



Addendum #1

Request for Proposals for A/E Services

Gray Courthouse Improvements

Issued: March 21, 2025

This addendum is part of the RFP solicitation documents for the above-named project and modifies the original RFP documents dated March 19, 2025. Acknowledgement of receipt of this addendum is required as part of your proposal response.

Question #1: Was the scope of work in this RFP part of the on-going Courthouse Expansion project?

Response: No, this is a separate project. The Courthouse Expansion project does not include any significant work in the Gray Courthouse or the scope of work in this RFP.

This RFP is to address work needed at the Gray Courthouse building that can only happen once the Courthouse Expansion project is finished. After completion of the Courthouse Expansion project, office space on the 2nd floor of the Gray Courthouse will become available to new occupants. Part of the scope of work in this RFP is to remodel the 1st and 2nd floors of the Gray Courthouse building so that the spaces are better suited to the new occupants. Additionally, we are using this project as an opportunity to complete other work listed in the RFP that is needed for the building.

Question #2: The RFP notes that the full seismic evaluation and schematic upgrade design is available. Is it possible to receive a copy of these documents so we fully understand the initial engineering approach at this time?

Response: Yes. The full version of the Gray Courthouse Structural Evaluation Report is attached to this Addendum.

END OF ADDENDUM #1

STRUCTURAL EVALUATION REPORT

Deschutes County Courthouse,
Bend, OR

AV PROJECT NO. 21699



Image Courtesy of Google Earth

PREPARED FOR

Deschutes County

20 DECEMBER 2024

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1. INTRODUCTION

This report summarizes the structural assessment performed on the existing Deschutes County "Gray Courthouse," located at 1164 NW Bond Street in Bend, Oregon and constructed circa 1940, along with an outline of the recommended structural improvements. The following report builds on the initial Seismic Life Safety report provided by Ashley & Vance Engineering in 2019 which included a Tier 1 analysis and associated Tier 1 Checklists, both included for reference here as Appendix B.

Deschutes County requested that Ashley & Vance Engineering provide a schematic design report for a seismic upgrade of the existing Deschutes County "Gray Courthouse" building. This report will determine the adequacy of the existing building and identify any deficiencies within the existing design to a BSE-1E Life Safety Performance Level. This report has not been prompted by any required upgrade and the report itself, as well as any suggested upgrades herein, are purely voluntary. The results of this report can help Deschutes County identify which potential upgrades would be cost effective should they decide to move forward with any future tenant improvements.

The existing three-story courthouse building includes a penthouse and a partially subterranean lower level. The structure is composed of concrete slabs and beams at each level that are supported on concrete columns. The lateral system for the building is concrete shear walls that are mostly located at the building perimeter with some interior walls. The schematic design analysis of the existing courthouse building was performed based on plans provided to our office along with material testing results. The analysis was performed using the 2017 ASCE 41 document for Seismic Evaluation and Retrofit of Existing Buildings.

The following drawings were reviewed by Ashley & Vance Engineering:

- Original Construction Specifications
 - Dated: April 24, 1940
 - Architect: Truman E. Phillips, Architect
- 2005 Remodel
 - Dated February 03, 2005 with delta 5 revisions dated April 13, 2005
 - Architect: Steele Associates Architects
 - Structural Engineer: Froelich Consulting Engineers, Inc.
- Concrete Testing Dated April 10, 2024
 - Testing Agency: Wallace Group
- Concrete Testing Dated September 19, 2024
 - Testing Agency: Wallace Group

2. SITE HAZARDS

The following section provides site hazard data, including general project information, as well as site-specific design criteria related to soils, seismic, and wind.

CRITERIA	
Coordinates	44.0608, -121.3103
Elevation	3642 ft
Risk Category	II

Table 1: Site Hazard Overview Design Criteria

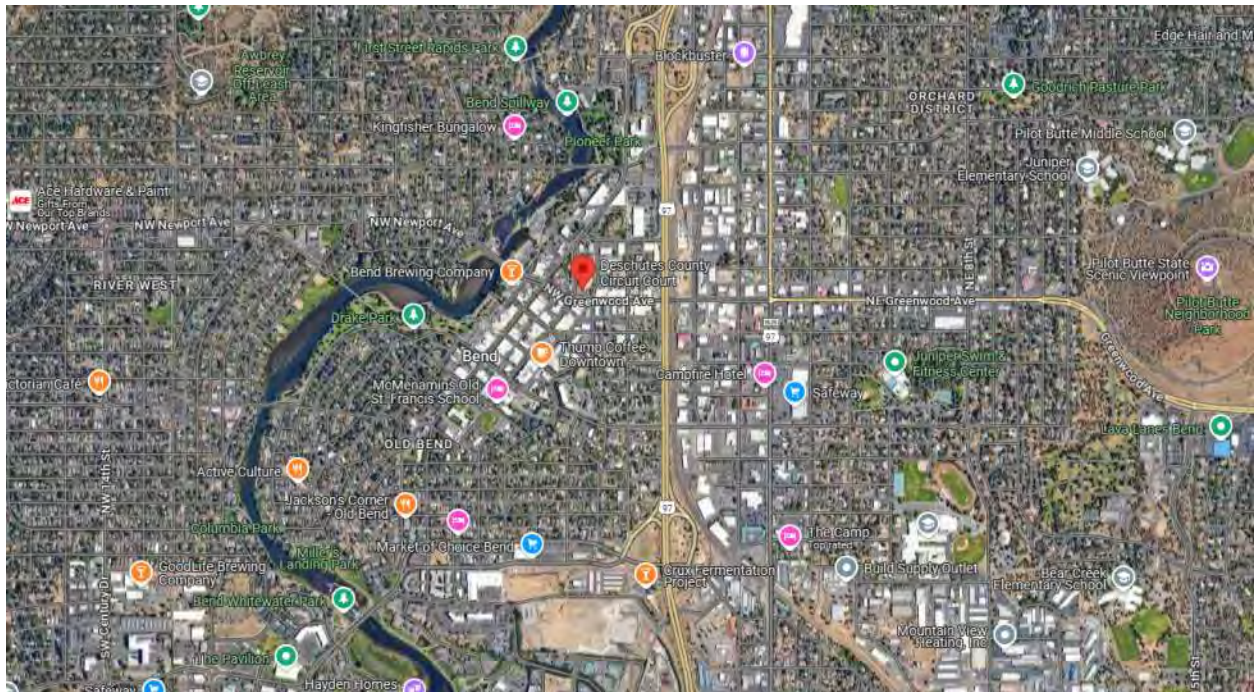


Figure 1: Area Map of Project Location

SUMMARY

Soil Type	D (Assumed)
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Table 2: Soils Design Criteria**BASIC PARAMETERS - 2022 OSSC (ASCE 7-16)**

Name	Value	Description
Ss	0.379	MCER ground motion (period=0.2s)
S1	0.197	MCER ground motion (period=1.0s)
Sms	0.567	Site-modified spectral acceleration value
Sm1	0.435	Site-modified spectral acceleration value
SDS	0.378	Numeric seismic design value at 0.2s SA
SD1	0.290	Numeric seismic design value at 1.0s SA

Table 3: Seismic Design Criteria - ASCE 7-16

Reference: ATC Hazards by Location

BASIC PARAMETERS - ASCE 41-17 (BSE-1E)

Name	Value	Description
Ss	0.103	MCER ground motion (period=0.2s)
S1	0.047	MCER ground motion (period=1.0s)
SXS	0.165	Site modified spectral response at 0.2s SA
SX1	0.113	Site modified spectral response at 1.0s SA

Table 4: Seismic Design Criteria - ASCE 41-17 (BSE-1E)

Reference: ATC Hazards by Location

3. FINDINGS & RECOMMENDATIONS

The lateral analysis of the existing concrete building was performed using ASCE 41-17 with a seismic hazard level of BSE-1E for a Life Safety performance level. This level of analysis meets the Basic Performance Objective for Existing Buildings (BPOE) according to ASCE 41-17, Table 2-1. The BSE-1E hazard level represents a seismic event that has a 20% probability of exceedance in 50 years. As a comparison, the base code design level is a 10% probability of exceedance in 50 years. This results in a reduced design seismic ground motion based on the criteria for analysis of existing buildings.

To better understand the existing conditions, core drilling at various locations throughout the building was permitted. Specifically, cores were located at basement level walls, mid-level walls, and at the stairwell leading up to the penthouse suite for a total of six sample cylinders. The distribution of the various samples helped to identify whether different pours during construction would have generated different strengths. This allowed us to use a knowledge factor of 1.0, as opposed to 0.75 per ASCE 41 section 7.5.2.2 which, in turn increased the existing member capacity for concrete in our analysis. The average cylinder strength was 2,971 psi.

In addition to determining the strength of the concrete, scanning was performed at the walls, columns, and floors in various locations at each level to better understand the reinforcement spacing in each element. With the equipment used, we were unable to accurately determine the size of the rebar at the exterior walls. In some cases, where interior "non-structural" walls were removed by saw cut, the ends of the bars were visible, and #4 bars were confirmed at those locations. At the time of this report, Deschutes County representatives chose not to locate and remove rebar from the existing structure for testing the strength of the reinforcing steel as it was considered too invasive. With the observed existing bar layouts, the building walls were analyzed for the BPOE level, as outlined below. The scans also revealed that the column reinforcement tie spacing does not conform with the standards of ASCE 41. Additionally, there are no confined boundary elements at the ends of concrete walls. These limitations are accounted for in the analysis of these members.

We performed a rigid diaphragm analysis to understand the load distribution to the existing concrete walls at each level. Then, the walls were each analyzed for their tributary loads. Per the scans, flexural capacity of the walls was determined using #4 bars spaced at 24" on center vertically with two #4 bars at the ends of each wall. The results indicate that there are two walls that are exceeding their assumed capacities while all other walls were found to be in conformance with the ASCE 41 code requirements. If the existing wall reinforcement is greater than #4 bars, the capacity of these walls will exceed the design load demands for the design loads. Based on this information and the number of existing walls, both at the perimeter and interior, the seismic risk is perceived to be low. While beneficial, supplementing additional reinforcement in nonconforming walls is not required.

In addition, the existing concrete columns were analyzed for incidental seismic loading. The analysis found that the column loads did not exceed the existing capacities based on the hazard level. As previously noted, the spacing of the existing column ties does not conform to the standards within ASCE 41. Though the analysis did not find that strengthening would be required, Ashley & Vance Engineering recommends adding a Fiber Reinforced Polymer (FRP) wrap as a voluntary measure to provide a conforming confinement on the existing columns.

APPENDIX A:
STRUCTURAL PLAN VIEWS & DETAILS

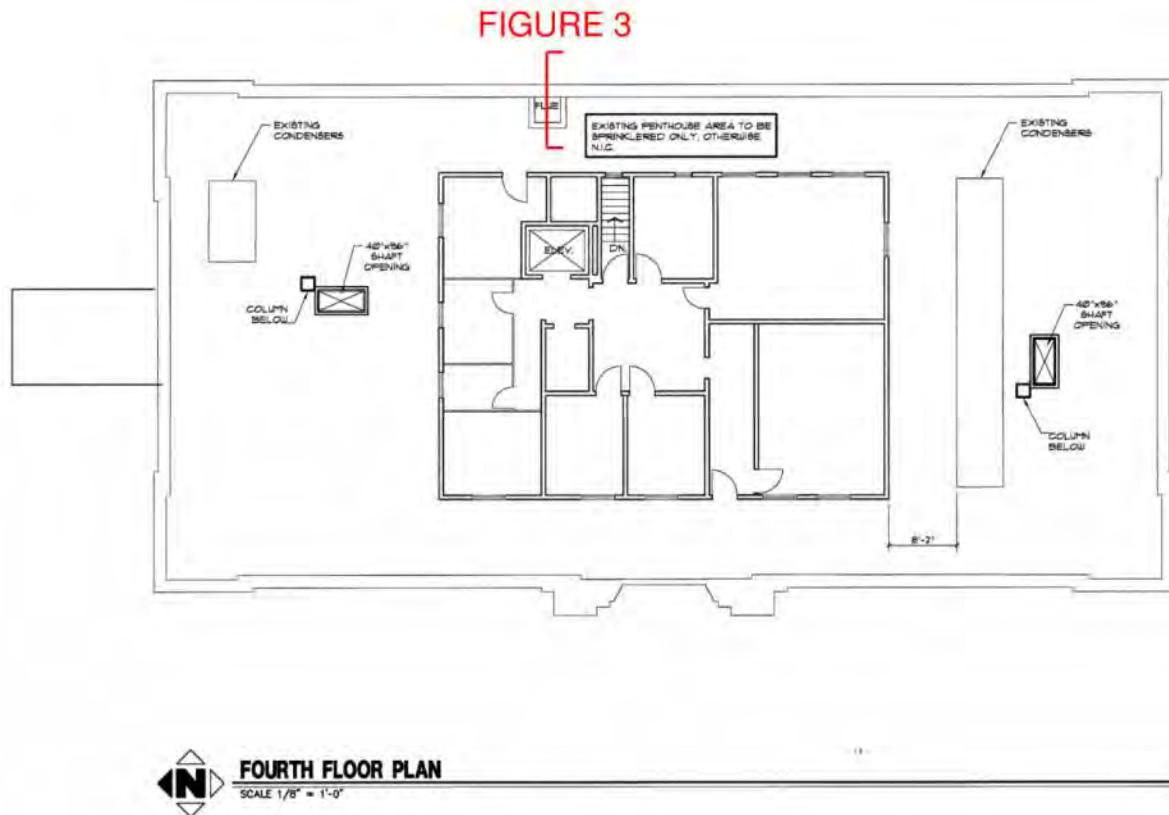


Figure 2: Existing Fourth Floor and Roof Framing Plan

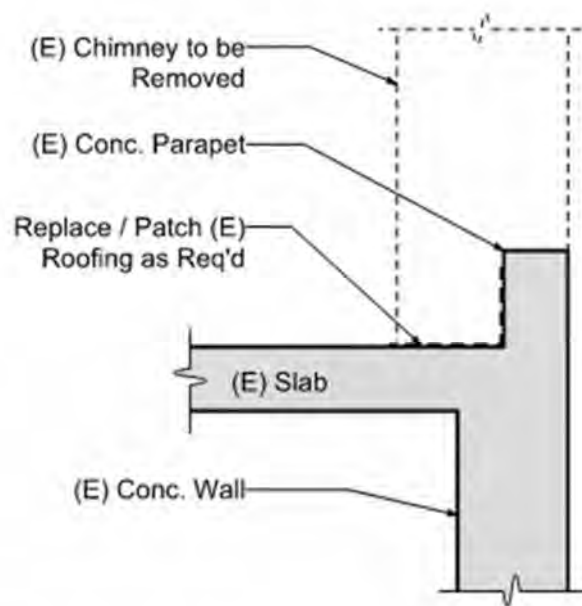


Figure 3: Chimney Removal Detail at Roof

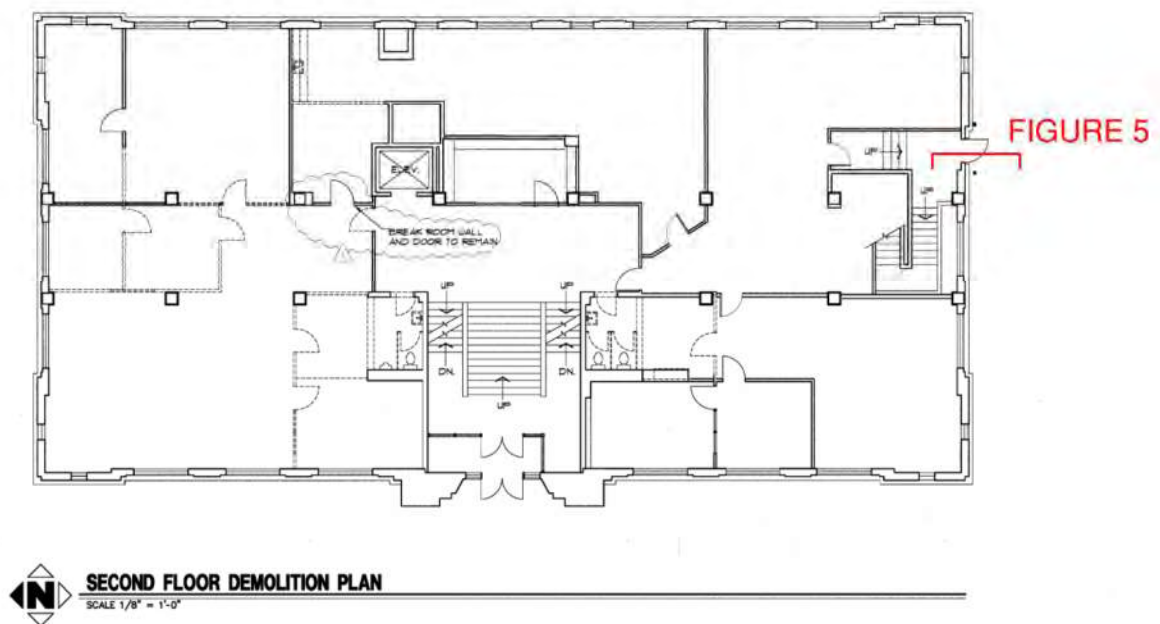
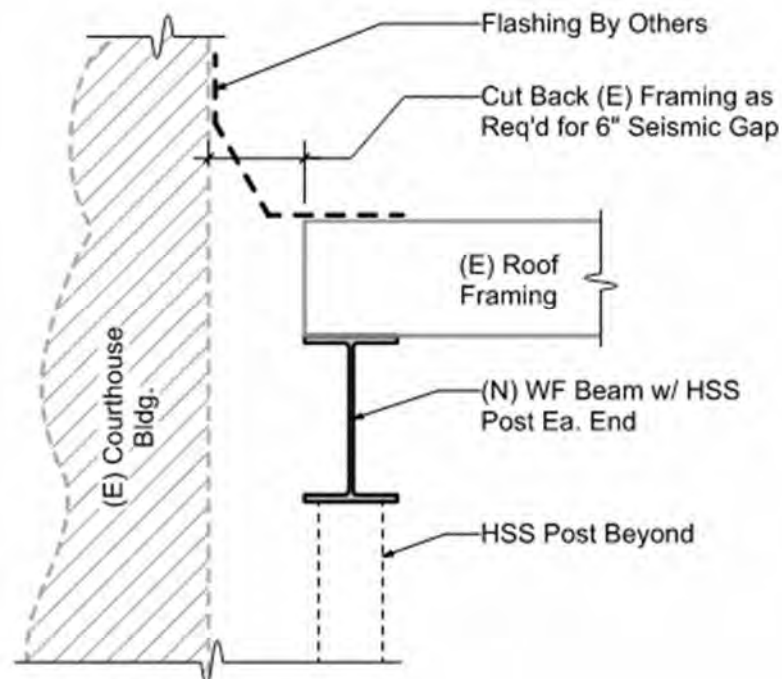
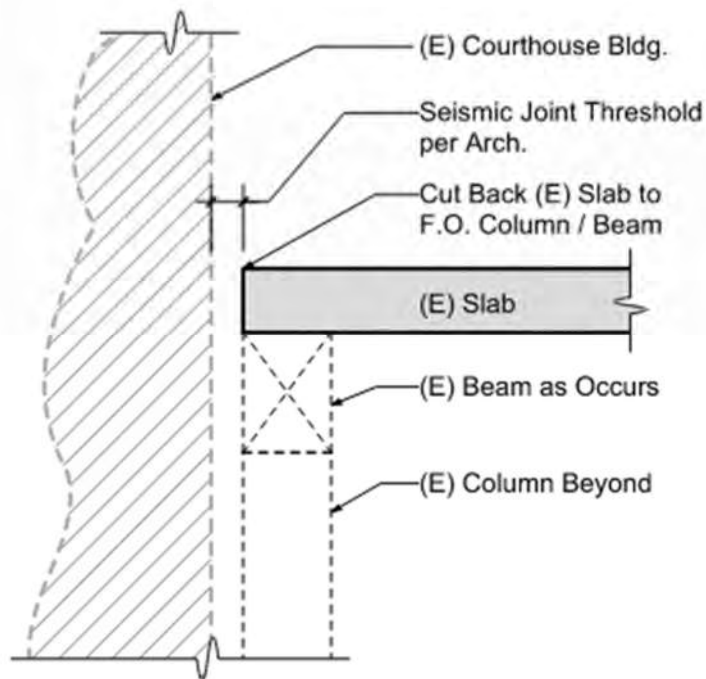


Figure 4: Existing Second Floor Plan



Condition at Roof



Condition at Floor

Figure 5: Seismic Gap Retrofit Detail at Elevated Pedestrian Skywalk

APPENDIX B:
SEISMIC LIFE SAFETY CODE REPORT PER ASCE 41-13 (TIER 1 ANALYSIS)



33 NW Franklin Avenue
Bend, OR 97703
(541) 647-1445

Memorandum

Date: August 19, 2019

To: Lee Randall
Director Deschutes County Facilities
14 NW Kearney Ave.
Bend, OR 97703

Project: Old Court House Seismic Review
1164 NW Bond
Bend, OR 97703

Job #: 181140

Subject: Seismic Life Safety Code Report per ASCE 41-13

Comments:

Per your request, we have performed a Tier 1 analysis of the Old Courthouse at 1164 NW Bond. It is our understanding that the performance objective with which we wish to achieve is that of Life Safety (LS). Our investigation has determined there is one type of building which must be assessed using the Tier 1 check lists. That building type is as follows:

C2, Concrete Shear walls with Stiff Diaphragms.

In addition to this building type, we have provided the Basic Configuration Checklist and the Non-Structural checklist.

INITIAL FINDINGS**Building Type C2**

The original building was constructed in 1940 and has 3 stories with a penthouse suite. The construction type consists of concrete walls, columns, beams and flat slabs and a smaller penthouse suite that is also comprised of concrete walls, columns, beams and roof slab. The perimeter exterior concrete walls are tooled to look like stone block. The lateral system consists of concrete walls 8"-12" thick. The gravity system consists of concrete columns down the center corridor of the building in the N-S direction. They are approximately 13' apart. They range in size from 13" square at the upper levels to 18"x20" at the lowest level. These in turn support concrete beams along the same lines. These in turn support what appears to be a 7" concrete slab. The building dimensions are approximately 60'x122' and each level is approximately 7200 sqft in area. The penthouse is 40'x54' and is approximately 2,110 sqft in area. At the first floor there is a small popout on the east side of the building that is 20'-6"x33'-6" and occupies an area of 691sqft. On the north end of the building there was an exterior steel egress stair added in 2005. This stair consists of steel moment frame and occupies an area of 212 sqft. This stair is outside the scope of this report; however, it appears light enough and with sufficient ductility and strength to resist seismic forces.

TIER 1 ANALYSIS RESULTS

Our findings show that the existing building is in good shape and is capable of resisting seismic loading based on the initial Building Type C2 Tier 1 assessment. The concrete building has a few deficiencies and unknowns that may need to be addressed. These areas of concern are listed here, followed by a short description of a possible solution:

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1. **REINFORCING STEEL:** At this point it is unknown what is the size and spacing of the reinforcing in the concrete walls.
 - a. Further investigation will be necessary. Steel is necessary for ductility within the system.
2. **TRANSFER TO SHEAR WALLS:** At this point it is unknown what the size and spacing of the reinforcing between the concrete walls and the concrete floor slabs are.
 - a. It is likely that the floor reinforcing is what turns into the concrete walls and that this is sufficient, however, further investigation will be necessary.
3. **FOUNDATION DOWELS:** At this point it is unknown what the size and spacing is of the reinforcing dowels of the concrete walls to the foundation elements.
 - a. Further investigation may be necessary and it can be reasonably assumed that the conc. wall reinforcing, once found, is the same as the dowels into the foundation.
4. **DEFLECTION COMPATIBILITY:** At this point it is unknown what the size and spacing is of the reinforcing within secondary components such as columns and beams.
 - a. Further investigation will be necessary to determine the shear reinforcing within these elements to verify compatibility with drifts ratio's and other deflections.
5. **COUPLING BEAMS:** At this point it is unknown what the size and spacing is of the reinforcing within any coupling beams, i.e., beams over egress or beams part of the of the lateral force resisting system.

The Basic Life Safety Configuration checklist has a few deficiencies that may need to be addressed. These areas of concern are:

1. **ADJACENT BUILDINGS:** The clear distance between the building being evaluated and any adjacent building is greater than 4% of the height of the shorter buildings.
 - a. The newer courthouse, built in 1977 has a skybridge that abuts the south end of the building within this report. It is not clear what the seismic separation between these two buildings is, but the calculated minimum clear distance should be 13-1/2" based on the heights of the two structures. If not, a seismic event will cause the two buildings to shake, likely out of phase to each other, which would in turn cause the skybridge to buckle and potentially collapse in addition to damaging the buildings to either side of the skybridge. Unfortunately, we don't have structural drawings of this skybridge as it was built as addendum #3 and not included with the original drawings of the building built in 1977. The architectural drawings show a cross section of the bridge. It appears to be two concrete beams with a concrete slab between the two concrete beams. The 2004 architectural set calls out a 2" expansion joint which is not sufficient.
 - b. Further evaluation based on actual story drifts will need to be calculated to verify the stiffness of the two buildings. Further investigation will need to be made into the structure of the skybridge/covered walkway. It may be possible to create a seismic joint at the south face of the 1940's concrete building giving sufficient gap between it and the skybridge. If this is done, further analysis will need to be done to verify the adequacy of the lateral condition at the free end of the skybridge. It will likely need additional structure to give it lateral stiffness.
2. **VERTICAL IRREGULARITIES:** The penthouse suite has conc. SW's that frame over conc. beams below. This constitutes a vertical irregularity.
 - a. Further analysis will need to be done to verify the capacity of the Concrete beams supporting the walls above.

The Non-Structural checklist has a few deficiencies that may need to be addressed. There are numerous unknown items that are outside the scope of this structural review. These items are typically not life threatening. The areas of concern are:

1. **MECHANICAL ANCHORAGE:** Some but not all of the mechanical equipment on the roof are anchored.
 - a. Anchor all equipment not currently anchored.
2. **FIRE SUPPRESSION PIPING:** Not all fire suppression piping is anchored and or braced according to NFPA-13



- a. This is typically outside of a structural engineer's scope of work. A plumbing systems designer would be better suited to provide a proposal for the work after a more thorough review is done.
3. **DRIFT.** It does not appear that rigid cementitious partitions are detailed to accommodate drift ratios.
 - a. These can be left as is, but there could be cracking during a seismic event. The cost of fixing cracks in gyp walls, is probably as costly as retrofitting them to meet the requirements listed here. We don't recommend upgrading these walls.
4. **TALL NARROW CONTENTS.** There are numerous locations where tall narrow contents should be braced.
 - a. Brace or remove all shelving with tall narrow contents with kickers to the floor structure or tiebacks to walls.
5. **CONCRETE PARAPETS:** At this point it is unknown what is the size and spacing of the vertical reinforcing in the concrete parapets above the main entrance.
 - a. Further investigation will be necessary to find out if there is reinforcing in these parapets.
6. **APPENDAGES:** There is a chimney that extends above the 4th level roof. It is not attached to the penthouse and appears to be about 25 ft tall.
 - a. We recommend removing the chimney, however, if this is not desirable or possible due to historic requirements, it is possible to brace it with diagonal struts.



SUMMARY

Further investigation should be done to scan the walls, columns and beams to determine reinforcing size and spacing should be done. Adequate reinforcing may render the above unknowns as compliant and some of the below stated items as not necessary. The following items are typical improvements that represent the most cost-effective work to improve the integrity of the concrete building.

1. Wrap concrete columns with Fiber Reinforced Polymer (FRP). This would apply to columns that do not meet compatibility requirements for the concrete building per item 4 above for the Building type C2 Tier 1 assessment.
2. Wrap concrete beams above egress points with FRP. This would ensure that the coupling beams above these locations do not crack and break, potentially causing fall hazards and or blocking exits.
3. Anchor all rooftop mechanical equipment to structure below.
4. Sawcut (E) concrete beams and slab and provide adequate seismic gap at (E) skybridge/covered walkway. Provide additional lateral system to brace free end of skybridge/covered walkway. This would likely be within the scope of the newer courthouse building to the south.
5. Remove or brace the (E) chimney.
6. Brace all tall and narrow contents.
7. In addition to the above stated it should be determined what the construction configuration and geometry of the two concrete entry walls which stick out beyond the face of the walls for the main building. These, if cast in place as solid concrete will add significant mass to the building. It is unlikely that they are, however, it should be verified.

These evaluations and conclusions are based on a site visit by Rollston to the site on July 9th, 2019. In addition to the site visit we were able to review previous reports, specs and Tenant Improvements provided by Deschutes County. The T1 set of drawings were architectural but provided good as-built dimensions. These were done in 2005 by Steele Architecture.

Please find the Tier 1 checklists attached.

Please do not hesitate to contact my office if you have any further questions or need anything else.

Sincerely,

A handwritten signature in blue ink, appearing to read 'John D. Fischer', is written over a light blue horizontal line.

John D. Fischer, PE 85686
Principal Engineer

Tier 1 Checklists Attached:
C2, Basic Structural, Non-Structural



**LIFE SAFETY STRUCTURAL CHECKLIST FOR BUILDING TYPE
C2: Concrete Shearwalls with Stiff Diaphragms
ASCE 41-13, Section 16.10LS**

Building Type C2

These buildings have floor and roof framing that consists of cast-in-place concrete slabs, concrete beams, one-way joists, two-way waffle joists, or flat slabs. Floors are supported on steel beams and columns or on concrete beams and columns or bearing walls. Seismic forces are resisted by cast-in-place concrete shear walls. In older construction, shear walls are lightly reinforced but often extend throughout the building. In more recent construction, shear walls occur in isolated locations and are more heavily reinforced with boundary elements and closely spaced ties to provide ductile performance. The diaphragms consist of concrete slabs and are stiff relative to the walls. Foundations consist of concrete spread footings, mat foundations, or deep foundations.

