := 0.4 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 9.18$$

AISC 341-16
Table D1.1

Webs of rolled or built-up I-shaped sections

$$C_a = \frac{P_u}{\phi_c \cdot P_y}$$

AISC 341-16
Table D1.1

$$\lambda_{md_w}(C_a) := \begin{cases} 3.96\left(1 - 3.04 \cdot C_a\right) \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{if } C_a \le 0.114 \\ \max\left[1.29 \cdot \left(2.12 - C_a\right), 1.57\right] \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{otherwise} \end{cases}$$

AISC 341-16
Table D1.1

$\lambda_{md_w_max} := \lambda_{md_w}(0) = 90.93$ — Minimum limiting web ratio (Pu = 0)

$\lambda_{md_w_min} := \lambda_{md_w}(1) = 36.05$ — Minimum limiting web ratio (Pu = ϕPn)

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Frame Properties

Grid Line "P.1"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T$ in — Width of outside flanges

$t_{fo} := (0.375 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.375)^T$ in — Thickness of inside flanges

$b_{fi} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T$ in — Width of inside flanges

$t_{fi} := (0.625 \quad 0.625 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.625 \quad 0.625)^T$ in — Thickness of inside flanges

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.25 \quad 0.25 \quad 0.25 \quad 0.3125 \quad 0.3125)^T$ in — Thickness of webs

Maximum depth of webs

$h_{max} := (33.946 \quad 33.983 \quad 30.769 \quad 33.988 \quad 33.988 \quad 30.769 \quad 33.98 \quad 33.9466)^T$ in

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (13.33 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 13.33)$ — Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 9.6 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 9.6 \quad 9.6)$ — Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ — Width-to-thickness ratios of webs

$\lambda_w = (108.63 \quad 108.75 \quad 123.08 \quad 135.95 \quad 135.95 \quad 123.08 \quad 108.74 \quad 108.63)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

4/8 members fail to meet slenderness ratio for outside flange.

6/8 members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "Q.2"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (32 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 32)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 8 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 8 \quad 9.6)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (102.4 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 102.4)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

4 / 8 members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "Q"

$b_{fo} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.75 \quad 0.75)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 14 \quad 8 \quad 8 \quad 8 \quad 8 \quad 14 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.75 \quad 0.75 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.75 \quad 0.75)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.375 \quad 0.375 \quad 0.3125 \quad 0.25 \quad 0.25 \quad 0.3125 \quad 0.375 \quad 0.375)^T \cdot \text{in}$

$h_{max} := (34 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 34)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 8 \quad 8)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (8 \quad 9.33 \quad 8 \quad 8 \quad 8 \quad 8 \quad 9.33 \quad 8)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (90.67 \quad 90.67 \quad 98.56 \quad 136 \quad 136 \quad 98.56 \quad 90.67 \quad 90.67)$

$\lambda_{md_w_max} = 90.93$

4 / 8 members fail to meet slenderness ratio for webs.

2 / 8 members fail to meet slenderness ratio for outside flange.

2 / 8 members fail to meet slenderness ratio for inside flange.

2 / 8 members pass all requirements

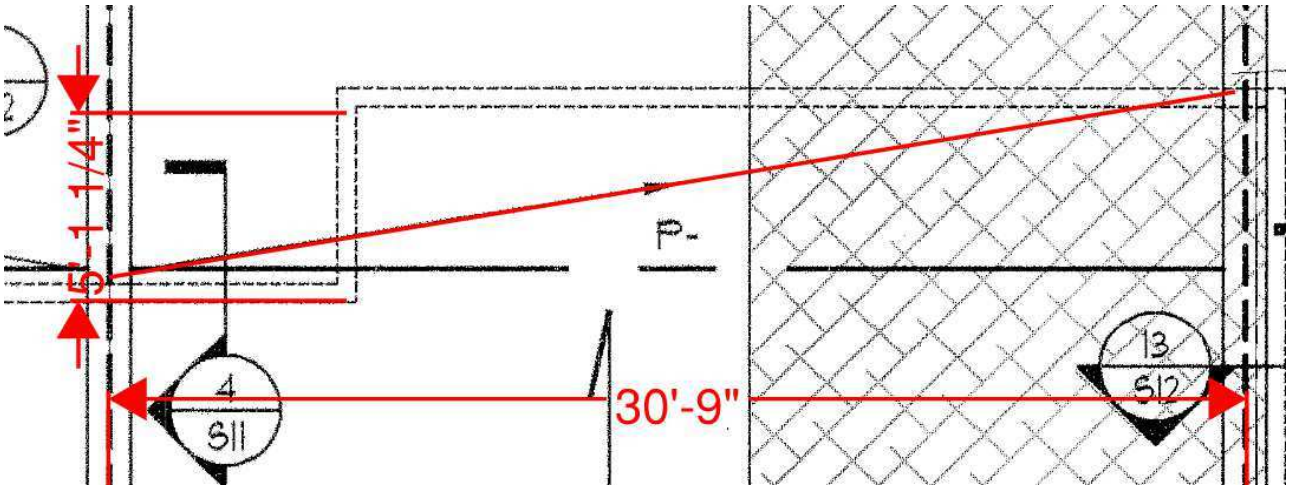
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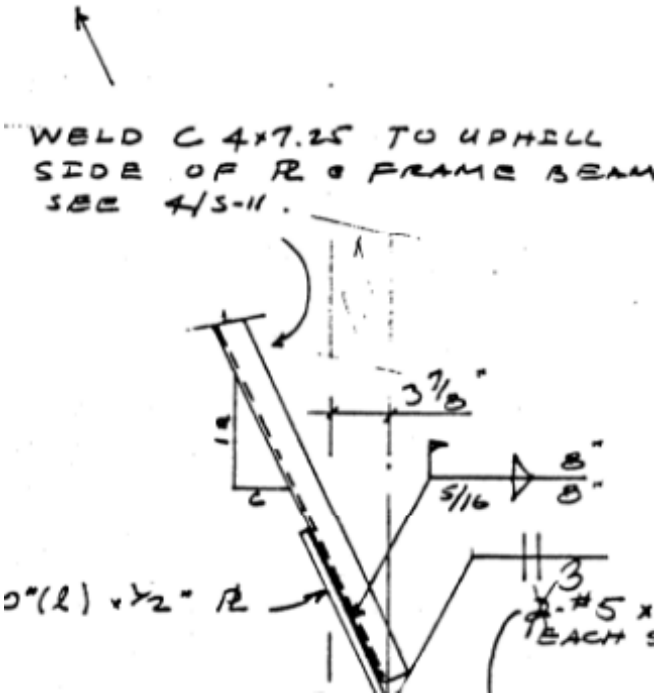
PROJECT: 21156AN - ASD Tier 1
(1 of 3)

Date: 11/10/2021
By: NIC

ASCE 41-17 Quick-Checks: Brace Axial Stress



Brace plan lengths per S-7 of 1994 record drawings



Brace vertical slope per RS-7 of record drawings

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PROJECT: 21156AN - ASD Tier 1
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Date: 11/10/2021
By: NIC

- **Notes:**
  1. *Reference ASCE 41-17 4.4.3.4*
  2. *Record drawings, 1994*

- **Brace Axial Stress - Braces: C4x7.25**

$F_y := 36ksi$

Record Drawings, 1994
S0.1

$F_{ye} := 1.25 \cdot F_y = 45 \cdot ksi$

Expected yield strength, per ASCE 41-17 Table 4-9 Footnotes

$M_s := \frac{3.5 + 2.5}{2} = 3$

"Tension only" members modification factor, damage control limit state @ BSE-2E
ASCE Table 4-9

$s_{avg} := 30.75ft$

Average effective span, all braced frames

$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (30.75 \quad 5 \quad 10)$

Vector of brace direction, note resisting shear is along first index

$u := u^T$

$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 32.72\,ft$

Average length of braces

$L_{br} = 32.72\,ft$

$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.94 \\ 0.15 \\ 0.31 \end{pmatrix}$

Unit vector of brace direction

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PROJECT: 21156AN - ASD Tier 1
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Date: 11/10/2021
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$A_{br} := 2.13in^2$ Average x-sectional area of a diagonal brace

$V_{2E} := 0.6 \cdot 309kip = 185.4 \cdot kip$ Story shear at BSE-2E

$n_{br} := 2$ Number of braced frames acting per direction (two braces per end of MF)

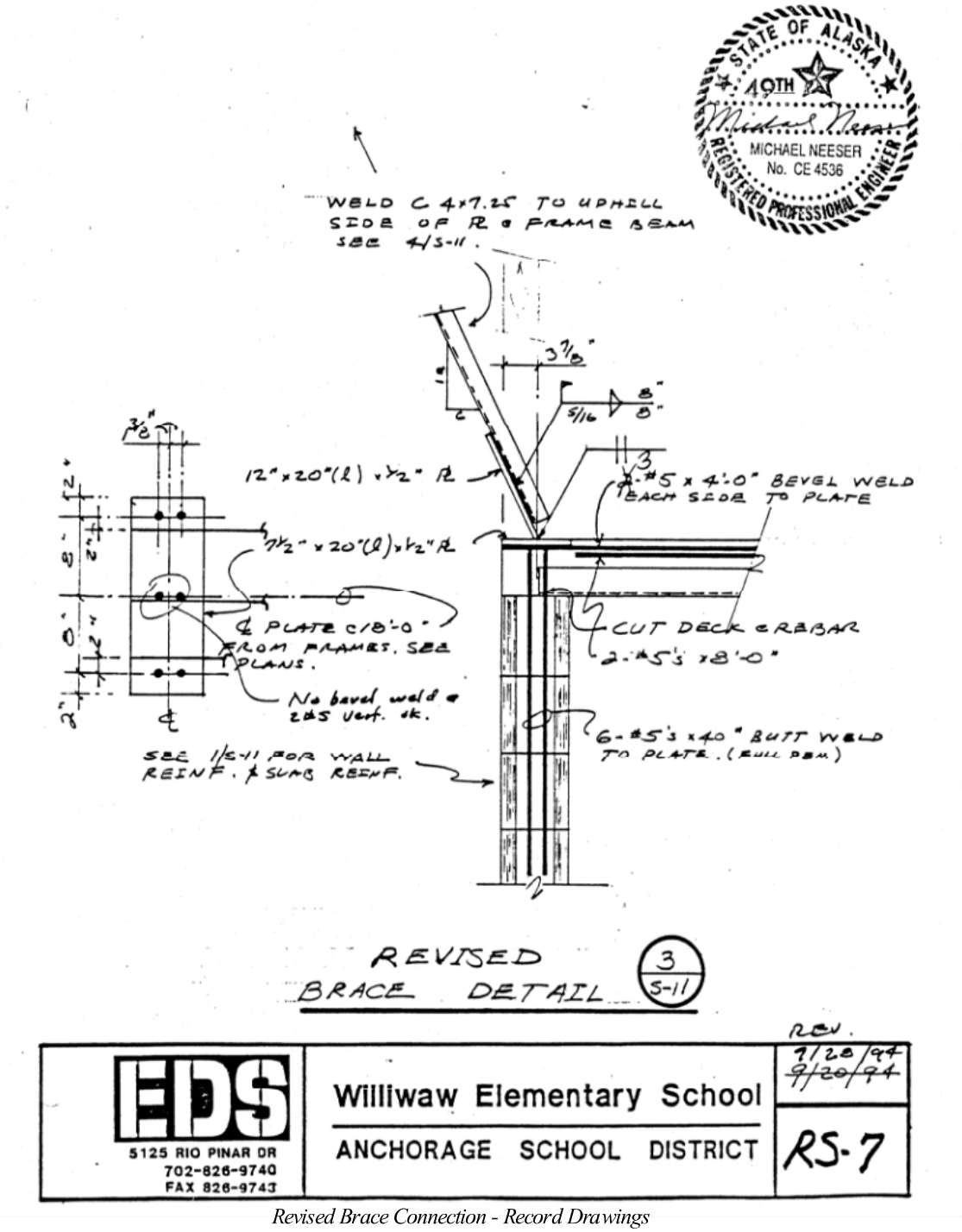
$T := \frac{V_{2E}}{u'_1} = 197.27 \cdot kip$ Tension component along brace from demand shear direction

$f_1 := \frac{1}{M_s} \cdot \left(\frac{T}{s_{avg} \cdot n_{br}} \right) \cdot \left(\frac{L_{br}}{A_{br}} \right) = 16.42 \cdot ksi$ Brace axial stress - Eq. 4-9

$DCR_1 := \frac{f_1}{0.5 \cdot (F_y)} = 91.25 \cdot \%$

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S3 Quick-Checks
Connection Strength



Revised Brace Connection - Record Drawings

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Demand Loads

Brace Unit Vector

$$s_{avg} := \frac{2 \cdot 28ft + 4 \cdot 27.33ft}{6} = 27.55\,ft$$

Average effective span, all braced frames

$$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (27.55 \quad 5 \quad 10)$$

Vector of brace direction, note resisting shear is along first index

$$u := u^T$$

$$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 29.74\,ft$$

Average length of braces

$$L_{br} = 29.74\,ft$$

$$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.93 \\ 0.17 \\ 0.34 \end{pmatrix}$$

Unit vector of brace direction

Yield Force of Brace

$$F_y := 36ksi$$

Brace yield strength
1994 Record Drawings, S-1

$$A_{br} := 2.13in^2$$

$$T_{br} := F_y \cdot A_{br} = 76.68 \cdot kip$$

Average tension per brace

Vertical Force

$$F_{vert} := T_{br} \cdot u'_3 = 25.79 \cdot kip$$

Vertical force per brace connection

Force Perpedicular to Wall

$$F_{perp} := T_{br} \cdot u'_2 = 12.89 \cdot kip$$

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Connection Capacity and Utilization

Welds to brace

$$\phi R_n := 2 \cdot 1.392 \cdot 5.8 in \cdot kpi = 111.36 \cdot kip$$

Fillet Weld Strength
AISC SCM 15th
(8-2a)

$$U := \frac{T_{br}}{\phi R_n} = 0.69$$

check = "OK"

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

CMU Shear Breakout - Parallel to CMU Wall

Connection Properties

$s_{rb} := 2 \cdot (1.375in) = 2.75 \cdot in$ — Separation between reinforcement - perpendicular to CMU wall

$d_b := \frac{5}{8}in = 0.63 \cdot in$ — Diameter of reinforcement

$A_b := \pi \cdot \frac{d_b^2}{4} = 0.31 \cdot in^2$

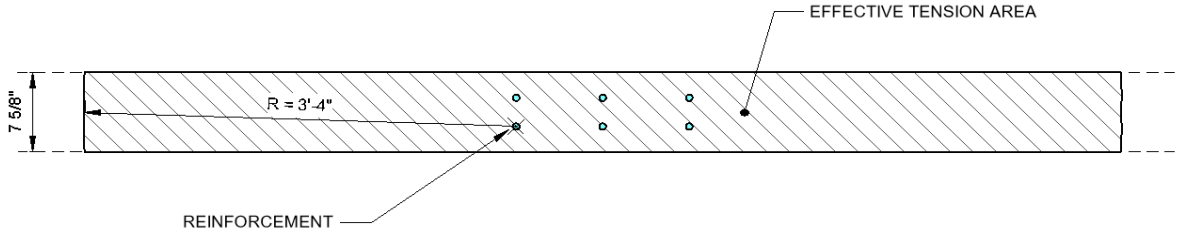
$l_e := \frac{7.625in}{2} - 1.375in = 2.44 \cdot in$ — Edge distance of reinforcement

$l_b := 40in$ — Reinforcement length of embedment

$n_b := 6$ — Total number of anchors per connection

$F_y := 60ksi$ — Yield strength of reinforcement

$f'_m := 1500psi$ — *1994 Record Drawings S-1*



$A'_{pt} := 5.08ft^2 = 731.52 \cdot in^2$

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

Shear Breakout

Brace connections appear far from free edges - assume shear breakout does not occur.

Masonry Shear Crushing

$$\phi B_{vnc} := n_b \cdot 0.5 \cdot 1050 \cdot \left(f'_m \cdot A_b \right)^{\frac{1}{4}} \cdot lbf^{\frac{3}{4}} = 14.59 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Shear Pryout

$$\phi B_{vnpry} := 0.5 \cdot 8 \cdot A'_{pt} \cdot \sqrt{f'_m \cdot \frac{1}{psi}} \cdot psi = 113.33 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Yielding

$$\phi B_{vns} := n_b \cdot 0.9 \cdot 0.6 \cdot A_b \cdot F_y = 59.64 \cdot kip$$

TMS 402-16 (Equation 9-8)

Limiting Capacity Per Anchor Group

$$\phi B_{nv} := \min\left(\phi B_{vnc}, \phi B_{vnpry}, \phi B_{vns} \right) = 14.59 \cdot kip$$

$$U := \frac{T_{br}}{\phi B_{nv}} = 5.26$$

check = "NG"

The brace connection is **non-compliant** with the check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

S2 Quick-Checks
Connection Strength

Brace Properties
C4x7.25

Geometry

Flange

$t_f := 0.296in$

$b_f := 1.72in$

$\lambda_f := \frac{b_f}{t_f} = 5.81$

Web

$d := 4in$

$k := 0.75in$

$t_w := 0.321in$

$h := d - 2 \cdot k = 2.5 \cdot in$

$\lambda_w := \frac{h}{t_w} = 7.79$

Material

$F_y := 36ksi$ — Yield Strength
Record Drawings, S-1

$R_y := 1.5$ — *AISC 341-16 Table A3.1*

$E := 29000ksi$ — Steel MoE

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Ductility Requirement

Flange

$$\lambda_{md} := 0.40 \sqrt{\frac{E}{R_y \cdot F_y}} = 9.27$$

$$U := \frac{\lambda_f}{\lambda_{md}} = 62.69 \cdot \%$$

check = "OK"

Web

$$\lambda_{md} := 1.57 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 36.38$$

$$U := \frac{\lambda_w}{\lambda_{md}} = 21.41 \cdot \%$$

check = "OK"

The brace connection is **compliant** with the check.

West B Wing

1.0 – SEISMIC LOADING:

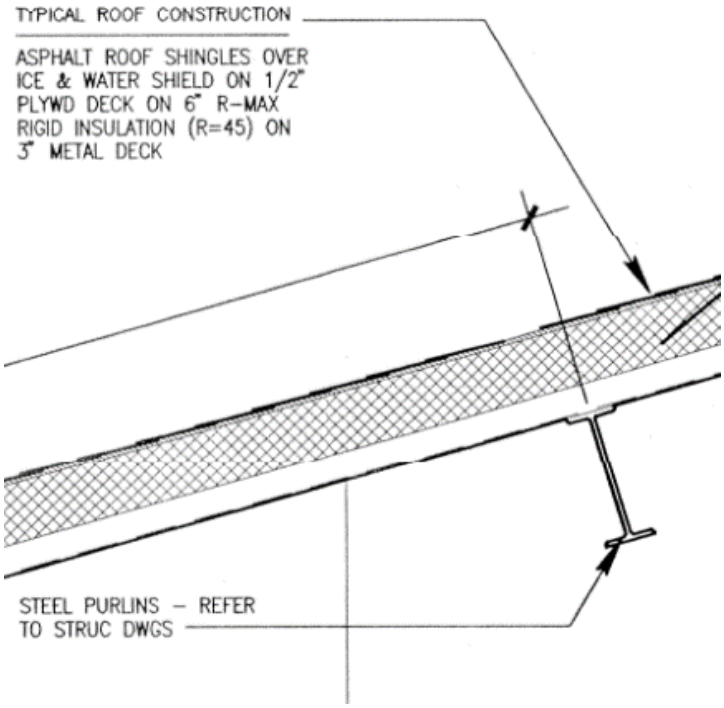
1.1 Building Weights
1.2 Seismic Hazard: ASCE 41
1.3 Seismic Forces
1.4 Base Shear Comparison

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

1.0 Typical Sloped Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Shingles	2.50	
Dead	Membrane	0.30	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.50	6" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**13.10**	**Summary**



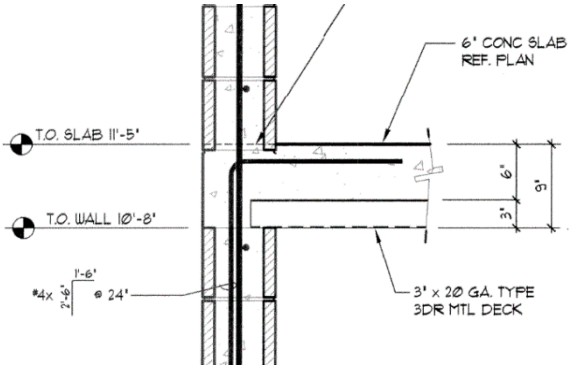
Above - 1 / A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

2.0 Boiler and Fan Room Floors - 6" SOD

Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab on deck	90.65	9" Total, 6" slab on PLW3 Verco deck + 3" 145pcf concrete
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**94.95**	**Summary**



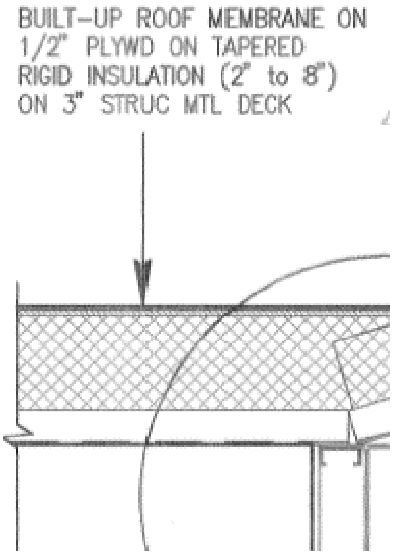
Above - 12 / S-11 of 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

3.0 Typical Built-Up Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Built-up roof membrane	5.50	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.25	5" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**15.55**	**Summary**



Above - 2 / A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Fan Room Corridor Floors - 2 1/2" SOD

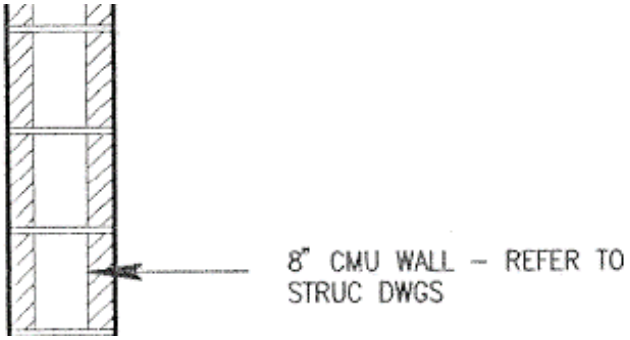
Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab	48.30	5 1/2" total, Verco catalog
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**52.60**	**Summary**

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Typical 8" CMU Single Wythe Corridor Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	8" CMU	86.00	135 pcf, fully grouted
	Multiplier	1.00	
Dead	**Total**	**86.00**	



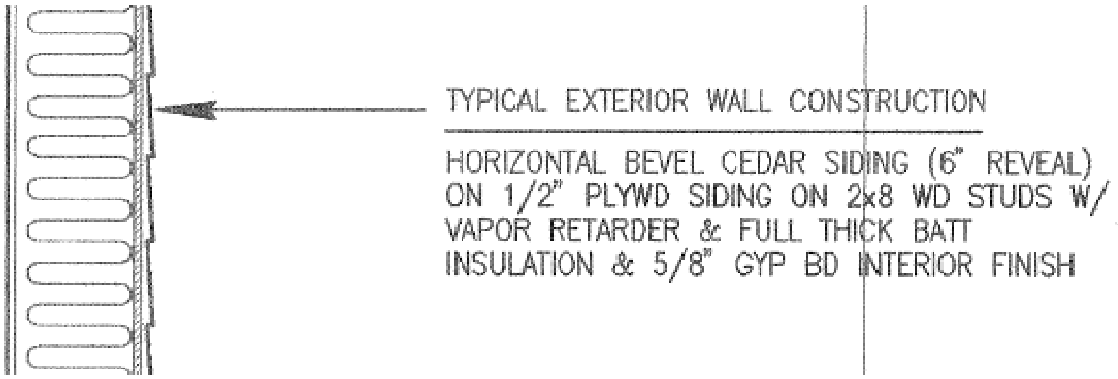
Above - 2/A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