Low & Moderate Seismicity**Seismic-Force-Resisting System**

- | | | | | |
|-------------------------------------|--------------------------|--------------------------|-------------------------------------|--|
| C | NC | N/A | U | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | COMPLETE FRAMES: Steel or concrete frames classified as secondary components form a complete vertical-load-carrying system. (Commentary: Sec. A.3.1.6.1, Tier 2: Sec. 5.5.2.5.1) |
| C | NC | N/A | U | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | REDUNDANCY: The number of lines of shear walls in each principal direction is greater than or equal to 2. (Commentary: Sec. A.3.2.1.1, Tier 2: Sec. 5.5.1.1) |
| C | NC | N/A | U | |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 4.5.3.3, is less than the greater of 100 lb/in.^2 or $2\sqrt{f'_c}$. (Commentary: Sec. A.3.2.2.1, Tier 2: Sec. 5.5.3.1.1) |
| C | NC | N/A | U | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area is not less than 0.0012 in the vertical direction and 0.0020 in the horizontal direction. (Commentary: Sec. A.3.2.2.2, Tier 2: Sec. 5.5.3.1.3) |

Connections

- | | | | | |
|--------------------------|--------------------------|--------------------------|-------------------------------------|---|
| C | NC | N/A | U | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | TRANSFER TO SHEAR WALLS: Diaphragms are connected for transfer of seismic forces to the shear walls. (Commentary: Sec. A.5.2.1, Tier 2: Sec. 5.7.2) |
| C | NC | N/A | U | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | FOUNDATION DOWELS: Wall reinforcement is doweled into the foundation with vertical bars equal in size and spacing to the vertical wall reinforcing immediately above the foundation. (Commentary: Sec. A.5.3.5, Tier 2: Sec. 5.7.3.4) |

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 | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | DEFLECTION COMPATIBILITY: Secondary components have the shear capacity to develop the flexural strength of the components. (Commentary: Sec. A.3.1.6.2, Tier 2: Sec. 5.5.2.5.2) |
| C | NC | N/A | U | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | FLAT SLABS: Flat slabs/plates not part of seismic-force-resisting system have continuous bottom steel through the column joints. (Commentary: Sec. A.3.1.6.3, Tier 2: Sec. 5.5.2.5.3) |

☐ C ☐ NC ☐ N/A ☒ U
COUPLING BEAMS: The stirrups in coupling beams over means of egress are spaced at or less than $d/2$ and are anchored into the confined core of the beam with hooks of 135 degrees or more. The ends of both walls to which the coupling beam is attached are supported at each end to resist vertical loads caused by overturning. (Commentary: Sec. A.3.2.2.3, Tier 2: Sec. 5.5.3.2.1)

Diaphragms (Flexible or Stiff)

☒ C ☐ NC ☐ N/A ☐ U
DIAPHRAGM CONTINUITY: The diaphragms are not composed of split-level floors and do not have expansion joints. (Commentary: Sec. A.4.1.1, Tier 2: Sec. 5.6.1.1)

☒ 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. (Commentary: Sec. A.4.1.4, Tier 2: Sec. 5.6.1.3)

Connections

☐ C ☐ NC ☐ N/A ☒ U
UPLIFT AT PILE CAPS: Pile caps have top reinforcement and piles are anchored to the pile caps. (Commentary: Sec. A.5.3.8, Tier 2: Sec. 5.7.3.5)

NOTES: NONE

BASIC CHECKLIST LIFE SAFETY BASIC CONFIGURATION CHECKLIST ASCE 41-13

Basic Checklist

The evaluation statements represent general configuration issues applicable for most buildings based on observed earthquake structural damage during actual earthquakes. This checklist should be completed for all buildings in Very Low, Low, Moderate, and High Seismicity for Life Safety Performance Levels.

Low Seismicity

Building System

General

- | C | NC | N/A | U | |
|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------|--|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | LOAD PATH: The structure shall contain 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 foundations. (Commentary: Sec.A.2.1.1, Tier 2: Sec. 5.4.1.1) |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ADJACENT BUILDINGS: The clear distance between the building being evaluated and any adjacent building is greater than 4% of the height of the shorter building. This statement shall not apply for the following building types: W1, W1a, and W2. (Commentary: Sec. A.2.1.2, Tier 2: Sec. 5.4.1.2) |
| <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | MEZZANINES: Interior mezzanine levels are braced independently from the main structure or are anchored to the seismic-force-resisting elements of the main structure. (Commentary: Sec. A.2.1.3, Tier 2: Sec. 5.4.1.3) |

Building Configuration

- | C | NC | N/A | U | |
|-------------------------------------|-------------------------------------|--------------------------|--------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 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. (Commentary: Sec. A.2.2.2, Tier 2: Sec. 5.4.2.1) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | SOFT STORY: The stiffness of the seismic-force-resisting system in any story is not less than 70% of the seismic-force-resisting stiffness in an adjacent story above or less than 80% of the average seismic-force-resisting system stiffness of the three stories above. (Commentary: Sec. A.2.2.3, Tier 2: Sec. 5.4.2.2) |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | VERTICAL IRREGULARITIES: All vertical elements in the seismic-force-resisting system are continuous to the foundation. (Commentary: Sec. A.2.2.4, Tier 2: Sec. 5.4.2.3) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 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. (Commentary: Sec. A.2.2.5, Tier 2: Sec. 5.4.2.4) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | MASS: There is no change in effective mass more than 50% from one story to the next. Light roofs, penthouses, and mezzanines need not be considered. (Commentary: Sec.A.2.2.6, Tier 2: Sec. 5.4.2.5) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 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. (Commentary: Sec. A.2.2.7, Tier 2: Sec. 5.4.2.6) |

Moderate Seismicity

(Complete the following items in addition to the items for Low Seismicity)

Geologic Site Hazards

- | C | NC | N/A | U | |
|-------------------------------------|--------------------------|--------------------------|--------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | LIQUEFACTION: Liquefaction-susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 feet under the building. (Commentary: Sec. A.6.1.1 Tier 2: 5.4.3.1) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | SLOPE FAILURE: The building site is sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or is capable of accommodating any predicted movements without failure. (Commentary: Sec. A.6.1.2. Tier 2: 5.4.3.1) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site are not anticipated. (Commentary: Sec. A.6.1.3. Tier 2: 5.4.3.1) |

High Seismicity

(Complete the following items in addition to the items for Low and Moderate Seismicity)

Foundation Configuration

- | C | NC | N/A | U | |
|-------------------------------------|--------------------------|--------------------------|--------------------------|---|
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 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 $0.6S_a$. (Commentary: Sec. A.6.2.1, Tier 2: Sec. 5.4.3.3) |
| <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 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. (Commentary: Sec. A.6.2.2, Tier 2: Sec. 5.4.3.4) |

NOTES:

NON-STRUCTURAL CHECKLIST ASCE 41-13

Nonstructural Checklist

The following checklist shall be completed for combinations of Performance Levels and Level of seismicity as required by Table 4-6. Checklist items are grouped by system or component type. Each item is preceded by an annotation indicating the Level(s) of Seismicity for which it is required, given a desired performance Level. The Performance Level is designated by LS for Life Safety or PR for Position Retention. The Levels of Seismicity is designated by L, M, or H, for Low, Moderate, and High, respectively. For example, the annotation "LS-H; PR-LMH" indicates that the checklist item is required in High Seismicity when the Performance Level is Life Safety and in Low, Moderate, or High Seismicity when the Performance Level is Position Retention.

A checklist item shall be marked Compliant only when the following conditions are all true:

1. Supporting members relied on for compliance have complete load paths to supporting structural members.
2. Bracing members, connecting members, and supporting structural or architectural components relied on for compliance are of materials and dimensions suitable to the application.
3. Fasteners and connectors relied on for compliance are of materials and sizes suitable to the application.

For evaluation at the Life Safety Performance Level, a checklist item need not be marked Noncompliant if the noncompliance occurs only in locations where related damage would not cause severe injury or death to one or more people.

Life Safety Systems

- | | | | | | | | | | |
|---|--------------------------|--------------------------|-------------------------------------|---|--------------------------|--------------------------|--------------------------|-------------------------------------|---|
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>LS-LMH; PR-LMH. FIRE SUPPRESSION PIPING: Fire suppression piping is anchored and braced in accordance with NFPA-13. (Commentary: Sec. A.7.13.1, Tier 2: Sec. 13.7.4)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>LS-LMH; PR-LMH. FLEXIBLE COUPLINGS: Fire suppression piping has flexible couplings in accordance with NFPA-13. (Commentary: Sec. A.7.13.2, Tier 2: Sec. 13.7.4)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>LS-LMH; PR-LMH. EMERGENCY POWER: Equipment used to power or control life safety system is anchored or braced. (Commentary: Sec. A.7.12.1, Tier 2: Sec. 13.7.7)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>LS-LMH; PR-LMH. STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts are braced and have flexible connections at seismic joints. (Commentary: Sec. A.7.14.1, Tier 2: Sec. 13.7.6)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>LS-MH; PR-MH. SPRINKLER CEILING CLEARANCE: Penetration through panelized ceilings for fire suppression devices provide clearances in according with NFPA-13. (Commentary: Sec. A.7.13.3, Tier 2: Sec. 13.7.4)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |

Hazardous Materials

- | | | | | | | | | | |
|---|--------------------------|--------------------------|-------------------------------------|---|--------------------------|--------------------------|--------------------------|-------------------------------------|--|
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>LS-LMH; PR-LMH. HAZARDOUS MATERIAL EQUIPMENT: Equipment mounted on vibration isolators and containing hazardous material is equipped with restraints or snubbers. (Commentary: Sec. A.7.12.2, Tier 2: Sec. 13.7.1)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |
| <table border="0"> <tr> <td>C</td><td>NC</td><td>N/A</td><td>U</td></tr> <tr> <td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr> </table> | C | NC | N/A | U | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <p>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. (Commentary: Sec. A.7.15.1, Tier 2: Sec. 13.8.4)</p> |
| C | NC | N/A | U | | | | | | |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | | | | |

- ☐ C ☐ NC ☐ N/A ☒ U **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. (Commentary: Sec. A.7.13.4, Tier 2: Sec. 13.7.3 and 13.7.5)
- ☐ C ☐ NC ☐ N/A ☒ U **LS-MH; PR: MH. SHUT-OFF VALVES:** Piping containing hazardous material, including natural gas, has shut-off valves or other devices to limit spills or leaks. (Commentary: Sec. A.7.13.3, Tier 2: Sec. 13.7.3 and 13.7.5)
- ☐ C ☐ NC ☐ N/A ☒ U **LS-LMH; PR-LMH. FLEXIBLE COUPLINGS:** Hazardous material ductwork and piping, including natural gas piping, has flexible couplings. (Commentary: Sec. A.7.15.4, Tier 2: Sec. 13.7.3 and 13.7.5)
- ☐ C ☐ NC ☐ N/A ☒ U **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. (Commentary: Sec. A.7.13.6, Tier 2: Sec. 13.7.3, 13.7.5, and 13.7.6)

Partitions

- ☐ C ☐ NC ☒ N/A ☐ U **LS-LMH; PR-LMH. UNREINFORCED MASONRY:** Unreinforced masonry or hollow-clay tile partitions are braced at a spacing of at most 10 ft in Low or Moderate Seismicity, or at most 6 ft in High Seismicity. (Commentary: Sec. A.7.1.1, Tier 2: Sec. 13.6.2)
- ☐ C ☐ NC ☒ N/A ☐ U **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. (Commentary: Sec. A.7.2.1, Tier 2: Sec. 13.6.2)
- ☐ C ☐ NC ☐ N/A ☒ U **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. (Commentary: Sec. A.7.1.2, Tier 2: Sec. 13.6.2)

Ceilings

- ☐ C ☐ NC ☒ N/A ☐ U **LS-MH; PR-LMH. SUSPENDED LATH AND PLASTER:** Suspended lath and plaster ceilings have attachments that resist seismic forces for every 12 square feet of area. (Commentary: Sec. A.7.2.3, Tier 2: Sec. 13.6.4)
- ☐ C ☐ NC ☒ N/A ☐ U **LS-MH; PR-LMH. SUSPENDED GYPSUM BOARD:** Suspended gypsum board ceilings have attachments that resist seismic forces for every 12 square feet of area. (Commentary: Sec. A.7.2.3, Tier 2: Sec. 13.6.4)

Light Fixtures

- ☐ C ☐ NC ☐ N/A ☒ U **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. (Commentary: Sec. A.7.3.2, Tier 2: Sec. 13.6.4 and 13.7.9)

Cladding and Glazing

- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **LS-MH; PR-MH. CLADDING ANCHORS:** Cladding components weighing more than 10 pounds over square feet are mechanically anchored to the structure at a spacing equal to or less than the following: for Life Safety in Moderate Seismicity, 6 ft; for Life Safety in High Seismicity and for Position Retention in any seismicity, 4 ft. (Commentary: Sec. A.7.4.1, Tier 2: Sec. 13.6.1)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **LS-MH; PR-MH. CLADDING ISOLATION:** For steel or concrete moment frame buildings, panel connections are detailed to accommodate a story drift ratio 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. (Commentary: Sec. A.7.4.3, Tier 2: Sec. 13.6.1)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **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 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. (Commentary: Sec. A.7.4.4, Tier 2: Sec. 13.6.1)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **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. (Commentary: Sec. A.7.4.5, Tier 2: Sec. 13.6.1.4)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **LS-MH; PR-MH. BEARING CONNECTIONS:** Where bearing connections are used, there is a minimum of two bearing connections for each cladding panel. (Commentary: Sec. A.7.4.6, Tier 2: Sec. 13.6.1.4)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **LS-MH; PR-MH. INSERTS:** Where concrete cladding components use inserts, the inserts have positive anchorage or are anchored to reinforcing steel. (Commentary: Sec. A.7.4.7, Tier 2: Sec. 13.6.1.4)
- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **LS-MH; PR-MH. OVERHEAD GLAZING:** Glazing panes of any size in curtain walls and individual interior or exterior panes more than 16 square feet in area are laminated annealed or laminated heat-strengthened glass and are detailed to remain in the frame when cracked. (Commentary: Sec. A.7.4.8; Tier 2: Sec. 13.6.1.5)

Masonry Veneer

- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **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 square feet, and the ties have spacing no greater than the following: for Life Safety in Low or Moderate Seismicity, 36 inches; for Life Safety in High seismicity and for Position Retention in any seismicity, 24 inches. (Commentary: Sec. A.7.5.1, Tier 2: Sec. 13.6.1.2)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **LS-LMH; PR-LMH. SHELF ANGLES:** Masonry veneer is supported by shelf angles or other elements at each floor above the ground floor. (Commentary: Sec. A.7.5.2, Tier 2: Sec. 13.6.1.2)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **LS-LMH; PR-LMH. WEAKENED PLANES:** Masonry veneer is anchored to the backup adjacent to weakened planes, such as at the locations of flashing. (Commentary: Sec. A.7.5.3, Tier 2: Sec. 13.6.1.2)
- ☐ **C** ☐ **NC** ☒ **N/A** ☐ **U** **LS-LMH; PR-LMH. UNREINFORCED MASONRY BACK-UP:** There is no unreinforced masonry backup. (Commentary: Sec. A.7.7.2, Tier 2: Sec. 13.6.1.1 and 13.6.1.2)

- ☐ C ☐ NC ☒ N/A ☐ U
LS-MH; PR-MH. STUD TRACKS: For veneer with metal stud backup, stud tracks are fastened to the structure at a spacing equal to or less than 24 inches on center. (Commentary: Sec. A.7.6.1, Tier 2: Sec. 13.6.1.1 and 13.6.1.2)
- ☐ C ☐ NC ☒ N/A ☐ U
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. (Commentary: Sec. A.7.7.1, Tier 2: Sec. 13.6.1.1 and 13.6.1.2)

Parapets, Cornices, Ornamentation, and Appendages

- ☐ C ☐ NC ☒ N/A ☐ U
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. (Commentary: Sec. A.7.8.1, Tier 2: Sec. 13.6.5)
- ☐ C ☐ NC ☒ N/A ☐ U
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; for Life Safety in High Seismicity and for Position Retention in any seismicity, 6 ft. (Commentary: Sec. A.7.8.2, Tier 2: Sec. 13.6.6)
- ☐ C ☐ NC ☐ N/A ☒ U
LS-MH; PR-LMH. CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 have vertical reinforcement. (Commentary: Sec. A.7.8.3, Tier 2: Sec. 13.6.5)
- ☐ C ☒ NC ☐ N/A ☐ U
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. This checklist item does not apply to parapets or cornices covered by other checklist items. (Commentary: Sec. A.7.8.4, Tier 2: Sec. 13.6.6)

Masonry Chimneys

- ☐ C ☐ NC ☒ N/A ☐ U
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. (Commentary: Sec. A.7.9.1, Tier 2: Sec. 13.6.7)
- ☐ C ☐ NC ☒ N/A ☐ U
LS-LMH; PR-LMH. ANCHORAGE: Masonry chimneys are anchored at each floor level, at the topmost ceiling level, and at the roof. (Commentary: Sec. A.7.9.2, Tier 2: Sec. 13.6.7)

Stairs

- ☐ C ☐ NC ☒ N/A ☐ U
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. (Commentary: Sec. A.7.10.1, Tier 2: Sec. 13.6.2 and 13.6.8)
- ☐ C ☐ NC ☒ N/A ☐ U
LS-LMH; PR-LMH. STAIR DETAILS: In moment frame structures, the connection between the stairs and the structure does not rely on shallow anchors in concrete. Alternatively, the stair details are capable of accommodating the drift calculated using the Quick Check procedure of Section 4.5.3.1 without including any lateral stiffness contribution from the stairs. (Commentary: Sec. A.7.10.2, Tier 2: Sec. 13.6.8)

Contents and Furnishings

- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **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. (Commentary: Sec. A.7.11.1. Tier 2: Sec. 13.8.1)
- ☐ **C** ☒ **NC** ☐ **N/A** ☐ **U** **LS-H; PR-MH. TALL NARROW CONTENTS:** Contents more than 6 ft in 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. (Commentary: Sec. A.7.11.2. Tier 2: Sec. 13.8.2)
- ☐ **C** ☒ **NC** ☐ **N/A** ☐ **U** **LS-H; PR-H. FALL-PRONE CONTENTS:** Equipment, stored items, or other contents weighing more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level are braced or otherwise restrained. (Commentary: Sec. A.7.11.3. Tier 2: Sec. 13.8.2)

Mechanical and Electrical Equipment

- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **LS-H; PR-H. FALL-PRONE EQUIPMENT:** Equipment weighing more than 20 lb whose center of mass is more than 4 ft above the adjacent floor level, and which is not in-line equipment, is braced. (Commentary: Sec. A.7.12.4. Tier 2: Sec. 13.7.1 and 13.7.7)
- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **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, is supported and laterally braced independent of the duct or piping system. (Commentary: Sec. A.7.12.5. Tier 2: Sec. 13.7.1)
- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **LS-H; PR-MH. TALL NARROW EQUIPMENT:** Equipment more than 6 ft 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. (Commentary: Sec. A.7.12.6. Tier 2: Sec. 13.7.1 and 13.7.7)

Elevators

- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **LS-H; PR-H. RETAINER GUARDS:** Sheaves and drums have cable retainer guards. (Commentary: Sec. A.7.16.1. Tier 2: Sec. 13.8.6)
- ☐ **C** ☐ **NC** ☐ **N/A** ☒ **U** **LS-H; PR-H. RETAINER PLATE:** A retainer plate is present at the top and bottom of both car and counterweight. (Commentary: Sec. A.7.16.2. Tier 2: Sec. 13.8.6)

NOTES: NONE

APPENDIX C:
SCHEMATIC DESIGN STRUCTURAL CALCULATIONS



33 NW Franklin Avenue, Ste. 100

Bend, OR 97703

(541) 647-1445

STRUCTURAL CALCULATIONS:

PROJECT NO.:

21699

PROJECT NAME:

Old Courthouse Seismic Assessment

PROJECT TYPE:

Voluntary Upgrade

Existing Three-Story, Commercial Building

PROJECT ADDRESS:

1164 NW Bond St.

Bend, OR 97701

ARCHITECT:

LRS

1693 SW Chandler Ave

Suite 140

Bend, OR 97702

PROJECT ENGINEER:

Mike Simmons, SE

DATE:

October 24, 2024



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DESIGN PARAMETERS

Code: 2022 OSSC (Based upon the 2021 IBC)

Note:

The intent of lateral design is to prevent structural failures, in the event of seismic activities or high-winds, but not to prevent the damage of architectural finishes or systems. The lateral calculations herein conform to the specifications of the current Oregon Structural Specialty Code (OSSC). Ashley & Vance Engineering Inc. provides no guarantees, expressed or implied, as to the adequacy of the OSSC provisions.

These calculations, specifications, details and drawings are instruments of service and are the property of Ashley & Vance Engineering Inc. The information contained herein is for use on the specific project referenced above and shall not be used otherwise without the written authorization of Ashley & Vance Engineering Inc.


 Job: [21699 - Old Courthouse Seismic Assessment - Deschutes County](#)

Load Sheet

PENTHOUSE ROOF LOADS

 Typical Roof Live Loads **20.0** psf

Snow Load	$P_s = 0.7 \cdot C_e \cdot C_t \cdot I \cdot C_s \cdot P_g$	
Ground Snow Load: psf		30.0 psf
Exposure Factor: C_e		1.0 psf
Thermal Factor: C_t		1.1 psf
Importance Factor: I		1.0 psf
Roof Slope Factor: C_s		1.0 psf
Minimum Roof Snow Load per OSSC		25.0 psf
		25.0 psf

Typical Penthouse Roof Dead Loads

PVC/TPO Membrane	2.0 psf
3" Concrete Slab	37.5 psf
Concrete Beams	4.9 psf
10" Batt Insulation	0.8 psf
Suspended T-bar Ceiling	1.8 psf
MEP	2.0 psf
Sprinklers	1.0 psf
Misc. Loads	2.0 psf
Total Dead Load	52.0 psf

ROOF LOADS

 Typical Roof Live Loads **20.0** psf

 Typical Roof Snow Loads **25.0** psf

Typical Roof Dead Loads

PVC/TPO Membrane	2.0 psf
7" Concrete Slab	87.5 psf
Concrete Beams	54.2 psf
Suspended T-bar Ceiling	1.8 psf
MEP	2.0 psf
Sprinklers	1.0 psf
Misc. Loads	1.5 psf
Total Dead Load	150.0 psf



Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County

Load Sheet

FLOOR LOADS

Typical Floor Live Loads	40 psf
Typical Corridor Live Load	80 psf

Typical Floor Dead Loads	
Carpet	1.0 psf
7" Concrete Slab	87.5 psf
Concrete Beams	54.2 psf
Sprinklers	1.0 psf
Suspended T-bar Ceiling	1.8 psf
MEP	2.0 psf
Misc. Loads	2.5 psf
Total Dead Load	150.0 psf

Partition Load	
Assumed Partition Load	20 psf



Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County

Load Sheet

PENTHOUSE ADDED WEIGHTS FOR SEISMIC

Weight due to beams for Seismic

Area of beams =	68 sqft	Total =	10200 lbs
Depth of beams =	12 in		
Weight of beams =	150 pcf	Eff. =	4.8 psf
Area of Penthouse =	2110 sqft		

Added weight due to Conc. walls for Seismic

Height of walls =	5.5 ft	Total =	113025 lbs
Weight of conc. =	150 pcf		
Area of walls =	137 sqft	Eff. =	53.6 psf

ROOF ADDED WEIGHTS FOR SEISMIC

Weight due to beams

Area of beams =	1300 sqft	Total =	390000 lbs
Depth of beams =	24 in		
Weight of Conc. =	150 pcf	Eff. =	54.2 psf
Area of total floor =	7200 sqft		

Added weight due to 10" Conc. walls for Seismic (incl. 3ft parapet)

Height of walls =	10.5 ft	Total =	525000 lbs
Weight of Conc. =	150 pcf		
Area of walls =	400 sqft	Eff. =	76.7 psf

Added weight due to Conc. Col's. for Seismic

Trib Height of Col's =	7.5 ft	Total =	23625 lbs
Weight of Conc. =	150 pcf		
Area of Col's. =	21 sqft	Eff. =	3.3 psf

Added weight due to Conc. penthouse walls for Seismic

Height of walls =	5.5 ft	Total =	113025 lbs
Weight of conc. =	150 pcf		
Area of walls =	137 sqft	Eff. =	15.7 psf



Job: [21699 - Old Courthouse Seismic Assessment - Deschutes County](#)

Load Sheet

3RD FLOOR ADDED WEIGHTS FOR SEISMIC

Weight due to beams

Area of beams =	1300 sqft	Total =	390000 lbs
Depth of beams =	24 in		
Weight of Conc. =	150 pcf	Eff. =	54.2 psf
Area of total floor =	7200 sqft		

Added weight due to 10" Conc. walls for Seismic

Height of walls =	13.25 ft	Total =	530000 lbs
Weight of Conc. =	150 pcf		
Area of walls =	320 sqft	Eff. =	73.6 psf

Added weight due to Conc. Col's. for Seismic

Trib Height of Col's =	13.25 ft	Total =	41737.5 lbs
Weight of Conc. =	150 pcf		
Area of Col's. =	21 sqft	Eff. =	5.8 psf

2ND FLOOR ADDED WEIGHTS FOR SEISMIC

Weight due to beams

Area of beams =	1300 sqft	Total =	390000 lbs
Depth of beams =	24 in		
Weight of Conc. =	150 pcf	Eff. =	54.2 psf
Area of total floor =	7200 sqft		

Added weight due to 10" Conc. walls for Seismic

Height of walls =	11.5 ft	Total =	460000 lbs
Weight of Conc. =	150 pcf		
Area of walls =	320 sqft	Eff. =	63.9 psf

Added weight due to Conc. Col's. for Seismic

Trib Height of Col's =	11.5 ft	Total =	36225 lbs
Weight of Conc. =	150 pcf		
Area of Col's. =	21 sqft	Eff. =	5.0 psf

SEISMIC DESIGN PARAMETERS

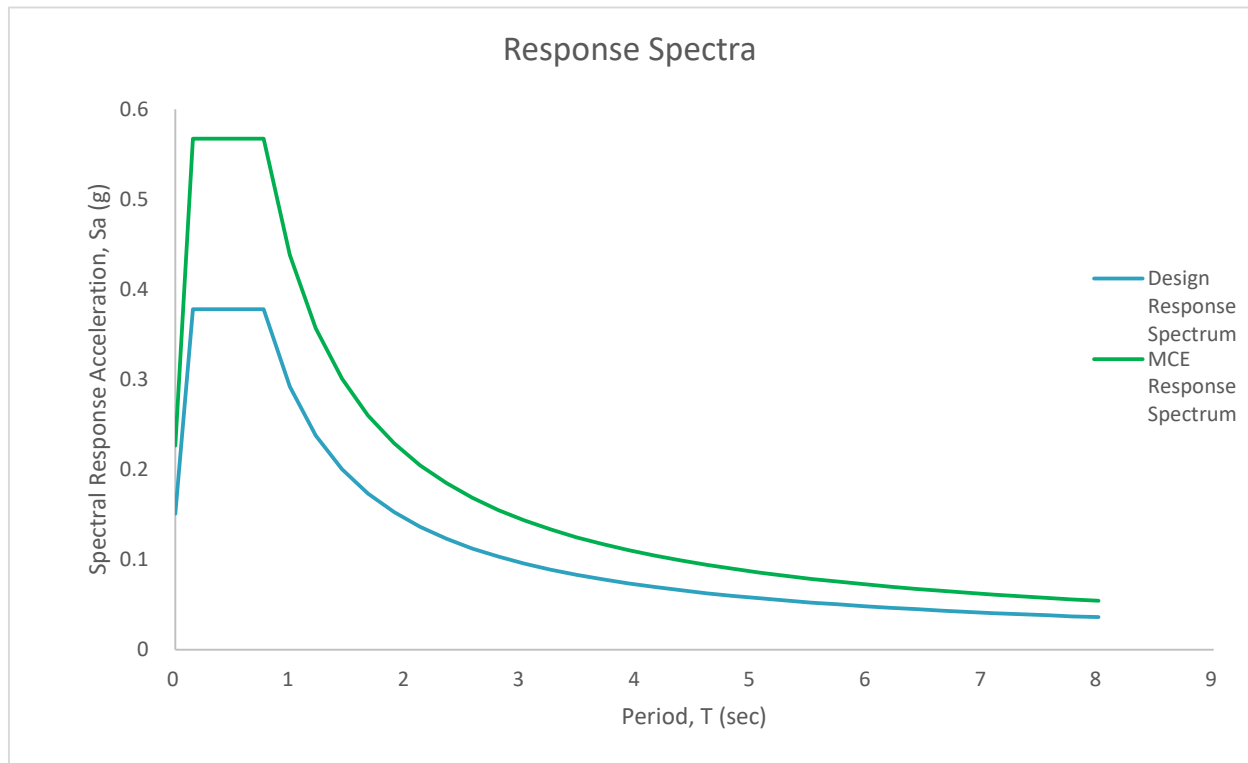
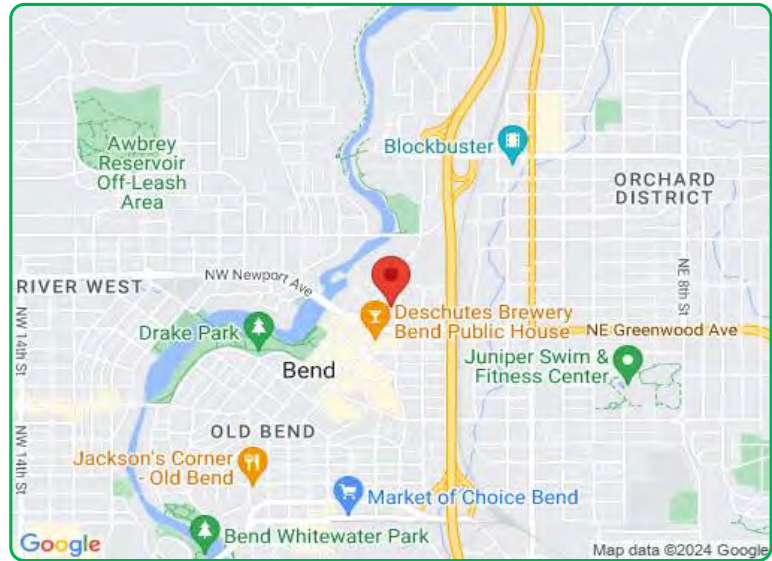
Criteria:

Building Code: [ASCE7-16](#)
 Site Latitude: [44.06094](#)
 Site Longitude: [-121.31065](#)
 Risk Category: [II](#)
 Soil Classification: [D](#)

Ground Motion Values:

S_s : [0.379](#) S_1 : [0.197](#)
 F_a : [1.497](#) F_v : [2.206](#)
 S_{MS} : [0.567](#) S_{M1} : [0.435](#)
 S_{DS} : [0.378](#) S_{D1} : [0.290](#)

(S_s & S_1 Taken From Raw USGS Data)



⚠ This is a beta release of the new ATC Hazards by Location website. Please [contact us](#) with feedback.

ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

ATC

Hazards by Location

Search Information

Address: 1164 NW Bond St, Bend, OR 97703, USA

Coordinates: 44.060938, -121.3106484

Elevation: 3644 ft

Timestamp: 2024-04-15T21:48:59.618Z

Hazard Type: Seismic

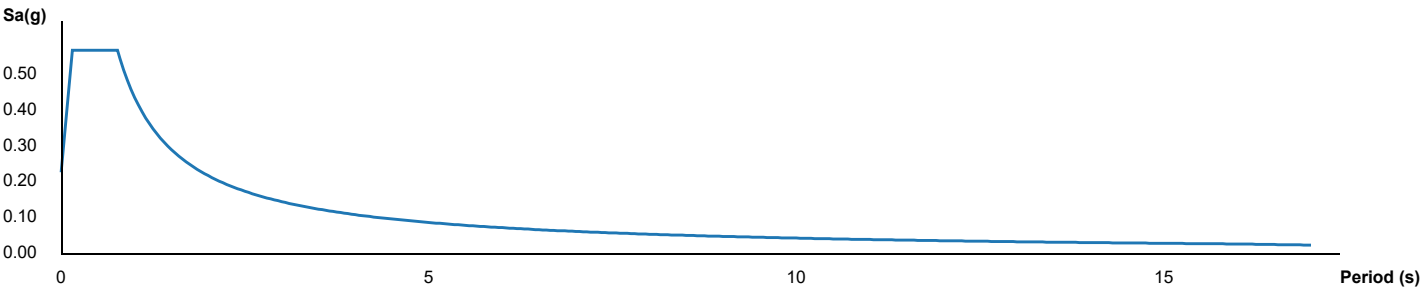
Reference Document: ASCE41-17

Site Class: D-default

Custom Probability:



Horizontal Response Spectrum - Hazard Level BSE-2N



Hazard Level BSE-2N

Name	Value	Description
SsUH	0.419	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR _S	0.905	Coefficient of risk (0.2s)
SsRT	0.379	Probabilistic risk-targeted ground motion (0.2s)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S _S	0.379	MCE _R ground motion (period=0.2s)
F _a	1.497	Site amplification factor at 0.2s
S _{XS}	0.567	Site modified spectral response (0.2s)
S1UH	0.224	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
CR ₁	0.882	Coefficient of risk (1.0s)
S1RT	0.197	Probabilistic risk-targeted ground motion (1.0s)
S1D	0.6	Factored deterministic acceleration value (1.0s)
S ₁	0.197	MCE _R ground motion (period=1.0s)
F _v	2.205	Site amplification factor at 1.0s
S _{X1}	0.435	Site modified spectral response (1.0s)

Hazard Level BSE-1N

Name	Value	Description
S _{XS}	0.378	Site modified spectral response (0.2s)
S _{X1}	0.29	Site modified spectral response (1.0s)

Hazard Level BSE-2E

Name	Value	Description
S_S	0.26	MCE_R ground motion (period=0.2s)
F_a	1.592	Site amplification factor at 0.2s
S_{XS}	0.414	Site modified spectral response (0.2s)
S_1	0.136	MCE_R ground motion (period=1.0s)
F_v	2.329	Site amplification factor at 1.0s
S_{X1}	0.316	Site modified spectral response (1.0s)

Hazard Level BSE-1E

Name	Value	Description
S_S	0.103	MCE_R ground motion (period=0.2s)
F_a	1.6	Site amplification factor at 0.2s
S_{XS}	0.164	Site modified spectral response (0.2s)
S_1	0.047	MCE_R ground motion (period=1.0s)
F_v	2.4	Site amplification factor at 1.0s
S_{X1}	0.114	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.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).

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Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

LRFD Lateral Force Analysis
2022 OSSC

SEISMIC DESIGN BASE SHEAR (STATIC)

Risk Category: II (IBC Table 1604.5)
 $I_e = 1.00$ (ASCE Table 1.5-2)
 $R = 1$ (ASCE Table 12.2-1)
 $C_d = 4$ (ASCE Table 12.2-1)
 $\Omega_o = 2.5$ (ASCE Table 12.2-1)
 Reduced by 1/2 for flexible diaphragms per ASCE Table 12.2-1 footnote b

SEISMIC GROUND MOTION VALUES

Latitude: 44.060938
 Longitude: -121.310648
 Site Classification = D Site Specific Site Class per Soils? **No** F_a Min = 1.2 per 1613.2.3

Short Period

$S_S = 0.379$
 $F_a = 1.497$ (IBC Table 1613.2.3(1))
 $S_{MS} = 0.567$ (IBC Eq. 16-36)
 $S_{DS} = 0.378$ (IBC Eq. 16-38)

Long Period

$S_1 = 0.197$
 $F_v = 2.206$ (IBC Table 1613.2.3(2))
 $S_{M1} = 0.435$ (IBC Eq. 16-37)
 $S_{D1} = 0.290$ (IBC Eq. 16-39)

APPROXIMATE FUNDAMENTAL PERIOD

Building Type: **All Other Structural Systems**
 Maximum Height = **38.0 ft**
 $T_a = 0.31$ sec (ASCE Eq. 12.8-7)
 $T_0 = 0.15$ sec (ASCE 11.3)
 $T_s = 0.77$ sec (ASCE 11.3)
 $T_L = 8$ sec (ASCE Figure 22-14)

SEISMIC DESIGN CATEGORY

SDC = D (ASCE 11.6)

SEISMIC BASE SHEAR

$C_s = 0.3782$ **Govs** (ASCE Eq. 12.8-2)
 $C_{s\text{ MAX}} = 0.9465$ (ASCE Eq. 12.8-3 & Eq. 12.8-4)
 $C_{s\text{ MIN}} = 0.0166$ (ASCE Eq. 12.8-5 & Eq. 12.8-6)
 $C_s = 0.3782$
 $V = 0.378 * W$



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

LRFD Lateral Force Analysis
ASCE 41-17

PSEUDO LATERAL FORCE (LSP)

Risk Category: **II** (CBC Table 1604.5)
 Earthquake Hazard Level: **BSE-1E**
 Probability of Exceedance: **20%** in 50 Years
 EQ Mean Return Period: **224** Years

SEISMIC GROUND MOTION VALUES

Latitude: **44.060938** $\alpha = 60$ (Site Class Factor, Eq 7-22)
 Longitude: **-121.310648** $\beta = 5\%$ (Sec. 7.2.3.6)
 Site Classification = **D** Soils Report? **No** F_a Min = 1.2 per 1613.2.3
 LFRS Type = **Concrete Shear Wall**
 Level of Seismicity = **High**

Short Period

$S_s = 0.103$
 $F_a = 1.600$ (IBC Table 1613.2.3(1))
 $S_{XS} = 0.165$ (Eq. 2-1)

Long Period

$S_1 = 0.047$
 $F_v = 2.400$ (IBC Table 1613.2.3(2))
 $S_{X1} = 0.113$ (Eq. 2-2)

APPROXIMATE FUNDAMENTAL PERIOD

Building Type: **All Other Structural Systems**
 Maximum Height = **38.0 ft**
 $T_a = 0.31$ sec (Sec. 7.4.1.2.2)
 $T_0 = 0.14$ sec (ASCE 11.3)
 $T_s = 0.68$ sec (ASCE 11.3)

MODIFICATION FACTORS

$\mu_{\text{strength}} = 3.00$ (Eq. 7-31)
 $C_1 = 1.356$ (Eq. 7-22)
 $C_2 = 1.053$ (Eq. 7-23)
 $C_m = 0.80$ (Table 7-4)
 Alt: $C_1 \cdot C_2 = 1.40$ (Table 7-3)

SPECTRAL ACCELERATION

$B_1 = 1.002$ (Eq. 2-3)
 S_a for T between 0 and $T_0 = 0.29$ g
 S_a for T between T_0 and $T_s = 0.16$ g
 S_a for $T > T_s = 0.37$ g
 Spectral Acceleration $S_a = 0.16$ g

PSEUDO LATERAL FORCE

$V = C_1 C_2 C_m S_a W = 0.185 * W$ (Eq. 7-21)



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

LRFD Lateral Force Analysis
ASCE 41-17

PSEUDO LATERAL FORCE (LSP)

Risk Category: **II** (CBC Table 1604.5)
 Earthquake Hazard Level: **BSE-2E**
 Probability of Exceedance: **5%** in 50 Years
 EQ Mean Return Period: **975** Years

SEISMIC GROUND MOTION VALUES

Latitude: **44.060938** $\alpha = 60$ (Site Class Factor, Eq 7-22)
 Longitude: **-121.310648** $\beta = 5\%$ (Sec. 7.2.3.6)
 Site Classification = **D** Soils Report? **No** F_a Min = 1.2 per 1613.2.3
 LFRS Type = **Concrete Shear Wall**
 Level of Seismicity = **High**

Short Period

$S_s = 0.260$
 $F_a = 1.592$ (IBC Table 1613.2.3(1))
 $S_{xs} = 0.414$ (Eq. 2-1)

Long Period

$S_1 = 0.136$
 $F_v = 2.328$ (IBC Table 1613.2.3(2))
 $S_{x1} = 0.317$ (Eq. 2-2)

APPROXIMATE FUNDAMENTAL PERIOD

Building Type: **All Other Structural Systems**
 Maximum Height = **38.0 ft**
 $T_a = 0.31$ sec (Sec. 7.4.1.2.2)
 $T_0 = 0.15$ sec (ASCE 11.3)
 $T_s = 0.77$ sec (ASCE 11.3)

MODIFICATION FACTORS

$\mu_{\text{strength}} = 3.00$ (Eq. 7-31)
 $C_1 = 1.356$ (Eq. 7-22)
 $C_2 = 1.053$ (Eq. 7-23)
 $C_m = 0.80$ (Table 7-4)
 Alt: $C_1 * C_2 = 1.40$ (Table 7-3)

SPECTRAL ACCELERATION

$B_1 = 1.002$ (Eq. 2-3)
 S_a for T between 0 and $T_0 = 0.66$ g
 S_a for T between T_0 and $T_s = 0.41$ g
 S_a for $T > T_s = 1.03$ g
 Spectral Acceleration $S_a = 0.41$ g

PSEUDO LATERAL FORCE

$V = C_1 C_2 C_m S_a W = 0.463 * W$ (Eq. 7-21)



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

LRFD Lateral Force Analysis
ASCE 41-17

Response Spectrum (ASCE 41-17, Sec. 2.4.1.7)

Design Response Spectrum Parameters (BSE-1E)

Long Period Transition

Damping Coefficient for the viscous damping effects

Spectral Response Acceleration at short periods

Spectral Response Acceleration at a period of 1 sec

$$T_0 = 0.137 \text{ sec}$$

$$T_S = 0.685 \text{ sec}$$

$$T_L = 8 \text{ sec}$$

$$B_1 = 1.002$$

$$S_{XS} / B_1 = 0.165 \text{ g}$$

$$S_{X1} / B_1 = 0.113 \text{ g}$$

Spectral Response Acceleration Curves

For $T < T_0$:

$$S_a = S_{XS} [(5/B_1 - 2) * (T/T_S) + 0.4]$$

For $T_0 \leq T \leq T_S$:

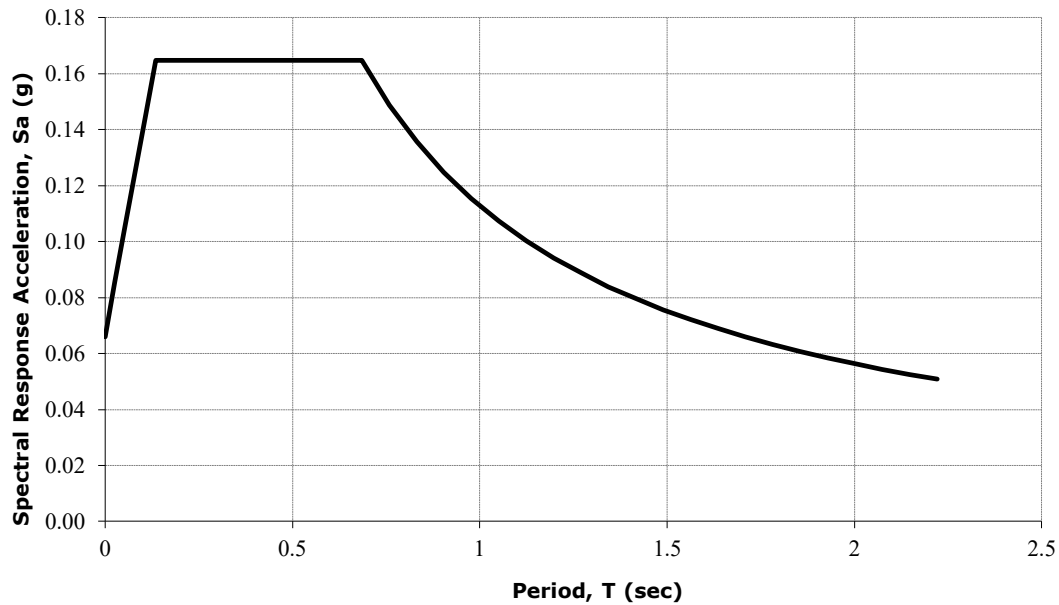
$$S_a = S_{XS} / B_1$$

For $T_S < T \leq T_L$:

$$S_a = S_{X1} / (B_1 T)$$

For $T > T_L$:

$$S_a = S_{X1} T_L / (B_1 T^2)$$



Design Response Spectrum



LRFD Lateral Force Analysis
2022 OSSC

Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

C_s :	0.185
k =	1.00 (ASCE Eq. 12.8-12)

VERTICAL SEISMIC FORCE DISTRIBUTION (ASCE 12.8.3)										
Level	Height (ft)	DL (psf)	PL (psf)	Floor Area (sq.ft.)	Weight (lbs)	wh^k (k-ft)	C_v (12.8-12)	Story Shear (lbs)	Story Shear (psf)	% Total
Penthouse	50.0	52.0	58.6	2110	233295	11664.8	0.083	83818	39.7	8.3%
Roof	38.0	150.0	105.6	7200	1840650	69944.7	0.499	502595	69.8	58.2%
Third	23.0	150.0	89.4	7200	1723738	39646.0	0.283	284880	39.6	78.2%
Second	11.5	150.0	78.9	7200	1648225	18954.6	0.135	136200	18.9	100.0%
Totals:					5445908	#####	1.0	1007493	168.0	

		DIAPHRAGM LOADS (ASCE 12.10)									
		NORTH-SOUTH DIRECTION					EAST-WEST DIRECTION				
Level	DL (psf)	PL (psf)	(12.10-1) (psf)	Max (psf)	Min (psf)	Gov (psf)	PL (psf)	(12.10-1) (psf)	Max (psf)	Min (psf)	Gov (psf)
Penthouse Roof Third Second	52	58.566	39.7	16.7	8.4	16.7	58.566	39.7	16.7	8.4	16.7
	150	105.65	97.2	38.7	19.3	38.7	105.65	97.2	38.7	19.3	38.7
	150	89.408	67.7	36.2	18.1	36.2	89.408	67.7	36.2	18.1	36.2
	150	78.92	50.8	34.6	17.3	34.6	78.92	50.8	34.6	17.3	34.6



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Stress check per Table 17-24

Tier 1 Checks (BSE-1E)

Assumed strength of concrete

$f'_c = 2500$ psi, per archived specs.

Allowable stresses

$v = 100$ psi or
 $2vf'_c = 100$ psi, whichever is greater.

Conc. Wall thickness

$bw = 8$ in

Force at each level

Penthouse $V_j = 83818.2$ lbs
 Roof $V_j = 502595$ lbs
 3rd Floor $V_j = 284880$ lbs
 2nd Floor $V_j = 136200$ lbs

$v_j \text{ avg} = (1/M_s) * (V_j/A_w)$ (Eq. 4-8)
 $M_s = 3$ (Table 4-8)

Level	Direction	Length of wall	$v_j \text{ avg} =$			
Penthouse	EW	50 ft	5.82071 psi	<	100	OK!
Roof	EW	70 ft	24.9303 psi	<	100	OK!
3rd Floor	EW	70 ft	14.131 psi	<	100	OK!
2nd Floor	EW	70 ft	6.75596 psi	<	100	OK!
Penthouse	NS	68 ft	4.27993 psi	<	100	OK!
Roof	NS	92 ft	18.9687 psi	<	100	OK!
3rd Floor	NS	92 ft	10.7518 psi	<	100	OK!
2nd Floor	NS	92 ft	5.1404 psi	<	100	OK!

Check Overturning per Table 17-2

$0.6S_a = 0.1$ < 1.58 = Ratio of base over height
 Height = 38 ft
 Length of bldg = 60 ft
OK!


 Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County
Testing Results

The following is a summary of the testing results that were produced by Wallace Group on April 15, 2024 and September 25, 2024. The values used for the analysis of the building are provided after the results summary based on ASCE 41.

Reinforcement

Intermediate grade reinforcement based on April 24, 1940 Specifications.

$f_y =$ 40 ksi

Concrete

<u>Location</u>	<u>Date</u>	<u>Compressive Strength (psi)</u>
Storage South	4/15/2024	3350
Storage North	4/15/2024	2610
Stair South	4/15/2024	4200
South Stair 1	9/25/2024	2500
South Stair 2	9/25/2024	2340
Middle Stair	9/25/2024	2830

Concrete

Average (E) Conc. Strength (psi) = 2971

Average (E) Conc. Strength (psi) = 2822 (Highest and lowest omitted)

Conservatively use 2500 psi



Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County **Diaphragm**

Diaphragm Forces	
Level	Seis. (psf)
Penthouse	16.7
Roof	38.7
Third	36.2
Second	34.6

Chord Force

Diaphragm Force = 278447 lb

Min. Diaphragm Depth = 35 ft (Conservative at Stair)
 Diaphragm Width = 50 ft (between interior walls)

Diaphragm Dist. Load = 5568.94 plf

Mu = 1741 k-ft
 Tu = 50 k

m = 2 (Table 10-13)

As Req'd = 0.42 sq in

Slab Bars @ 5"oc (N/S), so considered satisfied

Diaphragm Shear

Diaphragm Shear = 139.224 k
 Diaphragm Depth Ea. End = 60 ft
 m = 1

Unit Diaphragm Shear = 2.33 k/ft

As Req'd = 0.04 sq in / ft



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

<u>Story Shears</u>		<u>Center of Mass ⁽¹⁾</u>		<u>Building Length</u>	
X-direction	100.0 kips	X _{C.M.}	Y _{C.M.}	L _x	L _y
Y-direction	100.0 kips	28.2 ft	19.8 ft	54 ft	40 ft

Walls Parallel to Y-axis

Wall ID	Centroid Location x y		Wall Length	Wall Thickness	Wall Height	Modulus of Elasticity	Fixity Condition	Rigidity ⁽²⁾ (kip/in)	R _y *x	R _y *d	R _y *d ²
A	0.0 ft	6.0 ft	12.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	1038 k/in	0.00E+00	4.47E+04	1.92E+06
B	0.0 ft	18.0 ft	5.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	103 k/in	0.00E+00	4.42E+03	1.90E+05
C	0.0 ft	27.3 ft	7.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	316 k/in	0.00E+00	1.36E+04	5.85E+05
D	0.0 ft	37.0 ft	3.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	37 k/in	0.00E+00	1.58E+03	6.79E+04
E	54.0 ft	14.5 ft	29.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	5700 k/in	3.08E+05	6.24E+04	6.83E+05
F	54.0 ft	35.3 ft	6.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	171 k/in	9.26E+03	1.88E+03	2.05E+04
Σ =								7364	3.2E+05	1.29E+05	3.47E+06

Walls Parallel to X-axis

Wall ID	Centroid Location x y		Wall Length	Wall Thickness	Wall Height	Modulus of Elasticity	Fixity Condition	Rigidity (kip/in)	R _x *y	R _x *d	R _x *d ²
AA	2.0 ft	0.0 ft	4.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	54 k/in	0.00E+00	1.18E+03	2.60E+04
AB	12.5 ft	0.0 ft	9.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	510 k/in	0.00E+00	1.12E+04	2.45E+05
AC	22.5 ft	0.0 ft	3.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	37 k/in	0.00E+00	8.03E+02	1.76E+04
AD	30.5 ft	0.0 ft	4.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	54 k/in	0.00E+00	1.18E+03	2.60E+04
AE	39.8 ft	0.0 ft	3.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	23 k/in	0.00E+00	5.11E+02	1.12E+04
AF	43.5 ft	0.0 ft	2.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	14 k/in	0.00E+00	2.98E+02	6.54E+03
AG	50.8 ft	0.0 ft	4.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	54 k/in	0.00E+00	1.18E+03	2.60E+04
AH	3.8 ft	40.0 ft	7.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	316 k/in	1.26E+04	5.71E+03	1.03E+05
AI	15.3 ft	40.0 ft	9.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	510 k/in	2.04E+04	9.22E+03	1.67E+05
AJ	25.0 ft	40.0 ft	6.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	171 k/in	6.86E+03	3.10E+03	5.60E+04
AK	31.8 ft	40.0 ft	3.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	37 k/in	1.46E+03	6.62E+02	1.20E+04
AL	39.0 ft	40.0 ft	2.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	14 k/in	5.44E+02	2.46E+02	4.45E+03
AM	45.5 ft	40.0 ft	2.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	14 k/in	5.44E+02	2.46E+02	4.45E+03
AN	52.0 ft	40.0 ft	2.5 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	14 k/in	5.44E+02	2.46E+02	4.45E+03
AO	42.5 ft	21.0 ft	21.0 ft	8.0 in	15.0 ft	1500 ksi	fixed-free	3333 k/in	7.00E+04	3.08E+03	2.84E+03
Σ =								5153	1.1E+05	3.89E+04	7.13E+05



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

Center of Rigidity⁽³⁾

X _{C.R.}	Y _{C.R.}
4.31E+01	21.9 ft

Torsional Irregularity Amplification

A _x	1.0
A _y	1.0

Eccentricity

	actual	actual+acc	actual-acc
e _x	14.9 ft	17.6 ft	12.2 ft
e _y	2.1 ft	4.1 ft	0.1 ft

% Relative Rigidity

Walls Parallel to Y-axis			Walls Parallel to X-axis			Diagonal Walls			
Wall ID	Y-dir	Torsion	Wall ID	X-dir	Torsion	Wall ID	X-dir	Y-dir	Torsion
A	14.1%	26.7%	AA	1.0%	0.7%	0	0.0%	0.0%	0.0%
B	1.4%	2.6%	AB	9.9%	6.7%	0	0.0%	0.0%	0.0%
C	4.3%	8.1%	AC	0.7%	0.5%	0	0.0%	0.0%	0.0%
D	0.5%	0.9%	AD	1.0%	0.7%	0	0.0%	0.0%	0.0%
E	77.4%	37.3%	AE	0.5%	0.3%				
F	2.3%	1.1%	AF	0.3%	0.2%				
			AG	1.0%	0.7%				
			AH	6.1%	3.4%				
			AI	9.9%	5.5%				
			AJ	3.3%	1.9%				
			AK	0.7%	0.4%				
			AL	0.3%	0.1%				
			AM	0.3%	0.1%				
			AN	0.3%	0.1%				
			AO	64.7%	1.8%				



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

Resultant Shear Wall Forces

Y-Dir Loading Walls Parallel to Y-axis

Wall ID	Translational Fy ⁽⁴⁾	Rotational Fy ⁽⁵⁾		Resultant Force
		act+acc	act-acc	
A	14.1 kips	18.8 kips	13.0 kips	32.9 kips
B	1.4 kips	1.9 kips	1.3 kips	3.2 kips
C	4.3 kips	5.7 kips	4.0 kips	10.0 kips
D	0.5 kips	0.7 kips	0.5 kips	1.2 kips
E	77.4 kips	-26.2 kips	-18.2 kips	59.2 kips
F	2.3 kips	-0.8 kips	-0.5 kips	1.8 kips

X-Dir Loading Walls Parallel to Y-axis

Wall ID	Translational Fx	Rotational Fx		Resultant Force
		act+acc	act-acc	
A	0	-4.4 kips	-0.1 kips	4.4 kips
B	0	-0.4 kips	0.0 kips	0.4 kips
C	0	-1.3 kips	0.0 kips	1.3 kips
D	0	-0.2 kips	0.0 kips	0.2 kips
E	0	6.1 kips	0.1 kips	6.1 kips
F	0	0.2 kips	0.0 kips	0.2 kips

Wall ID	Max Force
A	32.9 kips
B	3.2 kips
C	10.0 kips
D	1.2 kips
E	59.2 kips
F	1.8 kips

Walls Parallel to X-axis

Wall ID	Translational Fy ⁽⁴⁾	Rotational Fy ⁽⁵⁾		Resultant Force
		act+acc	act-acc	
AA	0	-0.5 kips	-0.3 kips	0.5 kips
AB	0	-4.7 kips	-3.3 kips	4.7 kips
AC	0	-0.3 kips	-0.2 kips	0.3 kips
AD	0	-0.5 kips	-0.3 kips	0.5 kips
AE	0	-0.2 kips	-0.1 kips	0.2 kips
AF	0	-0.1 kips	-0.1 kips	0.1 kips
AG	0	-0.5 kips	-0.3 kips	0.5 kips
AH	0	-2.4 kips	-1.7 kips	2.4 kips
AI	0	-3.9 kips	-2.7 kips	3.9 kips
AJ	0	-1.3 kips	-0.9 kips	1.3 kips
AK	0	-0.3 kips	-0.2 kips	0.3 kips
AL	0	-0.1 kips	-0.1 kips	0.1 kips
AM	0	-0.1 kips	-0.1 kips	0.1 kips
AN	0	-0.1 kips	-0.1 kips	0.1 kips
AO	0	-1.3 kips	-0.9 kips	1.3 kips

Walls Parallel to X-axis

Wall ID	Translational Fx	Rotational Fx		Resultant Force
		act+acc	act-acc	
AA	1.0 kips	-0.1 kips	0.0 kips	1.0 kips
AB	9.9 kips	-1.1 kips	0.0 kips	9.9 kips
AC	0.7 kips	-0.1 kips	0.0 kips	0.7 kips
AD	1.0 kips	-0.1 kips	0.0 kips	1.0 kips
AE	0.5 kips	0.0 kips	0.0 kips	0.5 kips
AF	0.3 kips	0.0 kips	0.0 kips	0.3 kips
AG	1.0 kips	-0.1 kips	0.0 kips	1.0 kips
AH	6.1 kips	-0.6 kips	0.0 kips	6.1 kips
AI	9.9 kips	-0.9 kips	0.0 kips	9.9 kips
AJ	3.3 kips	-0.3 kips	0.0 kips	3.3 kips
AK	0.7 kips	-0.1 kips	0.0 kips	0.7 kips
AL	0.3 kips	0.0 kips	0.0 kips	0.3 kips
AM	0.3 kips	0.0 kips	0.0 kips	0.3 kips
AN	0.3 kips	0.0 kips	0.0 kips	0.3 kips
AO	64.7 kips	-0.3 kips	0.0 kips	64.7 kips

Wall ID	Max Force
AA	1.0 kips
AB	9.9 kips
AC	0.7 kips
AD	1.0 kips
AE	0.5 kips
AF	0.3 kips
AG	1.0 kips
AH	6.1 kips
AI	9.9 kips
AJ	3.3 kips
AK	0.7 kips
AL	0.3 kips
AM	0.3 kips
AN	0.3 kips
AO	64.7 kips



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

Appendix

$$(1) \quad x_{C.M.} = \frac{\sum W_i x_i}{\sum W_i}, y_{C.M.} = \frac{\sum W_i y_i}{\sum W_i}$$

$$(2.a) \quad \text{fixed} - \text{fixed} : \text{Rigidity} = \frac{Et}{\left(\frac{h}{L}\right)^3 + 3\left(\frac{h}{L}\right)}$$