5.0 Exterior Wall

Load Category	Item	Weight	Comment
		(psf)	
Dead	Cedar Siding	2.00	
Dead	1/2" plywood	1.5	
Dead	(2) 2x8 studs @ 16" OC	5.00	
Dead	Batt insulation	0.80	
Dead	5/8" Gyp	2.00	
	Multiplier	1.00	
Dead	**Total**	**11.30**	



Above - 4/A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

6.0 Typical CFS Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	3 1/2" CFS Studs	0.59	Spaced 16" OC per 11 / S-11, 1994 Drawings
Dead	(2) layers 5/8" GWB	4.00	
Dead			
Dead			
Dead			
Dead	Multiplier	1.00	
Dead	**Total**	**4.59**	

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

1.0 - Floor & Roof Dead Weights

Floor	Sub Area	Trib. Area		Typ. Weight	Weight	Comments
(#)		(sf)		(psf)	(kip)	
(1) Mezzanine	*2 1/2" SoD*	626		53	33	
	Total	**626**			**33**	
(2) Roof	*Sloped Roof*	4732		13.1	62	
	Total	**4732**			**62**	
∑ Floors	>>>>

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

3.0 - Wall Dead Weights - Tributary to Floor

Floor		Trib. Height	Length	Typ. Weight	Weight	Comments
(#)		(ft)	(ft)	(psf)	(kip)	
(1) Mezzanine	***Total***				***84***	***Total weight of walls trib to floor***
		5.8	*167*	*86.0*	*82*	*8" CMU - First Floor*
		2.6	*131*	*4.6*	*2*	*CFS - Second Floor*
(2) Roof	***Total***				***5***	***Total weight of walls trib to roof***
		8.3	*144*	*11.3*	*14*	*Wood - Full Height*
		8.3	*100*	*4.6*	*4*	*CFS - Full Height*
		2.6	*131*	*4.6*	*2*	*CFS - Second Floor*

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

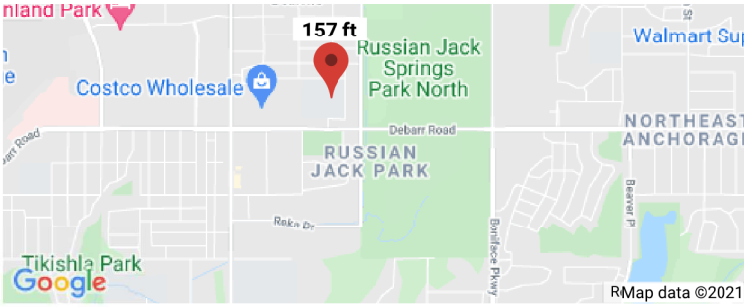
4.0 - Seismic Weights Tributary To Story

Floor (#)	Wall Weight (kip)	Floor Weight (kip)	20% Snow Weight (kip)		Seismic Weight (kip)	Comments
0						*Ground floor*
1	*84*	*33*	*0*		*117*	*Mezzanine*
2	*5*	*62*	*38*		*105*	*Roof*
Σ Floors	>>>>

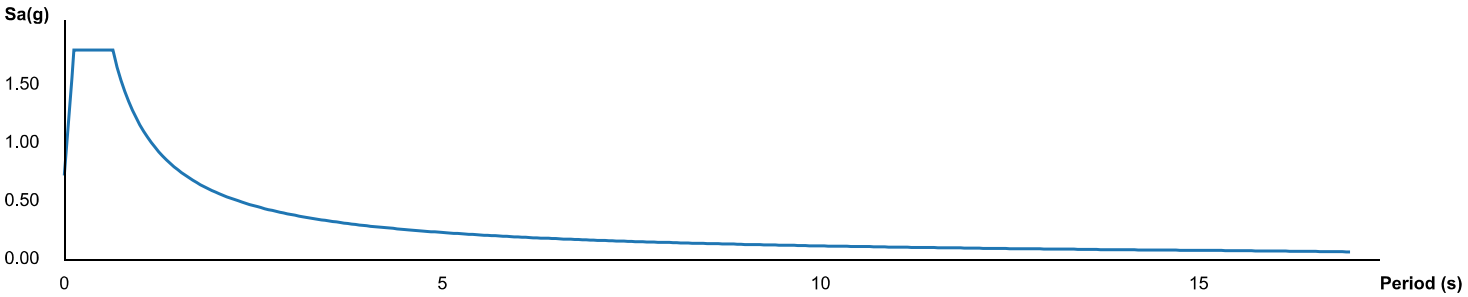
Hazards by Location

Search Information

Address:	williwaw elementary anchorage ak
Coordinates:	61.21115649999999, -149.7970792
Elevation:	157 ft
Timestamp:	2021-10-20T21:29:10.115Z
Hazard Type:	Seismic
Reference Document:	ASCE41-17
Site Class:	D-default
Custom Probability:	



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	1.707	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_S	1.111	Coefficient of risk (0.2s)
SsRT	1.897	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S_S	1.5	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.8	Site modified spectral response (0.2s)
S1UH	0.809	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_1	1.036	Coefficient of risk (1.0s)
S1RT	0.839	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.68	Factored deterministic acceleration value (1.0s)
S_1	0.68	MCE_R ground motion (period=1.0s)
F_v	1.7	Site amplification factor at 1.0s
S_{X1}	1.156	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S_{XS}	1.2	Site modified spectral response (0.2s)
S_{X1}	0.771	Site modified spectral response (1.0s)

Hazard Level BSE-2E

Name	Value	Description
S_S	1.306	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.567	Site modified spectral response (0.2s)
S_1	0.597	MCE_R ground motion (period=1.0s)
F_v	1.703	Site amplification factor at 1.0s
S_{X1}	1.016	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.787	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	0.944	Site modified spectral response (0.2s)
S_1	0.33	MCE_R ground motion (period=1.0s)
F_v	1.97	Site amplification factor at 1.0s
S_{X1}	0.651	Site modified spectral response (1.0s)

T_L Data

Name	Value	Description
T_L	16	Long-period transition period (s)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

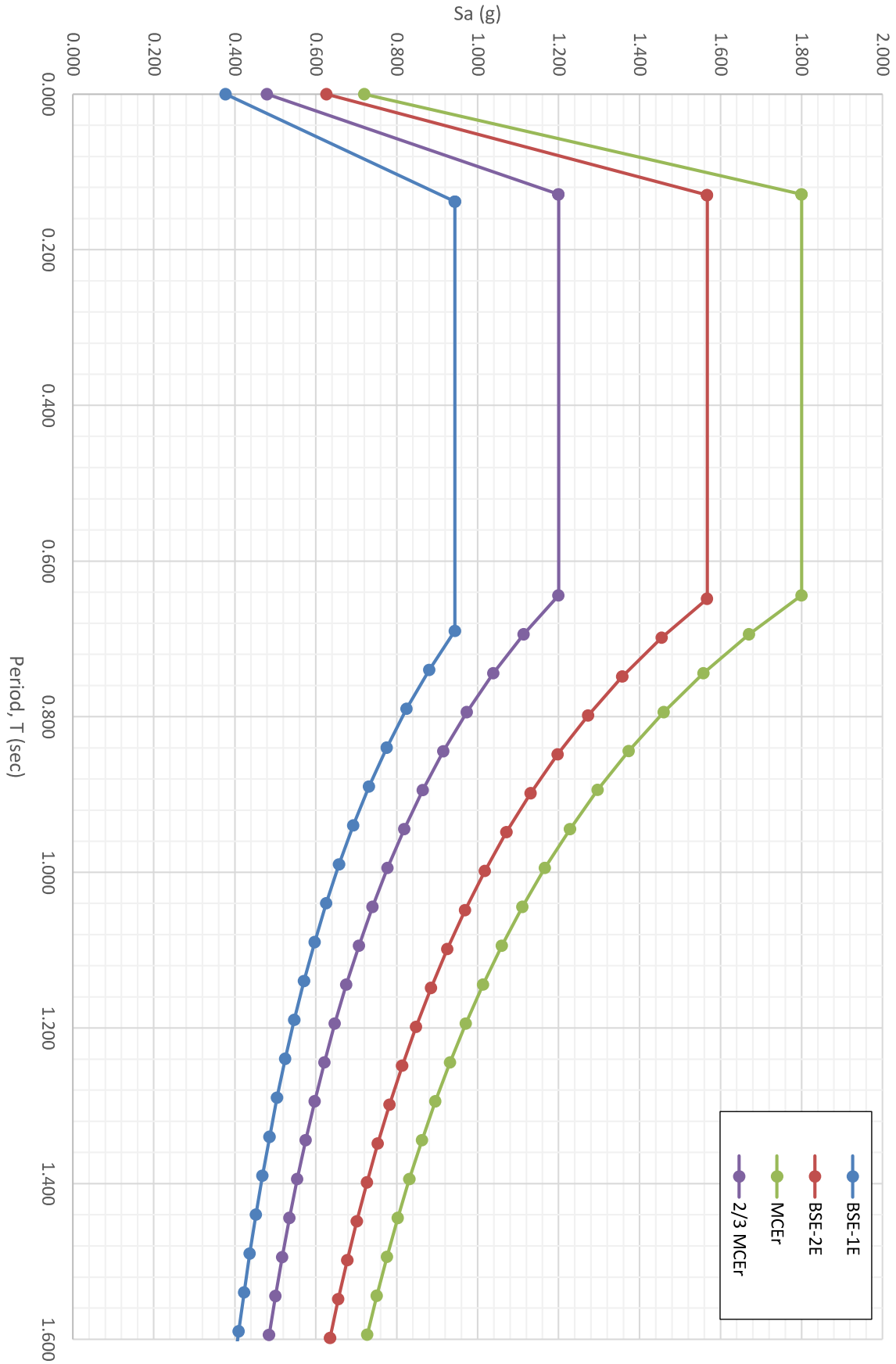
Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Project:
21156AN - ASD Tier 1
Seismic Response Spectra - Site Class D

C-149
Name: NIC
Date: 11/10/2021



Anchorage School District Seismic Evaluation: Williwaw Elementary Tier – 1 Report (February 2022)
Attachment E

Professional Services Ocean View and Williwaw Elementary Schools Tier 2/3 Seismic Evaluation
RFP Number 2026-603

1 - Seismic Base Shear: ASCE 41-17 Tier I Procedure

Notes: *1. Seismic Forces calculated following the Tier - III procedure of ASCE 41-17. Analysis Method used is the LSP*

Seismic Response Spectra Inputs			
BSE-1E	S_{x1}	0.651	(g)
	S_{xs}	0.944	(g)
	S_a	0.944	(g)
BSE-2E	S_{x1}	1.016	(g)
	S_{xs}	1.567	(g)
	S_a	1.567	(g)
Period	T	0.16	(sec)

Seismic Base Shears			
Weight	W	244	(kip)
BSE - 1E	V_{1E}	322	(kip)
BSE - 2E	V_{2E}	535	(kip)

Comments:

$S_a = \frac{S_{X1}}{T} < S_{XS}$ $Eq. 4-3$

$T = C_t H_n^{\beta}$ Eq. 4–4

$V = CS_aW$ Eq. 4-1

$C_{vx} = \frac{w_x h_x^k}{\sum w_i h_i^k}$ Eq. 4-2a

$F_i = C_{vx} V$ Eq. 4-2a

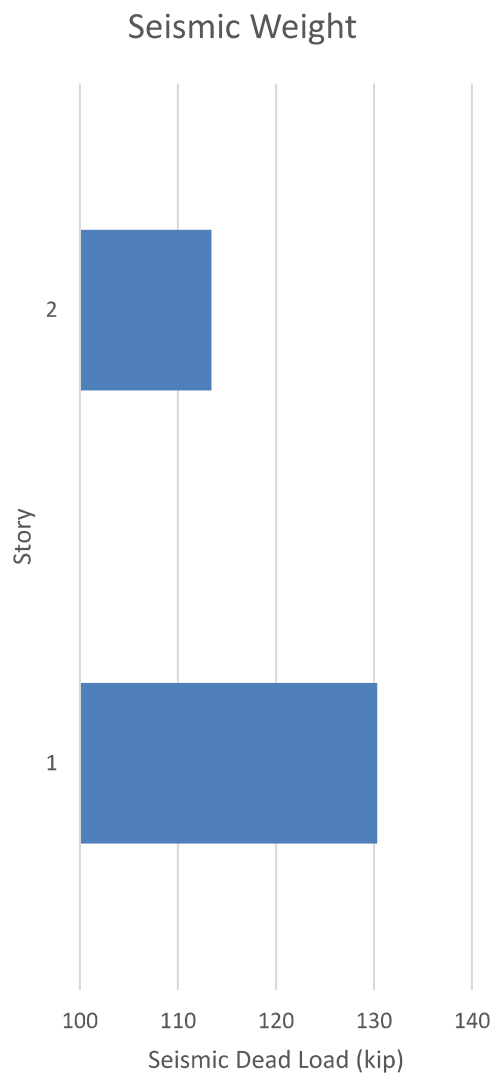
Seismic Base Shear - Tier 1 Method		
C	1.4	ASCE 41-17, Table 4-7
k	1.00	ASCE 41-17 Section 7.4.1.3.2

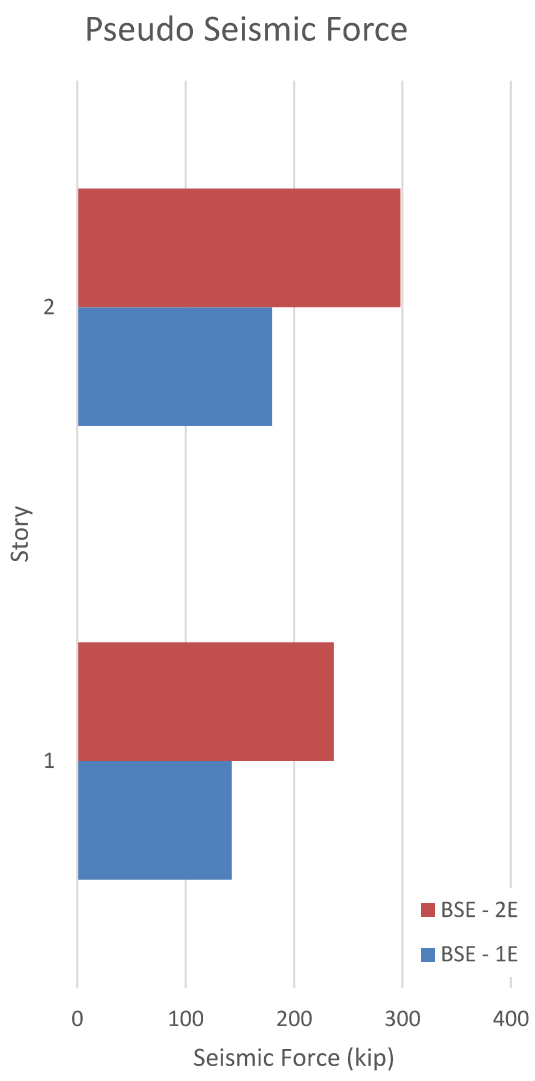
Approx. Structural Period (Method-2 Emperical)		
C_t	0.02	ASCE 41-17 Section 4.4.2.3
β	0.75	ASCE 41-17 Section 4.4.2.3
h_n	16.66	(ft) - Structural Height

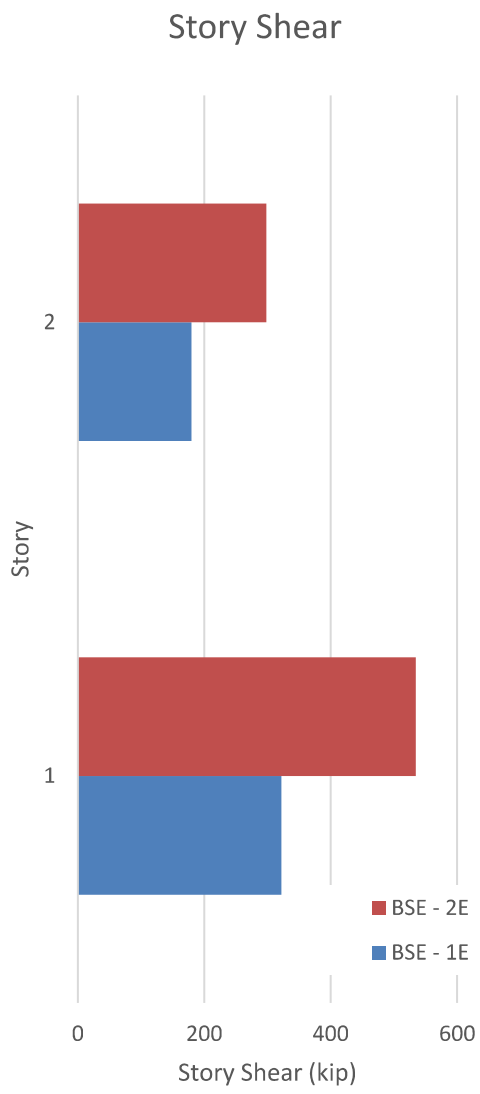
2 - Pseudo Seismic Forces Story Forces

				Seismic Weights Tributary:				BSE - 1E		BSE -2E	
			Story Height	Tot. Story	Diaphragm			Story Force	Story Shear	Story Force	Story Shear
	Floor	Elevation	h_{ix}	W_x	N-S W_{px}	E-W W_{px}	$w_x h_x^k$	F_x	V_x	F_x	V_x
		(ft)	(ft)	(kip)	(kip)	(kip)		(kip)	(kip)	(kip)	(kip)
Ground	0	0	0					-	-	-	-
EW Loading - Mezzanine	1	11.50	11.50	130			1499	143	322	237	535
EW Loading - Roof	2	16.66	5.16	113			1890	180	180	298	298
NS Loading - Mezzanine	1	11.50	11.50	130				172	172	286	286
NS Loading - Roof	2	16.66	5.16	113				150	150	249	249
		Totals ->>	**16.7**	**244**			**3,389**	**322**	**322**	**535**	**535**

3 - Pseudo Seismic Forces Story Forces & Story Shear Plots:







PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/10/2021
By: NIC

Base Shear Comparision (1 of 2)

- **Notes:**
  1. IBC 2018 / ASCE 7-16 vs. 1991 UBC
  2. For derivation of building seismic weight see seismic load calculations.

- **Building Properties:**

$W_b := 222 \cdot kip$ — Building seismic weight, total

$h_n := 16.66 \cdot ft$ — Height of roof

- **Base Shear: 1991 UBC**

$Z := 0.4$ — Zone 4 - Record drawings

$I_s := 1.25$ — Importance factor - Record Drawings

$R_w := 6.0$ — System Performance Factor, Record drawings

$C := 2.75$ — Record drawings

$$T_s := 0.035 \cdot \left(\frac{h_n}{ft}\right)^{0.75} \cdot s = 0.29\,s$$ — Eq 34-3 UBC

$$V_{s1} := \frac{Z \cdot I_s \cdot C}{R_w} \cdot W_b = 50.88 \cdot kip$$ — 1991 UBC Eq. 34-1 Base shear

$s_{a_UBC} := Z \cdot C = 1.1$ — Effective seismic acceleration

$$R_{eq} := \frac{R_w}{1.54} = 3.9$$ — Equivalent force reduction factor, "Ductile Design of Steel Structures", Burneau, Equation 7.53

PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/10/2021
By: NIC

Base Shear Comparision (2 of 2)

- **Base Shear: 2018 IBC & ASCE 7-16**

$c_t := 0.02$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$x := 0.75$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$T_a := (\text{sec}) \cdot c_t \cdot \left(\frac{h_n}{\text{ft}}\right)^x = 0.16\,\text{s}$ — ASCE 7-16 Eq. 12.8-7 Approximate fundamental period

$I_e := 1.25$ — ASCE 7-16 Table 1.5-2 Importance factor, type III building

$S_{ds} := 1.2$

$S_{d1} := 0.773$ — Design spectral response acceleration, site class - D default

$R' := 2$ — Response modification coefficient, ASCE 7-16 Table 12.2.1 Ordinary Reinforced Masonry Walls

$C_s := \frac{S_{ds}}{\left(\frac{R'}{I_e}\right)} = 0.75$ — ASCE 7-16 Eq. 12.8-2, Seismic response coefficient

$V_{s2} := 0.7 C_s \cdot (W_b) = 116.55 \cdot \text{kip}$ — Seismic Base Shear, ASCE 7-16 Eq. 12.8-1

- **ASD - Seismic Base Shear Comparision**

$\frac{V_{s2}}{V_{s1}} = 229.09 \cdot \%$ — Increase in equivalent lateral force between original building code & 2018 IBC

$\frac{S_{ds}}{s_{a_UBC}} = 109.09 \cdot \%$ — Increase in seismic acceleration between original building code & 2018 IBC

$\frac{R'}{R_{eq}} = 51.33 \cdot \%$ — Decrease in percieved ductility between original building code & 2018 IBC

West B Wing

2.0 – QUICK-CHECKS:

2.1 Wood Frames (W2) Quick-Checks
2.2 Reinforced Masonry (RM1) Quick-Checks
2.3 Steel Light Frames (S3) Quick-Checks
2.4 Steel Braced Frame (S2) Quick-Checks

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Length *(ft)*	E-W SW Length *(ft)*	Max Stress *(plf)*	Comments
All	110	50	-	594.7	EW Loading - 40% Roof
Maximum Stress (psi)				**594.7**	< 1000 plf (Plywood), ASCE 41-17, A3.2.7.1

System Modification Factor, Ms 3.75 Average of LS and CP

1 - Shear Wall Properties & Area

Type	Description	Area	X-Dir Tot. Area	Y-Dir Tot. Area
Wx		in^2/ft	in^2	in^2
W1	8" CMU	91.5	8418	1922
		Total	8418	1922

2 - Shear Wall Areas: Mezzanine Interior Walls

Length X- Dir: (East - West)							Length Y- Dir: (North - South)						
W1							W1						
ft							ft						
92							21						
92						<< Total >>	21						
8418						<< Area >>	1922						

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Area *(in^2)*	N-S SW Area *(in^2)*	Max Stress *(psi)*	Comments
All	377	8418	-	11.9	EW Loading - 60% Roof and Full Mezzanine
All	256	-	1922	35.5	NW Loading - Mezzanine Loading
Maximum Stress (psi)				**35.5**	**< 70 psi, ASCE 41-17, A.3.2.4.1**

System Modification Factor, Ms	3.75	Average of LS and CP

2.0 Reinforcement Ratio Checks

Wall Type	Net Area (in2/ft)	Vertical Bars				Horizontal Bars				Total Ratio	Comments
		Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio	Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio		
W1	91.5	5	16	0.23010	0.00251	4	32.0	0.07363	0.00080	0.00332	8", fully grouted. 4,5,10/S-10
W2	91.5	5	24	0.15340	0.00168	4	32.0	0.07363	0.00080	0.00248	8", fully grouted. 9,15/S-10

Minimum total reinforcing steel ratio: 0.00248
Minimum reinforcing steel ratio in either direction: 0.00080
Maximum reinforcing spacing (in): 32

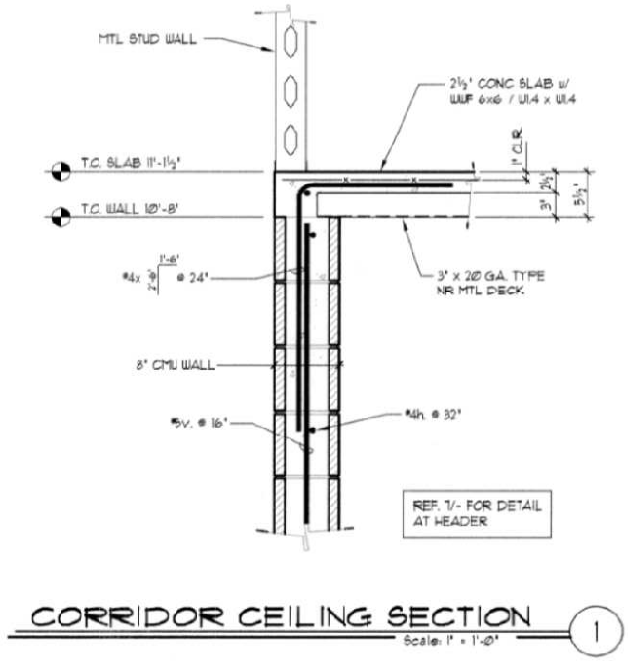
Project:
21156AN - ASD Tier 1
Quick-Checks

C-159
Name: NIC
Date: 11/10/2021

Inputs		
Ψ	1.15	Average of CP and LS
Sxs	1.567	BSE-2E

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C1	Mezzanine	All corridors	86	2	5.5	1705	5400	8" CMU, fully grouted

C1 connections are compliant with quick check calculation.

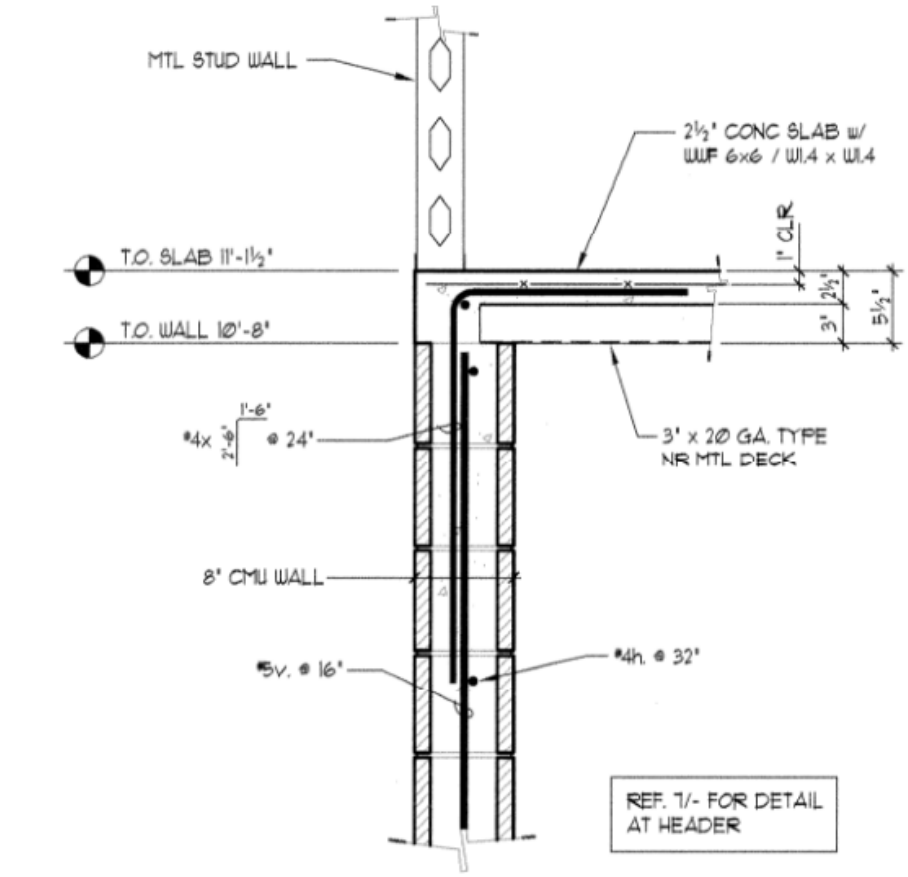


1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

ASCE 41-17 Quick-Checks:
Exterior CMU Out-of-Plane Connection Capacity

Connection - C1:



CORRIDOR CEILING SECTION 1
Scale: 1" = 1'-0"

1 / S-11, 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

Connection Strengths and Geometry

Concrete and Reinforcement

$f'_c := 4000psi$ — Concrete compressive strength
1994 Record Drawings, S-1

$c_c := 1in$ — Clear concrete cover

$f_{yr} := 60ksi$ — Reinforcement yield strength

$d_{br} := \frac{4in}{8} = 0.5 \cdot in$ — Diameter of reinforcing bars

Reinforcement Development into Slab-on-Deck

$\psi_t := 1.0 \quad \psi_e := 1.0 \quad \psi_g := 1.0 \quad \lambda := 1.0$ — *ACI 318-19 Table 25.4.2.5*

$$l_d := \frac{\frac{f_{yr}}{psi} \cdot \psi_t \cdot \psi_e \cdot \psi_g}{25\lambda \cdot \sqrt{\frac{f'_c}{psi}}} \cdot d_{br} = 18.97 \cdot in$$

ACI 318-19 Table 25.4.2.3

Detail shows 18" leg for bent bar. Consider bar fully developed.

Shear Yielding of Reinforcement

$$\phi R_n := 1.0 \cdot 0.6 \cdot f_{yr} \cdot \left(\frac{\pi}{4} \cdot d_{br}^{\,2} \right) = 7.07 \cdot kip$$

AISC 360-16 (J4-3)

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S3 Quick-Checks
Column Axial Stress Check

Geometry and Material Properties

Building

Moment frame on grid line "H" has the greatest tributary width for the West B wing:

$b_t := 27.33\,ft = 27.33\,ft$ — Tributary width of frame

$L_r := \frac{76ft}{2} = 38\,ft$ — Length of tributary roof

Column

Strength

$F_y := 50ksi$ — *Midco Drawings 8/94, C-1*

Outer Flange

$b_{fo} := 12in$

$t_{fo} := 0.5in$

$A_1 := b_{fo} \cdot t_{fo} = 6 \cdot in^2$

Inner Flange

$b_{fi} := 12in$

$t_{fi} := 0.75in$

$A_2 := b_{fi} \cdot t_{fi} = 9 \cdot in^2$

Web

$h := 18.08in$ — Minimum web depth

$t_w := 0.3125in$ — Thickness of web

$A_3 := h \cdot t_w = 5.65 \cdot in^2$

Section

$A_{tot} := \sum A = 20.65 \cdot in^2$

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Loads

Pressures

$p_d := 13.1psf$ — Roof dead load pressure

$p_s := 40psf$ — Roof snow load pressure

Point Loads

$P_d := p_d \cdot b_t \cdot L_r = 13.6 \cdot kip$ — Roof dead load point load

$P_s := p_s \cdot b_t \cdot L_r = 41.54 \cdot kip$ — Roof snow load point load

$P_g := 1.1 \cdot \left(P_d + P_s \right) = 60.66 \cdot kip$ — Total gravity loads
ASCE 41-17
(7-1)

Analysis

$$U := \frac{P_g}{F_y \cdot A_{tot}} = 5.88 \cdot \% \quad < 10\%, \text{per ASCE 41-17, A.3.1.3.2}$$

Columns are **compliant** with quick-check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/8/2021

S3 Quick-Checks
Flexural Stress Check

Loads

$V_{tot} := 249kip$ — Total shear resisted in principal direction
Seismic Loading Spreadsheet

Representative Sections

Smallest beam and column sections of frame are used as a upper bound for the flexural stress:

Beam Properties

$Z_{bm} := \min(155.55, 117.81, 117.81)\,in^3 = 117.81 \cdot in^3$ — Beam plastic section modulus
RISA3D

Column Properties

$Z_{col} := \min(142.34, 165.65, 137.72)\,in^3 = 137.72 \cdot in^3$ — Column plastic section modulus
RISA3D

Frame Properties

$F_y := 50ksi$ — Beam and column yield strength
Midco 8/94 Drawings
C-1

$n_f := 3$ — Number of frames resisting shear

$n_c := 2 \cdot n_f = 6$ — Number of frame columns

$h := 16.66ft$ — Story height

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Average Flexural Stress

$$M_s := \frac{9 + 6}{2}$$

Average of LS and CP

Beams

$$Z := 2 \cdot n_f \cdot Z_{bm} = 706.86 \cdot in^3$$

Sum of plastic moduli for beams (2x due to both ends moment connections)

$$f_{avg_bm} := V_{tot} \cdot \frac{1}{M_s} \cdot \left(\frac{n_c}{n_c - n_f} \right) \cdot \left(\frac{h}{2} \right) \cdot \frac{1}{Z} = 9.39 \cdot ksi$$

ASCE 41-17 (4-14)

Columns

$$Z := n_c \cdot Z_{col} = 826.32 \cdot in^3$$

Sum of plastic moduli for columns

$$f_{avg_col} := V_{tot} \cdot \frac{1}{M_s} \cdot \left(\frac{n_c}{n_c - n_f} \right) \cdot \left(\frac{h}{2} \right) \cdot \frac{1}{Z} = 8.03 \cdot ksi$$

ASCE 41-17 (4-14)

Utilization

$$U := \frac{\max\left(f_{avg_col}, f_{avg_bm} \right)}{F_y} = 18.78 \cdot \%$$

The above analysis is conservative as the smallest beam and column sections were used for representative frame elements.

The moment frames are compliant with the flexural stress quick-check.

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S3 Quick-Checks
Compact Members

$E := 29000ksi$ — Steel modulus of elasticity

$F_y := 50ksi$ — A-572, A-570 or A-529 Plate
C-1
MIDCO Permit Drawings

$R_y := 1.1$ — *AISC 341-16*
Table A3.1

Limiting Width-to-Thickness Ratios

Flanges of I-shaped sections

$$\lambda_{md_f} := 0.4 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 9.18$$

AISC 341-16
Table D1.1

Webs of rolled or built-up I-shaped sections

$$C_a = \frac{P_u}{\phi_c \cdot P_y}$$

AISC 341-16
Table D1.1

$$\lambda_{md_w}(C_a) := \begin{cases} 3.96\left(1 - 3.04 \cdot C_a\right) \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{if } C_a \le 0.114 \\ \max\left[1.29 \cdot \left(2.12 - C_a\right), 1.57\right] \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{otherwise} \end{cases}$$

AISC 341-16
Table D1.1

$\lambda_{md_w_max} := \lambda_{md_w}(0) = 90.93$ — Minimum limiting web ratio (Pu = 0)

$\lambda_{md_w_min} := \lambda_{md_w}(1) = 36.05$ — Minimum limiting web ratio (Pu = ϕPn)

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Frame Properties

Grid Line "G.05"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (32 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 32)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 8 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 8 \quad 9.6)$ Width-to-thickness ratios of inside flanges

Width-to-thickness ratios of webs

$\lambda_w := \frac{h_{max}}{t_w}^T = (102.4 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 102.4)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

4 / 8 members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "H.1"&"Q.2"

$b_{fo} := (10 \quad 10 \quad 8 \quad 8 \quad 8 \quad 8 \quad 10 \quad 10)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.625 \quad 0.75 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.75 \quad 0.625)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.3125 \quad 0.3125 \quad 0.25 \quad 0.1875 \quad 0.1875 \quad 0.25 \quad 0.3125 \quad 0.3125)^T \cdot \text{in}$

$h_{max} := (32 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 32)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 10 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10.67 \quad 10 \quad 10)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.6 \quad 8 \quad 8 \quad 10.67 \quad 10.67 \quad 8 \quad 8 \quad 9.6)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (102.4 \quad 108.8 \quad 123.2 \quad 181.33 \quad 181.33 \quad 123.2 \quad 108.8 \quad 102.4)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

4 / 8 members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "H" & "Q"

$b_{fo} := (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 12 \quad 12)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.75 \quad 0.75)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (12 \quad 14 \quad 8 \quad 8 \quad 8 \quad 8 \quad 14 \quad 12)^T \cdot \text{in}$ Width of inside flanges

$t_{fi} := (0.75 \quad 0.75 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.5 \quad 0.75 \quad 0.75)^T \cdot \text{in}$ Thickness of inside flanges

Thickness of webs

$t_w := (0.375 \quad 0.375 \quad 0.3125 \quad 0.25 \quad 0.25 \quad 0.3125 \quad 0.375 \quad 0.375)^T \cdot \text{in}$

$h_{max} := (34 \quad 34 \quad 30.8 \quad 34 \quad 34 \quad 30.8 \quad 34 \quad 34)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (12 \quad 12 \quad 8 \quad 8 \quad 8 \quad 8 \quad 8 \quad 8)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (8 \quad 9.33 \quad 8 \quad 8 \quad 8 \quad 8 \quad 9.33 \quad 8)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (90.67 \quad 90.67 \quad 98.56 \quad 136 \quad 136 \quad 98.56 \quad 90.67 \quad 90.67)$

$\lambda_{md_w_max} = 90.93$

4 / 8 members fail to meet slenderness ratio for webs.

2 / 8 members fail to meet slenderness ratio for outside flange.

2 / 8 members fail to meet slenderness ratio for inside flange.

2 / 8 members pass all requirements

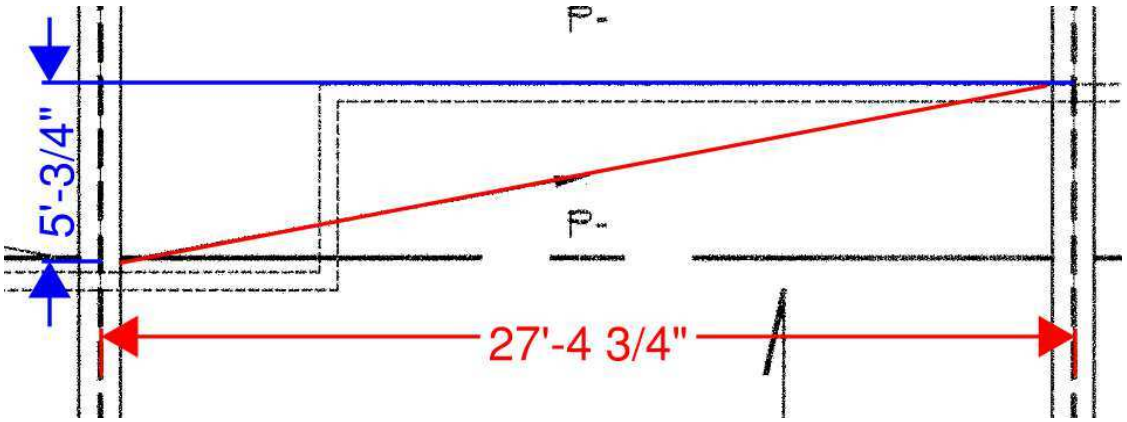
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Design Sheet

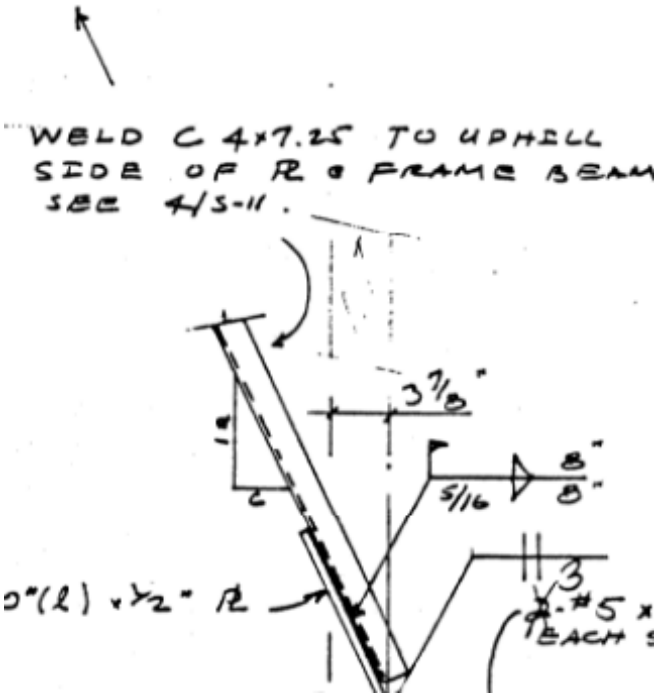
PROJECT: 21156AN - ASD Tier 1
(1 of 3)

Date: 11/10/2021
By: NIC

ASCE 41-17 Quick-Checks: Brace Axial Stress



Brace plan dimensions per S-5 of record drawings



Brace vertical slope per RS-7 of record drawings

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Design Sheet

PROJECT: 21156AN - ASD Tier 1
(2 of 3)

Date: 11/10/2021
By: NIC

- **Notes:**
  1. *Reference ASCE 41-17 4.4.3.4*
  2. *Record drawings, 1994*

- **Brace Axial Stress - Braces: C4x7.25**

$F_y := 36ksi$

Record Drawings, 1994
S0.1

$F_{ye} := 1.25 \cdot F_y = 45 \cdot ksi$

Expected yield strength, per ASCE 41-17 Table 4-9 Footnotes

$M_s := \frac{3.5 + 2.5}{2} = 3$

"Tension only" members modification factor, damage control limit state @ BSE-2E
ASCE Table 4-9

$s_{avg} := 26ft$

Average effective span, all braced frames

$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (26 \quad 5 \quad 10)$

Vector of brace direction, note resisting shear is along first index

$u := u^T$

$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 28.3\,ft$

Average length of braces

$L_{br} = 28.3\,ft$

$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.92 \\ 0.18 \\ 0.35 \end{pmatrix}$

Unit vector of brace direction

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Design Sheet

PROJECT: 21156AN - ASD Tier 1
(3 of 3)

Date: 11/10/2021
By: NIC

$A_{br} := 2.13in^2$ Average x-sectional area of a diagonal brace

$V_{2E} := 0.6 \cdot 276kip = 165.6 \cdot kip$ Story shear at BSE-2E

$n_{br} := 2$ Number of braced frames acting per direction (two braces per end of MF)

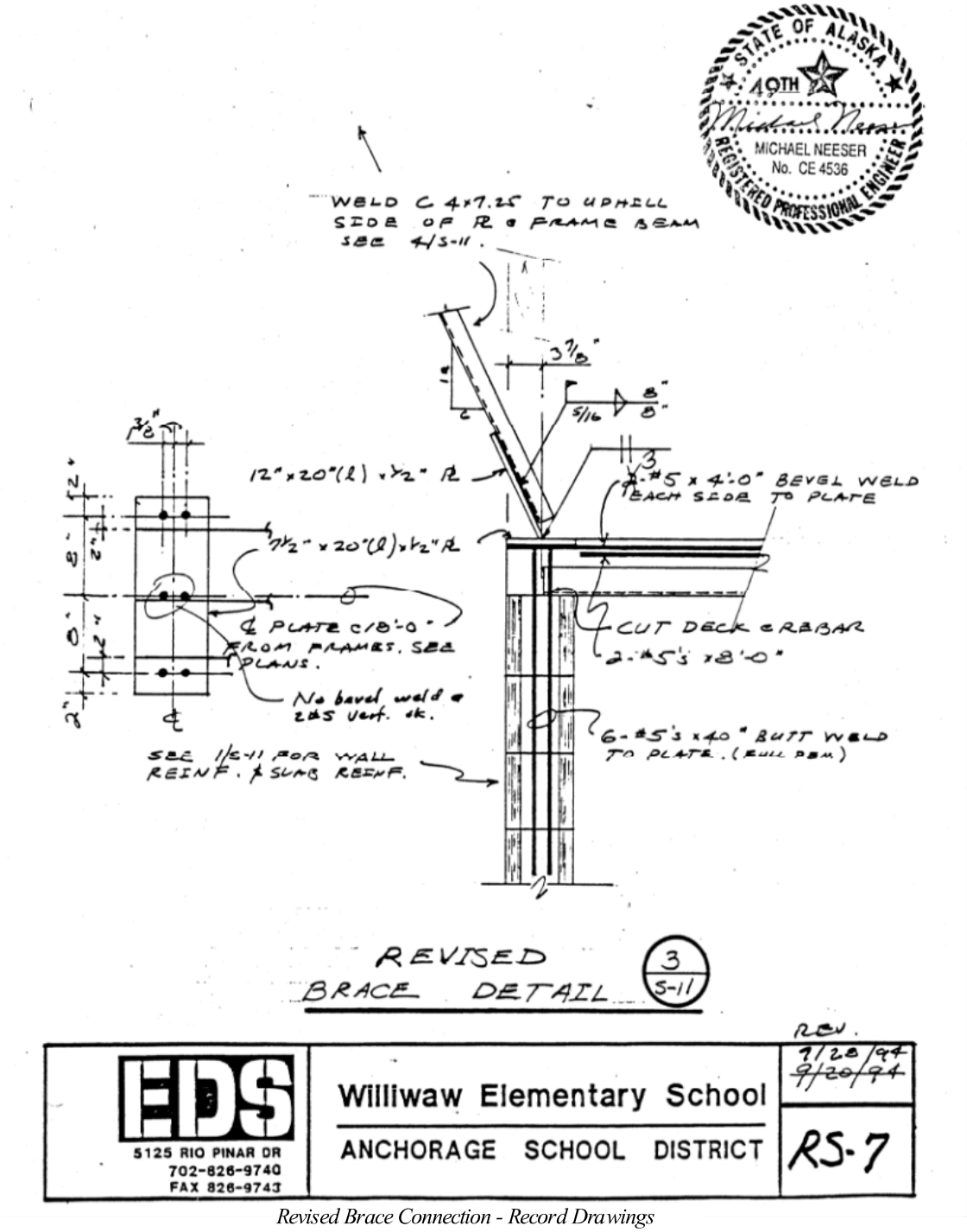
$T := \frac{V_{2E}}{u'_1} = 180.26 \cdot kip$ Tension component along brace from demand shear direction

$f_1 := \frac{1}{M_s} \cdot \left(\frac{T}{s_{avg} \cdot n_{br}} \right) \cdot \left(\frac{L_{br}}{A_{br}} \right) = 15.35 \cdot ksi$ Brace axial stress - Eq. 4-9

$DCR_1 := \frac{f_1}{0.5 \cdot (F_y)} = 85.3 \cdot \%$

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S2 Quick-Checks
Connection Strength



Revised Brace Connection - Record Drawings

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Demand Loads

Brace Unit Vector

$s_{avg} := 26ft$

Average effective span, all braced frames

$u := \left(\frac{s_{avg}}{ft} \quad 5 \quad 10 \right) = (26 \quad 5 \quad 10)$

Vector of brace direction, note resisting shear is along first index

$u := u^T$

$L_{br} := \sqrt{u^T \cdot u} \cdot ft = 28.3\,ft$

Average length of braces

$L_{br} = 28.3\,ft$

$u' := \frac{u}{\sqrt{u^T \cdot u}} = \begin{pmatrix} 0.92 \\ 0.18 \\ 0.35 \end{pmatrix}$

Unit vector of brace direction

Yield Force of Brace

$F_y := 36ksi$

Brace yield strength
1994 Record Drawings, S-1

$A_{br} := 2.13in^2$

$T_{br} := F_y \cdot A_{br} = 76.68 \cdot kip$

Average tension per brace

Vertical Force

$F_{vert} := T_{br} \cdot u'_3 = 27.09 \cdot kip$

Vertical force per brace connection

Force Perpedicular to Wall

$F_{perp} := T_{br} \cdot u'_2 = 13.55 \cdot kip$

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Connection Capacity and Utilization

Welds to brace

$$\phi R_n := 2 \cdot 1.392 \cdot 5 \cdot 8in \cdot kpi = 111.36 \cdot kip$$

Fillet Weld Strength
AISC SCM 15th
(8-2a)

$$U := \frac{T_{br}}{\phi R_n} = 0.69$$

check = "OK"

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CMU Shear Breakout - Parallel to CMU Wall

Connection Properties

$s_{rb} := 2 \cdot (1.375in) = 2.75 \cdot in$ — Separation between reinforcement - perpendicular to CMU wall

$d_b := \frac{5}{8}in = 0.63 \cdot in$ — Diameter of reinforcement

$A_b := \pi \cdot \frac{d_b^2}{4} = 0.31 \cdot in^2$

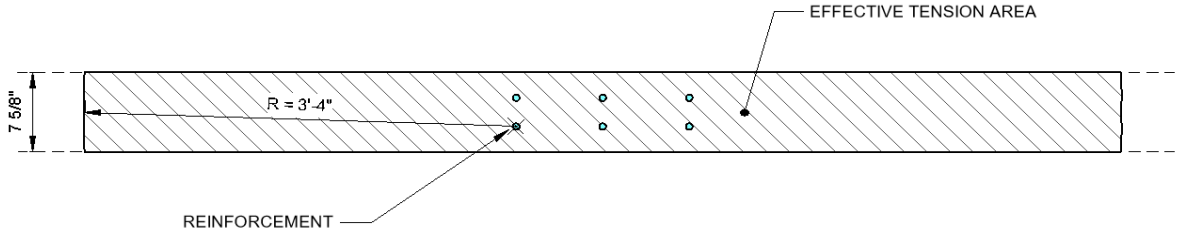
$l_e := \frac{7.625in}{2} - 1.375in = 2.44 \cdot in$ — Edge distance of reinforcement

$l_b := 40in$ — Reinforcement length of embedment

$n_b := 6$ — Total number of anchors per connection

$F_y := 60ksi$ — Yield strength of reinforcement

$f'_m := 1500psi$ — *1994 Record Drawings S-1*



$A'_{pt} := 5.08ft^2 = 731.52 \cdot in^2$

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Shear Breakout

Brace connections appear far from free edges - assume shear breakout does not occur.