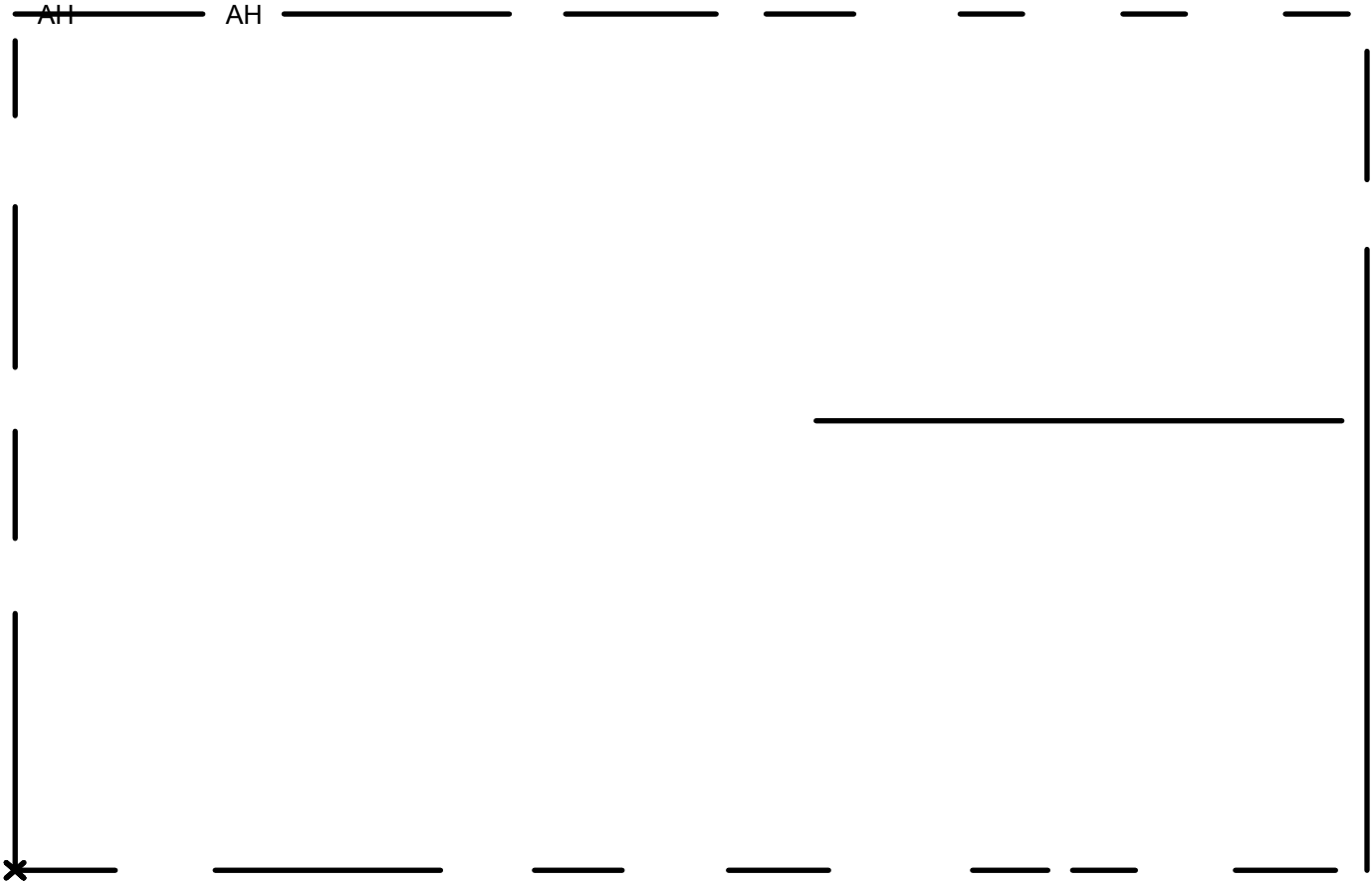
$$(2.b) \quad \text{fixed} - \text{free} : \text{Rigidity} = \frac{Et}{4\left(\frac{h}{L}\right)^3 + 3\left(\frac{h}{L}\right)}$$

$$(3) \quad x_{C.R.} = \frac{\sum R_i x_i}{\sum R_i}, y_{C.R.} = \frac{\sum R_i y_i}{\sum R_i}$$

$$(4) \quad F_i = F \frac{R_i}{\sum R_i}$$

$$(5) \quad F_{iM} = Fe \frac{R_i d_i}{\sum R_i d_i^2}$$

Shear Wall Layout





Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

<u>Story Shears</u>		<u>Center of Mass ⁽¹⁾</u>		<u>Building Length</u>	
X-direction	100.0 kips	X _{C.M.}	Y _{C.M.}	L _x	L _y
Y-direction	100.0 kips	59.5 ft	28.4 ft	120 ft	60 ft

Walls Parallel to Y-axis

Wall ID	Centroid Location		Wall Length	Wall Thickness	Wall Height	Modulus of Elasticity	Fixity Condition	Rigidity ⁽²⁾ (kip/in)	R _y *x	R _y *d	R _y *d ²
	x	y									
1	0.0 ft	2.5 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	0.00E+00	9.34E+03	5.68E+05
2	0.0 ft	10.8 ft	7.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	385 k/in	0.00E+00	2.34E+04	1.42E+06
3	0.0 ft	24.3 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	0.00E+00	9.34E+03	5.68E+05
4	0.0 ft	35.8 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	0.00E+00	9.34E+03	5.68E+05
5	0.0 ft	49.3 ft	7.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	385 k/in	0.00E+00	2.34E+04	1.42E+06
6	0.0 ft	57.3 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	0.00E+00	9.34E+03	5.68E+05
7	120.0 ft	2.5 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	1.84E+04	9.10E+03	5.38E+05
8	120.0 ft	10.8 ft	7.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	385 k/in	4.62E+04	2.28E+04	1.35E+06
9	120.0 ft	24.3 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	1.84E+04	9.10E+03	5.38E+05
10	120.0 ft	36.8 ft	6.5 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	316 k/in	3.79E+04	1.87E+04	1.11E+06
11	120.0 ft	49.3 ft	7.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	385 k/in	4.62E+04	2.28E+04	1.35E+06
12	120.0 ft	57.3 ft	5.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	154 k/in	1.84E+04	9.10E+03	5.38E+05
13	50.0 ft	11.0 ft	22.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	4619 k/in	2.31E+05	4.99E+04	5.39E+05
14	70.0 ft	11.0 ft	22.0 ft	8.0 in	13.0 ft	1500 ksi	fixed-free	4619 k/in	3.23E+05	4.25E+04	3.91E+05
Σ =								12168	7.4E+05	2.68E+05	1.15E+07

Walls Parallel to X-axis

Wall ID	Centroid Location		Wall Length	Wall Thickness	Wall Height	Modulus of Elasticity	Fixity Condition	Rigidity (kip/in)	$R_x \cdot y$	$R_x \cdot d$	$R_x \cdot d^2$	
	x	y										
101	2.0 ft	60.0 ft	4.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	171 k/in	1.03E+04	7.22E+03	3.04E+05	
102	9.3 ft	60.0 ft	6.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	510 k/in	3.06E+04	2.15E+04	9.04E+05	
103	22.0 ft	60.0 ft	4.5 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	237 k/in	1.42E+04	9.99E+03	4.21E+05	
104	34.0 ft	60.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	1.89E+04	1.33E+04	5.60E+05	
105	46.0 ft	60.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	1.89E+04	1.33E+04	5.60E+05	
106	54.5 ft	60.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	1.89E+04	1.33E+04	5.60E+05	
107	66.5 ft	60.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	1.89E+04	1.33E+04	5.60E+05	
108	74.8 ft	60.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	1.89E+04	1.33E+04	5.60E+05	
109	86.8 ft	60.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	1.89E+04	1.33E+04	5.60E+05	
110	98.5 ft	60.0 ft	4.5 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	237 k/in	1.42E+04	9.99E+03	4.21E+05	
111	109.8 ft	60.0 ft	3.5 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	118 k/in	7.07E+03	4.96E+03	2.09E+05	
112	2.0 ft	0.0 ft	4.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	171 k/in	0.00E+00	3.07E+03	5.49E+04	
113	9.5 ft	0.0 ft	6.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	510 k/in	0.00E+00	9.13E+03	1.63E+05	
114	22.0 ft	0.0 ft	4.5 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	237 k/in	0.00E+00	4.25E+03	7.60E+04	
115	34.0 ft	0.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	0.00E+00	5.65E+03	1.01E+05	
116	49.5 ft	0.0 ft	12.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	2492 k/in	0.00E+00	4.46E+04	7.98E+05	
117	71.3 ft	0.0 ft	12.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	2492 k/in	0.00E+00	4.46E+04	7.98E+05	
118	86.5 ft	0.0 ft	5.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	316 k/in	0.00E+00	5.65E+03	1.01E+05	
119	98.8 ft	0.0 ft	4.5 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	237 k/in	0.00E+00	4.25E+03	7.60E+04	
120	110.3 ft	0.0 ft	6.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	510 k/in	0.00E+00	9.13E+03	1.63E+05	
121	117.5 ft	0.0 ft	4.0 ft	8.0 in	10.0 ft	1500 ksi	fixed-free	171 k/in	0.00E+00	3.07E+03	5.49E+04	
Σ =									10623	1.9E+05	2.67E+05	8.00E+06



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

Center of Rigidity ⁽³⁾

X _{C.R.}	Y _{C.R.}
60.8 ft	17.9 ft

Torsional Irregularity Amplification

A _x	1.0
A _y	1.0

Eccentricity

	actual	actual+acc	actual-acc
e _x	1.3 ft	7.3 ft	-4.7 ft
e _y	-10.6 ft	-7.6 ft	-13.6 ft

% Relative Rigidity

Walls Parallel to Y-axis			Walls Parallel to X-axis			Diagonal Walls			
Wall ID	Y-dir	Torsion	Wall ID	X-dir	Torsion	Wall ID	X-dir	Y-dir	Torsion
1	1.3%	1.7%	101	1.6%	1.3%	0	0.0%	0.0%	0.0%
2	3.2%	4.4%	102	4.8%	4.0%	0	0.0%	0.0%	0.0%
3	1.3%	1.7%	103	2.2%	1.9%	0	0.0%	0.0%	0.0%
4	1.3%	1.7%	104	3.0%	2.5%	0	0.0%	0.0%	0.0%
5	3.2%	4.4%	105	3.0%	2.5%				
6	1.3%	1.7%	106	3.0%	2.5%				
7	1.3%	1.7%	107	3.0%	2.5%				
8	3.2%	4.3%	108	3.0%	2.5%				
9	1.3%	1.7%	109	3.0%	2.5%				
10	2.6%	3.5%	110	2.2%	1.9%				
11	3.2%	4.3%	111	1.1%	0.9%				
12	1.3%	1.7%	112	1.6%	0.6%				
13	38.0%	9.3%	113	4.8%	1.7%				
14	38.0%	7.9%	114	2.2%	0.8%				
			115	3.0%	1.1%				
			116	23.5%	8.3%				
			117	23.5%	8.3%				
			118	3.0%	1.1%				
			119	2.2%	0.8%				
			120	4.8%	1.7%				
			121	1.6%	0.6%				



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

Resultant Shear Wall Forces

Y-Dir Loading Walls Parallel to Y-axis

Wall ID	Translational Fy ⁽⁴⁾	Rotational Fy ⁽⁵⁾		Resultant Force
		act+acc	act-acc	
1	1.3 kips	0.4 kips	-0.2 kips	1.6 kips
2	3.2 kips	0.9 kips	-0.6 kips	4.0 kips
3	1.3 kips	0.4 kips	-0.2 kips	1.6 kips
4	1.3 kips	0.4 kips	-0.2 kips	1.6 kips
5	3.2 kips	0.9 kips	-0.6 kips	4.0 kips
6	1.3 kips	0.4 kips	-0.2 kips	1.6 kips
7	1.3 kips	-0.3 kips	0.2 kips	1.5 kips
8	3.2 kips	-0.9 kips	0.5 kips	3.7 kips
9	1.3 kips	-0.3 kips	0.2 kips	1.5 kips
10	2.6 kips	-0.7 kips	0.5 kips	3.0 kips
11	3.2 kips	0.5 kips	0.5 kips	3.7 kips
12	1.3 kips	-0.3 kips	0.2 kips	1.5 kips
13	38.0 kips	1.9 kips	-1.2 kips	39.8 kips
14	38.0 kips	-1.6 kips	1.0 kips	39.0 kips

Walls Parallel to X-axis

Wall ID	Translational Fy ⁽⁴⁾	Rotational Fy ⁽⁵⁾		Resultant Force
		act+acc	act-acc	
101	0	-0.3 kips	0.2 kips	0.3 kips
102	0	-0.8 kips	0.5 kips	0.8 kips
103	0	-0.4 kips	0.2 kips	0.4 kips
104	0	-0.5 kips	0.3 kips	0.5 kips
105	0	-0.5 kips	0.3 kips	0.5 kips
106	0	-0.5 kips	0.3 kips	0.5 kips
107	0	-0.5 kips	0.3 kips	0.5 kips
108	0	-0.5 kips	0.3 kips	0.5 kips
109	0	-0.5 kips	0.3 kips	0.5 kips
110	0	-0.4 kips	0.2 kips	0.4 kips
111	0	-0.2 kips	0.1 kips	0.2 kips
112	0	-0.1 kips	0.1 kips	0.1 kips
113	0	-0.3 kips	0.2 kips	0.3 kips
114	0	-0.2 kips	0.1 kips	0.2 kips
115	0	-0.2 kips	0.1 kips	0.2 kips
116	0	-1.7 kips	1.1 kips	1.7 kips
117	0	-1.7 kips	1.1 kips	1.7 kips
118	0	-0.2 kips	0.1 kips	0.2 kips
119	0	-0.2 kips	0.1 kips	0.2 kips
120	0	-0.3 kips	0.2 kips	0.3 kips
121	0	-0.1 kips	0.1 kips	0.1 kips

X-Dir Loading Walls Parallel to Y-axis

Wall ID	Translational Fx	Rotational Fx		Resultant Force
		act+acc	act-acc	
1	0	0.4 kips	0.7 kips	0.7 kips
2	0	0.9 kips	1.6 kips	1.6 kips
3	0	0.4 kips	0.7 kips	0.7 kips
4	0	0.4 kips	0.7 kips	0.7 kips
5	0	0.9 kips	1.6 kips	1.6 kips
6	0	0.4 kips	0.7 kips	0.7 kips
7	0	-0.4 kips	-0.6 kips	0.6 kips
8	0	-0.9 kips	-1.6 kips	1.6 kips
9	0	-0.4 kips	-0.6 kips	0.6 kips
10	0	-0.7 kips	-1.3 kips	1.3 kips
11	0	-0.9 kips	-1.6 kips	1.6 kips
12	0	-0.4 kips	-0.6 kips	0.6 kips
13	0	1.9 kips	3.5 kips	3.5 kips
14	0	-1.6 kips	-3.0 kips	3.0 kips

Walls Parallel to X-axis

Wall ID	Translational Fx	Rotational Fx		Resultant Force
		act+acc	act-acc	
101	1.6 kips	0.3 kips	0.5 kips	2.1 kips
102	4.8 kips	0.8 kips	1.5 kips	6.3 kips
103	2.2 kips	0.4 kips	0.7 kips	2.9 kips
104	3.0 kips	0.5 kips	0.9 kips	3.9 kips
105	3.0 kips	0.5 kips	0.9 kips	3.9 kips
106	3.0 kips	0.5 kips	0.9 kips	3.9 kips
107	3.0 kips	0.5 kips	0.9 kips	3.9 kips
108	3.0 kips	0.5 kips	0.9 kips	3.9 kips
109	3.0 kips	0.5 kips	0.9 kips	3.9 kips
110	2.2 kips	0.4 kips	0.7 kips	2.9 kips
111	1.1 kips	0.2 kips	0.3 kips	1.5 kips
112	1.6 kips	0.1 kips	0.2 kips	1.8 kips
113	4.8 kips	0.4 kips	0.6 kips	5.4 kips
114	2.2 kips	0.2 kips	0.3 kips	2.5 kips
115	3.0 kips	0.2 kips	0.4 kips	3.4 kips
116	23.5 kips	1.7 kips	3.1 kips	26.6 kips
117	23.5 kips	1.7 kips	3.1 kips	26.6 kips
118	3.0 kips	0.2 kips	0.4 kips	3.4 kips
119	2.2 kips	0.2 kips	0.3 kips	2.5 kips
120	4.8 kips	0.4 kips	0.6 kips	5.4 kips
121	1.6 kips	0.1 kips	0.2 kips	1.8 kips

Wall ID	Max Force
1	1.6 kips
2	4.0 kips
3	1.6 kips
4	1.6 kips
5	4.0 kips
6	1.6 kips
7	1.5 kips
8	3.7 kips
9	1.5 kips
10	3.0 kips
11	3.7 kips
12	1.5 kips
13	39.8 kips
14	39.0 kips

Wall ID	Max Force
101	2.1 kips
102	6.3 kips
103	2.9 kips
104	3.9 kips
105	3.9 kips
106	3.9 kips
107	3.9 kips
108	3.9 kips
109	3.9 kips
110	2.9 kips
111	1.5 kips
112	1.8 kips
113	5.4 kips
114	2.5 kips
115	3.4 kips
116	26.6 kips
117	26.6 kips
118	3.4 kips
119	2.5 kips
120	5.4 kips
121	1.8 kips



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

Rigid Diaphragm Shear Wall Load Distribution

Appendix

$$(1) \quad x_{C.M.} = \frac{\sum W_i x_i}{\sum W_i}, y_{C.M.} = \frac{\sum W_i y_i}{\sum W_i}$$

$$(2.a) \quad \text{fixed} - \text{fixed} : \text{Rigidity} = \frac{Et}{\left(\frac{h}{L}\right)^3 + 3\left(\frac{h}{L}\right)}$$

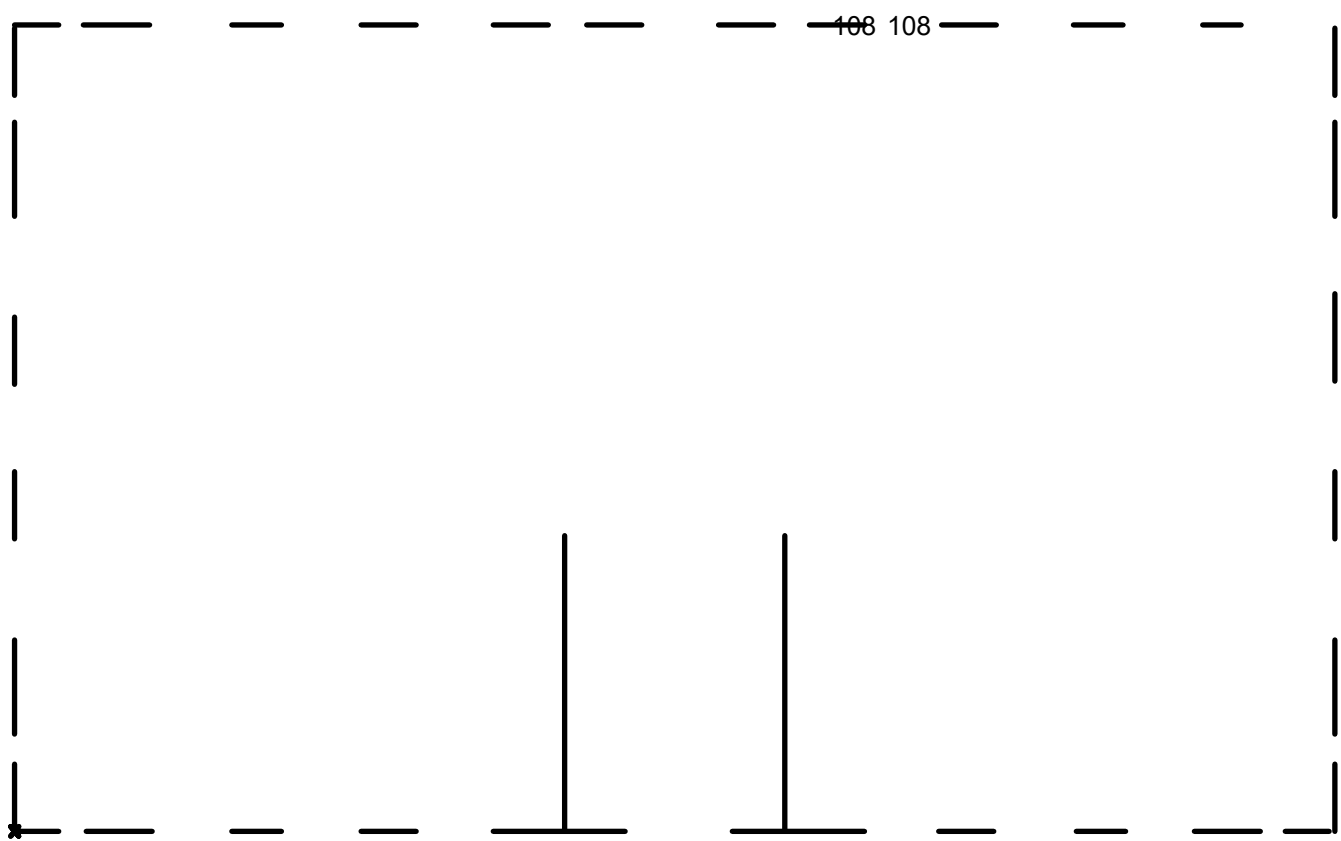
$$(2.b) \quad \text{fixed} - \text{free} : \text{Rigidity} = \frac{Et}{4\left(\frac{h}{L}\right)^3 + 3\left(\frac{h}{L}\right)}$$

$$(3) \quad x_{C.R.} = \frac{\sum R_i x_i}{\sum R_i}, y_{C.R.} = \frac{\sum R_i y_i}{\sum R_i}$$

$$(4) \quad F_i = F \frac{R_i}{\sum R_i}$$

$$(5) \quad F_{iM} = Fe \frac{R_i d_i}{\sum R_i d_i^2}$$

Shear Wall Layout





Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County

Existing Concrete Wall Analysis

ASCE 41-17

ASCE 41-17 Existing Wall Analysis for:

(E) 8" Concrete Wall

Wall Type	Wall Thickness (in)	Wall Length (in)	Mn (k-ft)	Horiz Ties	# of Mats	Horiz Spacing (in)	Height (in)	α_{Col}	BE Vert Bars
A	8	30.00	58.1	#4	1	24	138	2.00	#4
B	8	36.00	73.6	#4	1	24	138	2.00	#4
C	8	42.00	90.2	#4	1	24	138	2.00	#4
D	8	48.00	107.9	#4	1	24	138	2.00	#4
E	8	54.00	126.5	#4	1	24	138	2.00	#4
F	8	60.00	165.0	#4	1	24	138	2.00	#4
G	8	72.00	211.6	#4	1	24	138	2.17	#4
H	8	78.00	261.0	#4	1	24	138	2.46	#4
J	8	84.00	288.9	#4	1	24	138	2.71	#4
K	8	90.00	317.7	#4	1	24	138	2.93	#4
L	8	108.00	444.2	#4	1	24	138	3.00	#4
M	8	144.00	713.8	#4	1	24	138	3.00	#4
N	8	252.00	2039.9	#4	1	24	138	3.00	#4
O	8	264.00	2039.9	#4	1	24	138	3.00	#4
P	8	348.00	3736.4	#4	1	24	138	3.00	#4



Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County

Existing Concrete Wall Analysis

ASCE 41-17

ASCE 41-17 Existing Wall Analysis for:

(E) 16" Concrete Wall

Wall Type	Wall Thickness (in)	Wall Length (in)	Mn (k-ft)	Horiz Ties	# of Mats	Horiz Spacing (in)	Height (in)	α_{Col}	BE Vert Bars
A	16	30.00	80.9	#4	2	24	138	2.00	#4
B	16	36.00	103.9	#4	2	24	138	2.00	#4
C	16	42.00	129.1	#4	2	24	138	2.00	#4
D	16	48.00	156.3	#4	2	24	138	2.00	#4
E	16	54.00	185.4	#4	2	24	138	2.00	#4
F	16	60.00	254.5	#4	2	24	138	2.00	#4
G	16	72.00	331.2	#4	2	24	138	2.17	#4
H	16	78.00	421.9	#4	2	24	138	2.46	#4
J	16	84.00	469.4	#4	2	24	138	2.71	#4
K	16	90.00	518.9	#4	2	24	138	2.93	#4
L	16	108.00	747.5	#4	2	24	138	3.00	#4
M	16	144.00	1238.0	#4	2	24	138	3.00	#4
N	16	252.00	3744.1	#4	2	24	138	3.00	#4
O	8	264.00	2039.9	#4	1	24	138	3.00	#4
P	16	348.00	7007.0	#4	2	24	138	3.00	#4



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

ASCE 41-17 Wall Analysis for:

8" Concrete Walls

$f'_c =$ **2500** psi
 $\lambda =$ **1** [ASCE 41-17, 10.4.2.3.1]
 $\kappa =$ **1** [ASCE 41-17, 6.2.4]
 $k =$ **1** [ASCE 41-17, 10.4.2.3.1]

f_y (Long) = **40** ksi
 f_y (Trans) = **40** ksi

New Concrete Wall Analysis

ASCE 41-17

Table 10-21 & 10-22

Confined Boundary?

No

Performance Level:

Life Safety

Label	Type	P_{MAX} (k)	P_{DEAD} (k)	P_{LIVE} (k)	V_{MAX} (k)	M_{MAX} (k-ft)	$((A_g - A'_g)f_{yE} + P)/t_w l_w f'_{ce}$	$V/(t_w l_w V'_{ce})$	m (f)	m (s)	V_c	V_s	$V/(\kappa V_n)$	$M/(\kappa M_n)$
A - Penthouse	M	51.1	11.9	23.0	27.6	262.1	0.02	0.48	2.50	2.00	172.8	48.0	0.12	0.37
B - Penthouse	F	30.6	7.5	13.5	2.7	25.9	0.02	0.12	2.50	2.00	48	20.0	0.04	0.16
C - Penthouse	K	38.0	9.1	16.9	8.4	79.8	0.02	0.24	2.50	2.00	105.6	30.0	0.06	0.25
D - Penthouse	C	26.3	6.6	11.5	1.0	9.3	0.03	0.06	2.50	2.00	33.6	14.0	0.02	0.10
E - Penthouse	P	100.4	22.5	45.9	49.7	472.2	0.01	0.36	2.50	2.00	417.6	116.0	0.09	0.13
F - Penthouse	G	33.7	8.2	14.9	1.5	14.3	0.02	0.06	2.50	2.00	62.4	24.0	0.02	0.07
AA - Penthouse	D	27.8	6.9	12.2	0.9	8.5	0.02	0.05	2.50	2.00	38.4	16.0	0.02	0.08
AB - Penthouse	L	42.2	10.0	18.9	8.3	78.9	0.02	0.2	2.50	2.00	129.6	36.0	0.05	0.18
AC - Penthouse	C	26.3	6.6	11.5	0.6	5.7	0.03	0.04	2.50	2.00	33.6	14.0	0.01	0.06
AD - Penthouse	D	27.8	6.9	12.2	0.9	8.5	0.02	0.05	2.50	2.00	38.4	16.0	0.02	0.08
AE - Penthouse	B	24.8	6.3	10.8	0.4	3.7	0.03	0.03	2.50	2.00	28.8	12.0	0.01	0.05
AF - Penthouse	A	23.5	6.0	10.2	0.2	2.2	0.03	0.02	2.50	2.00	24	10.0	0.01	0.04
AG - Penthouse	D	27.8	6.9	12.2	0.9	8.5	0.02	0.05	2.50	2.00	38.4	16.0	0.02	0.08
AH - Penthouse	K	38.0	9.1	16.9	5.1	48.8	0.02	0.15	2.50	2.00	105.6	30.0	0.04	0.15
AI - Penthouse	L	42.2	10.0	18.9	8.3	78.9	0.02	0.2	2.50	2.00	129.6	36.0	0.05	0.18
AJ - Penthouse	G	33.7	8.2	14.9	2.8	26.6	0.02	0.1	2.50	2.00	62.4	24.0	0.03	0.13
AK - Penthouse	C	26.3	6.6	11.5	0.6	5.7	0.03	0.04	2.50	2.00	33.6	14.0	0.01	0.06
AL - Penthouse	A	23.5	6.0	10.2	0.2	2.2	0.03	0.02	2.50	2.00	24	10.0	0.01	0.04
AM - Penthouse	A	23.5	6.0	10.2	0.2	2.2	0.03	0.02	2.50	2.00	24	10.0	0.01	0.04
AN - Penthouse	A	23.5	6.0	10.2	0.2	2.2	0.03	0.02	2.50	2.00	24	10.0	0.01	0.04
AO - Penthouse	N	77.2	17.5	35.1	54.3	515.5	0.02	0.54	2.50	2.00	302.4	84.0	0.14	0.25



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

ASCE 41-17 Wall Analysis for:

8" Concrete Walls

f'_c = **2500** psi
 λ = **1** [ASCE 41-17, 10.4.2.3.1]
 κ = **1** [ASCE 41-17, 6.2.4]
 k = **1** [ASCE 41-17, 10.4.2.3.1]

f_y (Long) = **40** ksi
 f_y (Trans) = **40** ksi

New Concrete Wall Analysis

ASCE 41-17

Table 10-21 & 10-22

Confined Boundary?