Masonry Shear Crushing

$$\phi B_{vnc} := n_b \cdot 0.5 \cdot 1050 \cdot \left(f'_m \cdot A_b \right)^{\frac{1}{4}} \cdot lbf^{\frac{3}{4}} = 14.59 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Shear Pryout

$$\phi B_{vnpry} := 0.5 \cdot 8 \cdot A'_{pt} \cdot \sqrt{f'_m \cdot \frac{1}{psi}} \cdot psi = 113.33 \cdot kip$$

TMS 402-16 (Equation 9-7)

Anchor Yielding

$$\phi B_{vns} := n_b \cdot 0.9 \cdot 0.6 \cdot A_b \cdot F_y = 59.64 \cdot kip$$

TMS 402-16 (Equation 9-8)

Limiting Capacity Per Anchor Group

$$\phi B_{nv} := \min\left(\phi B_{vnc}, \phi B_{vnpry}, \phi B_{vns} \right) = 14.59 \cdot kip$$

$$U := \frac{T_{br}}{\phi B_{nv}} = 5.26$$

check = "NG"

The brace connection is **non-compliant** with the check.

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S2 Quick-Checks
Connection Strength

Brace Properties
C4x7.25

Geometry

Flange

$t_f := 0.296in$

$b_f := 1.72in$

$\lambda_f := \frac{b_f}{t_f} = 5.81$

Web

$d := 4in$

$k := 0.75in$

$t_w := 0.321in$

$h := d - 2 \cdot k = 2.5 \cdot in$

$\lambda_w := \frac{h}{t_w} = 7.79$

Material

$F_y := 36ksi$ — Yield Strength
Record Drawings, S-1

$R_y := 1.5$ — *AISC 341-16 Table A3.1*

$E := 29000ksi$ — Steel MoE

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Ductility Requirement

Flange

$$\lambda_{md} := 0.40\sqrt{\frac{E}{R_y \cdot F_y}} = 9.27$$

$$U := \frac{\lambda_f}{\lambda_{md}} = 62.69 \cdot \%$$

check = "OK"

Web

$$\lambda_{md} := 1.57 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 36.38$$

$$U := \frac{\lambda_w}{\lambda_{md}} = 21.41 \cdot \%$$

check = "OK"

The brace connection is **compliant** with the check.

Middle Building

1.0 – SEISMIC LOADING:

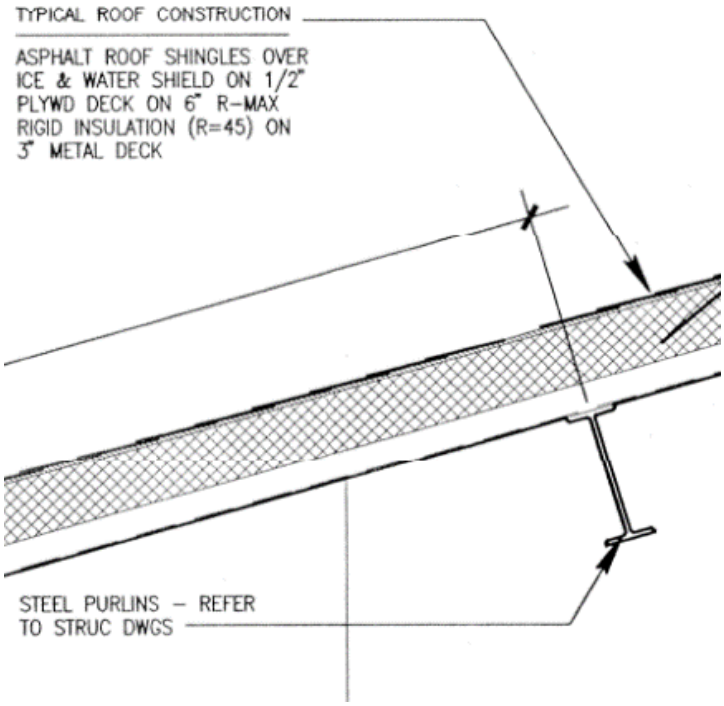
1.1 Building Weights
1.2 Seismic Hazard: ASCE 41
1.3 Seismic Forces
1.4 Base Shear Comparison

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

1.0 Typical Sloped Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Shingles	2.50	
Dead	Membrane	0.30	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.50	6" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**13.10**	**Summary**



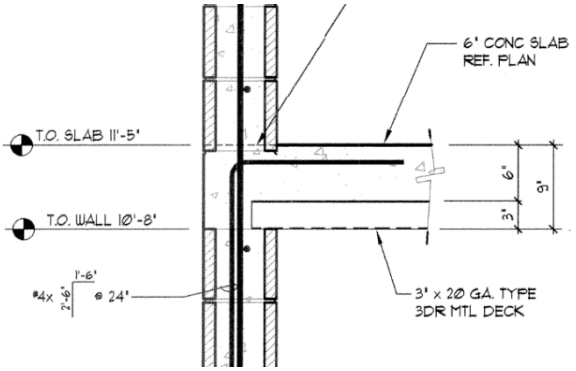
Above - 1 / A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

2.0 Boiler and Fan Room Floors - 6" SOD

Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab on deck	90.65	9" Total, 6" slab on PLW3 Verco deck + 3" 145pcf concrete
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**94.95**	**Summary**



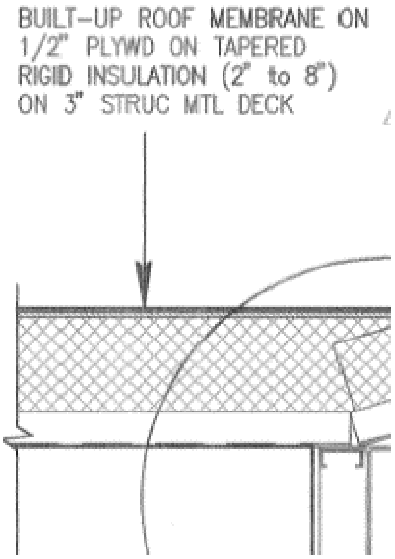
Above - 12 / S-11 of 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

3.0 Typical Built-Up Roof Weight:

Load Category	Item	Weight *(psf)*	Comment
Dead	Built-up roof membrane	5.50	
Dead	1/2" Plywood	1.50	
Dead	Rigid Insulation	1.25	5" (0.25 psf / in)
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustic Tiles	1.80	
Dead	Steel purlins	3.00	
	Multiplier	1.00	
Dead	**Total**	**15.55**	**Summary**



Above - 2 / A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Fan Room Corridor Floors - 2 1/2" SOD

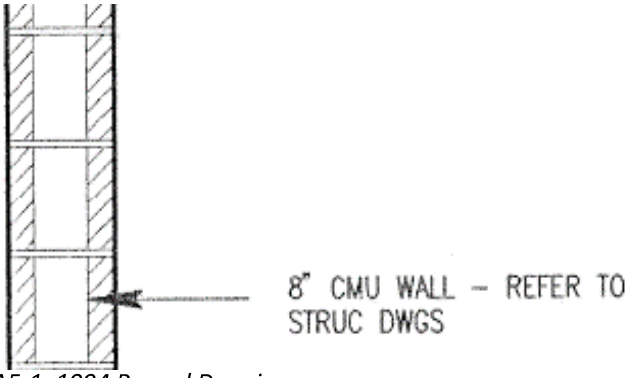
Load Category	Item	Weight *(psf)*	Comment
Dead	Concrete Slab	48.30	5 1/2" total, Verco catalog
Dead	3" 20ga Metal Deck	2.50	
Dead	Suspended Acoustical Tiles	1.80	
	Multiplier	1.00	
Dead	**Total**	**52.60**	**Summary**

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

4.0 Typical 8" CMU Single Wythe Corridor Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	8" CMU	86.00	135 pcf, fully grouted
	Multiplier	1.00	
Dead	**Total**	**86.00**	



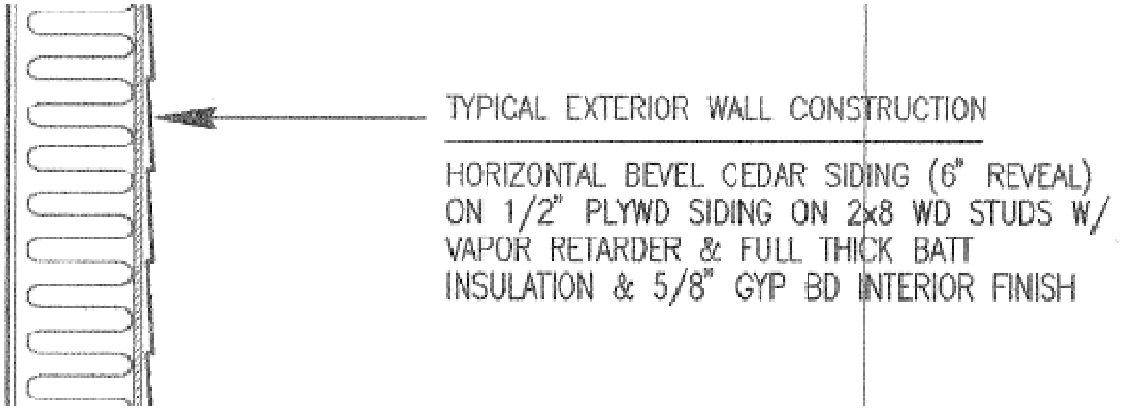
Above - 2/A5-1, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

5.0 Exterior Wall

Load Category	Item	Weight	Comment
		(psf)	
Dead	Cedar Siding	2.00	
Dead	1/2" plywood	1.5	
Dead	(2) 2x8 studs @ 16" OC	5.00	
Dead	Batt insulation	0.80	
Dead	5/8" Gyp	2.00	
	Multiplier	1.00	
Dead	**Total**	**11.30**	



Above - 4/A5-3, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Typical Building Weights

Name: NIC
Date: 11/10/2021

6.0 Typical CFS Wall

Load Category	Item	Weight *(psf)*	Comment
Dead	3 1/2" CFS Studs	0.59	Spaced 16" OC per 11 / S-11, 1994 Drawings
Dead	(2) layers 5/8" GWB	4.00	
Dead			
Dead			
Dead			
Dead	Multiplier	1.00	
Dead	**Total**	**4.59**	

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

1.0 - Floor & Roof Dead Weights

Floor	Sub Area	Trib. Area		Typ. Weight	Weight	Comments
(#)		(sf)		(psf)	(kip)	
(1) Mezzanine	*6" SoD*	3278		95	311	
	Total	**3278**			**311**	
(2) Roof	*Sloped Roof*	19142		13.1	251	
	Built-up Roof	3180		15.55	49	
	Total	**22322**			**300**	
∑ Floors	>>>>

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

3.0 - Wall Dead Weights - Tributary to Floor

Floor		Trib. Height	Length	Typ. Weight	Weight	Comments
(#)		(ft)	(ft)	(psf)	(kip)	
(1) Mezzanine	***Total***				***156***	***Total weight of walls trib to floor***
		5.8	*0*	*86.0*	*0*	*8" CMU - First Floor*
		3.1	*0*	*4.6*	*0*	*CFS - Second Floor*
		11.9	*153*	*86.0*	*156*	*8" CMU - Full Height*
(2) Roof	***Total***				***253***	***Total weight of walls trib to roof***
		8.8	*400*	*11.3*	*40*	*Wood - Full Height*
		8.8	*1023*	*4.6*	*41*	*CFS - Full Height*
		3.1	*0*	*4.6*	*0*	*CFS - Second Floor*
		8.8	*279*	*86.0*	*212*	*8" CMU - Full Height*

Project:
21156AN - ASD Tier 1
Seismic Weights

Name: NIC
Date: 11/10/2021

4.0 - Seismic Weights Tributary To Story

Floor (#)	Wall Weight (kip)	Floor Weight (kip)	20% Snow Weight (kip)		Seismic Weight (kip)	Comments
0						*Ground floor*
1	*156*	*311*	*0*		*468*	*Mezzanine*
2	*253*	*300*	*179*		*732*	*Roof*
∑ Floors	>>>>

Hazards by Location

Search Information

Address: williwaw elementary anchorage ak

Coordinates: 61.21115649999999, -149.7970792

Elevation: 157 ft

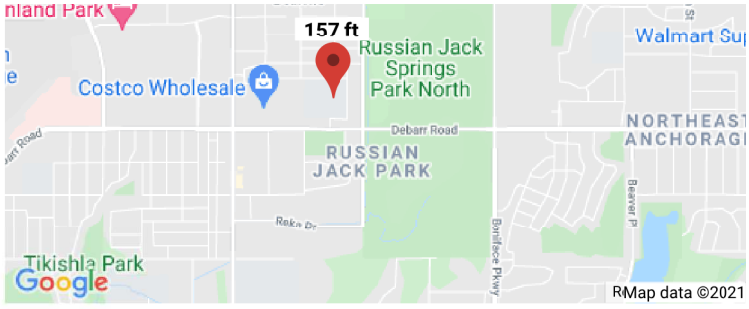
Timestamp: 2021-10-20T21:29:10.115Z

Hazard Type: Seismic

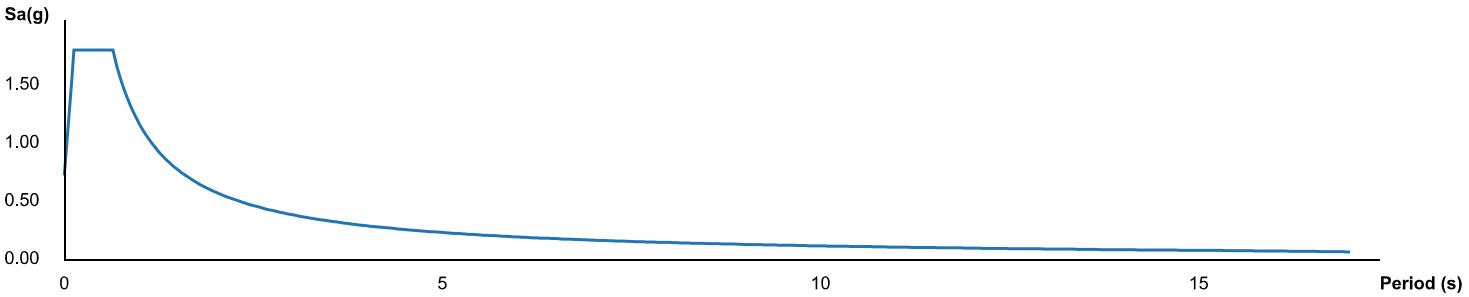
Reference Document: ASCE41-17

Site Class: D-default

Custom Probability:



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	1.707	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_S	1.111	Coefficient of risk (0.2s)
SsRT	1.897	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S_S	1.5	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.8	Site modified spectral response (0.2s)
S1UH	0.809	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR_1	1.036	Coefficient of risk (1.0s)
S1RT	0.839	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.68	Factored deterministic acceleration value (1.0s)
S_1	0.68	MCE_R ground motion (period=1.0s)
F_v	1.7	Site amplification factor at 1.0s
S_{X1}	1.156	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S_{XS}	1.2	Site modified spectral response (0.2s)
S_{X1}	0.771	Site modified spectral response (1.0s)

Hazard Level BSE-2E

Name	Value	Description
S_S	1.306	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	1.567	Site modified spectral response (0.2s)
S_1	0.597	MCE_R ground motion (period=1.0s)
F_v	1.703	Site amplification factor at 1.0s
S_{X1}	1.016	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.787	MCE_R ground motion (period=0.2s)
F_a	1.2	Site amplification factor at 0.2s
S_{XS}	0.944	Site modified spectral response (0.2s)
S_1	0.33	MCE_R ground motion (period=1.0s)
F_v	1.97	Site amplification factor at 1.0s
S_{X1}	0.651	Site modified spectral response (1.0s)

T_L Data

Name	Value	Description
T_L	16	Long-period transition period (s)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

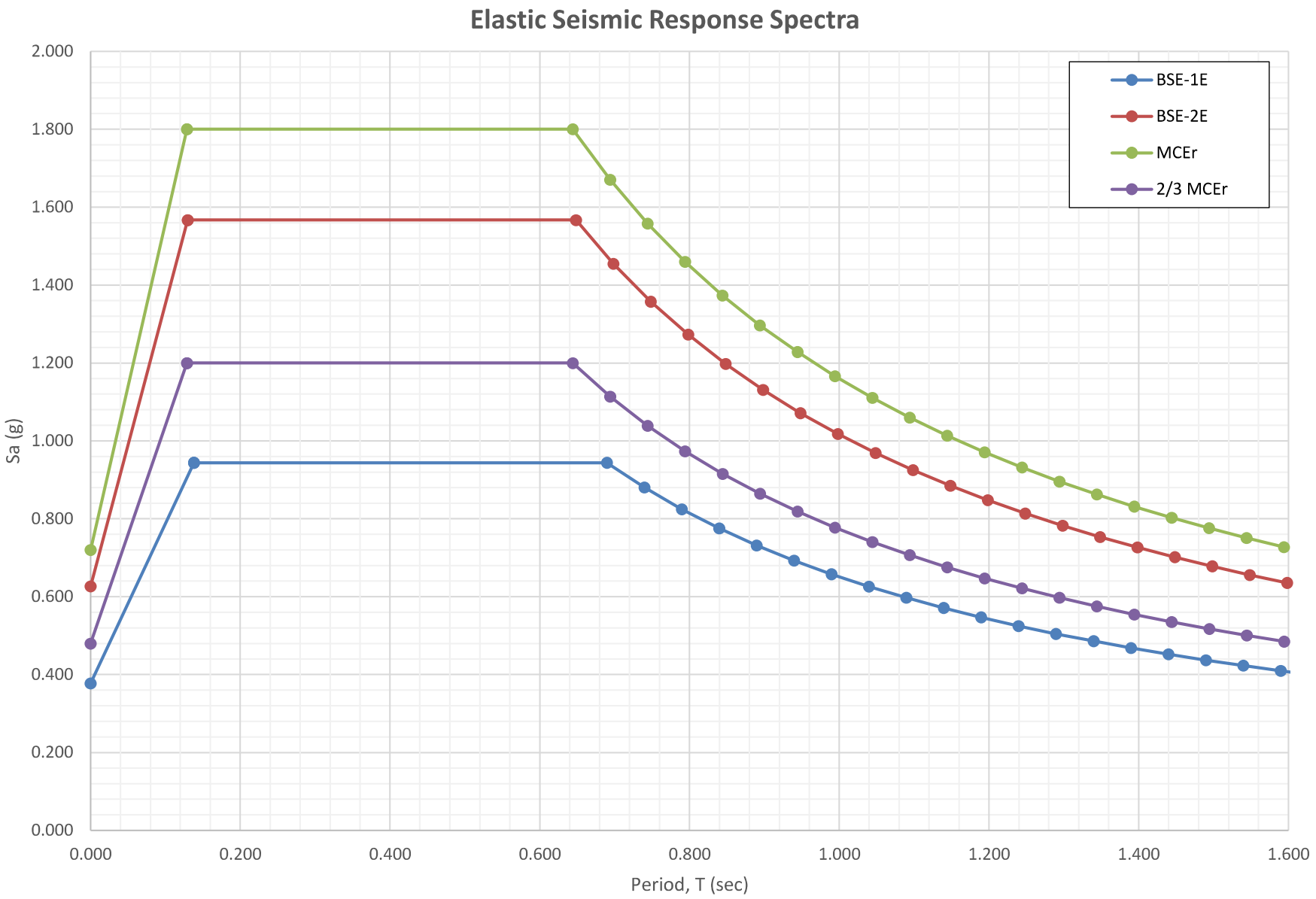
Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Project:
21156AN - ASD Tier 1
Seismic Response Spectra - Site Class D

C-193
Name: NIC
Date: 11/10/2021



1 - Seismic Base Shear: ASCE 41-17 Tier I Procedure

Notes: *1. Seismic Forces calculated following the Tier - III procedure of ASCE 41-17. Analysis Method used is the LSP*

Seismic Response Spectra Inputs			
BSE-1E	S_{x1}	0.651	(g)
	S_{xs}	0.944	(g)
	S_a	0.944	(g)
BSE-2E	S_{x1}	1.016	(g)
	S_{xs}	1.567	(g)
	S_a	1.567	(g)
Period	T	0.17	(sec)

Seismic Base Shears			
Weight	W	1314	(kip)
BSE - 1E	V_{1E}	1736	(kip)
BSE - 2E	V_{2E}	2882	(kip)

Comments:

$$S_a = \frac{S_{X1}}{T} < S_{XS} \quad Eq. 4-3$$

$$T = C_t H_n^{\beta} \quad \text{Eq. 4–4}$$

$$V = CS_aW \quad \text{Eq. 4-1}$$

$$C_{vx} = \frac{w_x h_x^k}{\sum w_i h_i^k} \quad \text{Eq. 4-2a}$$

$$F_i = C_{vx}V \quad \text{Eq. 4-2a}$$

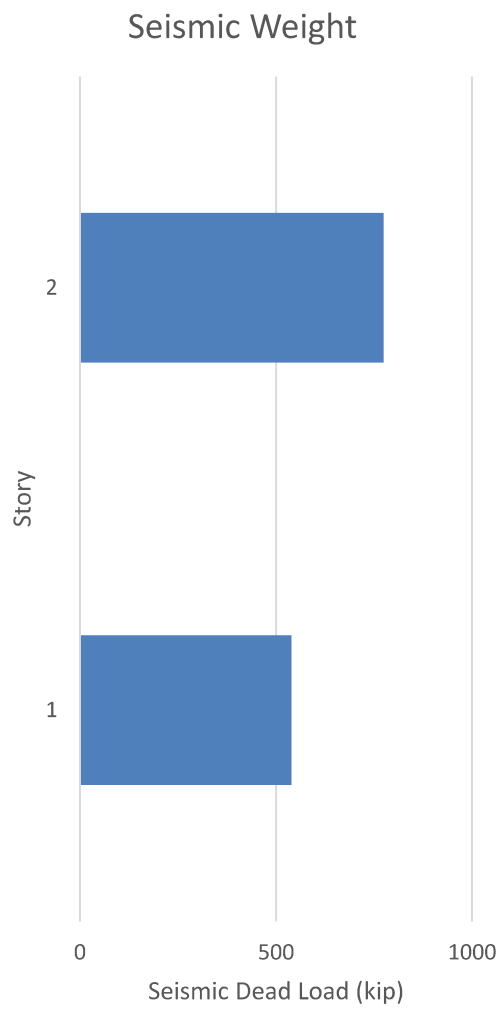
Seismic Base Shear - Tier 1 Method		
C	1.4	ASCE 41-17, Table 4-7
k	1.00	ASCE 41-17 Section 7.4.1.3.2

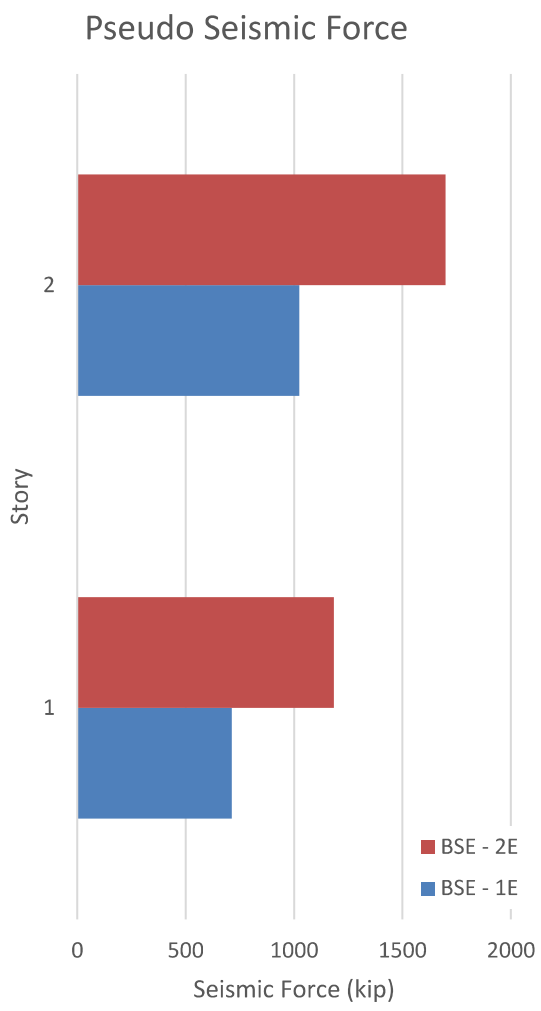
Approx. Structural Period (Method-2 Emperical)		
C_t	0.02	ASCE 41-17 Section 4.4.2.3
β	0.75	ASCE 41-17 Section 4.4.2.3
h_n	17.67	(ft) - Structural Height

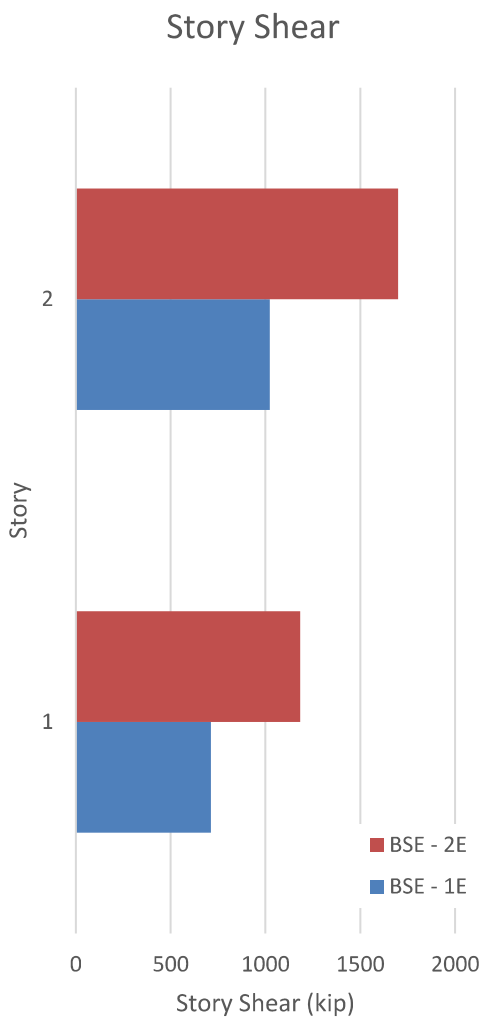
2 - Pseudo Seismic Forces Story Forces

				Seismic Weights Tributary:				BSE - 1E		BSE -2E	
			Story Height	Tot. Story	Diaphragm			Story	Story	Story	Story
	Floor	Elevation	h_{ix}	W_x	N-S W_{px}	E-W W_{px}	$w_x h_x^k$	Force	Shear	Force	Shear
		(ft)	(ft)	(kip)	(kip)	(kip)		F_x (kip)	V_x (kip)	F_x (kip)	V_x (kip)
Ground	0	0	0					-	-	-	-
Mezzanine	1	11.50	11.50	539			6201	713	713	1183	1183
Roof	2	17.67	6.17	774			13683	1023	1023	1699	1699
		Totals ->>	17.7	1,314			19,883	1,736	1,736	2,882	2,882

3 - Pseudo Seismic Forces Story Forces & Story Shear Plots:







PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/8/2021
By: NIC

Base Shear Comparision (1 of 2)

- **Notes:**
  1. IBC 2018 / ASCE 7-16 vs. 1991 UBC
  2. For derivation of building seismic weight see seismic load calculations.

- **Building Properties:**

$W_b := 1314 \cdot kip$ — Building seismic weight, total

$h_n := 17.67 \cdot ft$ — Height of roof

- **Base Shear: 1991 UBC**

$Z := 0.4$ — Zone 4 - Record drawings

$I_s := 1.25$ — Importance factor - Record Drawings

$R_w := 6.0$ — System Performance Factor, Record drawings

$C := 2.75$ — Record drawings

$$T_s := 0.035 \cdot \left(\frac{h_n}{ft}\right)^{0.75} \cdot s = 0.3\,s$$ — Eq 34-3 UBC

$$V_{s1} := \frac{Z \cdot I_s \cdot C}{R_w} \cdot W_b = 301.13 \cdot kip$$ — 1991 UBC Eq. 34-1 Base shear

$s_{a_UBC} := Z \cdot C = 1.1$ — Effective seismic acceleration

$$R_{eq} := \frac{R_w}{1.54} = 3.9$$ — Equivalent force reduction factor, "Ductile Design of Steel Structures", Burneau, Equation 7.53

PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN ASD T1

Date: 11/8/2021
By: NIC

Base Shear Comparision (2 of 2)

- **Base Shear: 2018 IBC & ASCE 7-16**

$c_t := 0.02$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$x := 0.75$ — ASCE 7-16 Table 12.8-2 fundamental period coefficient

$T_a := (\text{sec}) \cdot c_t \cdot \left(\frac{h_n}{\text{ft}}\right)^x = 0.17\,\text{s}$ — ASCE 7-16 Eq. 12.8-7 Approximate fundamental period

$I_e := 1.25$ — ASCE 7-16 Table 1.5-2 Importance factor, type III building

$S_{ds} := 1.2$

$S_{d1} := 0.773$ — Design spectral response acceleration, site class - D default

$R' := 2$ — Response modification coefficient, ASCE 7-16 Table 12.2.1 Ordinary Reinforced Masonry Walls

$C_s := \frac{S_{ds}}{\left(\frac{R'}{I_e}\right)} = 0.75$ — ASCE 7-16 Eq. 12.8-2, Seismic response coefficient

$V_{s2} := 0.7 C_s \cdot (W_b) = 689.85 \cdot \text{kip}$ — Seismic Base Shear, ASCE 7-16 Eq. 12.8-1

- **ASD - Seismic Base Shear Comparision**

$\frac{V_{s2}}{V_{s1}} = 229.09 \cdot \%$ — Increase in equivalent lateral force between original building code & 2018 IBC

$\frac{S_{ds}}{s_{a_UBC}} = 109.09 \cdot \%$ — Increase in seismic acceleration between original building code & 2018 IBC

$\frac{R'}{R_{eq}} = 51.33 \cdot \%$ — Decrease in percieved ductility between original building code & 2018 IBC

Middle Building

2.0 – QUICK-CHECKS:

2.1 Wood Frames (W2) Quick-Checks
2.2 Reinforced Masonry (RM1) Quick-Checks
2.3 Steel Light Frames (S3) Quick-Checks
2.4 Steel Braced Frame (S2) Quick-Checks

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	Trib. Seismic Shear *(kip)*	E-W SW Length *(ft)*	N-S SW Length *(ft)*	Max Stress *(plf)*	Comments
All	94	131	-	191.7	North Gym Wall
Maximum Stress (psi)				**191.7**	< 1000 plf (Plywood), ASCE 41-17, A3.2.7.1

System Modification Factor, Ms 3.75 Average of LS and CP

1 - Shear Wall Properties & Area

Type	Description	Area	X-Dir Tot. Area	Y-Dir Tot. Area
Wx		in^2/ft	in^2	in^2
W1	8" CMU - Mezzanine	91.5	19512	5376
W2	8" CMU - Roof	91.5	8578	0
	Total		28091	5376

2 - Shear Wall Areas: Mezzanine Interior Walls

Length X- Dir: (East - West)							Length Y- Dir: (North - South)						
W1	W2						W1	W2					
ft	ft						ft	ft					
213.25	93.75						58.75	0					
213.25	93.75					<< Total >>	58.75	0					
19512	8578					<< Area >>	5376	0					

Project:
21156AN - ASD Tier 1
RM1 Quick Checks

Name: NIC
Date: 11/10/2021

1.0 Shear Stress Checks

Area	EW Loading		NS Loading		Max Stress	Comments
	Trib Shear (kip)	SW Area (in^2)	Trib Shear (kip)	SW Area (in^2)	*(psi)*	
All	604	8578	0	0	18.8	Roof SW
All	1026	19512	1026	5376	50.9	Mezzanine SW
Maximum Stress (psi)					**50.9**	**< 70 psi, ASCE 41-17, A.3.2.4.1**

System Modification Factor, Ms 3.75 Average of LS and CP

2.0 Reinforcement Ratio Checks

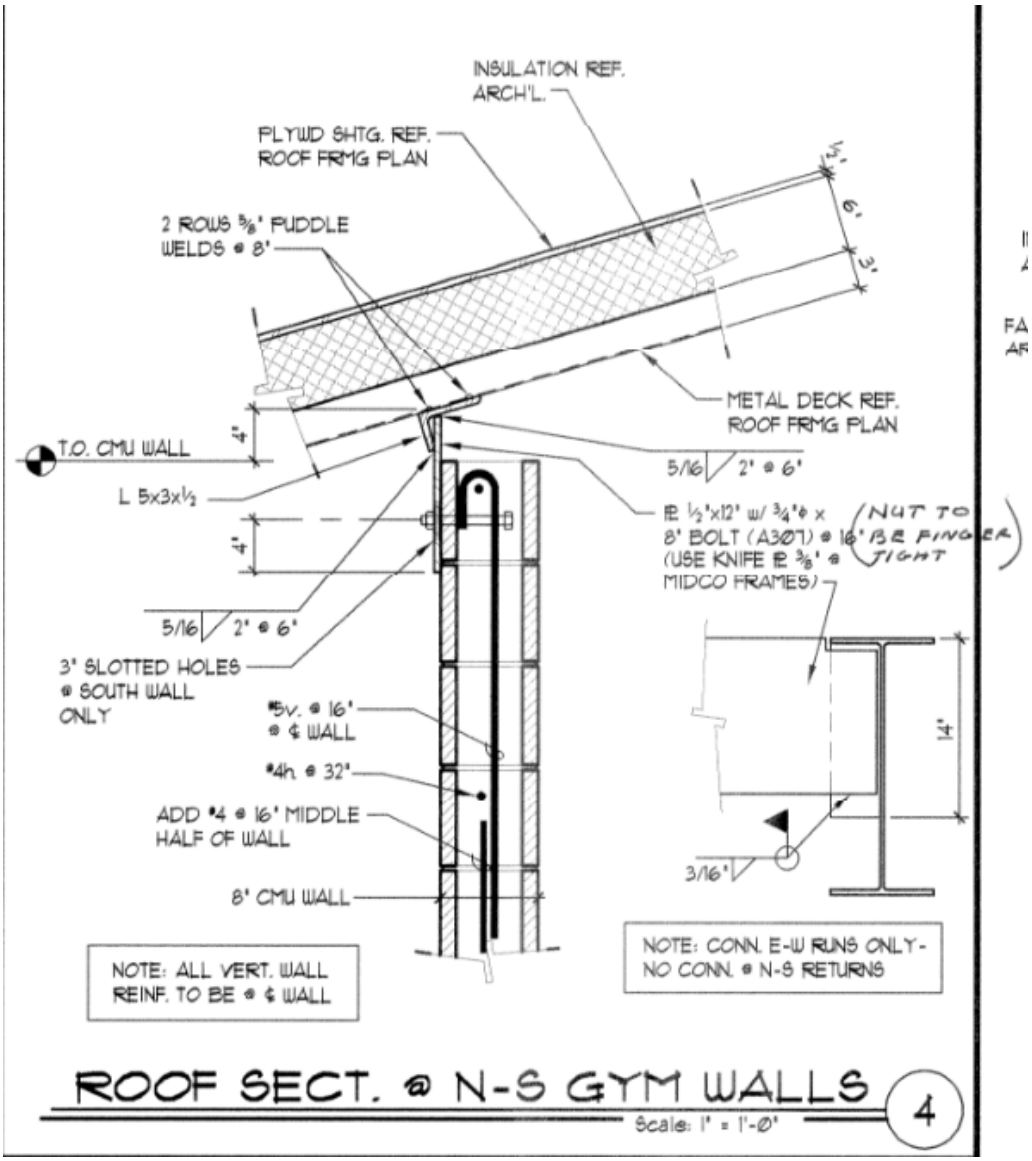
Wall Type	Net Area (in2/ft)	Vertical Bars				Horizontal Bars				Total Ratio	Comments
		Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio	Size (#)	Max Spacing (in)	Area (in2/ft)	Ratio		
W1	91.5	5	16	0.23010	0.00251	4	32.0	0.07363	0.00080	0.00332	8", fully grouted. 4,5,10/S-10
W2	91.5	5	24	0.15340	0.00168	4	32.0	0.07363	0.00080	0.00248	8", fully grouted. 9,15/S-10

Minimum total reinforcing steel ratio: 0.00248
Minimum reinforcing steel ratio in either direction: 0.00080
Maximum reinforcing spacing (in): 32

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

ASCE 41-17 Quick-Checks:
Exterior CMU Out-of-Plane Connection Capacity

Connection - C1:



4 / S-12 1994 Record Drawings

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

Connection Strengths and Geometry - 8" Wall

Masonry

$f'_m := 1500psi$ — *Record Drawings, 1994 S-1*

Anchors

$f_y := 49ksi$ — Headed stud yield strength

$l_b := 7.5in$ — Length of embedment

$l_e := \frac{7.625in}{2} = 3.81 \cdot in$ — Edge distance of anchor *Assumed*

$d_b := \frac{3}{4}in$ — Diameter of anchor

$n_b := 1$ — Number of anchors

$s_b := 16in$ — Anchor spacing

$A_b := \frac{\pi}{4} \cdot \left(d_b\right)^2 = 0.44 \cdot in^2$ — Cross-sectional area of anchor

Plate

$F_{y_pl} := 36ksi$ — Plate yield strength

$t_{pl} := 0.5in$ — Plate thickness

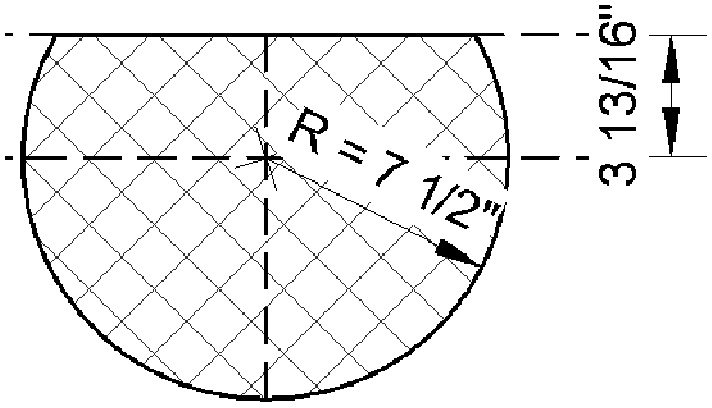
$l_{e_pl} := 1in$ — Overhang length of plate to CMU / Angle (assumed)

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Anchor Projected Areas

Tension

$$A'_{pt} := 0.99ft^2 = 142.56 \cdot in^2$$



Above - Tension cone overlapped area

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Anchorage Capacity

Masonry Tensile Breakout

$$\phi B_{anb} := 0.5 \cdot 4 \cdot A'_{pt} \cdot \sqrt{\frac{f'_m}{psi}} \cdot psi = 11.04 \cdot kip$$

TMS 402-16 (Equation 9-1)

$$\phi B_{ans} := 0.9 \cdot A_b \cdot f_y = 19.48 \cdot kip$$

TMS 402-16 (Equation 9-2)

Limiting Capacity Per Anchor Group

$$\phi B_{nv} := \min\left(\phi B_{anb}, \phi B_{ans}\right) = 11.04 \cdot kip$$

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Plate Bending

$$Z_x := \frac{s_b \cdot t_{pl}^2}{4} = 1 \cdot in^3$$

Effective plastic section modulus of plate

$$\phi P_n := \frac{0.9 \cdot F_{y_pl} \cdot Z_x}{\max\left(l_{e_pl}, l_e\right)} = 8.5 \cdot kip$$

Plate out-of-plane capacity

Plate Weld

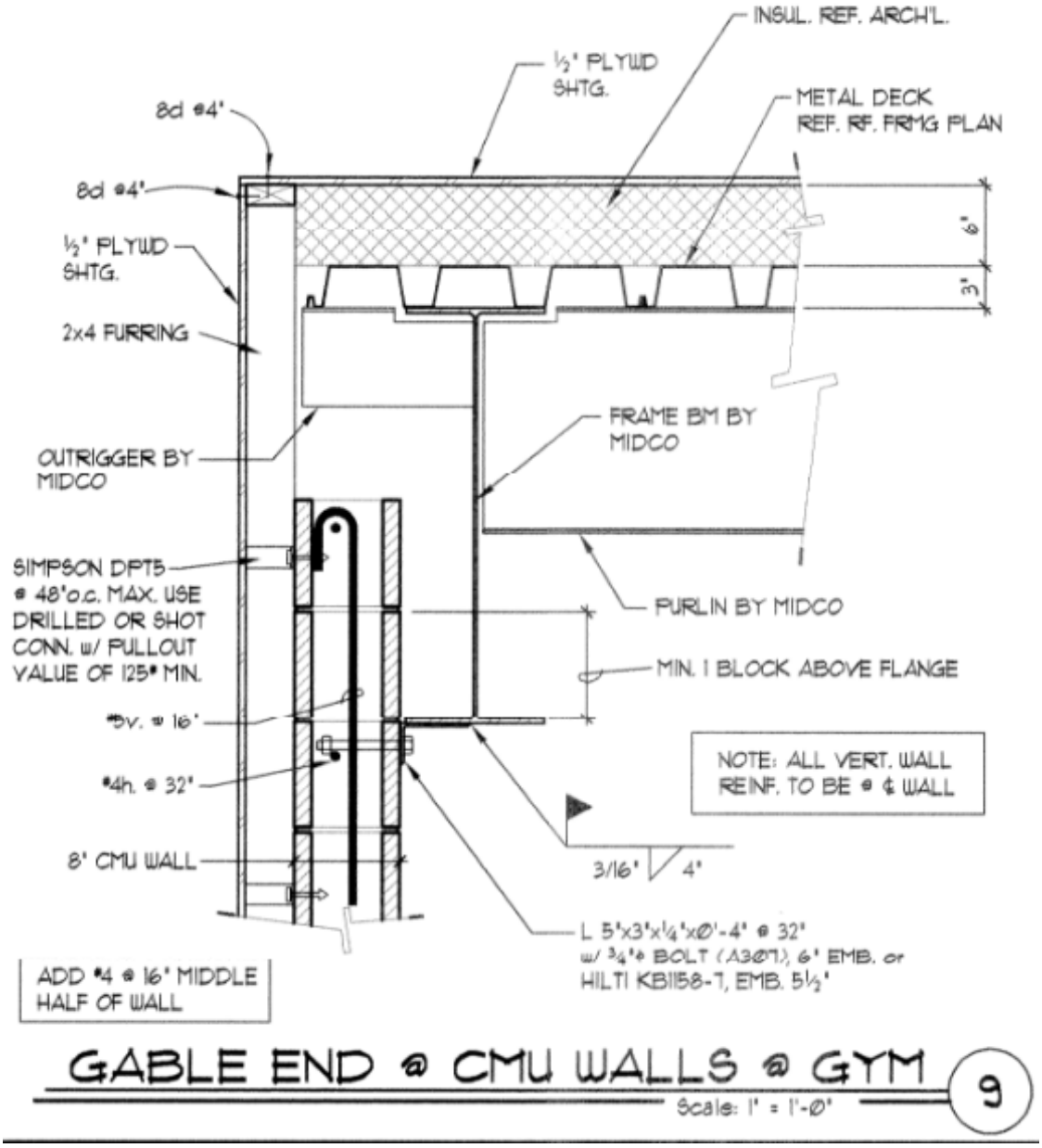
By inspection, plate welds will not govern.

Connection Capacity

$$\phi R_n := \min\left(\phi B_{nv}, \phi P_n\right) = 8.5 \cdot kip$$

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Connection - C2:



9 / S-12 1994 Record Drawings

Furring will not resist out-of-plane load of CMU wall. All load will travel into steel frame.