No

Performance Level:

Life Safety

Label	Type	P_{MAX} (k)	P_{DEAD} (k)	P_{LIVE} (k)	V_{MAX} (k)	M_{MAX} (k-ft)	$((A_g - A'_g)f_{YE} + P)/t_w l_w f'_{CE}$	$V/(t_w l_w f'_{CE})$	m (f)	m (s)	V_c	V_s	$V/(\kappa V_n)$	$M/(\kappa M_n)$
1 - Roof	F	117.8	45.0	39.9	9.5	90.3	0.08	0.4	2.50	2.50	48	20.0	0.14	0.55
1 - Third	F	164.6	66.6	52.9	14.1	134.1	0.1	0.59	2.50	2.50	48	20.0	0.21	0.81
2 - Roof	J	127.4	48.6	43.2	23.7	225.2	0.06	0.71	2.50	2.50	91.2	28.0	0.20	0.78
2 - Third	J	182.6	73.8	58.8	35.2	334.5	0.08	1.05	2.50	2.50	91.2	28.0	0.30	1.16
3 - Roof	F	117.8	45.0	39.9	9.5	90.3	0.08	0.4	2.50	2.50	48	20.0	0.14	0.55
3 - Third	F	164.6	66.6	52.9	14.1	134.1	0.1	0.59	2.50	2.50	48	20.0	0.21	0.81
4 - Roof	F	117.8	45.0	39.9	9.5	90.3	0.08	0.4	2.50	2.50	48	20.0	0.14	0.55
4 - Third	F	164.6	66.6	52.9	14.1	134.1	0.1	0.59	2.50	2.50	48	20.0	0.21	0.81
5 - Roof	J	127.4	48.6	43.2	23.7	225.2	0.06	0.71	2.50	2.50	91.2	28.0	0.20	0.78
5 - Third	J	182.6	73.8	58.8	35.2	334.5	0.08	1.05	2.50	2.50	91.2	28.0	0.30	1.16
6 - Roof	F	117.8	45.0	39.9	9.5	90.3	0.08	0.4	2.50	2.50	48	20.0	0.14	0.55
6 - Third	F	164.6	66.6	52.9	14.1	134.1	0.1	0.59	2.50	2.50	48	20.0	0.21	0.81
7 - Roof	F	117.8	45.0	39.9	8.7	83.0	0.08	0.37	2.50	2.50	48	20.0	0.13	0.50
7 - Third	F	164.6	66.6	52.9	13.0	123.4	0.1	0.55	2.50	2.50	48	20.0	0.19	0.75
8 - Roof	J	127.4	48.6	43.2	21.8	207.3	0.06	0.65	2.50	2.50	91.2	28.0	0.18	0.72
8 - Third	J	182.6	73.8	58.8	32.4	308.0	0.08	0.97	2.50	2.50	91.2	28.0	0.27	1.07
9 - Roof	F	117.8	45.0	39.9	8.7	83.0	0.08	0.37	2.50	2.50	48	20.0	0.13	0.50
9 - Third	F	164.6	66.6	52.9	13.0	123.4	0.1	0.55	2.50	2.50	48	20.0	0.19	0.75
10 - Roof	H	125.1	47.7	42.4	17.9	170.0	0.06	0.58	2.50	2.50	76.8	26.0	0.17	0.65
10 - Third	H	178.1	72.0	57.3	26.6	252.5	0.09	0.86	2.50	2.50	76.8	26.0	0.26	0.97
11 - Roof	J	127.4	48.6	43.2	21.8	207.3	0.06	0.65	2.50	2.50	91.2	28.0	0.18	0.72
11 - Third	J	182.6	73.8	58.8	32.4	308.0	0.08	0.97	2.50	2.50	91.2	28.0	0.27	1.07
12 - Roof	F	117.8	45.0	39.9	8.7	83.0	0.08	0.37	2.50	2.50	48	20.0	0.13	0.50
12 - Third	F	164.6	66.6	52.9	13.0	123.4	0.1	0.55	2.50	2.50	48	20.0	0.19	0.75
13 - Roof	O	200.5	75.6	68.6	233.7	2219.9	0.03	2.22	2.50	2.00	316.8	88.0	0.58	1.09
13 - Third	O	319.1	127.8	103.6	347.1	3297.7	0.05	3.29	2.50	2.00	316.8	88.0	0.86	1.62
14 - Roof	O	200.5	75.6	68.6	228.7	2172.5	0.03	2.17	2.50	2.00	316.8	88.0	0.56	1.06
14 - Third	O	319.1	127.8	103.6	339.7	3227.3	0.05	3.22	2.50	2.00	316.8	88.0	0.84	1.58



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

ASCE 41-17 Wall Analysis for:

8" Concrete Walls

f'_c = **2500** psi
 λ = **1** [ASCE 41-17, 10.4.2.3.1]
 κ = **1** [ASCE 41-17, 6.2.4]
 k = **1** [ASCE 41-17, 10.4.2.3.1]

f_y (Long) = **40** ksi
 f_y (Trans) = **40** ksi

New Concrete Wall Analysis

ASCE 41-17

Table 10-21 & 10-22

Confined Boundary?

No

Performance Level:

Life Safety

Label	Type	P_{MAX} (k)	P_{DEAD} (k)	P_{LIVE} (k)	V_{MAX} (k)	M_{MAX} (k-ft)	$((A_g - A'_g)f_{YE} + P)/t_w l_w f'_{CE}$	$V/(t_w l_w V'_{CE})$	m (f)	m (s)	V_c	V_s	$V/(\kappa V_n)$	$M/(\kappa M_n)$
101 - Roof	D	113.0	43.2	38.2	12.4	118.2	0.09	0.65	2.50	2.50	38.4	16.0	0.23	1.10
101 - Third	D	155.4	63.0	49.9	18.5	175.6	0.12	0.97	2.37	2.50	38.4	16.0	0.34	1.63
102 - Roof	G	122.7	46.8	41.6	37.0	351.0	0.07	1.29	2.50	2.50	62.4	24.0	0.43	1.66
102 - Third	G	173.7	70.2	55.9	54.9	521.6	0.09	1.91	2.50	2.50	62.4	24.0	0.64	2.46
103 - Roof	E	115.3	44.1	39.0	17.2	163.3	0.08	0.8	2.50	2.50	43.2	18.0	0.28	1.29
103 - Third	E	159.8	64.8	51.3	25.5	242.5	0.11	1.19	2.43	2.50	43.2	18.0	0.42	1.92
104 - Roof	F	117.8	45.0	39.9	22.9	217.4	0.08	0.96	2.50	2.50	48	20.0	0.34	1.32
104 - Third	F	164.6	66.6	52.9	34.0	322.9	0.1	1.42	2.50	2.50	48	20.0	0.50	1.96
105 - Roof	F	117.8	45.0	39.9	22.9	217.4	0.08	0.96	2.50	2.50	48	20.0	0.34	1.32
105 - Third	F	164.6	66.6	52.9	34.0	322.9	0.1	1.42	2.50	2.50	48	20.0	0.50	1.96
106 - Roof	F	117.8	45.0	39.9	22.9	217.4	0.08	0.96	2.50	2.50	48	20.0	0.34	1.32
106 - Third	F	164.6	66.6	52.9	34.0	322.9	0.1	1.42	2.50	2.50	48	20.0	0.50	1.96
107 - Roof	F	117.8	45.0	39.9	22.9	217.4	0.08	0.96	2.50	2.50	48	20.0	0.34	1.32
107 - Third	F	164.6	66.6	52.9	34.0	322.9	0.1	1.42	2.50	2.50	48	20.0	0.50	1.96
108 - Roof	F	117.8	45.0	39.9	22.9	217.4	0.08	0.96	2.50	2.50	48	20.0	0.34	1.32
108 - Third	F	164.6	66.6	52.9	34.0	322.9	0.1	1.42	2.50	2.50	48	20.0	0.50	1.96
109 - Roof	F	117.8	45.0	39.9	22.9	217.4	0.08	0.96	2.50	2.50	48	20.0	0.34	1.32
109 - Third	F	164.6	66.6	52.9	34.0	322.9	0.1	1.42	2.50	2.50	48	20.0	0.50	1.96
110 - Roof	E	115.3	44.1	39.0	17.2	163.3	0.08	0.8	2.50	2.50	43.2	18.0	0.28	1.29
110 - Third	E	159.8	64.8	51.3	25.5	242.5	0.11	1.19	2.43	2.50	43.2	18.0	0.42	1.92
111 - Roof	C	110.4	42.3	37.3	8.6	81.4	0.1	0.52	2.50	2.50	33.6	14.0	0.18	0.90
111 - Third	C	150.7	61.2	48.3	12.7	120.9	0.14	0.76	2.23	2.50	33.6	14.0	0.27	1.34
112 - Roof	D	113.0	43.2	38.2	10.7	102.0	0.09	0.56	2.50	2.50	38.4	16.0	0.20	0.95
112 - Third	D	155.4	63.0	49.9	16.0	151.5	0.12	0.84	2.37	2.50	38.4	16.0	0.29	1.40
113 - Roof	G	122.7	46.8	41.6	31.9	303.1	0.07	1.11	2.50	2.50	62.4	24.0	0.37	1.43
113 - Third	G	173.7	70.2	55.9	47.4	450.3	0.09	1.65	2.50	2.50	62.4	24.0	0.55	2.13
114 - Roof	E	115.3	44.1	39.0	14.8	141.0	0.08	0.69	2.50	2.50	43.2	18.0	0.24	1.11
114 - Third	E	159.8	64.8	51.3	22.1	209.5	0.11	1.03	2.43	2.50	43.2	18.0	0.36	1.66
115 - Roof	F	117.8	45.0	39.9	19.8	187.8	0.08	0.83	2.50	2.50	48	20.0	0.29	1.14
115 - Third	F	164.6	66.6	52.9	29.4	279.0	0.1	1.23	2.50	2.50	48	20.0	0.43	1.69
116 - Roof	M	151.8	57.6	51.7	155.8	1480.5	0.04	2.71	2.50	2.00	172.8	48.0	0.71	2.07
116 - Third	M	228.1	91.8	73.7	231.5	2199.3	0.06	4.02	2.50	2.50	172.8	48.0	1.05	3.08
117 - Roof	M	151.8	57.6	51.7	155.8	1480.5	0.04	2.71	2.50	2.00	172.8	48.0	0.71	2.07
117 - Third	M	228.1	91.8	73.7	231.5	2199.3	0.06	4.02	2.50	2.50	172.8	48.0	1.05	3.08
118 - Roof	F	117.8	45.0	39.9	19.8	187.8	0.08	0.83	2.50	2.50	48	20.0	0.29	1.14
118 - Third	F	164.6	66.6	52.9	29.4	279.0	0.1	1.23	2.50	2.50	48	20.0	0.43	1.69
119 - Roof	E	115.3	44.1	39.0	14.8	141.0	0.08	0.69	2.50	2.50	43.2	18.0	0.24	1.11
119 - Third	E	159.8	64.8	51.3	22.1	209.5	0.11	1.03	2.43	2.50	43.2	18.0	0.36	1.66
120 - Roof	G	122.7	46.8	41.6	31.9	303.1	0.07	1.11	2.50	2.50	62.4	24.0	0.37	1.43
120 - Third	G	173.7	70.2	55.9	47.4	450.3	0.09	1.65	2.50	2.50	62.4	24.0	0.55	2.13
121 - Roof	D	113.0	43.2	38.2	10.7	102.0	0.09	0.56	2.50	2.50	38.4	16.0	0.20	0.95
121 - Third	D	155.4	63.0	49.9	16.0	151.5	0.12	0.84	2.37	2.50	38.4	16.0	0.29	1.40



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

ASCE 41-17 Wall Analysis for:

16" Concrete Walls

f'_c = **2500** psi
 λ = **1** [ASCE 41-17, 10.4.2.3.1]
 κ = **1** [ASCE 41-17, 6.2.4]
 k = **1** [ASCE 41-17, 10.4.2.3.1]

f_y (Long) = **40** ksi
 f_y (Trans) = **40** ksi

New Concrete Wall Analysis

ASCE 41-17

Table 10-21 & 10-22

Confined Boundary?

No

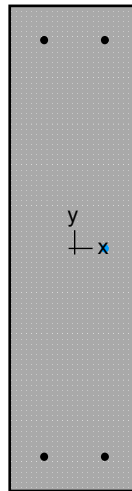
Performance Level:

Life Safety

Label	Type	P_{MAX} (k)	P_{DEAD} (k)	P_{LIVE} (k)	V_{MAX} (k)	M_{MAX} (k-ft)	$((A_g - A'_g)f_{YE} + P)/t_w l_w f'_{CE}$	$V/(t_w l_w V'_{CE})$	m (f)	m (s)	V_c	V_s	$V/(\kappa V_n)$	$M/(\kappa M_n)$
1 - Second	F	24.2	0.0	15.1	16.3	155.1	0.01	0.35	2.50	2.00	96	40.0	0.12	0.61
2 - Second	J	29.1	0.0	18.2	40.7	386.7	0.01	0.61	2.50	2.00	182.4	56.0	0.17	0.82
3 - Second	F	24.2	0.0	15.1	16.3	155.1	0.01	0.35	2.50	2.00	96	40.0	0.12	0.61
4 - Second	F	24.2	0.0	15.1	16.3	155.1	0.01	0.35	2.50	2.00	96	40.0	0.12	0.61
5 - Second	J	29.1	0.0	18.2	40.7	386.7	0.01	0.61	2.50	2.00	182.4	56.0	0.17	0.82
6 - Second	F	24.2	0.0	15.1	16.3	155.1	0.01	0.35	2.50	2.00	96	40.0	0.12	0.61
7 - Second	F	24.2	0.0	15.1	15.0	142.7	0.01	0.32	2.50	2.00	96	40.0	0.11	0.56
8 - Second	J	29.1	0.0	18.2	37.5	356.1	0.01	0.56	2.50	2.00	182.4	56.0	0.16	0.76
9 - Second	F	24.2	0.0	15.1	15.0	142.7	0.01	0.32	2.50	2.00	96	40.0	0.11	0.56
10 - Second	H	27.8	0.0	17.4	30.7	291.9	0.01	0.5	2.50	2.00	153.6	52.0	0.15	0.69
12 - Second	F	24.2	0.0	15.1	15.0	142.7	0.01	0.32	2.50	2.00	96	40.0	0.11	0.56
13 - Second	O	65.3	0.0	40.8	401.4	3813.2	0.01	3.81	2.50	2.00	316.8	88.0	0.99	1.87
14 - Second	O	65.3	0.0	40.8	392.8	3731.9	0.01	3.72	2.50	2.00	316.8	88.0	0.97	1.83
101 - Second	D	21.8	0.0	13.6	21.4	202.9	0.01	0.56	2.50	2.00	76.8	32.0	0.20	1.30
102 - Second	G	26.7	0.0	16.7	63.5	603.1	0.01	1.11	2.50	2.00	124.8	48.0	0.37	1.82
103 - Second	E	23.0	0.0	14.4	29.5	280.4	0.01	0.69	2.50	2.00	86.4	36.0	0.24	1.51
104 - Second	F	24.2	0.0	15.1	39.3	373.4	0.01	0.82	2.50	2.00	96	40.0	0.29	1.47
105 - Second	F	24.2	0.0	15.1	39.3	373.4	0.01	0.82	2.50	2.00	96	40.0	0.29	1.47
106 - Second	F	24.2	0.0	15.1	39.3	373.4	0.01	0.82	2.50	2.00	96	40.0	0.29	1.47
107 - Second	F	24.2	0.0	15.1	39.3	373.4	0.01	0.82	2.50	2.00	96	40.0	0.29	1.47
108 - Second	F	24.2	0.0	15.1	39.3	373.4	0.01	0.82	2.50	2.00	96	40.0	0.29	1.47
109 - Second	F	24.2	0.0	15.1	39.3	373.4	0.01	0.82	2.50	2.00	96	40.0	0.29	1.47
110 - Second	E	23.0	0.0	14.4	29.5	280.4	0.01	0.69	2.50	2.00	86.4	36.0	0.24	1.51
111 - Second	C	20.6	0.0	12.9	14.7	139.7	0.01	0.44	2.50	2.00	67.2	28.0	0.15	1.08
112 - Second	D	21.8	0.0	13.6	18.4	175.2	0.01	0.49	2.50	2.00	76.8	32.0	0.17	1.12
113 - Second	G	26.7	0.0	16.7	54.8	520.7	0.01	0.96	2.50	2.00	124.8	48.0	0.32	1.57
114 - Second	E	23.0	0.0	14.4	25.5	242.2	0.01	0.6	2.50	2.00	86.4	36.0	0.21	1.31
115 - Second	F	24.2	0.0	15.1	34.0	322.6	0.01	0.71	2.50	2.00	96	40.0	0.25	1.27
116 - Second	M	41.1	0.0	25.7	267.7	2543.2	0.01	2.33	2.50	2.00	345.6	96.0	0.61	2.05
117 - Second	M	41.1	0.0	25.7	267.7	2543.2	0.01	2.33	2.50	2.00	345.6	96.0	0.61	2.05
118 - Second	F	24.2	0.0	15.1	34.0	322.6	0.01	0.71	2.50	2.00	96	40.0	0.25	1.27
119 - Second	E	23.0	0.0	14.4	25.5	242.2	0.01	0.6	2.50	2.00	86.4	36.0	0.21	1.31
120 - Second	G	26.7	0.0	16.7	54.8	520.7	0.01	0.96	2.50	2.00	124.8	48.0	0.32	1.57
121 - Second	D	21.8	0.0	13.6	18.4	175.2	0.01	0.49	2.50	2.00	76.8	32.0	0.17	1.12



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type A-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	30 in
A_g	240 in ²
I_x	18000 in ⁴
I_y	1280 in ⁴
r_x	8.66025 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

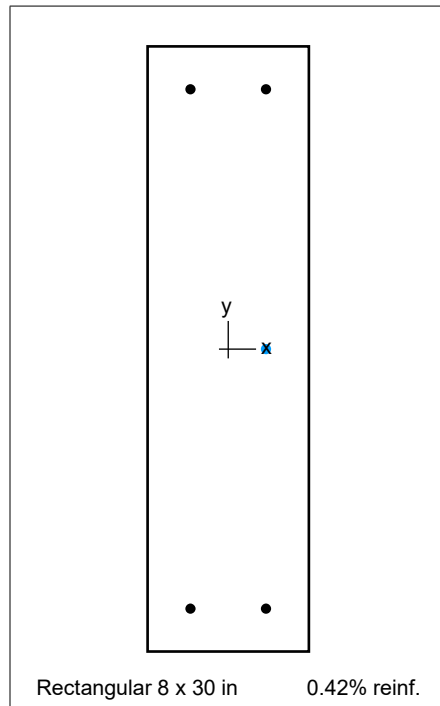


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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Total steel area, A_s	1.00 in ²
Rho	0.42 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	547.9	0.00	1.18	51.60	27.88	-0.00138	1.00000
X @ Allowable comp.	547.9	0.00	1.18	51.60	27.88	-0.00138	1.00000
X @ $f_s = 0.0$	425.5	122.09	1.18	27.88	27.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	340.1	171.33	0.85	22.66	27.88	0.00069	1.00000
X @ Balanced point	278.4	191.72	0.52	19.10	27.88	0.00138	1.00000
X @ Tension control	157.3	172.39	-0.88	11.33	27.88	0.00438	1.00000
X @ Pure bending	0.0	45.97	-1.25	1.92	27.88	0.04056	1.00000
X @ Max tension	-40.0	0.00	-1.25	0.00	27.88	9.99999	1.00000
-X @ Max compression	547.9	0.00	1.18	51.60	27.88	-0.00138	1.00000
-X @ Allowable comp.	547.9	0.00	1.18	51.60	27.88	-0.00138	1.00000
-X @ $f_s = 0.0$	425.5	-122.09	1.18	27.88	27.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	340.1	-171.33	0.85	22.66	27.88	0.00069	1.00000
-X @ Balanced point	278.4	-191.72	0.52	19.10	27.88	0.00138	1.00000
-X @ Tension control	157.3	-172.39	-0.88	11.33	27.88	0.00438	1.00000
-X @ Pure bending	0.0	-45.97	-1.25	1.92	27.88	0.04056	1.00000
-X @ Max tension	-40.0	0.00	-1.25	0.00	27.88	9.99999	1.00000

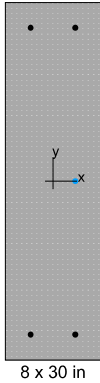
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	1.00	0.00	11.18	58.10	2.28	0.03375	1.000	0.70

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

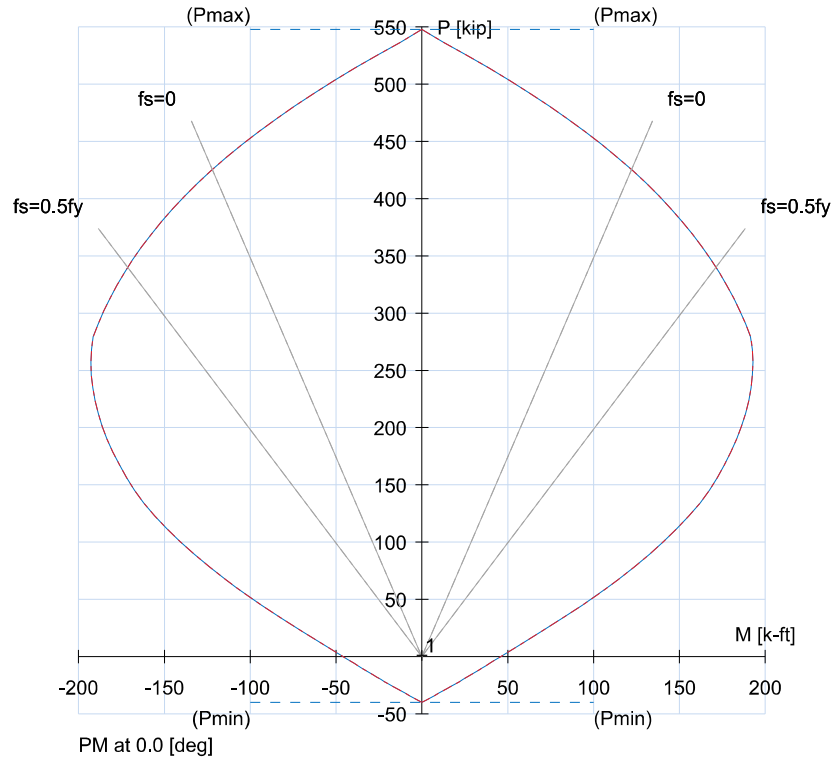
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	30 in
A_g	240 in ²
I_x	18000 in ⁴
I_y	1280 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.00 in ²
Rho	0.42 %
Min. clear spacing	3.25 in

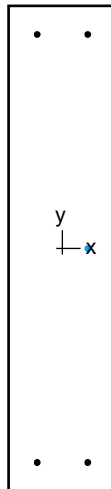


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	11.18	58.10	0.70

Max. Capacity Ratio: 0.70



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type B-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	36 in
A_g	288 in ²
I_x	31104 in ⁴
I_y	1536 in ⁴
r_x	10.3923 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

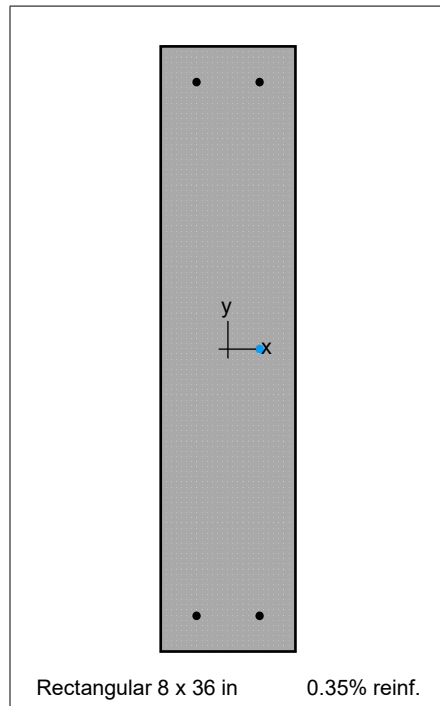


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.00 in ²
Rho	0.35 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	649.9	0.00	1.18	62.70	33.88	-0.00138	1.00000
X @ Allowable comp.	649.9	0.00	1.18	62.70	33.88	-0.00138	1.00000
X @ $f_s = 0.0$	512.2	167.02	1.18	33.88	33.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	410.8	239.38	0.88	27.54	33.88	0.00069	1.00000
X @ Balanced point	338.0	268.60	0.54	23.21	33.88	0.00138	1.00000
X @ Tension control	192.8	242.65	-0.83	13.77	33.88	0.00438	1.00000
X @ Pure bending	0.0	55.93	-1.25	1.92	33.88	0.04996	1.00000
X @ Max tension	-40.0	0.00	-1.25	0.00	33.88	9.99999	1.00000
-X @ Max compression	649.9	0.00	1.18	62.70	33.88	-0.00138	1.00000
-X @ Allowable comp.	649.9	0.00	1.18	62.70	33.88	-0.00138	1.00000
-X @ $f_s = 0.0$	512.2	-167.02	1.18	33.88	33.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	410.8	-239.38	0.88	27.54	33.88	0.00069	1.00000
-X @ Balanced point	338.0	-268.60	0.54	23.21	33.88	0.00138	1.00000
-X @ Tension control	192.8	-242.65	-0.83	13.77	33.88	0.00438	1.00000
-X @ Pure bending	0.0	-55.93	-1.25	1.92	33.88	0.04996	1.00000
-X @ Max tension	-40.0	0.00	-1.25	0.00	33.88	9.99999	1.00000

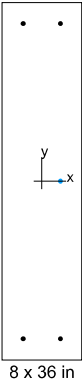
6. Factored Loads and Moments with Corresponding Capacity Ratios

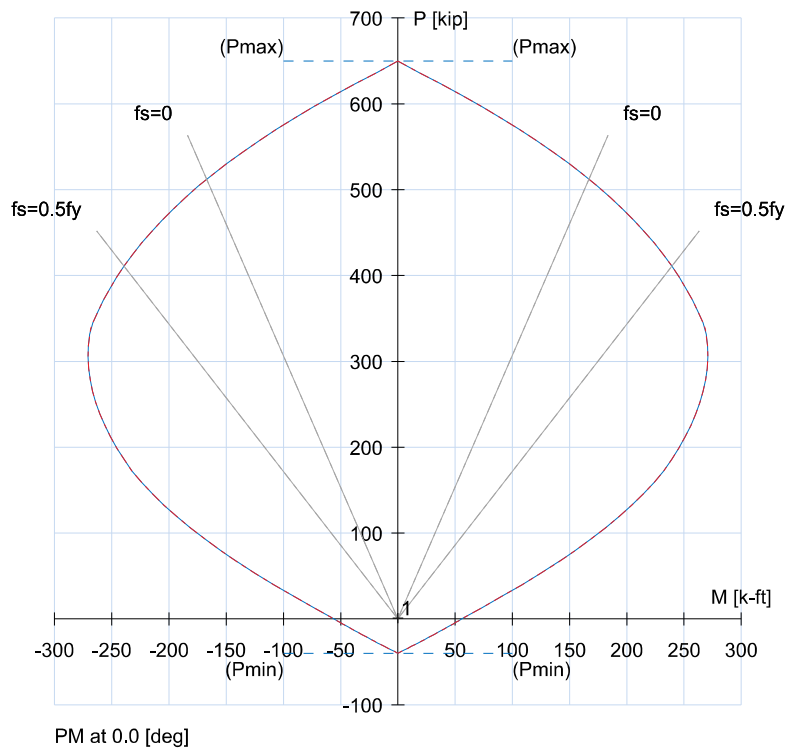
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	1.00	0.00	13.26	73.67	2.35	0.04025	1.000	0.73

7. Diagrams

7.1. PM at $\theta=0$ [deg]

	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	36 in
A_g	288 in ²
I_x	31104 in ⁴
I_y	1536 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.00 in ²
Rho	0.35 %
Min. clear spacing	3.25 in

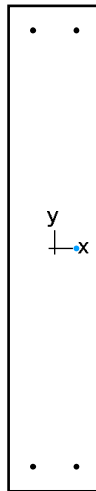


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	13.26	73.67	0.73

Max. Capacity Ratio: 0.73



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type C-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	42 in
A_g	336 in ²
I_x	49392 in ⁴
I_y	1792 in ⁴
r_x	12.1244 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

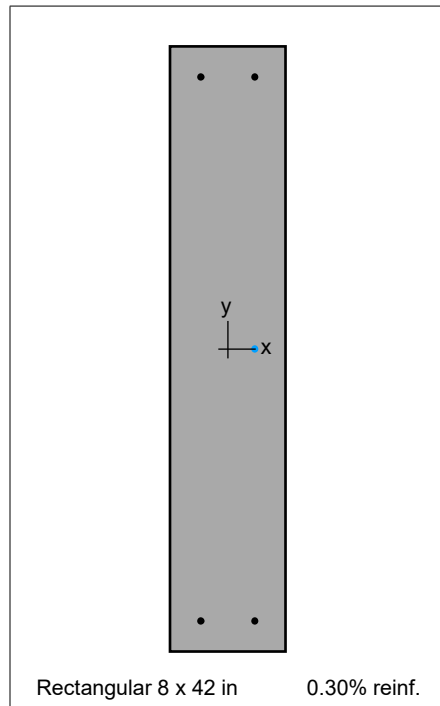


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.00 in ²
Rho	0.30 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	751.9	0.00	1.18	73.81	39.88	-0.00138	1.00000
X @ Allowable comp.	751.9	0.00	1.18	73.81	39.88	-0.00138	1.00000
X @ $f_s = 0.0$	598.9	218.45	1.18	39.88	39.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	481.3	318.32	0.89	32.42	39.88	0.00069	1.00000
X @ Balanced point	397.5	357.88	0.56	27.32	39.88	0.00138	1.00000
X @ Tension control	228.3	324.44	-0.80	16.21	39.88	0.00438	1.00000
X @ Pure bending	0.0	65.93	-1.25	1.92	39.88	0.05934	1.00000
X @ Max tension	-40.0	0.00	-1.25	0.00	39.88	9.99999	1.00000
-X @ Max compression	751.9	0.00	1.18	73.81	39.88	-0.00138	1.00000
-X @ Allowable comp.	751.9	0.00	1.18	73.81	39.88	-0.00138	1.00000
-X @ $f_s = 0.0$	598.9	-218.45	1.18	39.88	39.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	481.3	-318.32	0.89	32.42	39.88	0.00069	1.00000
-X @ Balanced point	397.5	-357.88	0.56	27.32	39.88	0.00138	1.00000
-X @ Tension control	228.3	-324.44	-0.80	16.21	39.88	0.00438	1.00000
-X @ Pure bending	0.0	-65.93	-1.25	1.92	39.88	0.05934	1.00000
-X @ Max tension	-40.0	0.00	-1.25	0.00	39.88	9.99999	1.00000

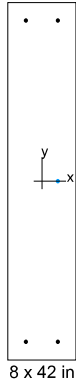
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	1.00	0.00	15.34	90.28	2.43	0.04632	1.000	0.75