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Connection Strengths and Geometry

Masonry

$f'_m := 1500psi$ — *Record Drawings, 1999 S0.1*

Anchors

$f_y := 49ksi$ — Headed stud yield strength

$l_b := 5.5in$ — Length of embedment

$l_e := 2 \cdot 7.625in = 15.25 \cdot in$ — Edge distance of anchor *Assumed*

$d_b := \frac{3}{4}in$ — Diameter of anchor

$n_b := 1$ — Number of anchors

$s_b := 32in$ — Anchor spacing within connection

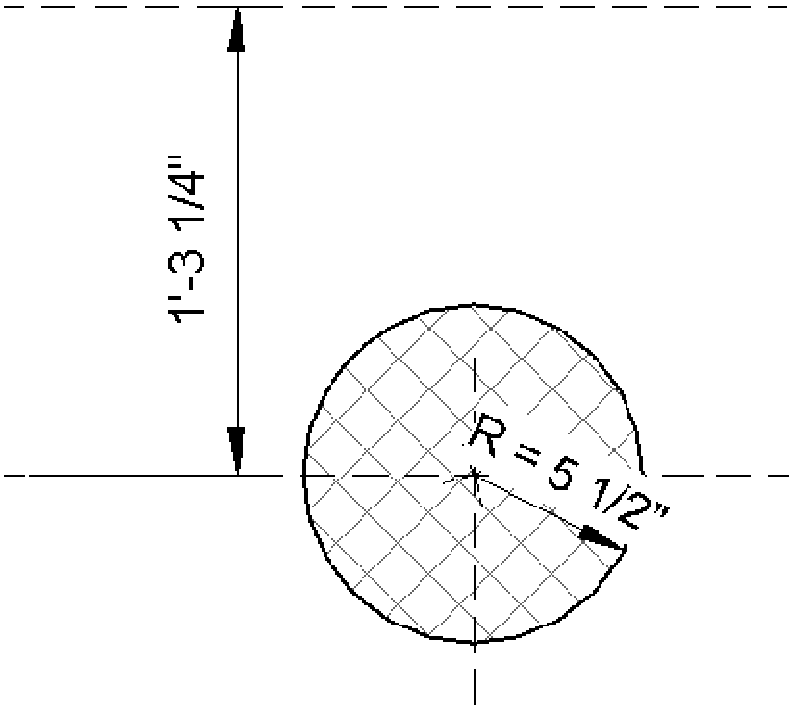
$A_b := \frac{\pi}{4} \cdot \left(d_b\right)^2 = 0.44 \cdot in^2$ — Cross-sectional area of anchor

ASD Tier 1 Inspections: Baxter Elementary 21156AN	Respec 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/5/2021

Anchor Projected Areas

Tension

$A'_{pt} := 0.66ft^2 = 95.04 \cdot in^2$



Above - Tension cone overlapped area

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Anchorage Capacity

Masonry Tensile Breakout

$$\phi B_{anb} := 0.5 \cdot 4 \cdot A'_{pt} \cdot \sqrt{\frac{f'_m}{psi}} \cdot psi = 7.36 \cdot kip$$

TMS 402-16 (Equation 9-1)

$$\phi B_{ans} := 0.9 \cdot A_b \cdot f_y = 19.48 \cdot kip$$

TMS 402-16 (Equation 9-2)

Limiting Capacity Per Anchor Group

$$\phi B_{nv} := \min\left(\phi B_{anb}, \phi B_{ans}\right) = 7.36 \cdot kip$$

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Angle Flexural Capacity

$l_{e_ang} := 1.5in$ Edge distance of angle (assumed)

$$Z_x := \frac{4in \cdot 0.25in^2}{4} = 0\,gal$$

$$\phi P_n := \frac{0.9 \cdot Z_x \cdot F_{y_pl}}{l_{e_ang}} = 5.4 \cdot kip$$

Angle Weld

$\phi R_{n_w} := 1.392 \cdot 3 \cdot 4in \cdot kpi = 16.7 \cdot kip$ *AISC SCM 15th (8-1)*

Angle Prying Action

$F_u := 58ksi$

$t_{ang} := 0.25in$

$b := l_{e_ang} = 1.5 \cdot in$

$$b' := b - \frac{d_b}{2} = 1.13 \cdot in$$

$p := \min(4in, 2 \cdot 1.75b) = 4 \cdot in$

$$t_{np} = \sqrt{\frac{4 \cdot T_u \cdot b'}{0.9 \cdot p \cdot F_u}}$$ *AISC SCM 15th (9-17a)*

$$T_u := \frac{t_{ang}^2 \cdot 0.9 \cdot p \cdot F_u}{4 \cdot b'} = 2.9 \cdot kip$$ Maximum tension to avoid prying action on bolt

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Prying Tension

$B_c := \phi B_{nv} = 7.36 \cdot kip$

Prying will occur. The maximum tension force per bolt, including prying effects, is:

$t_c := \sqrt{\frac{4 \cdot B_c \cdot b'}{0.9 \cdot p \cdot F_u}} = 0.4 \cdot in$ *AISC SCM 15th (9-26a)*

$a := b = 1.5 \cdot in$

$d' := d_b + \frac{1}{16} in = 0.81 \cdot in$

$\delta := 1 - \frac{d'}{p} = 0.8$ *AISC SCM 15th (9-20)*

$a' := \min\left(a + \frac{d_b}{2}, 1.25 \cdot b + \frac{d_b}{2}\right) = 1.87 \cdot in$ *AISC SCM 15th (9-23)*

$\rho := \frac{b'}{a'} = 0.6$ *AISC SCM 15th (9-22)*

$\alpha' := \frac{1}{\delta \cdot (1 + \rho)} \cdot \left[\left(\frac{t_c}{t_{ang}}\right)^2 - 1\right] = 1.21$ *AISC SCM 15th (9-28)*

$Q := \left(\frac{t_{ang}}{t_c}\right)^2 \cdot (1 + \delta \cdot \alpha') = 0.77$ *AISC SCM 15th (9-27)*

$T_c := B_c \cdot Q = 5688.6\,lbf$ Tensile capacity, including prying effects.

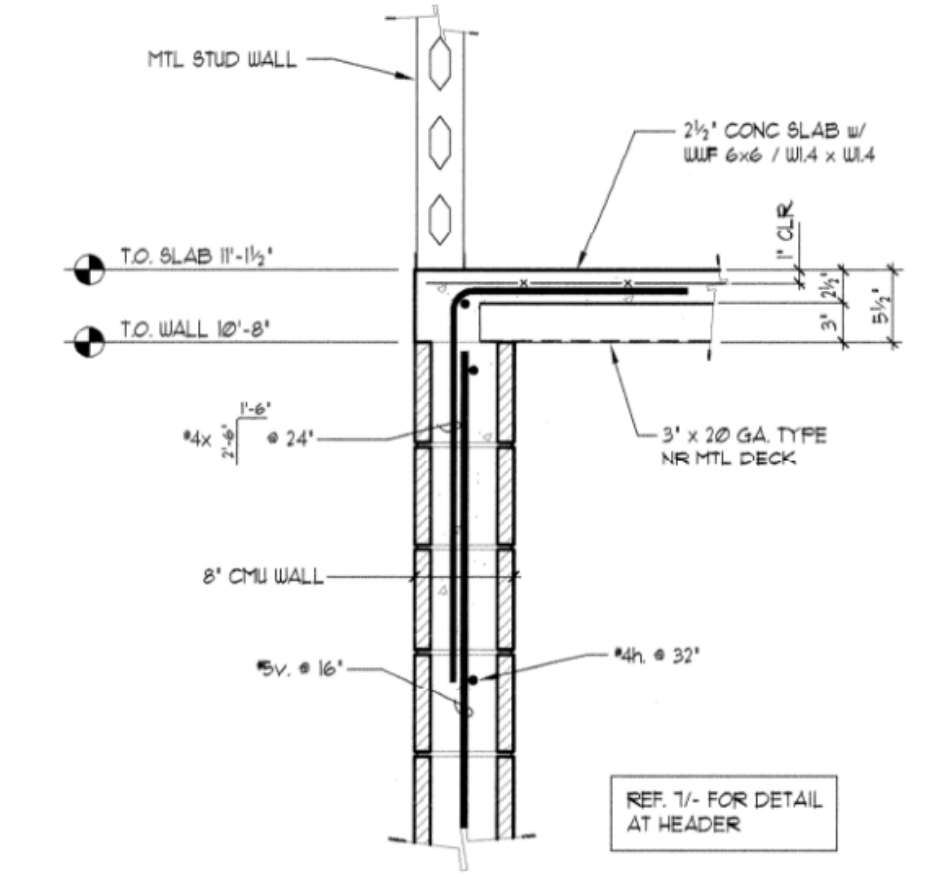
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Connection Capacity

$$\phi R_n := \min\left(\phi B_{nv}, \phi R_{n_w}, \phi P_n, T_c\right) = 5400\,\text{lbf}$$

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Connection - C3:



CORRIDOR CEILING SECTION 1
Scale: 1" = 1'-0"

1 / S-11, 1994 Record Drawings

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Connection Strengths and Geometry

Concrete and Reinforcement

$f'_c := 4000psi$ — Concrete compressive strength
1994 Record Drawings, S-1

$c_c := 1in$ — Clear concrete cover

$f_{yr} := 60ksi$ — Reinforcement yield strength

$d_{br} := \frac{4in}{8} = 0.5 \cdot in$ — Diameter of reinforcing bars

Reinforcement Development into Slab-on-Deck

$\psi_t := 1.0 \quad \psi_e := 1.0 \quad \psi_g := 1.0 \quad \lambda := 1.0$ — *ACI 318-19 Table 25.4.2.5*

$$l_d := \frac{\frac{f_{yr}}{psi} \cdot \psi_t \cdot \psi_e \cdot \psi_g}{25\lambda \cdot \sqrt{\frac{f'_c}{psi}}} \cdot d_{br} = 18.97 \cdot in$$

ACI 318-19 Table 25.4.2.3

Detail shows 18" leg for bent bar. Consider bar fully developed.

Shear Yielding of Reinforcement

$$\phi R_n := 1.0 \cdot 0.6 \cdot f_{yr} \cdot \left(\frac{\pi}{4} \cdot d_{br}^{\,2} \right) = 7.07 \cdot kip$$

AISC 360-16 (J4-3)

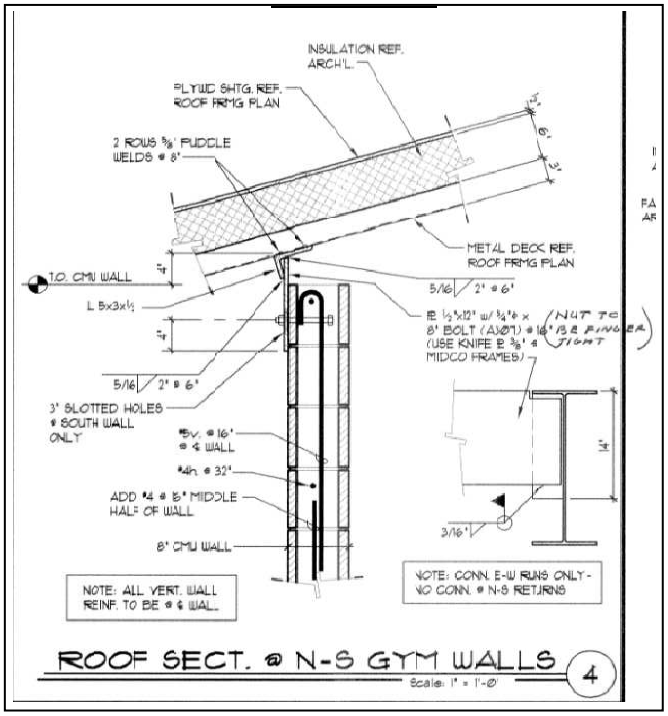
Project:
21156AN - ASD Tier 1
Quick-Checks

C-217
Name: NIC
Date: 11/10/2021

Inputs		
Ψ	1.15	Average of CP and LS
Sxs	1.567	BSE-2E

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C1	Roof	North Gym Wall	86	1.33	14	2886	8500	8" CMU, Fully grouted
	Roof	South Gym Wall	86	1.33	7	1443	8500	8" CMU, Fully grouted

C1 connections are compliant with quick check calculation.



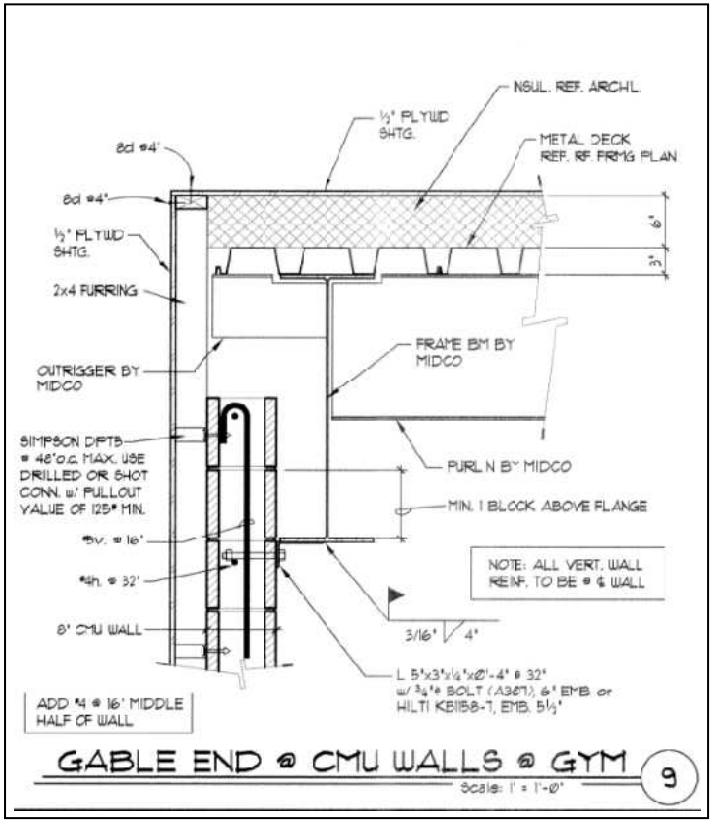
4 / S-12, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Quick-Checks

C-218
Name: NIC
Date: 11/10/2021

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C2	Low Roof	E & W Gym Walls	86	2	14	4339	5400	8" CMU, Fully grouted

C2 connections are non-compliant with quick check calculation.



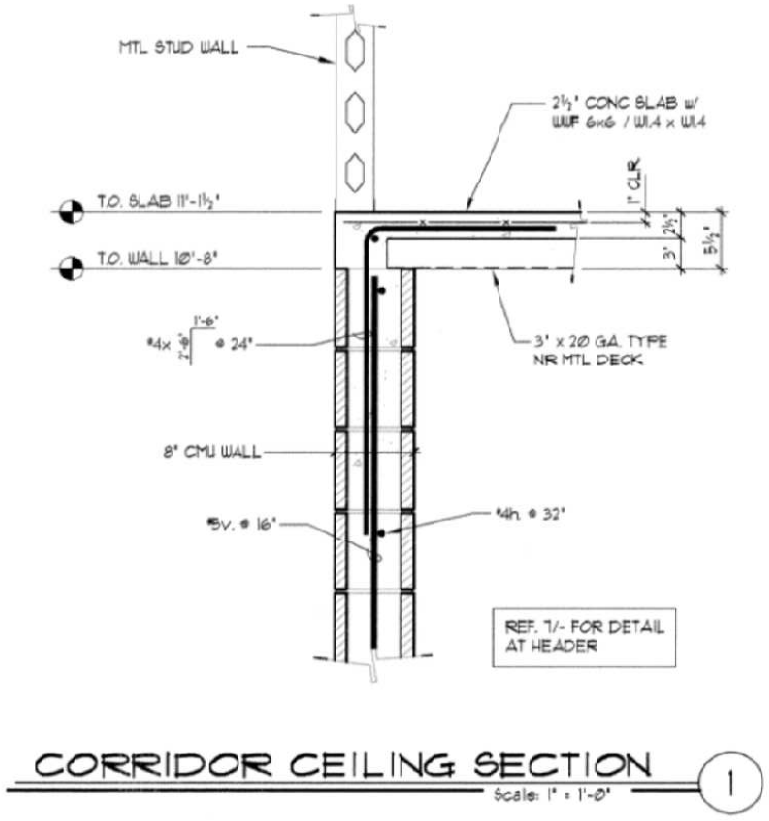
9 / S-12, 1994 Record Drawings

Project:
21156AN - ASD Tier 1
Quick-Checks

C-219
Name: NIC
Date: 11/10/2021

Connection	Floor	Grid / Area	Wp (psf)	Spacing (ft)	Trib Height (ft)	Demand (lbf)	Capacity (lbf)	Comments
C3	Mezzanine	All corridors	86	2	5.5	1705	5400	8" CMU, grouted 16" OC

C3 connections are compliant with quick check calculation.



1 / S-11, 1994 Record Drawings

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S3 Quick-Checks
Compact Members

$E := 29000ksi$ — Steel modulus of elasticity

$F_y := 50ksi$ — A-572, A-570 or A-529 Plate
C-1
MIDCO Permit Drawings

$R_y := 1.1$ — *AISC 341-16*
Table A3.1

Limiting Width-to-Thickness Ratios

Flanges of I-shaped sections

$$\lambda_{md_f} := 0.4 \cdot \sqrt{\frac{E}{R_y \cdot F_y}} = 9.18$$

AISC 341-16
Table D1.1

Webs of rolled or built-up I-shaped sections

$$C_a = \frac{P_u}{\phi_c \cdot P_y}$$

AISC 341-16
Table D1.1

$$\lambda_{md_w}(C_a) := \begin{cases} 3.96\left(1 - 3.04 \cdot C_a\right) \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{if } C_a \le 0.114 \\ \max\left[1.29 \cdot \left(2.12 - C_a\right), 1.57\right] \cdot \sqrt{\frac{E}{R_y \cdot F_y}} & \text{otherwise} \end{cases}$$

AISC 341-16
Table D1.1

$\lambda_{md_w_max} := \lambda_{md_w}(0) = 90.93$ — Minimum limiting web ratio (Pu = 0)

$\lambda_{md_w_min} := \lambda_{md_w}(1) = 36.05$ — Minimum limiting web ratio (Pu = ϕPn)

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Frame Properties

Grid Lines "J" Through "P"

$b_{fo} := (12 \quad 12 \quad 8 \quad 8 \quad 10 \quad 12 \quad 7)^T$ in — Width of outside flanges

$t_{fo} := (0.625 \quad 0.625 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5 \quad 0.25)^T$ in — Thickness of inside flanges

$b_{fi} := (14 \quad 14 \quad 8 \quad 8 \quad 12 \quad 12 \quad 7)^T$ in — Width of inside flanges

$t_{fi} := (0.75 \quad 0.625 \quad 0.375 \quad 0.375 \quad 0.625 \quad 0.625 \quad 0.25)^T$ in — Thickness of inside flanges

$t_w := (0.25 \quad 0.3125 \quad 0.25 \quad 0.25 \quad 0.25 \quad 0.25 \quad 0.1875)^T$ in — Thickness of webs

$h_{max} := (34 \quad 34 \quad 34 \quad 34 \quad 34 \quad 35.1 \quad 18)^T$ in — Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (9.6 \quad 9.6 \quad 10.67 \quad 10.67 \quad 10 \quad 12 \quad 14)$ — Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.33 \quad 11.2 \quad 10.67 \quad 10.67 \quad 9.6 \quad 9.6 \quad 14)$ — Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ — Width-to-thickness ratios of webs

$\lambda_w = (136 \quad 108.8 \quad 136 \quad 136 \quad 136 \quad 140.4 \quad 96)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

All members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "J" Through "P", Grids 5.2 - 9

$b_{fo} := (12 \quad 12 \quad 8 \quad 8 \quad 10 \quad 12 \quad 7)^T$ in — Width of outside flanges

$t_{fo} := (0.625 \quad 0.625 \quad 0.375 \quad 0.375 \quad 0.5 \quad 0.5 \quad 0.25)^T$ in — Thickness of inside flanges

$b_{fi} := (14 \quad 14 \quad 8 \quad 8 \quad 12 \quad 12 \quad 7)^T$ in — Width of inside flanges

$t_{fi} := (0.75 \quad 0.625 \quad 0.375 \quad 0.375 \quad 0.625 \quad 0.625 \quad 0.25)^T$ in — Thickness of inside flanges

$t_w := (0.25 \quad 0.3125 \quad 0.25 \quad 0.25 \quad 0.25 \quad 0.25 \quad 0.1875)^T$ in — Thickness of webs

$h_{max} := (34 \quad 34 \quad 34 \quad 34 \quad 34 \quad 35.1 \quad 18)^T$ in — Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (9.6 \quad 9.6 \quad 10.67 \quad 10.67 \quad 10 \quad 12 \quad 14)$ — Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (9.33 \quad 11.2 \quad 10.67 \quad 10.67 \quad 9.6 \quad 9.6 \quad 14)$ — Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ — Width-to-thickness ratios of webs

$\lambda_w = (136 \quad 108.8 \quad 136 \quad 136 \quad 136 \quad 140.4 \quad 96)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

All members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "J", "K", "N" & "P"

$b_{fo} := (8 \quad 8 \quad 8 \quad 10 \quad 8)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (8 \quad 8 \quad 8 \quad 10 \quad 8)^T \text{ in}$ Width of inside flanges

$t_{fi} := (0.375 \quad 0.375 \quad 0.375 \quad 0.375 \quad 0.375)^T \text{ in}$ Thickness of inside flanges

$t_w := (0.1875 \quad 0.25 \quad 0.25 \quad 0.1875 \quad 0.25)^T \text{ in}$ Thickness of webs

$h_{max} := (33.95 \quad 34 \quad 34 \quad 25.04 \quad 17)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10.67 \quad 10.67 \quad 10.67 \quad 13.33 \quad 10.67)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (10.67 \quad 10.67 \quad 10.67 \quad 13.33 \quad 10.67)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (181.07 \quad 136 \quad 136 \quad 133.55 \quad 68)$

$\lambda_{md_w_max} = 90.93$

4/5 members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

All members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Lines "L" & "M"

$b_{fo} := (10 \quad 12 \quad 8 \quad 10 \quad 8)^T \text{ in}$ Width of outside flanges

$t_{fo} := (0.375 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375)^T \text{ in}$ Thickness of inside flanges

$b_{fi} := (10 \quad 12 \quad 8 \quad 10 \quad 8)^T \text{ in}$ Width of inside flanges

$t_{fi} := (0.375 \quad 0.5 \quad 0.375 \quad 0.375 \quad 0.375)^T \text{ in}$ Thickness of inside flanges

$t_w := (0.1875 \quad 0.25 \quad 0.3125 \quad 0.25 \quad 0.25)^T \text{ in}$ Thickness of webs

$h_{max} := (33.95 \quad 34 \quad 34 \quad 33.97 \quad 17)^T \text{ in}$ Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (13.33 \quad 12 \quad 10.67 \quad 13.33 \quad 10.67)$ Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (13.33 \quad 12 \quad 10.67 \quad 13.33 \quad 10.67)$ Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ Width-to-thickness ratios of webs

$\lambda_w = (181.07 \quad 136 \quad 108.8 \quad 135.88 \quad 68)$

$\lambda_{md_w_max} = 90.93$

4/5 members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

All members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Line "1"

$b_{fo} := (10 \quad 12 \quad 8 \quad 8)^T \text{ in}$ — Width of outside flanges

$t_{fo} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375)^T \text{ in}$ — Thickness of inside flanges

$b_{fi} := (10 \quad 12 \quad 8 \quad 8)^T \text{ in}$ — Width of inside flanges

$t_{fi} := (0.5 \quad 0.5 \quad 0.375 \quad 0.375)^T \text{ in}$ — Thickness of inside flanges

$t_w := (0.3125 \quad 0.25 \quad 0.25 \quad 0.1875)^T \text{ in}$ — Thickness of webs

$h_{max} := (32.06 \quad 34 \quad 34 \quad 34)^T \text{ in}$ — Maximum depth of webs

$\lambda_{md_f} = 9.18$

$\lambda_{fo} := \frac{b_{fo}}{2 \cdot t_{fo}}^T = (10 \quad 12 \quad 10.67 \quad 10.67)$ — Width-to-thickness ratios of outside flanges

$\lambda_{fi} := \frac{b_{fi}}{2 \cdot t_{fi}}^T = (10 \quad 12 \quad 10.67 \quad 10.67)$ — Width-to-thickness ratios of inside flanges

$\lambda_w := \frac{h_{max}}{t_w}^T$ — Width-to-thickness ratios of webs

$\lambda_w = (102.59 \quad 136 \quad 136 \quad 181.33)$

$\lambda_{md_w_max} = 90.93$

All members fail to meet slenderness ratio for webs.

All members fail to meet slenderness ratio for outside flange.

All members fail to meet slenderness ratio for inside flange.

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Frame Properties

Grid Line "5.1"

Column

$b_f := 10in$ Flange width

$t_f := 0.5in$ Flange thickness

$h := 13in$ Web height

$t_w := 0.188in$ Web thickness

$\lambda_w := \frac{h}{t_w} = 69.15$ Column web slenderness ratio

$\lambda_{md_w_max} = 90.93$ Limiting web slenderness ratio

$\lambda_f := \frac{b_f}{t_f} = 20$

$\lambda_{md_f} = 9.18$

Column web is compliant with slenderness ratio.
Column flange is noncompliant with slenderness ratio.

Beam

$b_f := 10in$ Flange width

$t_f := 0.5in$ Flange thickness

$h := 21in$ Web height

$t_w := 0.188in$ Web thickness

$\lambda_w := \frac{h}{t_w} = 111.7$ Column web slenderness ratio

$\lambda_{md_w_max} = 90.93$ Limiting web slenderness ratio

$\lambda_f := \frac{b_f}{t_f} = 20$

$\lambda_{md_f} = 9.18$

Beam web is noncompliant with slenderness ratio.
Beam flange is noncompliant with slenderness ratio.

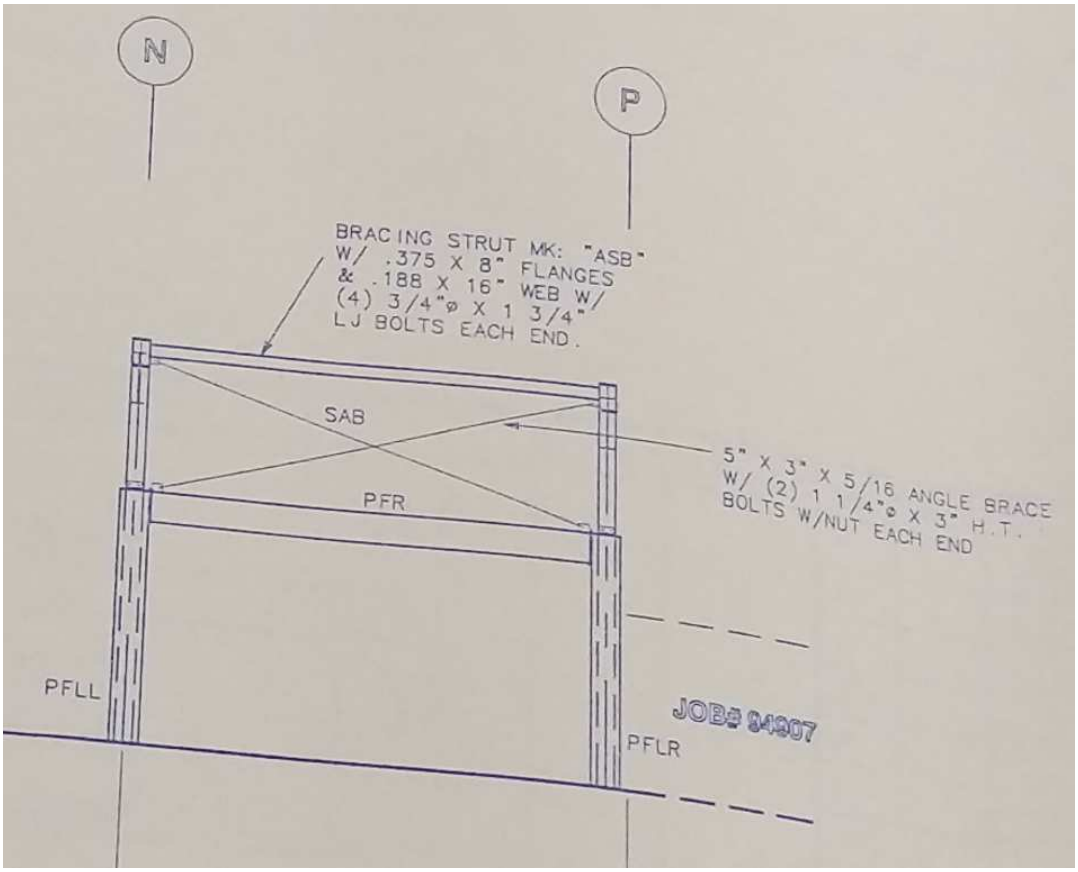
PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN - ASD Tier 1
(1 of 3)

Date: 11/10/2021
By: NIC

ASCE 41-17 Quick-Checks: Brace Axial Stress



Above - Typical bracing at Grid 5.1 (between grids J-K and N-P). Per Midco 1994 drawings, sheet S-7.

PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN - ASD Tier 1
(2 of 3)

Date: 11/10/2021
By: NIC

- **Notes:**
  1. *Reference ASCE 41-17 4.4.3.4*
  2. *Record drawings, 1994*

- **Brace Axial Stress - Braces: C4x7.25**

$F_y := 36ksi$ — *Record Drawings, 1994 S0.1*

$F_{ye} := 1.25 \cdot F_y = 45 \cdot ksi$ — Expected yield strength, per ASCE 41-17 Table 4-9 Footnotes

$M_s := \frac{3.5 + 2.5}{2} = 3$ — "Tension only" members modification factor, damage control limit state @ BSE-2E *ASCE Table 4-9*

$s_{avg} := 28ft$ — Average effective span, all braced frames

$z_{bf_top} := 20ft$ — Top elevation of braces *Midco 1994 Shop Drawings 94908N*

$z_{bf_base} := 15ft$ — Base elevation of braces *Midco 1994 Drawings Sheet S-7*

$L_{br} := \sqrt{\left(z_{bf_top} - z_{bf_base}\right)^2 + s_{avg}^2}$ — Average length of braces

$L_{br} = 28.44\,ft$

$A_{br} := 2.41in^2$ — Average x-sectional area of a diagonal brace

$V_{2E} := 1606kip$ — Story shear at BSE-2E

$B := 153.5ft$ — Total width of building

$b_{trib} := \frac{38ft + 97.5ft}{2}$ — Tributary width of braced frames

$n_{br} := 2$ — Number of braced frames resisting shear

$V_{trib} := V_{2E} \cdot \frac{b_{trib}}{B} = 708.84 \cdot kip$ — Tributary shear to braced frame

PDC ENGINEERS
PLAN • DESIGN • CONSTRUCT

Design Sheet

PROJECT: 21156AN - ASD Tier 1
(3 of 3)

Date: 11/10/2021
By: NIC

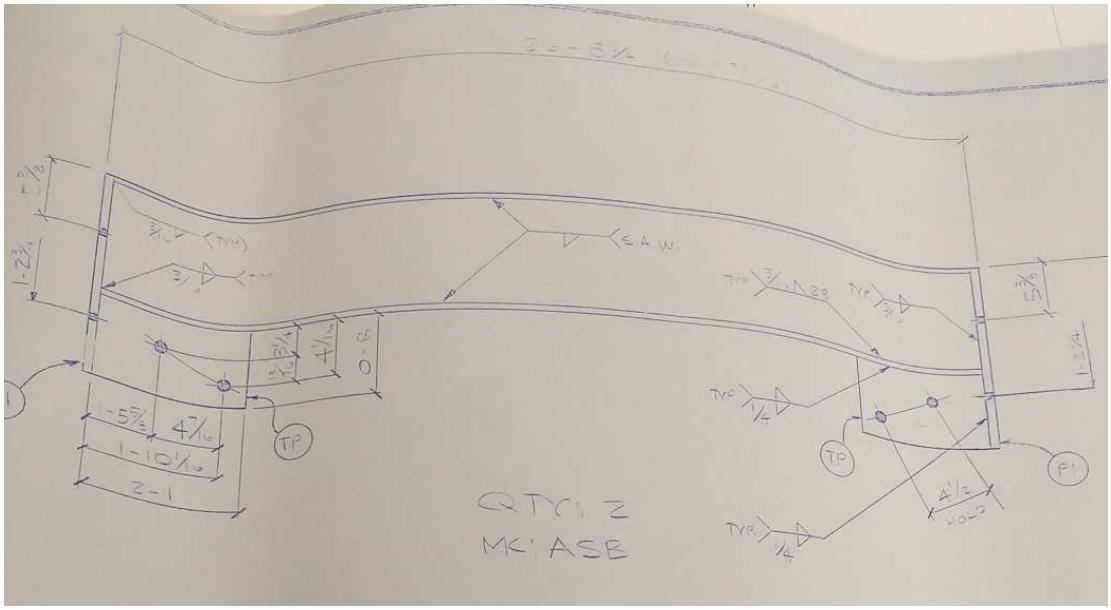
$$f_1 := \frac{1}{M_s} \cdot \left(\frac{V_{trib}}{s_{avg} \cdot n_{br}} \right) \cdot \left(\frac{L_{br}}{A_{br}} \right) = 49.8 \cdot ksi$$

Brace axial stress - Eq. 4-9

$$DCR_1 := \frac{f_1}{0.5 \cdot (F_y)} = 276.64 \cdot \%$$

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

S2 Quick-Checks
Connection Strength



Typical Braced Connection - Midco Shop Drawings, sheet 94908N

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Geometric and Material Properties

Brace Properties

L5x3x5/16

$F_{y_a} := 36ksi$

$A_g := 2.41in^2$ — Area of brace

$\phi T_n := 0.9 \cdot F_{y_a} \cdot A_g = 78.08 \cdot kip$ — Yield strength of brace
AISC 360-16
(J4-1)

Connection Properties

$t_{pl} := 0.625in$ — Thickness of plate

$F_{y_pl} := 50ksi$

$F_{u_pl} := 65ksi$ — Plate Strengths
Midco 1994 Drawings
Sheet C-1

$l_e := \sqrt{(25in - 22.0625in)^2 + (8in - 4.0625in)^2} = 4.91 \cdot in$ — Bolt Edge Distance

$n_b := 2$ — Number of bolts per connection

$d_b := 1.25in$ — Diameter of bolts
Midco Drawings,
Sheet S-7

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/9/2021

Connection Limit States

Bolt Bearing and Tearout

$$l_c := l_e - 0.5 \cdot \left(d_b + \frac{1\,in}{16} \right) = 4.26 \cdot in$$

$$\phi r_{n_tear} := 0.75 \cdot 1.2 \cdot l_c \cdot t_{pl} \cdot F_{u_pl} = 155.62 \cdot kip$$

$$\phi r_{n_bearing} := 0.75 \cdot 2.4 \cdot d_b \cdot t_{pl} \cdot F_{u_pl} = 91.41 \cdot kip$$

Welds

Welds are double sided 1/4" fillets.

$$t_{min} := \frac{6.19 \cdot 4 \cdot kpi}{F_{u_pl}} = 0.38 \cdot in$$

Min plate thickness for filler metal to govern weld strength

$$l_{min} := \frac{\phi T_n}{2 \cdot 1.392 \cdot 4 \cdot kpi} = 7.01 \cdot in$$

Plates are 8" x 2'-1".

The brace connection is **compliant** with the check.

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/10/2021

S2 Quick-Checks
Connection Strength

Brace Properties
L5x3x5/16

Geometry

$$t_a := \frac{5}{16}\text{in}$$

$$l_a := 5\text{in}$$

$$\lambda_a := \frac{l_a}{t_a} = 16$$

Material

$F_y := 36\text{ksi}$ — Yield Strength
Record Drawings, S-1

$R_y := 1.5$ — *AISC 341-16 Table A3.1*

$E := 29000\text{ksi}$ — Steel MoE

ASD Tier 1 Evaluations 21156AN	PDC Inc. Engineers 2700 Gambell St. Suite 500 Anchorage, AK 99503 T: (907) 743-3200	Designed By: Nathaniel I. Cox Date: 11/10/2021

Ductility Requirement

Flange

$$\lambda_{md} := 0.40\sqrt{\frac{E}{R_y \cdot F_y}} = 9.27$$

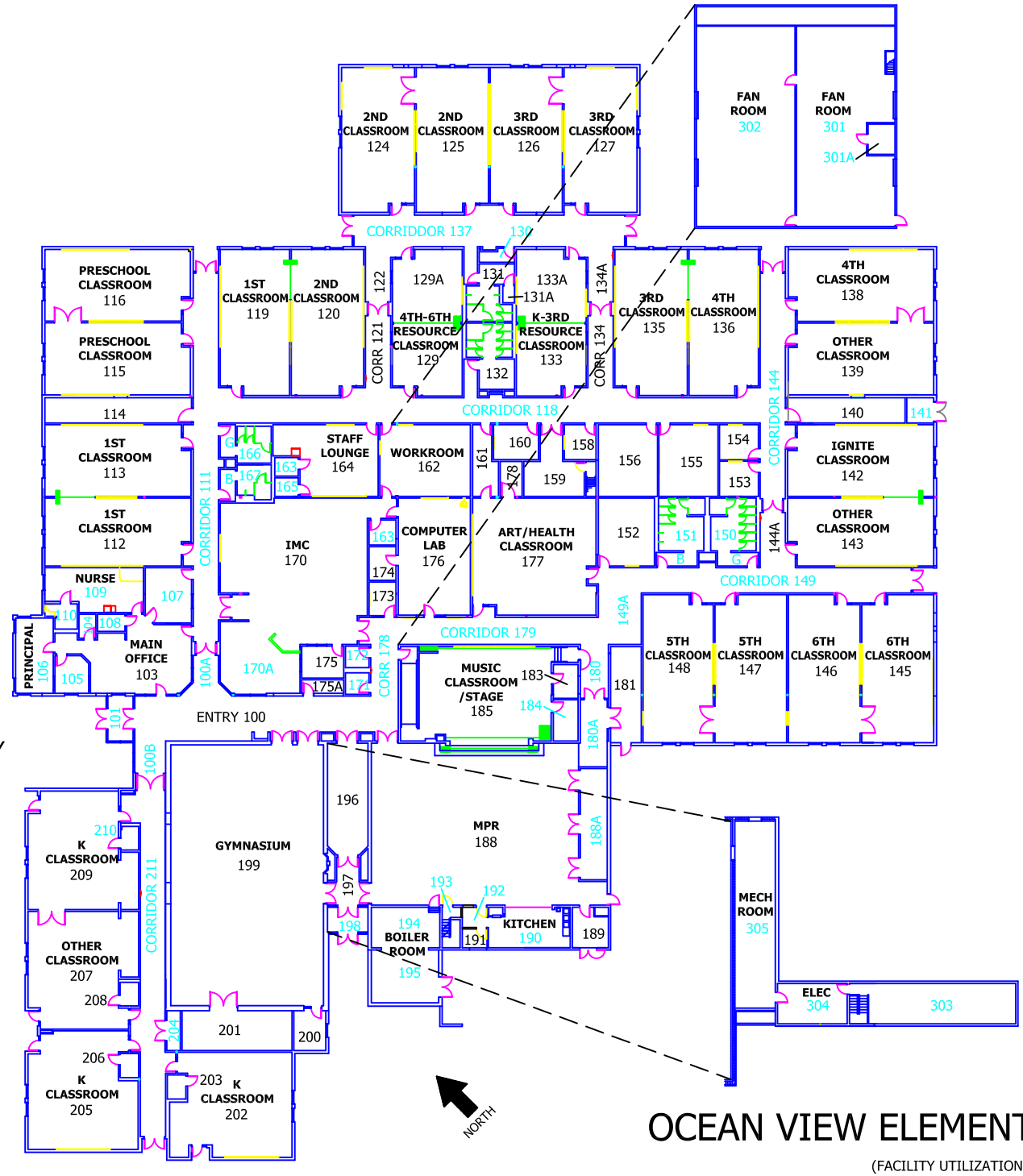
$$U := \frac{\lambda_a}{\lambda_{md}} = 172.61 \cdot \%$$

check = "NG"

The brace connection is **noncompliant** with the check.

ROOM: USE:

104	QUITE ROOM/ ALT. LEARNING
105	COUNSELOR OFFICE
107	CONFERENCE ROOM
108	SECURE STORAGE
114	GENERAL STORAGE
140	CUSTODIAL STORAGE
141	OUTDOOR STORAGE
152	OT/PT ROOM
153	PSYCHOLOGIST OFFICE
154	PTA OFFICE
155	INDIAN ED OFFICE
156	SPEECH OFFICE
158	PRESCHOOL SPEECH OFFICE
159	BPO OFFICE/ STORAGE
200	PE OFFICE
201	PE STORAGE
160	BREAK ROOM
161	ART STORAGE
163	IMC STORAGE
173	PE OFFICE
174	COMPUTER EQPT. STORAGE
175	LIBRARIAN OFFICE
175A	ELECTRICAL ROOM
178	KILN ROOM
181	BEFORE/AFTER SCHOOL STORAGE (CAMPFIRE PROGRAM)
183	MUSIC OFFICE
184	INSTRUMENT STORAGE
188A	TABLE/CHAIR STORAGE
189	RECEIVING
191	KITCHEN OFFICE
196	SKI WARM-UP AREA



OCEAN VIEW ELEMENTARY

(FACILITY UTILIZATION 2015-2016)

ANCHORAGE SCHOOL DISTRICT

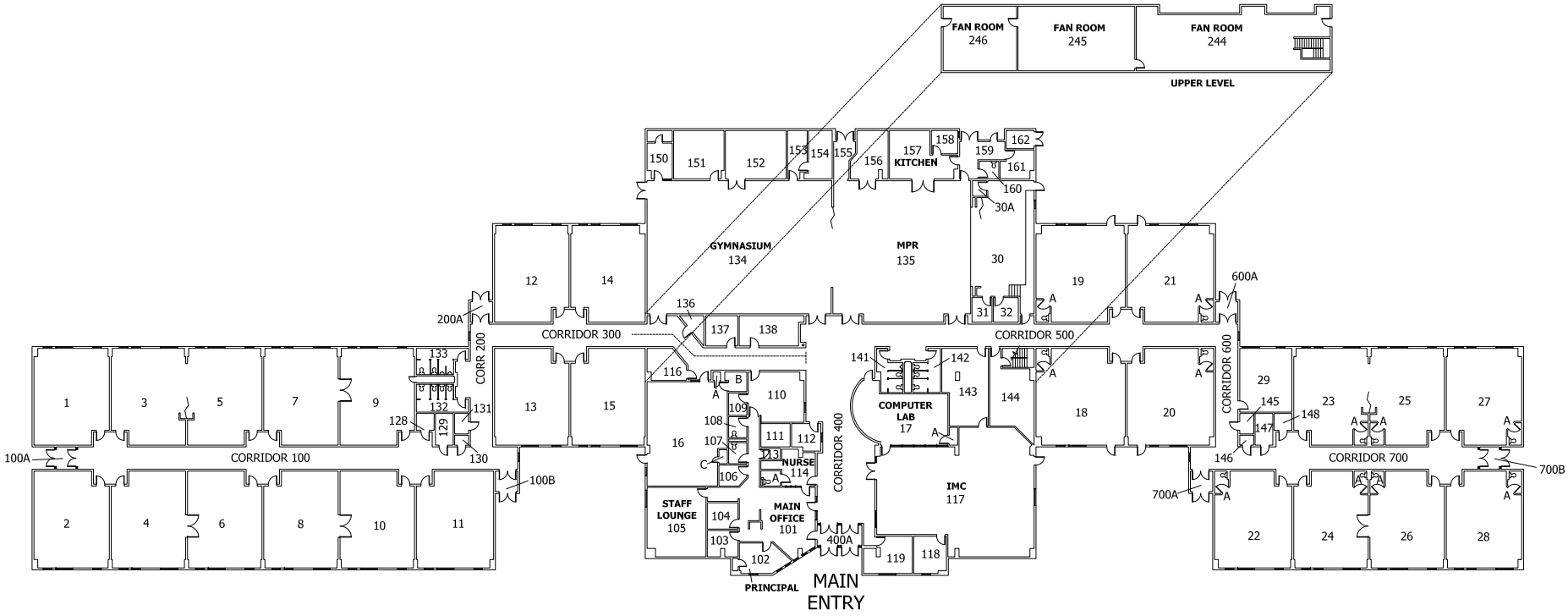
OCEAN VIEW ELEMENTARY SCHOOL
11911 JOHNS ROAD
ANCHORAGE, ALASKA 99515

USAGE FLOOR PLAN

DRAWN:
CHECKED:
DATE: 03/31/16
REVISIONS: 11/02/22

SCALE: NTS

SHEET NO.
1 OF 1



WILLAWAW ELEMENTARY

ANCHORAGE SCHOOL DISTRICT

PROJECT TITLE:
WILLIWAW ELEMENTARY SCHOOL
550 S. BRAGRAW
ANCHORAGE, ALASKA 99508

FLOOR PLAN

DRAWN:	T. JARONIK
CHECKED:	S. WILSON
DATE:	01/05/97
REVISIONS:	06/22/16
SCALE:	NTS
SHEET NO.	1 OF 1

A. GENERAL

Proposers/Offerors are advised that, notwithstanding any instructions or implications elsewhere in this RFP, only the documents shown and detailed on this Check List need to be submitted with and made part of their proposal/offer. Proposers/Offerors are hereby advised that failure to submit the documents shown and detailed on this Check List may be justification for rendering the proposal/offer non-responsive.

B. REQUIRED DOCUMENTS FOR OFFER PROPOSAL SUBMISSION

1. Attachment A, Proposal Transmittal Form
   Submit the completed Proposal Transmittal Form (Attachment A) as the first page of the proposal per Site.

2. All addenda issued should be acknowledged by manually signing the Addenda sheet and submitting it prior to the offer opening, or by indicating acknowledgement in the space provided on the Attachment A, Proposal Transmittal Form.

Items 3, 4, 5, & 6 TO BE SUBMITTED AS PART OF ORIGINAL PROPOSAL OR WITHIN THREE (3) CALENDAR DAYS OF NOTICE FROM THE DISTRICT IF NOT SUBMITTED WITH PROPOSAL.

DBE PARTICIPATION REQUIREMENTS MUST BE COMPLETED BY THE PROPOSAL SUBMISSION DATE.

ONLY 1 COPY OF 3, 4, 5 & 6 (below) is to be submitted.

3. Exhibit 1, Supplemental Term, Conditions and Forms

   - ✓ 1. Acknowledgement of Terms, Conditions, and Grant Clauses General Grant Clauses
   - ✓ 2. Certification Regarding Lobbying

4. Exhibit 2, Disadvantaged Business Enterprises, Contract Participation Form

5. Exhibit 3, Disadvantaged Business Enterprises, Prime Consultant/Contractor Certification

   - ✓ 1. Prime Consultant/Contractor Certification

6. Exhibit 4, Disadvantaged Business Enterprises, Contact Documentation Form

   - ✓ 1. Contact Documentation Form

EXHIBIT 1: SUPPLEMENTAL TERMS AND CONDITIONS
(2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II, Required Contract Clauses)

The supplemental conditions contained in this section are intended to cooperate with, to supplement, and to modify the general conditions and other specifications **for the acquisition of supplies, services, equipment, or construction services to insure compliance with 2 C.F.R. § 200.317 through 200.327 and 2 C.F.R. Part 200, Appendix II** for contracts being awarded using Federal Grant funds.

1. Flow Down of Terms and Conditions from the Grant Agreement

Subcontracts: If the vendor Subcontracts any of the work required under this Agreement, a copy of the signed Subcontract must be forwarded to the Anchorage School District ("District") for review and approval. The vendor agrees to include in the Subcontract that (i) the Subcontractor is bound by the terms of this Agreement, (ii) the Subcontractor is bound by all applicable local, state and federal laws and regulations, and (iii) the Subcontractor shall hold the District harmless against all claims of whatever nature arising out of the Subcontractor's performance of work under this Agreement, to the extent allowed and required by law.