7. Diagrams

7.1. PM at $\theta=0$ [deg]



8 x 42 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

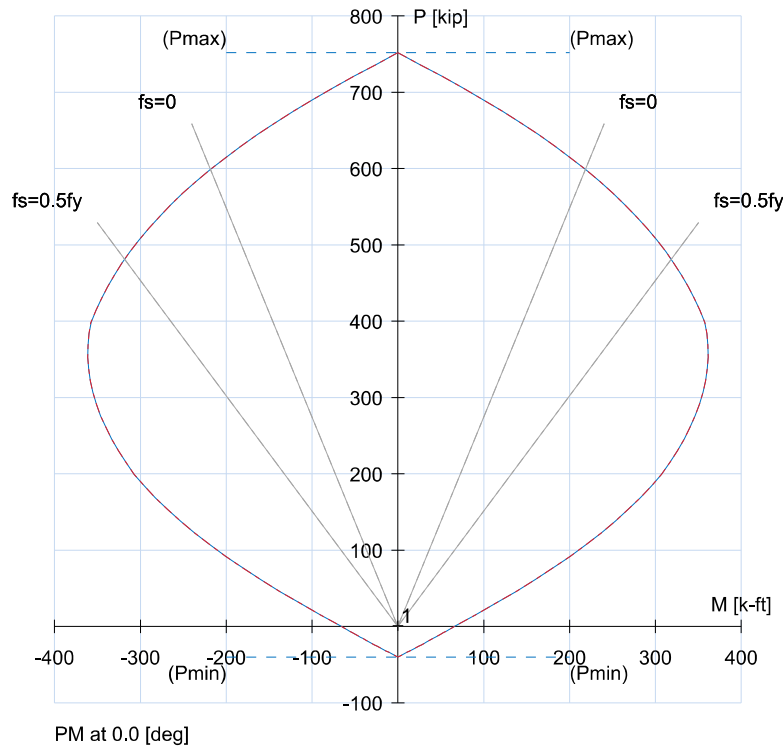
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	42 in
A_g	336 in ²
I_x	49392 in ⁴
I_y	1792 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.00 in ²
Rho	0.30 %
Min. clear spacing	3.25 in

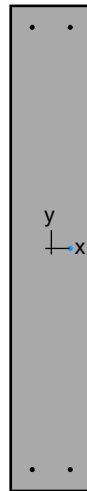


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	15.34	90.28	0.75

Max. Capacity Ratio: 0.75



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type D-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	48 in
A_g	384 in ²
I_x	73728 in ⁴
I_y	2048 in ⁴
r_x	13.8564 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

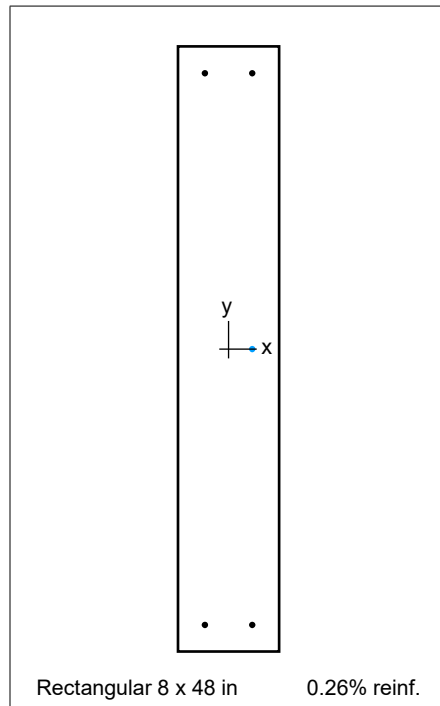


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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Total steel area, A_s	1.00 in ²
Rho	0.26 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	853.9	0.00	1.18	84.92	45.88	-0.00138	1.00000
X @ Allowable comp.	853.9	0.00	1.18	84.92	45.88	-0.00138	1.00000
X @ $f_s = 0.0$	685.6	276.37	1.18	45.88	45.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	551.9	408.15	0.90	37.30	45.88	0.00069	1.00000
X @ Balanced point	456.9	459.57	0.58	31.43	45.88	0.00138	1.00000
X @ Tension control	263.7	417.76	-0.78	18.65	45.88	0.00438	1.00000
X @ Pure bending	0.0	75.94	-1.25	1.92	45.88	0.06871	1.00000
X @ Max tension	-40.0	0.00	-1.25	0.00	45.88	9.99999	1.00000
-X @ Max compression	853.9	0.00	1.18	84.92	45.88	-0.00138	1.00000
-X @ Allowable comp.	853.9	0.00	1.18	84.92	45.88	-0.00138	1.00000
-X @ $f_s = 0.0$	685.6	-276.37	1.18	45.88	45.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	551.9	-408.15	0.90	37.30	45.88	0.00069	1.00000
-X @ Balanced point	456.9	-459.57	0.58	31.43	45.88	0.00138	1.00000
-X @ Tension control	263.7	-417.76	-0.78	18.65	45.88	0.00438	1.00000
-X @ Pure bending	0.0	-75.94	-1.25	1.92	45.88	0.06871	1.00000
-X @ Max tension	-40.0	0.00	-1.25	0.00	45.88	9.99999	1.00000

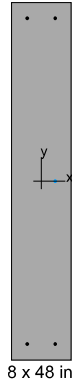
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	17.43	107.90	2.54	0.05127	1.000	0.77

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

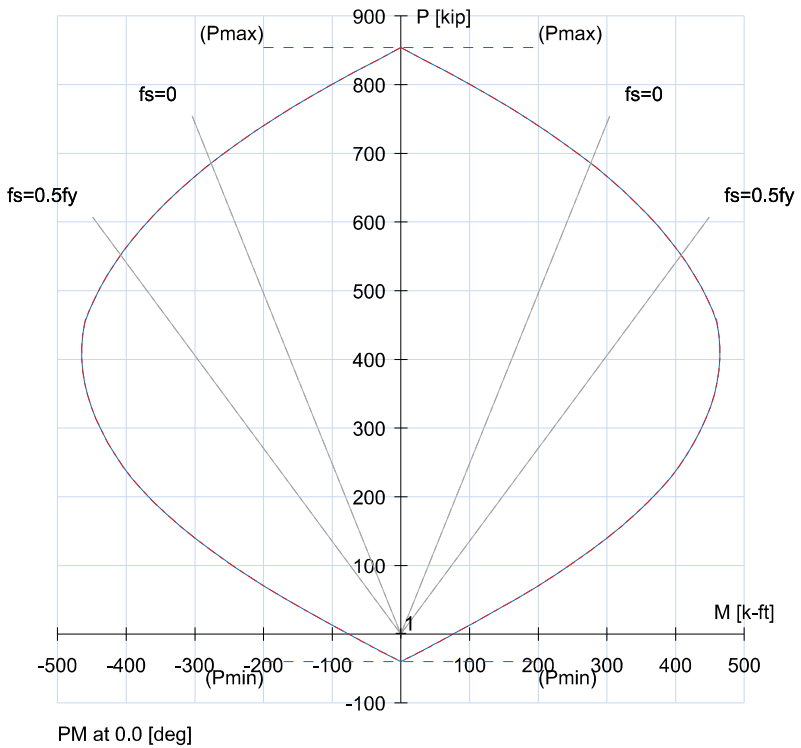
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	48 in
A_g	384 in ²
I_x	73728 in ⁴
I_y	2048 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.00 in ²
Rho	0.26 %
Min. clear spacing	3.25 in

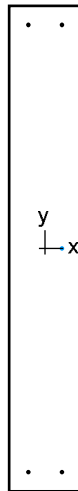


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	17.43	107.90	0.77

Max. Capacity Ratio: 0.77



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type E-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	54 in
A_g	432 in ²
I_x	104976 in ⁴
I_y	2304 in ⁴
r_x	15.5885 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

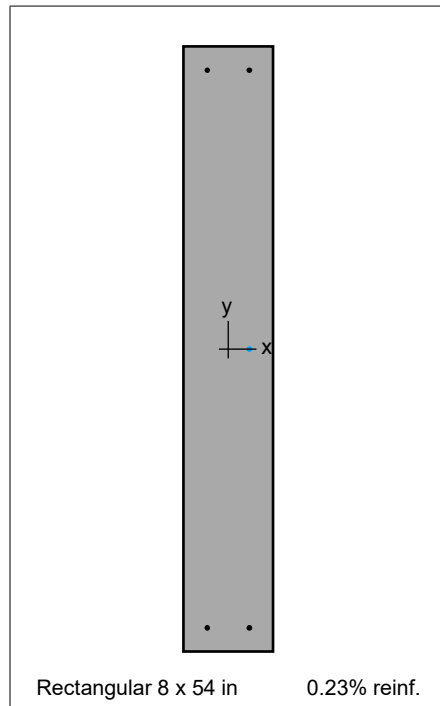


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.00 in ²
Rho	0.23 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	955.9	0.00	1.18	96.02	51.88	-0.00138	1.00000
X @ Allowable comp.	955.9	0.00	1.18	96.02	51.88	-0.00138	1.00000
X @ $f_s = 0.0$	772.3	340.81	1.18	51.88	51.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	622.5	508.86	0.91	42.18	51.88	0.00069	1.00000
X @ Balanced point	516.4	573.67	0.59	35.54	51.88	0.00138	1.00000
X @ Tension control	299.0	522.62	-0.76	21.09	51.88	0.00438	1.00000
X @ Pure bending	0.0	85.88	-1.25	1.92	51.88	0.07813	1.00000
X @ Max tension	-40.0	0.00	-1.25	0.00	51.88	9.99999	1.00000
-X @ Max compression	955.9	0.00	1.18	96.02	51.88	-0.00138	1.00000
-X @ Allowable comp.	955.9	0.00	1.18	96.02	51.88	-0.00138	1.00000
-X @ $f_s = 0.0$	772.3	-340.81	1.18	51.88	51.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	622.5	-508.86	0.91	42.18	51.88	0.00069	1.00000
-X @ Balanced point	516.4	-573.67	0.59	35.54	51.88	0.00138	1.00000
-X @ Tension control	299.0	-522.62	-0.76	21.09	51.88	0.00438	1.00000
-X @ Pure bending	0.0	-85.88	-1.25	1.92	51.88	0.07813	1.00000
-X @ Max tension	-40.0	0.00	-1.25	0.00	51.88	9.99999	1.00000

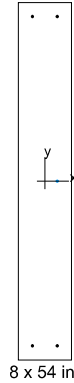
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	19.51	126.57	2.62	0.05646	1.000	0.78

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

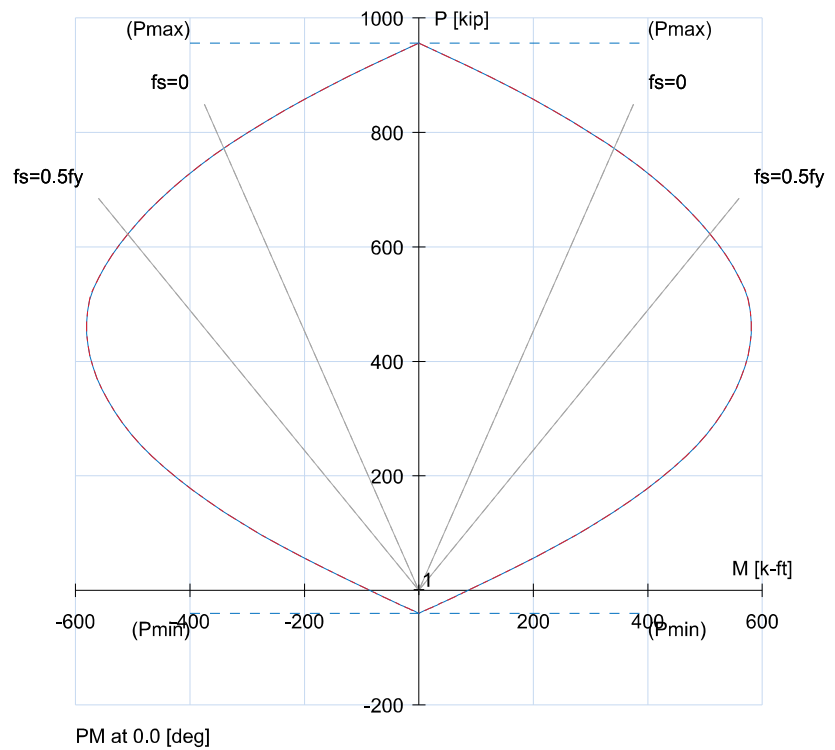
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	54 in
A_g	432 in ²
I_x	104976 in ⁴
I_y	2304 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.00 in ²
Rho	0.23 %
Min. clear spacing	3.25 in

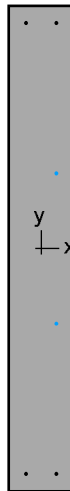


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	19.51	126.57	0.78

Max. Capacity Ratio: 0.78



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type F-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	60 in
A_g	480 in ²
I_x	144000 in ⁴
I_y	2560 in ⁴
r_x	17.3205 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

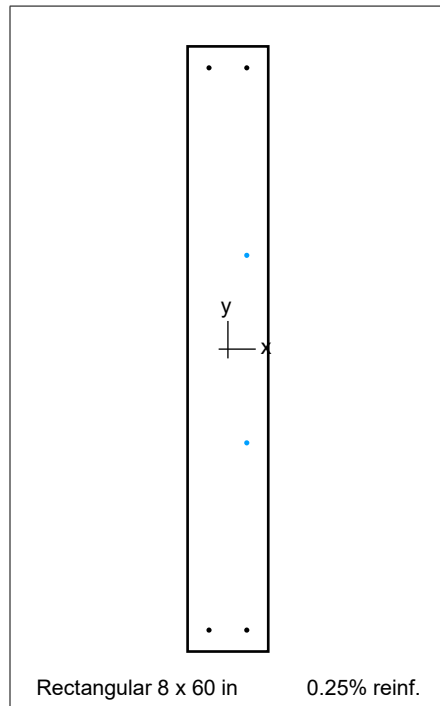


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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Total steel area, A_s	1.20 in ²
Rho	0.25 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	2	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1065.4	0.00	2.37	107.13	57.88	-0.00138	1.00000
X @ Allowable comp.	1065.4	0.00	2.37	107.13	57.88	-0.00138	1.00000
X @ $f_s = 0.0$	864.2	413.61	1.99	57.88	57.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	697.1	624.43	1.57	47.06	57.88	0.00069	1.00000
X @ Balanced point	579.8	705.91	1.21	39.65	57.88	0.00138	1.00000
X @ Tension control	333.2	646.83	-0.92	23.53	57.88	0.00438	1.00000
X @ Pure bending	0.0	114.64	-2.50	2.17	57.88	0.07711	1.00000
X @ Max tension	-48.0	0.00	-2.50	0.00	57.88	9.99999	1.00000
-X @ Max compression	1065.4	0.00	2.37	107.13	57.88	-0.00138	1.00000
-X @ Allowable comp.	1065.4	0.00	2.37	107.13	57.88	-0.00138	1.00000
-X @ $f_s = 0.0$	864.2	-413.61	1.99	57.88	57.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	697.1	-624.43	1.57	47.06	57.88	0.00069	1.00000
-X @ Balanced point	579.8	-705.91	1.21	39.65	57.88	0.00138	1.00000
-X @ Tension control	333.2	-646.83	-0.92	23.53	57.88	0.00438	1.00000
-X @ Pure bending	0.0	-114.64	-2.50	2.17	57.88	0.07711	1.00000
-X @ Max tension	-48.0	0.00	-2.50	0.00	57.88	9.99999	1.00000

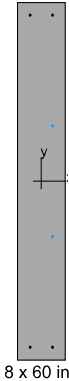
6. Factored Loads and Moments with Corresponding Capacity Ratios

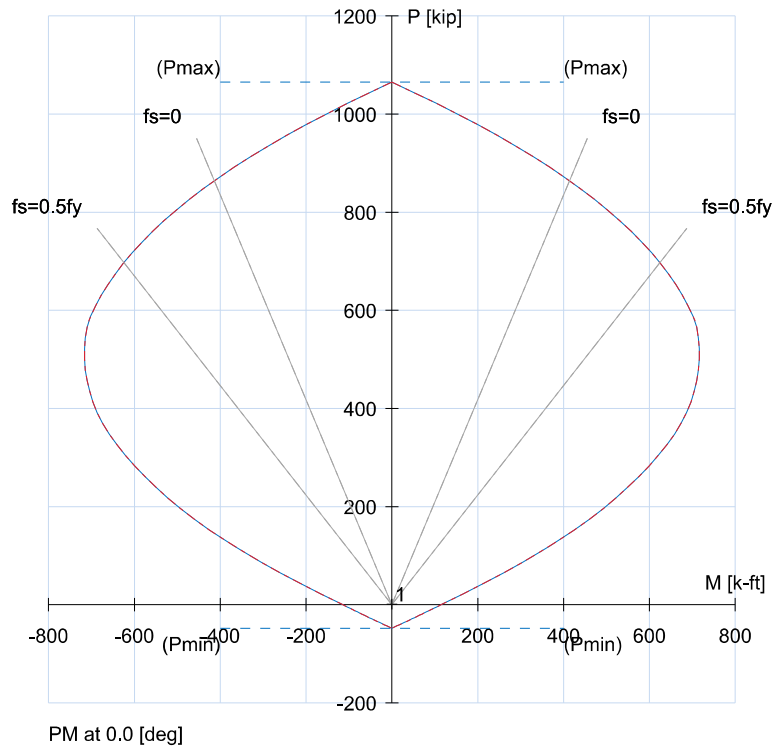
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	21.74	165.07	3.05	0.05395	1.000	0.77

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>8 x 60 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	60 in
A_g	480 in ²
I_x	144000 in ⁴
I_y	2560 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.25 %
Min. clear spacing	3.25 in

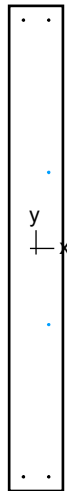


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	21.74	165.07	0.77

Max. Capacity Ratio: 0.77



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type G-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	72 in
A_g	576 in ²
I_x	248832 in ⁴
I_y	3072 in ⁴
r_x	20.7846 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

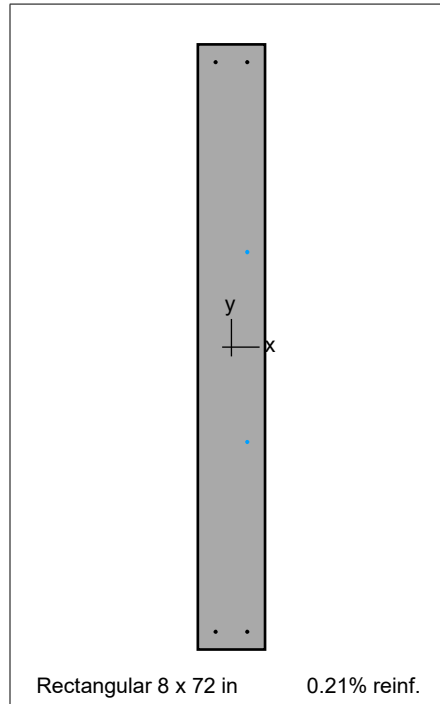


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.20 in ²
Rho	0.21 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	2	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1269.4	0.00	2.37	129.34	69.88	-0.00138	1.00000
X @ Allowable comp.	1269.4	0.00	2.37	129.34	69.88	-0.00138	1.00000
X @ $f_s = 0.0$	1037.6	575.36	2.00	69.88	69.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	838.2	881.11	1.57	56.81	69.88	0.00069	1.00000
X @ Balanced point	698.6	997.30	1.22	47.87	69.88	0.00138	1.00000
X @ Tension control	403.9	916.06	-0.90	28.41	69.88	0.00438	1.00000
X @ Pure bending	0.0	138.61	-2.50	2.17	69.88	0.09373	1.00000
X @ Max tension	-48.0	0.00	-2.50	0.00	69.88	9.99999	1.00000
-X @ Max compression	1269.4	0.00	2.37	129.34	69.88	-0.00138	1.00000
-X @ Allowable comp.	1269.4	0.00	2.37	129.34	69.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1037.6	-575.36	2.00	69.88	69.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	838.2	-881.11	1.57	56.81	69.88	0.00069	1.00000
-X @ Balanced point	698.6	-997.30	1.22	47.87	69.88	0.00138	1.00000
-X @ Tension control	403.9	-916.06	-0.90	28.41	69.88	0.00438	1.00000
-X @ Pure bending	0.0	-138.61	-2.50	2.17	69.88	0.09373	1.00000
-X @ Max tension	-48.0	0.00	-2.50	0.00	69.88	9.99999	1.00000

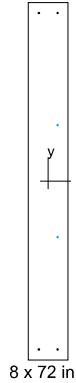
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	25.91	211.60	3.24	0.06172	1.000	0.79

7. Diagrams

7.1. PM at $\theta=0$ [deg]



8 x 72 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

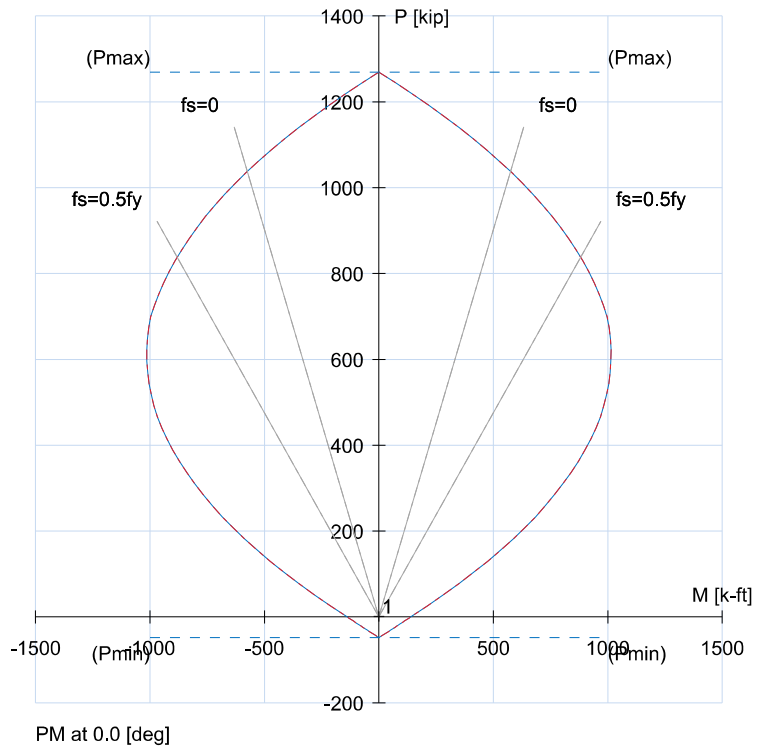
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	72 in
A_g	576 in ²
I_x	248832 in ⁴
I_y	3072 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.21 %
Min. clear spacing	3.25 in

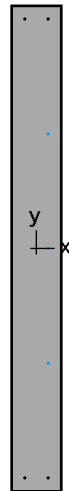


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	25.91	211.60	0.79

Max. Capacity Ratio: 0.79



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type H-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	78 in
A_g	624 in ²
I_x	316368 in ⁴
I_y	3328 in ⁴
r_x	22.5167 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

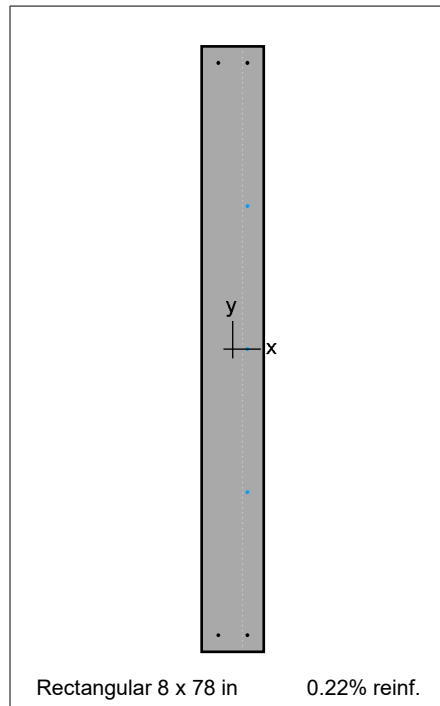


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.40 in ²
Rho	0.22 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	3	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1379.0	0.00	3.55	140.45	75.88	-0.00138	1.00000
X @ Allowable comp.	1379.0	0.00	3.55	140.45	75.88	-0.00138	1.00000
X @ $f_s = 0.0$	1130.5	669.36	2.96	75.88	75.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	913.4	1030.38	2.30	61.69	75.88	0.00069	1.00000
X @ Balanced point	759.9	1168.53	1.51	51.98	75.88	0.00138	1.00000
X @ Tension control	437.7	1077.95	-1.13	30.85	75.88	0.00438	1.00000
X @ Pure bending	0.0	175.26	-3.75	2.45	75.88	0.08994	1.00000
X @ Max tension	-56.0	0.00	-3.75	0.00	75.88	9.99999	1.00000
-X @ Max compression	1379.0	0.00	3.55	140.45	75.88	-0.00138	1.00000
-X @ Allowable comp.	1379.0	0.00	3.55	140.45	75.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1130.5	-669.36	2.96	75.88	75.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	913.4	-1030.38	2.30	61.69	75.88	0.00069	1.00000
-X @ Balanced point	759.9	-1168.53	1.51	51.98	75.88	0.00138	1.00000
-X @ Tension control	437.7	-1077.95	-1.13	30.85	75.88	0.00438	1.00000
-X @ Pure bending	0.0	-175.26	-3.75	2.45	75.88	0.08994	1.00000
-X @ Max tension	-56.0	0.00	-3.75	0.00	75.88	9.99999	1.00000

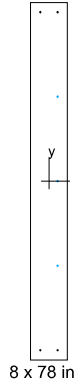
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	28.14	261.04	3.74	0.05791	1.000	0.78

7. Diagrams

7.1. PM at $\theta=0$ [deg]



8 x 78 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

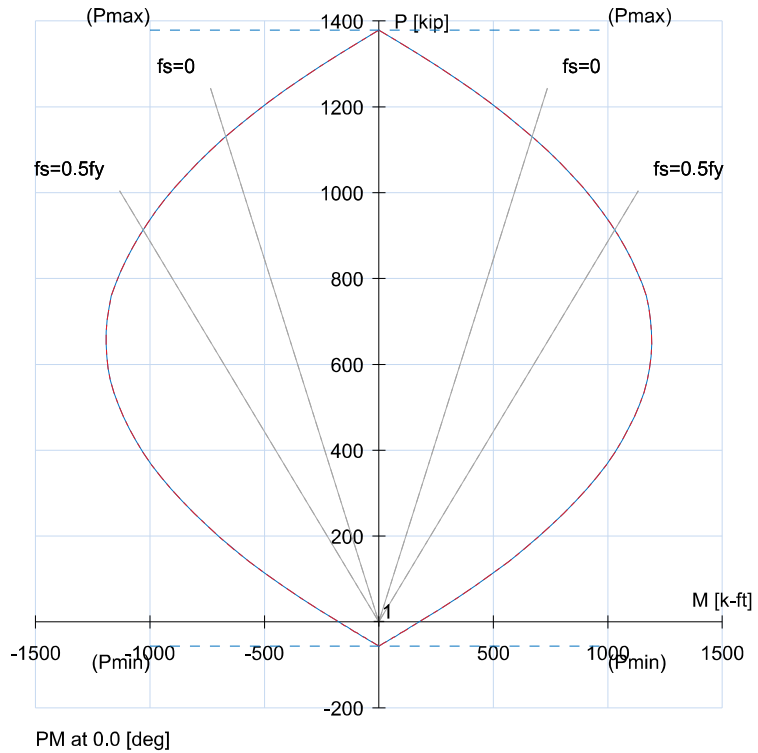
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	78 in
A_g	624 in ²
I_x	316368 in ⁴
I_y	3328 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.40 in ²
Rho	0.22 %
Min. clear spacing	3.25 in

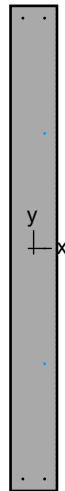


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	28.14	261.04	0.78

Max. Capacity Ratio: 0.78



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type J-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	84 in
A_g	672 in ²
I_x	395136 in ⁴
I_y	3584 in ⁴
r_x	24.2487 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

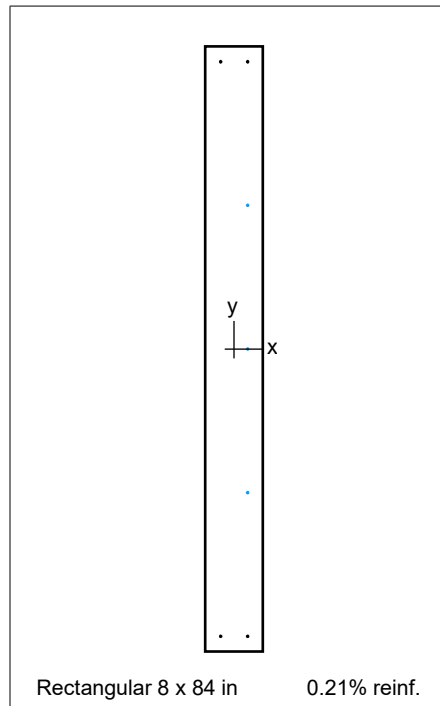


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.40 in ²
Rho	0.21 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	3	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1481.0	0.00	3.55	151.56	81.88	-0.00138	1.00000
X @ Allowable comp.	1481.0	0.00	3.55	151.56	81.88	-0.00138	1.00000
X @ $f_s = 0.0$	1217.2	766.76	2.96	81.88	81.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	983.9	1186.31	2.31	66.57	81.88	0.00069	1.00000
X @ Balanced point	819.3	1345.80	1.52	56.09	81.88	0.00138	1.00000
X @ Tension control	473.0	1242.25	-1.11	33.29	81.88	0.00438	1.00000
X @ Pure bending	0.0	189.26	-3.75	2.45	81.88	0.09729	1.00000
X @ Max tension	-56.0	0.00	-3.75	0.00	81.88	9.99999	1.00000
-X @ Max compression	1481.0	0.00	3.55	151.56	81.88	-0.00138	1.00000
-X @ Allowable comp.	1481.0	0.00	3.55	151.56	81.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1217.2	-766.76	2.96	81.88	81.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	983.9	-1186.31	2.31	66.57	81.88	0.00069	1.00000
-X @ Balanced point	819.3	-1345.80	1.52	56.09	81.88	0.00138	1.00000
-X @ Tension control	473.0	-1242.25	-1.11	33.29	81.88	0.00438	1.00000
-X @ Pure bending	0.0	-189.26	-3.75	2.45	81.88	0.09729	1.00000
-X @ Max tension	-56.0	0.00	-3.75	0.00	81.88	9.99999	1.00000