2. Compliance with Executive Order 11246 of September 24, 1965, entitled "Equal Employment Opportunity," as amended by Executive Order 11375 of October 13, 1967, and as supplemented in Department of Labor regulations

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, or national origin.

(3) The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The Contractor will comply with all provisions of Executive Order No. 11246 of Sept. 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be cancelled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order No. 11246 of Sept 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order No. 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(7) The Contractor will include the *portion of the sentence immediately preceding the first paragraph* and the provisions of Paragraphs (1) through (7) in every Subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order No. 11246 of Sept. 24, 1965, so that such provisions will be binding upon each Subcontractor or Vendor. The Contractor will take such action with respect to any Subcontract or Purchase Order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, That in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or Vendor as a result of such direction by the contracting agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States."

(8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States. The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided that if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract. The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance. The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of

future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

3. Davis Bacon Act (See Contract Provisions within Original Contract, if applicable); and Copeland Anti-Kickback Act (See Attached Certification, if applicable).

Note: In situations where the Davis-Bacon Act does not apply, neither does the Copeland "Anti-Kickback Act.

4. Contract Work Hours and Safety Standards Act of 1962, 40 U.S.C. 327 et seq.

The Contractor agrees it will require that mechanics and laborers (including watchmen and guards) employed on this federally assisted contract be paid wages of not less than one and one-half times their basic wage rates for all hours worked in excess of forty hours in a work week.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $26 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

5. Federal Fair Labor Standards Act, 29 U.S.C. Section 201 et seq.

The Contractor agrees it will require that covered employees be paid at least the minimum prescribed wage, and also that they be paid one and one-half times their basic wage rates for all hours worked in excess of the prescribed work-week.

6. Copeland "Anti-Kickback" Act (U.S.C. Section 51)

The Contractor agrees to comply with the Copeland Anti-Kickback Act of 1968, if applicable, which outlaws and prescribes penalties for "kickbacks" of wages in federally financed or assisted construction activities.

7. Reporting

The Contractor will provide any information requested by the District which is determined to be required to comply with 2 C.F.R. § 200 requirements and regulations pertaining to reporting.

8. Patents and Data

No reports, maps, or other documents produced in whole or in part under this contract shall be the subject of an application for copyright by or on behalf of the Contractor. The grantor agency and the grantee shall possess all rights to invention or discovery, as well as rights in data which may arise as a result of the Contractor's services.

9. Clean Air Act, Federal Water Pollution Control Act, Executive Order 11738, and US EPA Regulations

Contracts and sub grants of amounts in excess of $100,000 shall contain a provision that requires the Contractor or recipient to comply with all applicable standards, orders, or requirements issued under Section 112 and 306 of the Clean Air Act (42 U.S.C. § 1857 (h), Section 508 of the Clean Water Act (33 U.S. 1368), Executive Order 11738, and the U.S. Environmental Protection Agency regulations (40 CFR Part 15 and 61). Violations shall be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

10. Energy Conservation Requirements - 42 USC 6201

Energy Conservation - The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency, which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

11. If appropriate to the project, the Contractor will provide assurances regarding the following:

- **Procurement of Recovered Materials.** The requirements of Section 6002 of the Solid Waste Disposal Act, Pub. L. No. 89.272 (1965) (codified as amended by the Resource Conservation and Recovery Act at 42 U.S.C. § 6962. The requirements of 6002 include procuring only items designated in guidelines of EPA 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000.

    a) In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired –
        i. Competitively within a timeframe providing for compliance with the contract performance schedule;
        ii. Meeting contract performance requirements; or
        iii. At a reasonable price.

    b) Information about this requirement, along with the list of EPA-designate items, is available at EPA's Comprehensive Procurement Guidelines website, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

THE FOLLOWING DOCUMENTS NEED TO BE RETURNED TO THE DISTRICT.

1. Acknowledgement of Terms, Conditions, and Grant Clauses
2. Certification Regarding Lobbying

Acknowledgement of Terms, Conditions, and Grant Clauses

Flow Down of Terms and Conditions from the Grant Agreement

Subcontracts: If the Vendor Subcontracts any of the work required under this Agreement, a copy of the signed Subcontract must be available to the Department for review and approval. The Vendor agrees to include in the Subcontract that (i) the Subcontractor is bound by the terms of this Agreement, (ii) the Subcontractor is bound by all applicable state and federal laws and regulations, and (iii) the Subcontractor shall hold the District harmless against all claims of whatever nature arising out of the Subcontractor's performance of work under this Agreement, to the extent allowed and required by law.

Grant Clauses

On behalf of my firm, I acknowledge, and agree to perform all of the specifications and grant requirements identified in this document.

Vendor/Contractor Name _____ Date _____

Authorized Signature _____

Email Address _____

Address/Phone Number

_____

_____

Contract Number _____

CERTIFICATION REGARDING LOBBYING

(Byrd Anti-Lobbying Amendment, awards over $100,000)

The undersigned _____ (Vendor/ Contractor) certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal Contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal Contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for making lobbying contacts to an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal Contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form--LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions [as amended by "Government wide Guidance for New Restrictions on Lobbying," 61 Fed. Reg. 1413 (1/19/96). Note: Language in paragraph (2) herein has been modified in accordance with Section 10 of the Lobbying Disclosure Act of 1995 (P.L. 104-65, to be codified at 2 U.S.C. 1601, et seq.)]

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including Subcontracts, sub grants, and Contracts under grants, loans, and cooperative agreements) and that all sub recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31, U.S.C. § 1352 (as amended by the Lobbying Disclosure Act of 1995). Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

[Note: Pursuant to 31 U.S.C. § 1352(c)(1)-(2)(A), any person who makes a prohibited expenditure or fails to file or amend a required certification or disclosure form shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such expenditure or failure.]

The Vendor/Contractor, _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. A 3801, et seq., apply to this certification and disclosure, if any.

_____ Signature of Vendor/Contractor's Authorized Official

_____ Name and Title of Vendor/Contractor's Authorized Official

_____ Date

EXHIBIT 2
Disadvantaged Business Enterprises
CONTRACT PARTICIPATION FORM

Efforts to Obtain MBE/WBE/LSAF Participation

A. Please answer the following questions and return this questionnaire with attachments (i.e., ads, meeting attendance list, etc.) to the Purchasing Agent with your offer.

Project Name: _____
Solicitation Number: _____
Contractor: _____

B. Did your company: YES/NO

1. Attend any pre-proposal meetings that were scheduled by the District? ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, please list the meetings (e.g. site-visit, pre-proposal conference, proposal reading) attended below.

   a)
   b)
   c)

2. Did your company utilize the services or assistance, as appropriate, of such organizations as the Small Business Administration, Alaska District Office, the Department of Transportation and Public Facilities (DOT), Civil Rights Office and/or the US Department of Labor?

   ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

3. Advertise subcontracting opportunities in major circulation newspapers, such as:

   a) Anchorage Daily News?
   b) Pubic Website?
   c) Plans Rooms?
   d) Other types of notices?

   ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, please attach copies of any ads or notices.

4. Provide timely written notice to specific MBEs/WBEs/LSAFs that their interest it the contract is being solicited? ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, please attach a sample of such notification and list MBEs/WBEs contacted on the Contact Documentation Form (Exhibit 4).

5. Follow-up initial solicitations of interest by personally contacting MBEs/WBEs/LSAFs? ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, please list those MBEs/WBEs/LSAFs contacted on the Contact Documentation Form (Exhibit 4).

6. Select the portions of the contract to be performed by MBEs/WBEs/LSAFs in a manner that will increase the likelihood of MBE/WBE/LSAF participation? ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, please attach a list of those portions of the contract selected for MBE/WBE/LASF participation.

7. Provide interested MBEs/WBEs/LSAFs with timely and thorough information about the plans, specifications and technical requirements of the contract? ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, please list the MBEs/WBEs/LSAFs provided with such information on the Contact Documentation Form (Exhibit 4).

8. Negotiate in good faith with interested MBEs/WBEs/LSAFs, and not reject MBEs/WBEs/LSAFs as unqualified without sound reasons based on a thorough investigation of their capabilities? ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, list MBEs/WBEs/LSAFs with whom good faith negotiations were conducted on the Contact Documentation Form (Exhibit 4).

9. Assist interested MBEs/WBEs/LSAFs in obtaining bonding and/or insurance. ☐ **Yes** ☐ No ☐ **N/A (provide documentation)**

   If YES, list MBEs/WBEs/LSAFs assisted on the Contact Documentation Form (Exhibit 4).

10. For each question answered "YES" above that requires a listing of MBEs/WBEs/LSAFs, please provide that listing on this page. Answers need not be limited to a single line. If more space is needed, please attach supplemental sheets. You need only list an MBE/WBE/LSA firm only once. Use the first column to indicate the question(s) referenced above by each firm listed. Any question answered “N/A” above, please provide supporting documentation of good faith efforts taken.

EXHIBIT 3
Disadvantaged Business Enterprises
PRIME CONSULTANT/CONTRACTOR CERTIFICATION

I. PROJECT INFORMATION

Applicant/Entity Name	Total of District Funding
Anchorage School District	$

Prime Consultant/Contractor: _____
Contract Number: _____ **Contract Amount:** _____

II. AFFIRMATIVE STEPS (Applicant to all subcontracts awarded by the prime consultant/contractor)

I understand that it is my responsibility to comply with all state and federal regulations and guidance in the utilization of Minority, Women-Owned Businesses and Labor Surplus Area Firms in procurement. I certify that I will take affirmative steps to afford opportunities for Minority Business Enterprise (MBE), Women-Owned Business Enterprise (WBE) and Labor Surplus Area Firms (LSAF) by:

1. Including qualified MBEs/WBEs/LSAFs on procurement solicitation lists
2. Soliciting potential MBE's/WBE's/LSAFs.
3. Reducing contract size/quantities when economically feasible to permit maximum participation by MBE's/WBE's/LSAFs.
4. Establishing delivery schedules to encourage participation by MBE's/WBE's/LSAFs.
5. Using the services and assistance of the Small Business Administration, Minority Business Development Agency, U.S. Department of Commerce (https://www.sba.gov/), as appropriate, the Department of Transportation and Public Facilities (DOT), Civil Rights Office (http://www.dot.state.ak.us/cvlrts/directory.shtml) and/or the US Department of Labor (http//www.doleta.gov/lsa).
6. Requiring all Prime Consultants/Contractors to follow steps 1-5 listed above in employing MBE/WBE/LSA Subcontractors.

☐ **Exception:** As Prime Consultant/Contractor, I certify that I have reviewed the contract requirements and found no available subcontracting opportunities. I also certify that I will fulfill 100 percent of the contract requirements with my own employees and resources. (Check if applicable).

Signature – Prime Consultant/Contractor	Name & Title (print legibly)	Certification Date

III. DISTRICT APPROVAL SIGNATURE

Signature indicates the form meets DBE Requirements.

District Coordinator	Approval Date

EXHIBIT 4
Disadvantaged Business Enterprises
CONTACT DOCUMENTATION FORM

Project Name: _____ RFQ/ITB/RFP No. _____

Company Name:

_____

This form is provided for your convenience to document your efforts to meet the DBE Affirmative Steps on this project. You may use additional sheets, if needed. You may return this form or other supporting documentation, such as explanations, advertising notices, solicitations, telephone logs, etc. with your Contract Participation Form (Exhibit 2).

Firm: _____ MBE / WBE / LSAF

Address: _____ Phone No: _____

_____

Type of Work: _____ Amount: $_____

Dates of Contact: _____ _____ _____ _____ _____

Method of Contact:

_____

Name of Person Contacted: _____

Results of Contact: _____

If rejected, why:

_____

Firm: _____ MBE / WBE / LSAF

Address: _____ Phone No: _____

_____

Type of Work: _____ Amount: $_____

Dates of Contact: _____ _____ _____ _____ _____

Method of Contact:

_____

Name of Person Contacted: _____

Results of Contact: _____

If rejected, why:

_____

Firm: _____ MBE / WBE / LSAF

Address: _____ Phone No: _____

_____

Type of Work: _____ Amount: $_____

Dates of Contact: _____ _____ _____ _____ _____

Method of Contact:

_____

Name of Person Contacted: _____

Results of Contact: _____

If rejected, why:

_____

Disadvantaged Business Enterprise Program
Program Specifications for District Contracts

This project is a Federally funded contract and, is subject to any applicable federal and state regulations. Bidders/proposers shall be fully informed regarding the requirements of the regulations, statutes, and code regarding the Disadvantaged Business Enterprise Program (DBE).

A bidder/proposer who is determined not in compliance with the requirements of the applicable regulations and code, or these specifications will not be awarded this contract. Noncompliance after award of the contract constitutes a breach of the contract and may result in termination of the contract or other appropriate remedy for such breach.

Part I. Disadvantaged Business Enterprise Program Goals and Six Affirmative Steps.

All bidders/proposers shall solicit subcontractor or supplier bids/offers prior to bid/proposal opening for this project. The bidder/proposer acknowledges that post-bid/proposal opening of solicitations do not qualify for meeting Fair Share objectives or the Six Affirmative Steps.

A. All bidders/proposers on this project **shall** carry out the required Six Affirmative Steps, listed as items 1 through 6 below:

   1. Include qualified small, minority, women's business enterprises, and labor surplus area firms on solicitation lists.
   2. Assure that small, minority, women's business enterprises, and labor surplus area firms are solicited. If the MBE/WBE is only certified as a Disadvantaged Business Enterprise (DBE), such as through the Small Business Administration (SBA), Alaska District Office; and the Alaska Department of Transportation and Public Facilities (DOT&PF), Civil Rights Office, and the bidder has exhausted all efforts to determine the subcontractor MBE/WBE status, the bidder may document either category of certification to meet the good faith efforts.
   3. Divide total requirements when economically feasible, into small tasks or quantities to permit maximum participation of small, minority, women's business enterprises, and labor surplus area firms.
   4. Establish delivery schedules, where requirements of the work permit, which will encourage participation by small, minority, women's business enterprises, and labor surplus area firms.
   5. Use the services and assistance of the U.S. Small Business Administration and the Minority Business Development Agency of the U.S. Department of Commerce, as appropriate.
   6. If the prime contractor or proposer awards subcontracts/procurements, require the subcontractor to take the affirmative steps 1 through 5 above.

   7. Exception: As prime consultant/contractor, certify that they have reviewed the contract requirements and found no available subcontracting opportunities; and certify that they will fulfill 100 percent of the contract requirements with their own employees and resources.

B. The District will presume a lack of six affirmative steps to satisfy MBE, WBE and LSAF requirements if the bidder/proposer rejects any bids/offers from MBEs, WBEs and/or LSAF's, which are as low, or lower, than other competitor's bids/offers. The bidder/proposer that rejects an as-low or lower bid/offer from an MBE, WBE or LSAF may submit proof to rebut this presumption.

C. If a prime contractor is an MBE, WBE or LSAF, such prime also must carry out the Six Affirmative Steps to award any subcontracts or procurements on this project.

D. Record keeping requirements. The prime contractor must retain all records documenting their Six Affirmative Step for audit purposes and provide copies of these to the District DBE Officer upon request.

Apparent successful bidders/proposers, who fail to demonstrate completion of the required Six Affirmative Steps, will not be awarded this contract.

Part II: Certified Minority (MBE) and Women's (WBE) Business Enterprises

A. MBE/WBE, or a joint-venture with a MBE/WBE, must be currently certified prior to opening of bids/proposals in order to be considered a MBE/WBE enterprise.

B. Businesses must be certified by the Small Business Administration (SBA), Alaska District Office https://www.sba.gov/offices/district/ak/anchorage, Department of Transportation and Public Facilities (DOT), Civil Rights Office http://www.dot.state.ak.us/cvlrts/directory.shtml, or by state, local, Tribal or private entities whose certification criteria and who present proof of this will be eligible. Proof may be in the form of a letter from the certifying agency or a current listing in a directory maintained by the certifying agency.

C. Those companies certified as DBEs by one of the agencies listed in Part II.B above:

1. Whose majority ownership and control is vested in one or more minority individuals;
2. Whose majority ownership and control is vested in one or more non-minority women;
3. Whose majority ownership and control is vested in one or more minority individuals, and who are women may be counted toward either the MBE or the WBE, but not to both.

Part III: MBE and WBE Participation

The MBE or WBE must perform work on the project in the category/categories of work for which certification is issued. While the MBE or WBE may perform work in other categories for which certification is not issued, only that work performed in the certified categories.

A. The MBE or WBE must perform a useful business function according to custom and practice in the industry; i.e., must be responsible for the execution of a distinct element of work and must carry out its responsibilities by actually performing, managing, and supervising the work.

B. An MBE or WBE that acts merely as a broker or passive conduit of funds, without performing, managing, or supervising the work of its contract or subcontract in a manner consistent with normal business practices.

1. Presumption. If 50% or more of the total dollar amount of MBE or WBE's prime contract is subcontracted to a non-DBE, the MBE or WBE prime contractor will be presumed to be a broker, and no MBE or WBE participation may be reported.

2. Rebuttal. The MBE or WBE prime contractor may rebut this presumption by demonstrating that its actions are consistent with normal practices for prime contractors in its business and that it will actively perform, manage and supervise the work under this contract.

C. MBE or WBE trucker/hauler expenditures will be credited towards the contract only if the trucker/hauler is performing a commercially useful function. The following factors should be used in determining whether MBE or WBE trucker/hauler is performing a commercially useful function:

1. The MBE or WBE must be responsible for the management and supervision of the entire trucking/hauling operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting MBE or WBE objectives.

2. The MBE or WBE must itself own and operate at least one fully licensed, insured, and operational truck used on the contract.

D. For joint ventures, MBE and WBE participation consists of the portion of the dollar amount of the joint venture attributable to the MBE or WBE. However, where the MBE/WBE's risk of loss, control or management responsibilities are not commensurate with the share of profit.

Part IV: Submission of Minority, Women's Business Enterprises and Labor Surplus Area Firms Information

A. TO BE SUBMITTED AS PART OF BID/PROPOSAL OR WITHIN THREE (3) WORKING DAYS OF NOTICE FROM THE DISTRICT (ASD):

1. The bidder/proposer for this project shall submit their Contact Documentation (Exhibit 4), a completed and signed Prime Consultant/Contractor Certification (Exhibit 3) with their bid/proposal. If the bidder does not intend to utilize MBE, WBE or LSAF subcontractors, their Prime Consultant/Contractor Certification form must still be signed by bidder and, indicate "NONE TO BE USED". The bidder/proposal shall then be required to show that the mandatory Six Affirmative Steps were taken as set forth in these specifications, which are also included in the Contract Participation Form (Exhibit 2).

2. Bids/offers submitted without a completed and signed Contract Participation Form, completed and signed Prime Consultant/Contractor Certification Form, and sufficient Contact Documentation will be considered non-responsive, if not submitted with bid/offer or upon three (3) working days upon request, if not submitted with their bid/proposal.

3. A contract may not be awarded to a bidder/proposer who fails to submit the required supporting documents within the time specified. There shall be no substitutions, deletions, additions, or modifications to this listing subsequent to its submittal to Purchasing.

Part V: MBE/WBE/LSAF Utilization Removal/Substitution

If a successful bidder/proposer for a contract which contains MBE, WBE and/or LSA Firm participation requirements, at any time after award of contract, proposes to remove or make substitutions for MBE, WBE or LSA Firm subcontractors or joint-venture partners under the contract, a written notice of such removal or substitution shall be submitted to the District DBE Officer prior to commencement of performance of the affected work, with the names, addresses and phone numbers of the subcontractors or joint venture partners to be removed or substituted for and an explanation of the reasons for the removal and substitution. The successful bidder shall make good faith efforts as defined in Part I.B to utilize another MBE, WBE or LSA Firm subcontractor as the replacement. These efforts shall be documented and, the circumstances fully explained in writing, and approval obtained from the District DBE Officer prior to such replacement. The District DBE Officer shall, within seven (7) days of receipt of such notice, approve said notice or removal and substitution where it is shown that the requested action is for good cause and not for discriminatory purposes.

Part VI: Other Provisions

The District DBE Officer or his or her designee may visit the job site during regular working hours and interview subcontractors and employees for verification of compliance with these specifications and/or the regulations.

Part VII: Definitions

A. Minority Business Enterprise (MBE) or Women Owned Business Enterprise (WBE) - means a business concern which is owned and controlled by one or more minorities or women. Owned and controlled means a business:

4. Which is at least 51 percent owned by one or more minorities or women, or in the case of a publicly owned business, at least 51% of the stock is owned by one or more minorities or women;

5. Whose management and daily business operations are controlled by one or more such individuals.

B. Minority Individual - means an individual who is a citizen or lawful permanent resident of the United States and who is:

1. Black (a person having origins in any of the black racial groups in Africa);
2. Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);
3. Portuguese (a person of Portugal, Brazilian, or other Portuguese culture or origin, regardless of race);
4. Asian American (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands);
5. American Indian and Alaskan Native (a person having origins in any of the original peoples of North America or original peoples of Alaska), and
6. Members of other groups, or other individuals, found to be economically and socially disadvantaged by the United States Small Business Administration under section 8(1) of the federal Small Business Act.

C. Labor Surplus Area (LSA) – is defined as a civil jurisdiction (a city of more than 25,000 or a county, borough, or census area) that has a civilian average annual unemployment rate during the previous two (2) calendar years of 20 percent or more above the average annual civilian unemployment rate for all states during the same 24-month reference period. If the national annual average unemployment rate during the referenced period is less than 6.0 percent, then the qualifying rate is 6.0 percent. If the national annual average unemployment rate during the referenced period is above 10 percent, then the qualifying rate is 10 percent. Please reference the US Department of Labor, Employment and Training Administration at http//www.doleta.gov/lsa. The list becomes effective each October 1 and remains in effect through the following September 30.

D. Certification – a copy of a current MBE/WBE certification from any agency to be used for the District's monitoring of MBE/WBE participation in its program.

E. Joint Venture – a commercial enterprise undertaken by more than one business enterprise jointly, limited in its scope and duration to one project, for the purpose of each enterprises profiting thereby.

F. Fair Share - is a reasonable amount of funds commensurate with the total project funding, demographic factors and the availability of minority and women's businesses. A fair share does not constitute an absolute requirement, but a commitment on the part of the bidder/proposer to attempt to use minority and women's businesses by carrying out the "Good Faith Efforts".

For more information about these specifications, please contact the District DBE Officer at the Anchorage School District, Purchasing Warehouse, 4919 Van Buren Street, Anchorage, AK 99517; telephone (907) 742-8630.

Part VIII – Equal Opportunity, Minority, Women-Owned Business Enterprise and Labor Surplus Area Firm (MBE/WBE/LSAF) Participation

A. Equal Opportunity

No person or firm shall be discriminated against because of race, color, national origin, or sex in the award of District contracts. Further, the Contractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract.

B. MBE/WBE Participation

While there are no MBE/WBE/LSAF goals associated with this solicitation, the District is committed to achieving participation in its contracting programs by business enterprises that are owned and operated by minorities, women and labor surplus area firms (MBEs, WBEs and LSAF) regardless of the size of the enterprise. All bidders/offerors are strongly encouraged to take active steps to maximize the participation of MBEs, WBEs and LSAF in this contract.

C. Technical Assistance

The District will provide assistance to promote the participation of MBEs, WBEs and LSAF in this contract, including the identification of MBEs, WBEs and LSAF. To obtain assistance, interested parties are encouraged to contact the District's Purchasing Office at (907) 742-8621.