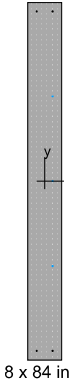
6. Factored Loads and Moments with Corresponding Capacity Ratios

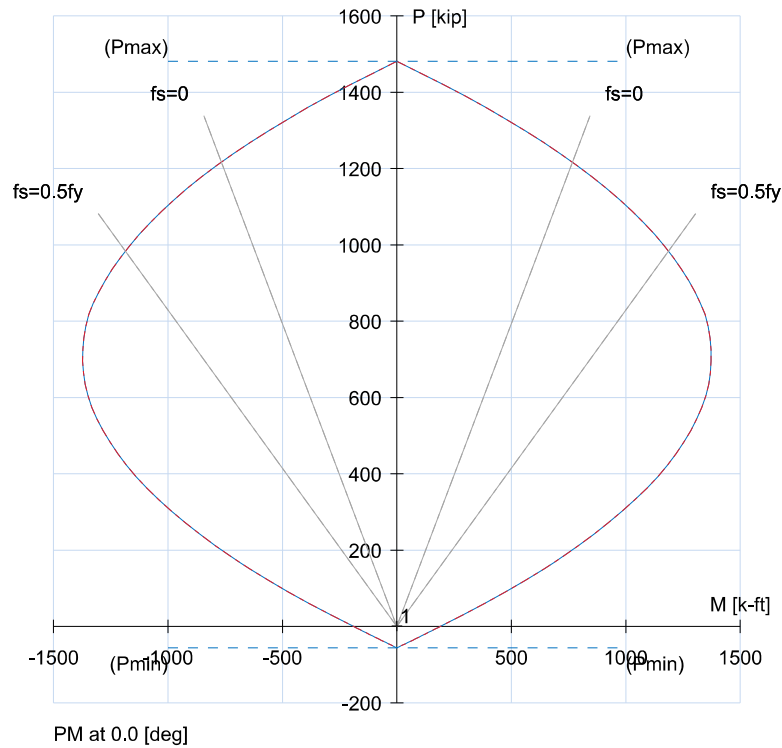
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	30.22	288.94	3.84	0.06089	1.000	0.79

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>8 x 84 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	84 in
A_g	672 in ²
I_x	395136 in ⁴
I_y	3584 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.40 in ²
Rho	0.21 %
Min. clear spacing	3.25 in

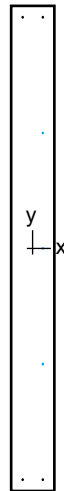


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	30.22	288.94	0.79

Max. Capacity Ratio: 0.79



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type K-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	90 in
A_g	720 in ²
I_x	486000 in ⁴
I_y	3840 in ⁴
r_x	25.9808 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

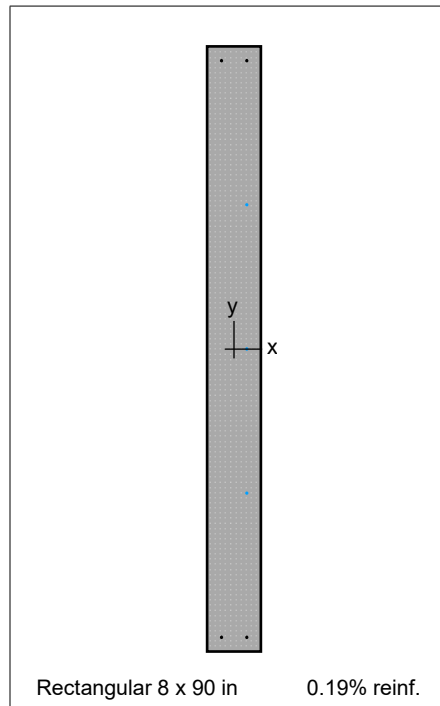


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.40 in ²
Rho	0.19 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	3	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1583.0	0.00	3.55	162.66	87.88	-0.00138	1.00000
X @ Allowable comp.	1583.0	0.00	3.55	162.66	87.88	-0.00138	1.00000
X @ $f_s = 0.0$	1303.9	870.66	2.96	87.88	87.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1054.4	1353.12	2.31	71.45	87.88	0.00069	1.00000
X @ Balanced point	878.7	1535.48	1.52	60.20	87.88	0.00138	1.00000
X @ Tension control	508.4	1418.10	-1.10	35.72	87.88	0.00438	1.00000
X @ Pure bending	0.0	203.27	-3.75	2.45	87.88	0.10464	1.00000
X @ Max tension	-56.0	0.00	-3.75	0.00	87.88	9.99999	1.00000
-X @ Max compression	1583.0	0.00	3.55	162.66	87.88	-0.00138	1.00000
-X @ Allowable comp.	1583.0	0.00	3.55	162.66	87.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1303.9	-870.66	2.96	87.88	87.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1054.4	-1353.12	2.31	71.45	87.88	0.00069	1.00000
-X @ Balanced point	878.7	-1535.48	1.52	60.20	87.88	0.00138	1.00000
-X @ Tension control	508.4	-1418.10	-1.10	35.72	87.88	0.00438	1.00000
-X @ Pure bending	0.0	-203.27	-3.75	2.45	87.88	0.10464	1.00000
-X @ Max tension	-56.0	0.00	-3.75	0.00	87.88	9.99999	1.00000

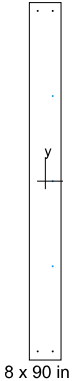
6. Factored Loads and Moments with Corresponding Capacity Ratios

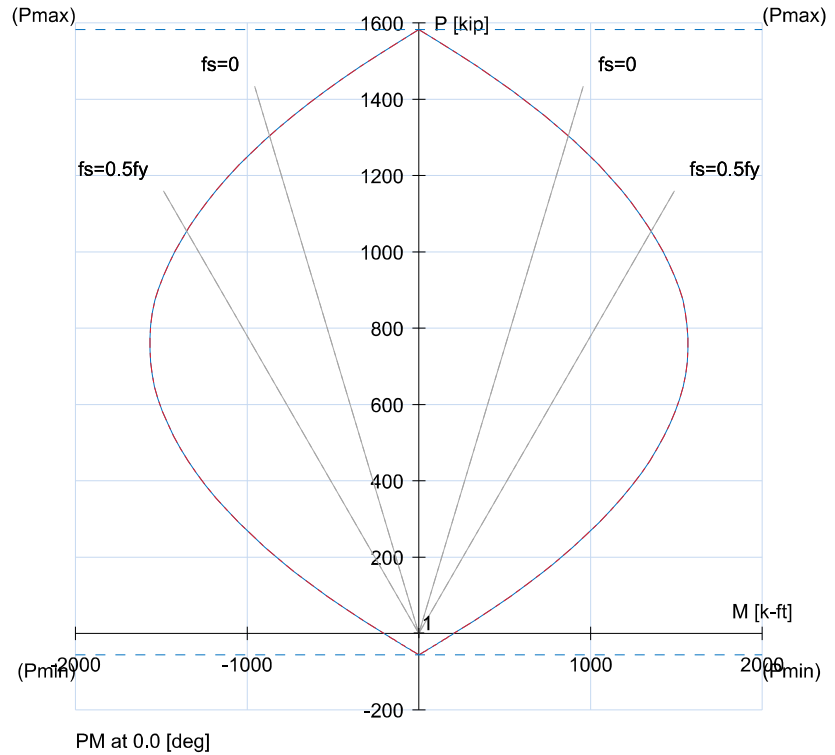
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	32.31	317.71	3.96	0.06362	1.000	0.80

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>8 x 90 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	90 in
A_g	720 in ²
I_x	486000 in ⁴
I_y	3840 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.40 in ²
Rho	0.19 %
Min. clear spacing	3.25 in

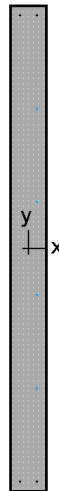


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	32.31	317.71	0.80

Max. Capacity Ratio: 0.80



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type L-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	108 in
A_g	864 in ²
I_x	839808 in ⁴
I_y	4608 in ⁴
r_x	31.1769 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

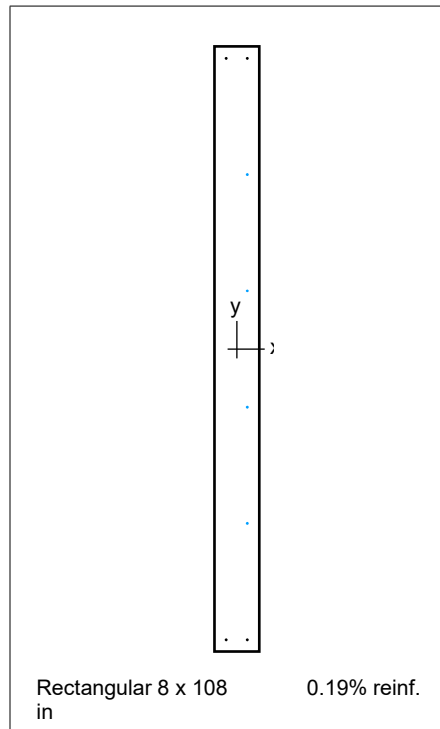


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.60 in ²
Rho	0.19 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	4	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1896.6	0.00	4.73	195.98	105.88	-0.00138	1.00000
X @ Allowable comp.	1896.6	0.00	4.73	195.98	105.88	-0.00138	1.00000
X @ $f_s = 0.0$	1569.6	1226.24	3.83	105.88	105.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1270.4	1927.47	3.02	86.09	105.88	0.00069	1.00000
X @ Balanced point	1060.2	2190.14	2.03	72.53	105.88	0.00138	1.00000
X @ Tension control	612.5	2032.48	-1.35	43.04	105.88	0.00438	1.00000
X @ Pure bending	0.0	279.82	-5.00	2.80	105.88	0.11044	1.00000
X @ Max tension	-64.0	0.00	-5.00	0.00	105.88	9.99999	1.00000
-X @ Max compression	1896.6	0.00	4.73	195.98	105.88	-0.00138	1.00000
-X @ Allowable comp.	1896.6	0.00	4.73	195.98	105.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1569.6	-1226.24	3.83	105.88	105.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1270.4	-1927.47	3.02	86.09	105.88	0.00069	1.00000
-X @ Balanced point	1060.2	-2190.14	2.03	72.53	105.88	0.00138	1.00000
-X @ Tension control	612.5	-2032.48	-1.35	43.04	105.88	0.00438	1.00000
-X @ Pure bending	0.0	-279.82	-5.00	2.80	105.88	0.11044	1.00000
-X @ Max tension	-64.0	0.00	-5.00	0.00	105.88	9.99999	1.00000

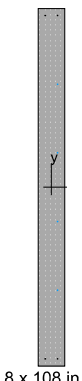
6. Factored Loads and Moments with Corresponding Capacity Ratios

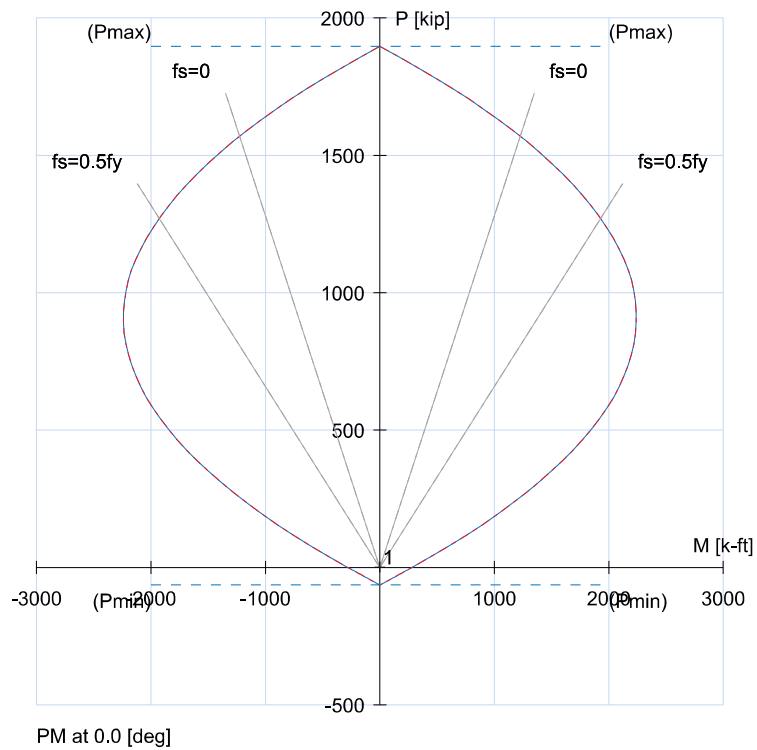
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	38.71	444.26	4.95	0.06111	1.000	0.80

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>8 x 108 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	108 in
A_g	864 in ²
I_x	839808 in ⁴
I_y	4608 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.60 in ²
Rho	0.19 %
Min. clear spacing	3.25 in

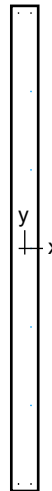


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	38.71	444.26	0.80

Max. Capacity Ratio: 0.80



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type M-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	144 in
A_g	1152 in ²
I_x	1.99066e+006 in ⁴
I_y	6144 in ⁴
r_x	41.5692 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

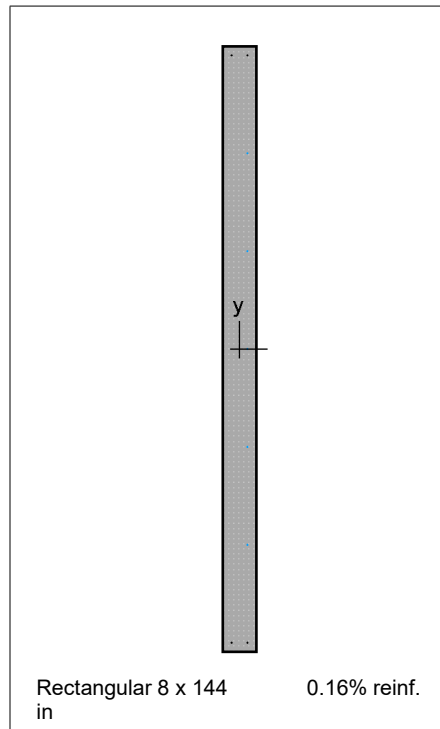


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.80 in ²
Rho	0.16 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	5	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	2516.2	0.00	5.92	262.62	141.88	-0.00138	1.00000
X @ Allowable comp.	2516.2	0.00	5.92	262.62	141.88	-0.00138	1.00000
X @ $f_s = 0.0$	2095.7	2112.00	4.76	141.88	141.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1697.4	3366.97	3.65	115.36	141.88	0.00069	1.00000
X @ Balanced point	1419.3	3831.94	2.46	97.19	141.88	0.00138	1.00000
X @ Tension control	822.1	3559.95	-1.64	57.68	141.88	0.00438	1.00000
X @ Pure bending	0.0	422.24	-6.25	3.15	141.88	0.13210	1.00000
X @ Max tension	-72.0	0.00	-6.25	0.00	141.88	9.99999	1.00000
-X @ Max compression	2516.2	0.00	5.92	262.62	141.88	-0.00138	1.00000
-X @ Allowable comp.	2516.2	0.00	5.92	262.62	141.88	-0.00138	1.00000
-X @ $f_s = 0.0$	2095.7	-2112.00	4.76	141.88	141.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1697.4	-3366.97	3.65	115.36	141.88	0.00069	1.00000
-X @ Balanced point	1419.3	-3831.94	2.46	97.19	141.88	0.00138	1.00000
-X @ Tension control	822.1	-3559.95	-1.64	57.68	141.88	0.00438	1.00000
-X @ Pure bending	0.0	-422.24	-6.25	3.15	141.88	0.13210	1.00000
-X @ Max tension	-72.0	0.00	-6.25	0.00	141.88	9.99999	1.00000

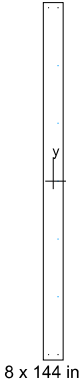
6. Factored Loads and Moments with Corresponding Capacity Ratios

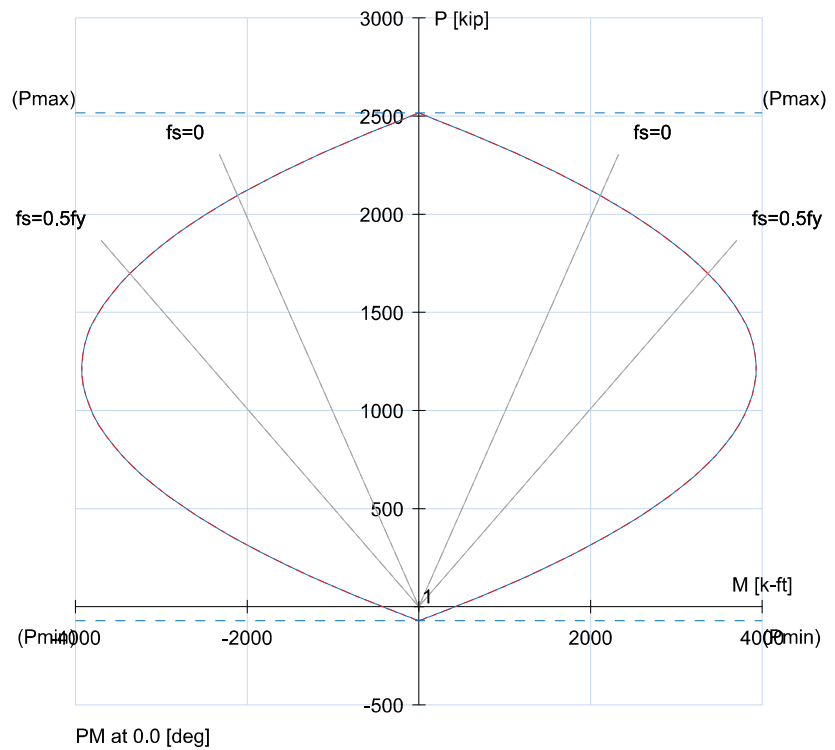
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	51.35	713.86	6.38	0.06369	1.000	0.82

7. Diagrams

7.1. PM at $\theta=0$ [deg]

	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	144 in
A_g	1152 in ²
I_x	1.99066e+006 in ⁴
I_y	6144 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.80 in ²
Rho	0.16 %
Min. clear spacing	3.25 in

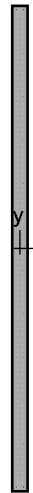


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	51.35	713.86	0.82

Max. Capacity Ratio: 0.82



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type N-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	252 in
A_g	2016 in ²
I_x	1.06687e+007 in ⁴
I_y	10752 in ⁴
r_x	72.7461 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

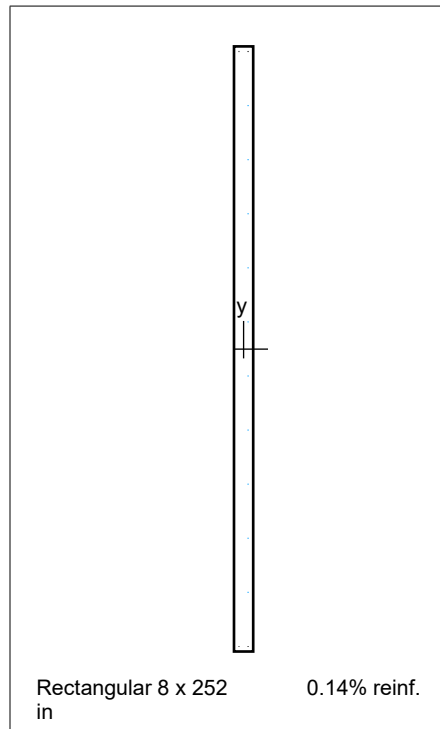


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	2.80 in ²
Rho	0.14 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	10	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	4390.0	0.00	11.84	462.53	249.88	-0.00138	1.00000
X @ Allowable comp.	4390.0	0.00	11.84	462.53	249.88	-0.00138	1.00000
X @ $f_s = 0.0$	3685.5	6218.13	9.33	249.88	249.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	2988.5	10113.27	7.11	203.17	249.88	0.00069	1.00000
X @ Balanced point	2502.1	11543.29	4.61	171.17	249.88	0.00138	1.00000
X @ Tension control	1448.5	10779.00	-2.90	101.58	249.88	0.00438	1.00000
X @ Pure bending	0.0	1154.46	-12.50	5.60	249.88	0.13098	1.00000
X @ Max tension	-112.0	0.00	-12.50	0.00	249.88	9.99999	1.00000
-X @ Max compression	4390.0	0.00	11.84	462.53	249.88	-0.00138	1.00000
-X @ Allowable comp.	4390.0	0.00	11.84	462.53	249.88	-0.00138	1.00000
-X @ $f_s = 0.0$	3685.5	-6218.13	9.33	249.88	249.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	2988.5	-10113.27	7.11	203.17	249.88	0.00069	1.00000
-X @ Balanced point	2502.1	-11543.29	4.61	171.17	249.88	0.00138	1.00000
-X @ Tension control	1448.5	-10779.00	-2.90	101.58	249.88	0.00438	1.00000
-X @ Pure bending	0.0	-1154.46	-12.50	5.60	249.88	0.13098	1.00000
-X @ Max tension	-112.0	0.00	-12.50	0.00	249.88	9.99999	1.00000

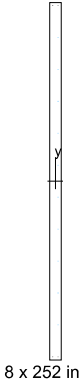
6. Factored Loads and Moments with Corresponding Capacity Ratios

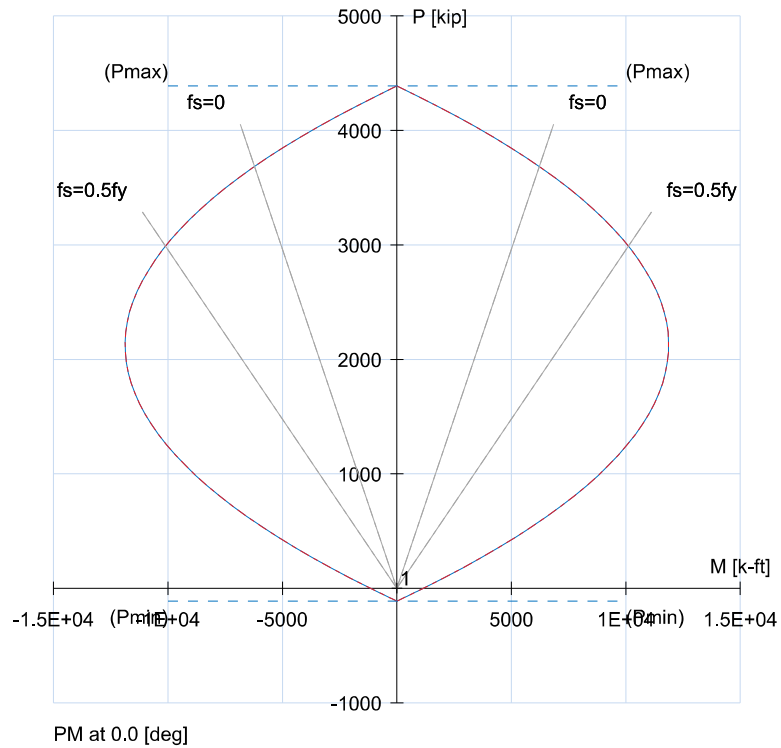
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	89.59	2039.93	11.79	0.06056	1.000	0.83

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>8 x 252 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	8 in
Depth	252 in
A_g	2016 in ²
I_x	1.06687e+007 in ⁴
I_y	10752 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	2.80 in ²
Rho	0.14 %
Min. clear spacing	3.25 in

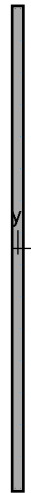


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	89.59	2039.93	0.83

Max. Capacity Ratio: 0.83



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1. General Information

File Name	J:\2021 All Jobs\21699 - Co...\Wall Type P-8.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	8 in
Depth	348 in
A_g	2784 in ²
I_x	2.80961e+007 in ⁴
I_y	14848 in ⁴
r_x	100.459 in
r_y	2.3094 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

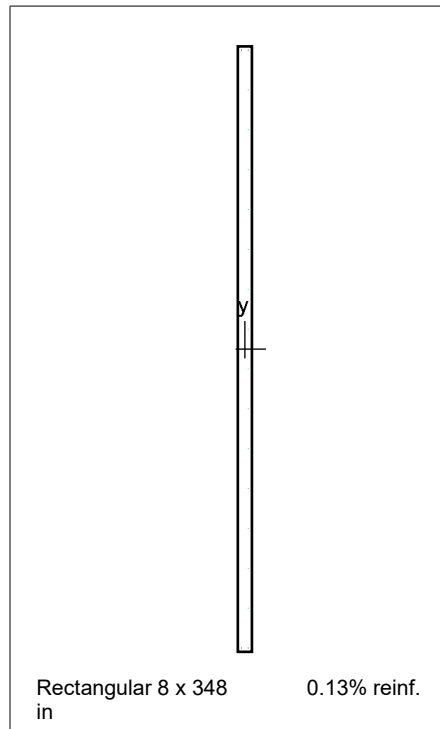


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	3.60 in ²
Rho	0.13 %
Minimum clear spacing	3.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	0	#4	1.5
Right	14	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	6052.3	0.00	16.57	640.24	345.88	-0.00138	1.00000
X @ Allowable comp.	6052.3	0.00	16.57	640.24	345.88	-0.00138	1.00000
X @ $f_s = 0.0$	5096.2	11674.07	12.99	345.88	345.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	4133.7	19135.58	9.81	281.23	345.88	0.00069	1.00000
X @ Balanced point	3463.2	21859.26	6.30	236.94	345.88	0.00138	1.00000
X @ Tension control	2005.5	20445.74	-3.99	140.61	345.88	0.00438	1.00000
X @ Pure bending	0.0	2051.27	-17.50	7.81	345.88	0.12986	1.00000
X @ Max tension	-144.0	0.00	-17.50	0.00	345.88	9.99999	1.00000
-X @ Max compression	6052.3	0.00	16.57	640.24	345.88	-0.00138	1.00000
-X @ Allowable comp.	6052.3	0.00	16.57	640.24	345.88	-0.00138	1.00000
-X @ $f_s = 0.0$	5096.2	-11674.07	12.99	345.88	345.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	4133.7	-19135.58	9.81	281.23	345.88	0.00069	1.00000
-X @ Balanced point	3463.2	-21859.26	6.30	236.94	345.88	0.00138	1.00000
-X @ Tension control	2005.5	-20445.74	-3.99	140.61	345.88	0.00438	1.00000
-X @ Pure bending	0.0	-2051.27	-17.50	7.81	345.88	0.12986	1.00000
-X @ Max tension	-144.0	0.00	-17.50	0.00	345.88	9.99999	1.00000

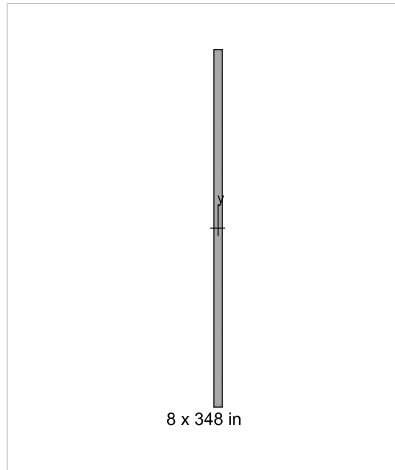
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	123.52	3736.40	16.36	0.06044	1.000	0.83

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

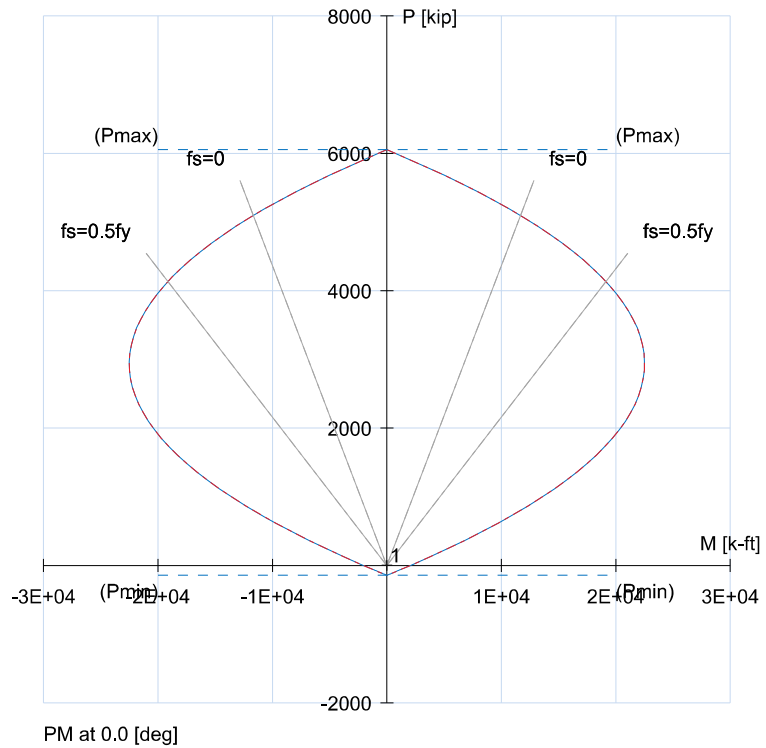
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	8 in
Depth	348 in
A_g	2784 in ²
I_x	2.80961e+007 in ⁴
I_y	14848 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	3.60 in ²
Rho	0.13 %
Min. clear spacing	3.25 in

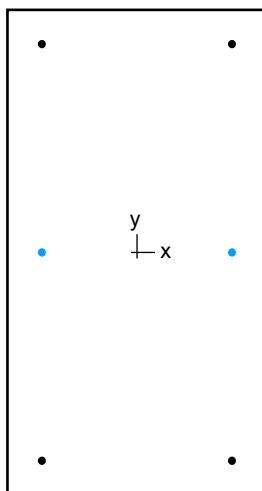


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	123.52	3736.40	0.83

Max. Capacity Ratio: 0.83



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type A-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	30 in
A_g	480 in ²
I_x	36000 in ⁴
I_y	10240 in ⁴
r_x	8.66025 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

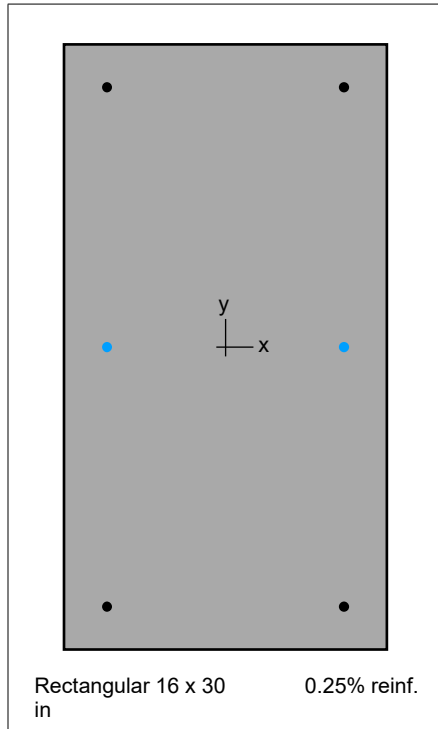


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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Total steel area, A_s	1.20 in ²
Rho	0.25 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	1	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1065.4	0.00	0.00	51.60	27.88	-0.00138	1.00000
X @ Allowable comp.	1065.4	0.00	0.00	51.60	27.88	-0.00138	1.00000
X @ $f_s = 0.0$	835.9	227.93	0.00	27.88	27.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	673.1	317.82	0.00	22.66	27.88	0.00069	1.00000
X @ Balanced point	557.6	350.02	0.00	19.10	27.88	0.00138	1.00000
X @ Tension control	315.4	311.36	0.00	11.33	27.88	0.00438	1.00000
X @ Pure bending	0.0	56.96	0.00	1.55	27.88	0.05089	1.00000
X @ Max tension	-48.0	0.00	0.00	0.00	27.88	9.99999	1.00000
-X @ Max compression	1065.4	0.00	0.00	51.60	27.88	-0.00138	1.00000
-X @ Allowable comp.	1065.4	0.00	0.00	51.60	27.88	-0.00138	1.00000
-X @ $f_s = 0.0$	835.9	-227.93	0.00	27.88	27.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	673.1	-317.82	0.00	22.66	27.88	0.00069	1.00000
-X @ Balanced point	557.6	-350.02	0.00	19.10	27.88	0.00138	1.00000
-X @ Tension control	315.4	-311.36	0.00	11.33	27.88	0.00438	1.00000
-X @ Pure bending	0.0	-56.96	0.00	1.55	27.88	0.05089	1.00000
-X @ Max tension	-48.0	0.00	0.00	0.00	27.88	9.99999	1.00000

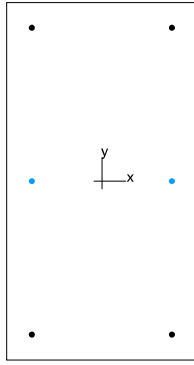
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	1.00	0.00	21.74	80.94	1.96	0.03965	1.000	0.77

7. Diagrams

7.1. PM at $\theta=0$ [deg]



16 x 30 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

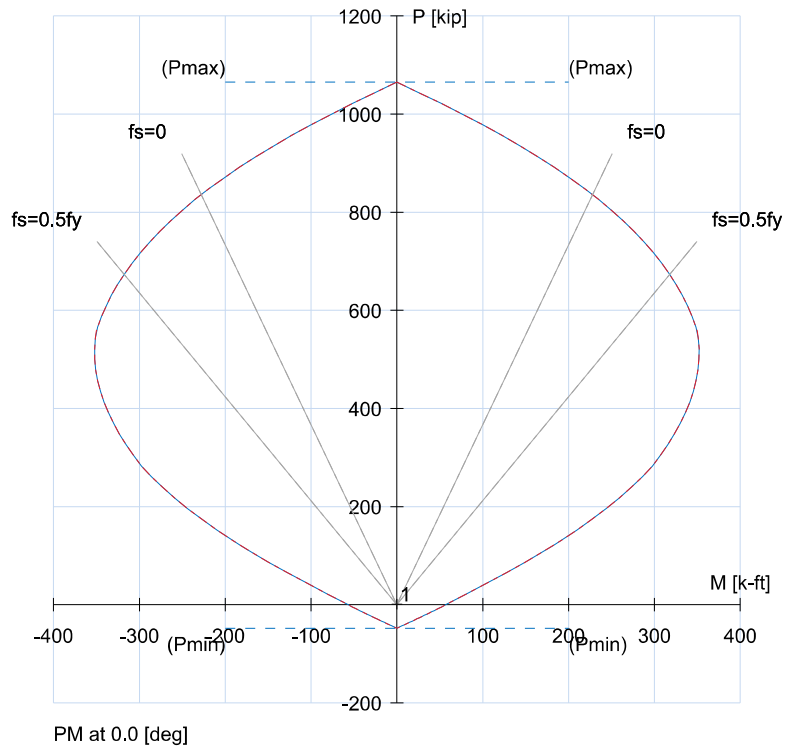
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	30 in
A_g	480 in ²
I_x	36000 in ⁴
I_y	10240 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.25 %
Min. clear spacing	11.25 in



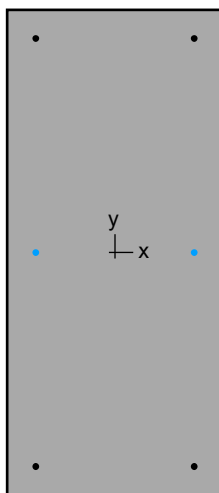
PM at 0.0 [deg]

No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	21.74	80.94	0.77

Max. Capacity Ratio: 0.77



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type B-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	36 in
A_g	576 in ²
I_x	62208 in ⁴
I_y	12288 in ⁴
r_x	10.3923 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

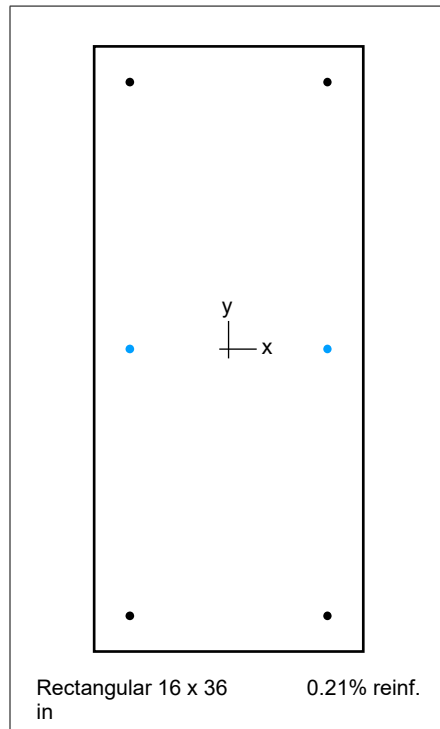


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.20 in ²
Rho	0.21 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	1	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1269.4	0.00	0.00	62.70	33.88	-0.00138	1.00000
X @ Allowable comp.	1269.4	0.00	0.00	62.70	33.88	-0.00138	1.00000
X @ $f_s = 0.0$	1009.3	313.99	0.00	33.88	33.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	814.4	448.14	0.00	27.54	33.88	0.00069	1.00000
X @ Balanced point	676.8	495.99	0.00	23.21	33.88	0.00138	1.00000
X @ Tension control	386.5	444.09	0.00	13.77	33.88	0.00438	1.00000
X @ Pure bending	0.0	68.95	0.00	1.55	33.88	0.06250	1.00000
X @ Max tension	-48.0	0.00	0.00	0.00	33.88	9.99999	1.00000
-X @ Max compression	1269.4	0.00	0.00	62.70	33.88	-0.00138	1.00000
-X @ Allowable comp.	1269.4	0.00	0.00	62.70	33.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1009.3	-313.99	0.00	33.88	33.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	814.4	-448.14	0.00	27.54	33.88	0.00069	1.00000
-X @ Balanced point	676.8	-495.99	0.00	23.21	33.88	0.00138	1.00000
-X @ Tension control	386.5	-444.09	0.00	13.77	33.88	0.00438	1.00000
-X @ Pure bending	0.0	-68.95	0.00	1.55	33.88	0.06250	1.00000
-X @ Max tension	-48.0	0.00	0.00	0.00	33.88	9.99999	1.00000

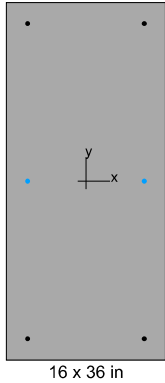
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	25.91	103.99	2.05	0.04660	1.000	0.79

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

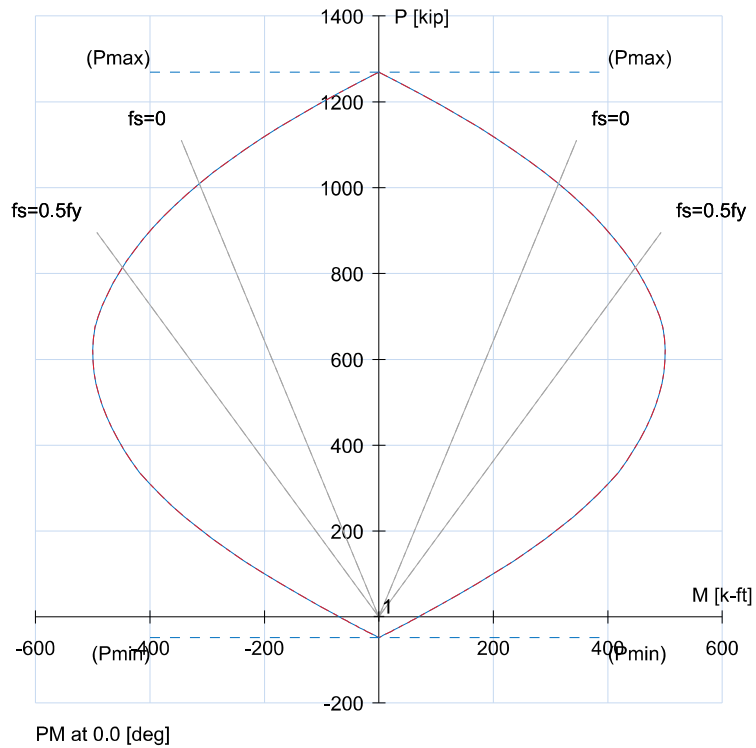
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	36 in
A_g	576 in ²
I_x	62208 in ⁴
I_y	12288 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.21 %
Min. clear spacing	11.25 in

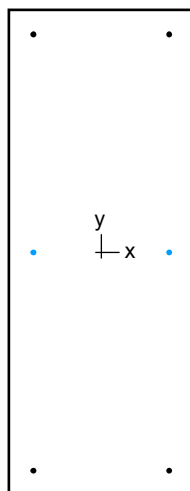


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	25.91	103.99	0.79

Max. Capacity Ratio: 0.79



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type C-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	42 in
A_g	672 in ²
I_x	98784 in ⁴
I_y	14336 in ⁴
r_x	12.1244 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

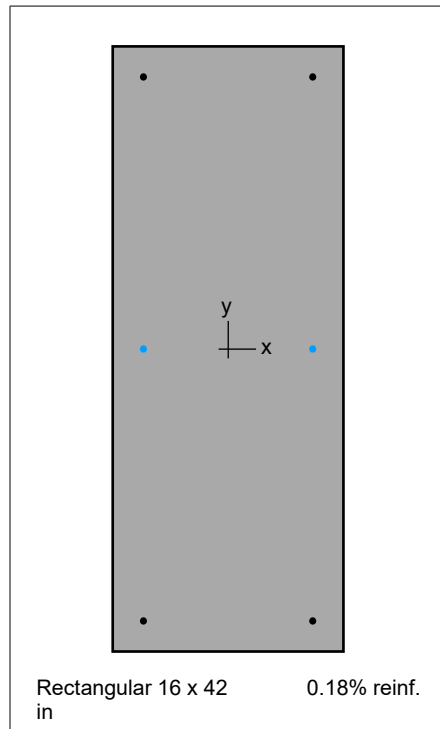


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.20 in ²
Rho	0.18 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	1	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1473.4	0.00	0.00	73.81	39.88	-0.00138	1.00000
X @ Allowable comp.	1473.4	0.00	0.00	73.81	39.88	-0.00138	1.00000
X @ $f_s = 0.0$	1182.7	413.06	0.00	39.88	39.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	955.5	600.23	0.00	32.42	39.88	0.00069	1.00000
X @ Balanced point	795.8	666.77	0.00	27.32	39.88	0.00138	1.00000
X @ Tension control	457.4	599.88	0.00	16.21	39.88	0.00438	1.00000
X @ Pure bending	0.0	80.97	0.00	1.55	39.88	0.07409	1.00000
X @ Max tension	-48.0	0.00	0.00	0.00	39.88	9.99999	1.00000
-X @ Max compression	1473.4	0.00	0.00	73.81	39.88	-0.00138	1.00000
-X @ Allowable comp.	1473.4	0.00	0.00	73.81	39.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1182.7	-413.06	0.00	39.88	39.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	955.5	-600.23	0.00	32.42	39.88	0.00069	1.00000
-X @ Balanced point	795.8	-666.77	0.00	27.32	39.88	0.00138	1.00000
-X @ Tension control	457.4	-599.88	0.00	16.21	39.88	0.00438	1.00000
-X @ Pure bending	0.0	-80.97	0.00	1.55	39.88	0.07409	1.00000
-X @ Max tension	-48.0	0.00	0.00	0.00	39.88	9.99999	1.00000

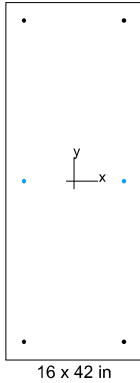
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	30.07	129.12	2.14	0.05289	1.000	0.81

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

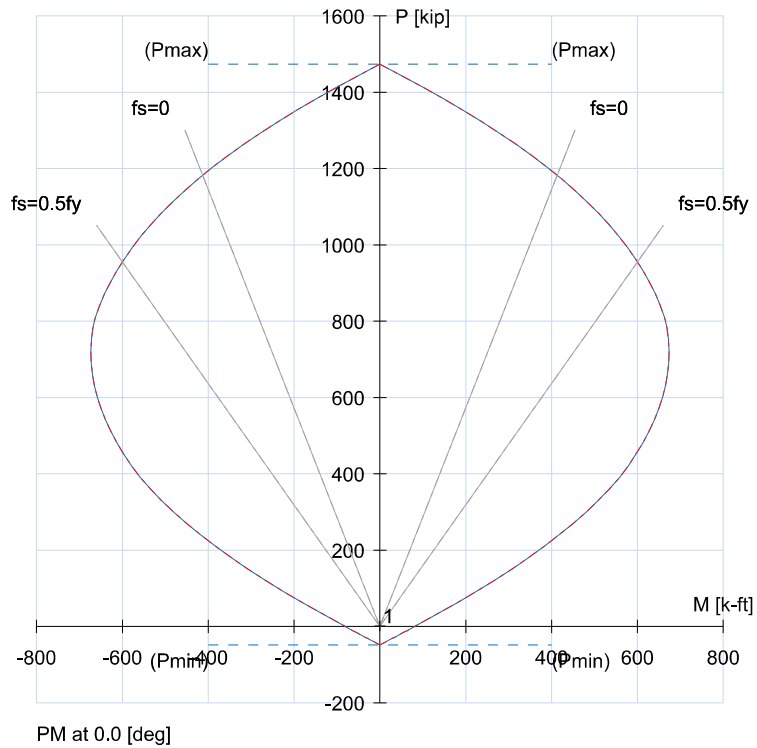
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	42 in
A_g	672 in ²
I_x	98784 in ⁴
I_y	14336 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.18 %
Min. clear spacing	11.25 in

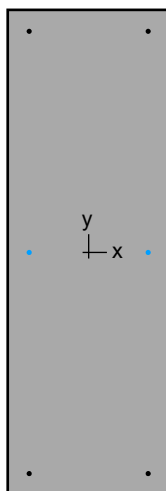


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	30.07	129.12	0.81

Max. Capacity Ratio: 0.81



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type D-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	48 in
A_g	768 in ²
I_x	147456 in ⁴
I_y	16384 in ⁴
r_x	13.8564 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

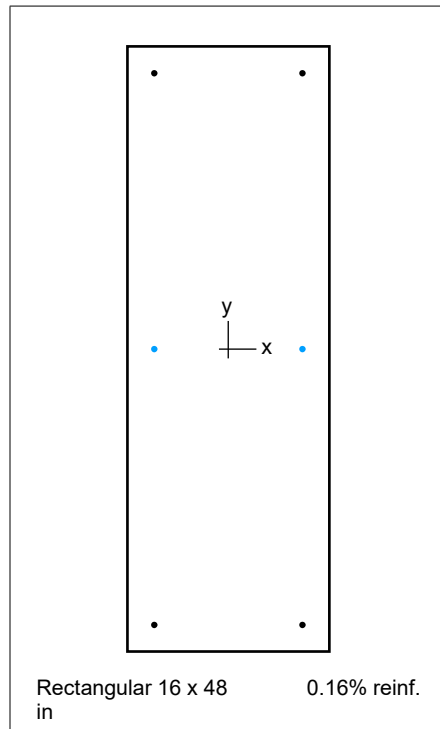


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.20 in ²
Rho	0.16 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	1	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1677.4	0.00	0.00	84.92	45.88	-0.00138	1.00000
X @ Allowable comp.	1677.4	0.00	0.00	84.92	45.88	-0.00138	1.00000
X @ $f_s = 0.0$	1356.1	525.13	0.00	45.88	45.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1096.7	774.09	0.00	37.30	45.88	0.00069	1.00000
X @ Balanced point	914.7	862.36	0.00	31.43	45.88	0.00138	1.00000
X @ Tension control	528.2	778.75	0.00	18.65	45.88	0.00438	1.00000
X @ Pure bending	0.0	92.99	0.00	1.55	45.88	0.08567	1.00000
X @ Max tension	-48.0	0.00	0.00	0.00	45.88	9.99999	1.00000
-X @ Max compression	1677.4	0.00	0.00	84.92	45.88	-0.00138	1.00000
-X @ Allowable comp.	1677.4	0.00	0.00	84.92	45.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1356.1	-525.13	0.00	45.88	45.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1096.7	-774.09	0.00	37.30	45.88	0.00069	1.00000
-X @ Balanced point	914.7	-862.36	0.00	31.43	45.88	0.00138	1.00000
-X @ Tension control	528.2	-778.75	0.00	18.65	45.88	0.00438	1.00000
-X @ Pure bending	0.0	-92.99	0.00	1.55	45.88	0.08567	1.00000
-X @ Max tension	-48.0	0.00	0.00	0.00	45.88	9.99999	1.00000

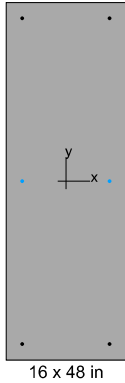
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	1.00	0.00	34.23	156.31	2.23	0.05859	1.000	0.82

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

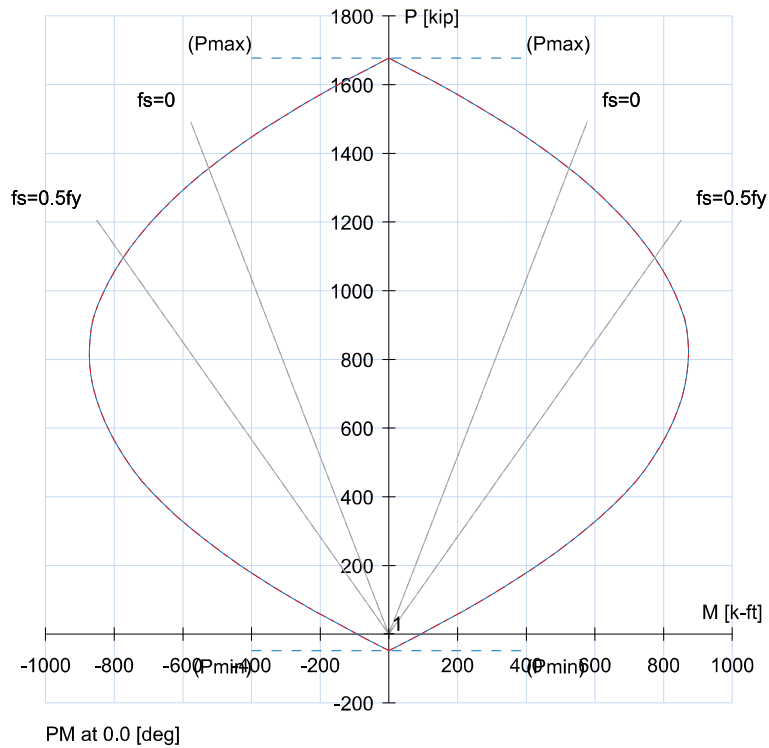
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	48 in
A_g	768 in ²
I_x	147456 in ⁴
I_y	16384 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.16 %
Min. clear spacing	11.25 in

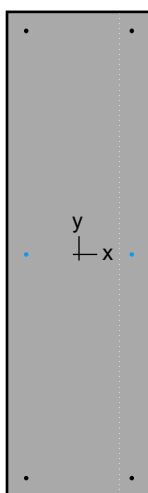


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	34.23	156.31	0.82

Max. Capacity Ratio: 0.82



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type E-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	54 in
A_g	864 in ²
I_x	209952 in ⁴
I_y	18432 in ⁴
r_x	15.5885 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

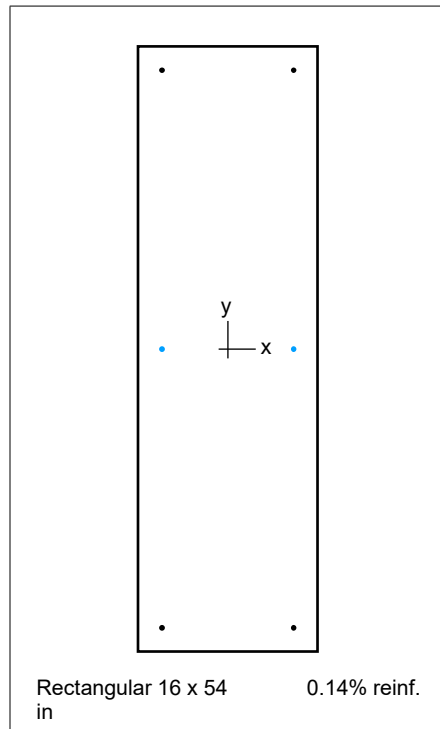


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.20 in ²
Rho	0.14 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	1	#4	1.5
Right	1	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	1881.4	0.00	0.00	96.02	51.88	-0.00138	1.00000
X @ Allowable comp.	1881.4	0.00	0.00	96.02	51.88	-0.00138	1.00000
X @ $f_s = 0.0$	1529.5	650.21	0.00	51.88	51.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1237.8	969.73	0.00	42.18	51.88	0.00069	1.00000
X @ Balanced point	1033.7	1082.76	0.00	35.54	51.88	0.00138	1.00000
X @ Tension control	598.9	980.68	0.00	21.09	51.88	0.00438	1.00000
X @ Pure bending	0.0	104.92	0.00	1.55	51.88	0.09731	1.00000
X @ Max tension	-48.0	0.00	0.00	0.00	51.88	9.99999	1.00000
-X @ Max compression	1881.4	0.00	0.00	96.02	51.88	-0.00138	1.00000
-X @ Allowable comp.	1881.4	0.00	0.00	96.02	51.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1529.5	-650.21	0.00	51.88	51.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1237.8	-969.73	0.00	42.18	51.88	0.00069	1.00000
-X @ Balanced point	1033.7	-1082.76	0.00	35.54	51.88	0.00138	1.00000
-X @ Tension control	598.9	-980.68	0.00	21.09	51.88	0.00438	1.00000
-X @ Pure bending	0.0	-104.92	0.00	1.55	51.88	0.09731	1.00000
-X @ Max tension	-48.0	0.00	0.00	0.00	51.88	9.99999	1.00000

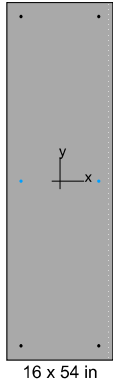
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	38.40	185.48	2.33	0.06379	1.000	0.83

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

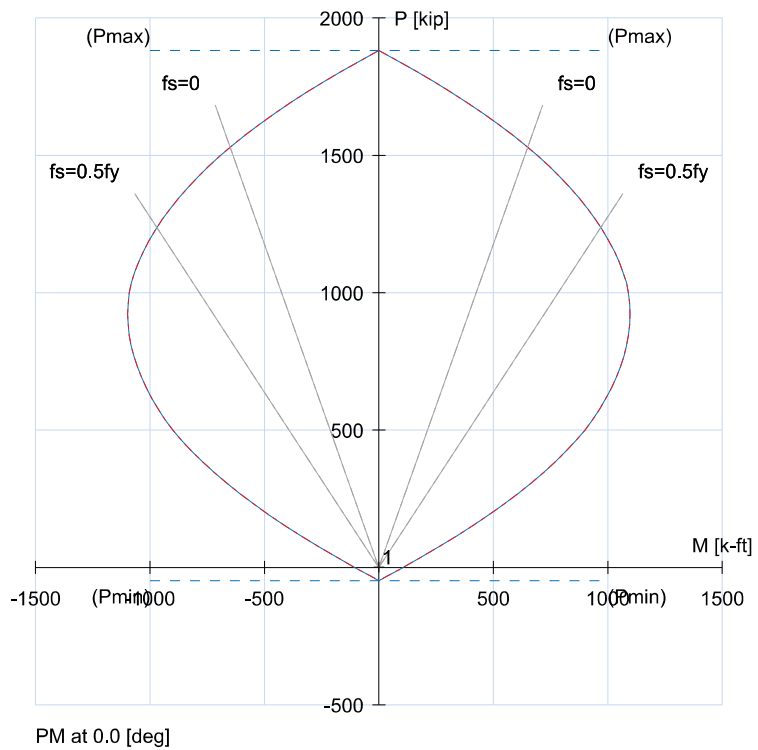
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	54 in
A_g	864 in ²
I_x	209952 in ⁴
I_y	18432 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.20 in ²
Rho	0.14 %
Min. clear spacing	11.25 in

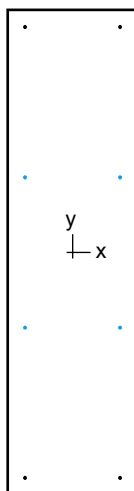


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	38.40	185.48	0.83

Max. Capacity Ratio: 0.83



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 Computer program for the Strength Design of Reinforced Concrete Sections
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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type F-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	60 in
A_g	960 in ²
I_x	288000 in ⁴
I_y	20480 in ⁴
r_x	17.3205 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

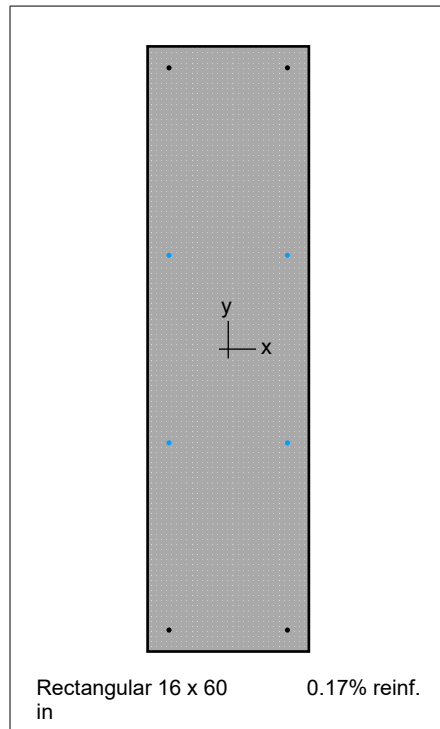


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.60 in ²
Rho	0.17 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	2	#4	1.5
Right	2	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	2100.6	0.00	0.00	107.13	57.88	-0.00138	1.00000
X @ Allowable comp.	2100.6	0.00	0.00	107.13	57.88	-0.00138	1.00000
X @ $f_s = 0.0$	1713.2	792.03	0.00	57.88	57.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1387.1	1195.09	0.00	47.06	57.88	0.00069	1.00000
X @ Balanced point	1160.4	1339.46	0.00	39.65	57.88	0.00138	1.00000
X @ Tension control	667.3	1221.29	0.00	23.53	57.88	0.00438	1.00000
X @ Pure bending	0.0	154.69	0.00	1.84	57.88	0.09112	1.00000
X @ Max tension	-64.0	0.00	0.00	0.00	57.88	9.99999	1.00000
-X @ Max compression	2100.6	0.00	0.00	107.13	57.88	-0.00138	1.00000
-X @ Allowable comp.	2100.6	0.00	0.00	107.13	57.88	-0.00138	1.00000
-X @ $f_s = 0.0$	1713.2	-792.03	0.00	57.88	57.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1387.1	-1195.09	0.00	47.06	57.88	0.00069	1.00000
-X @ Balanced point	1160.4	-1339.46	0.00	39.65	57.88	0.00138	1.00000
-X @ Tension control	667.3	-1221.29	0.00	23.53	57.88	0.00438	1.00000
-X @ Pure bending	0.0	-154.69	0.00	1.84	57.88	0.09112	1.00000
-X @ Max tension	-64.0	0.00	0.00	0.00	57.88	9.99999	1.00000

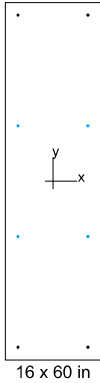
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	42.87	254.54	2.86	0.05763	1.000	0.81

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

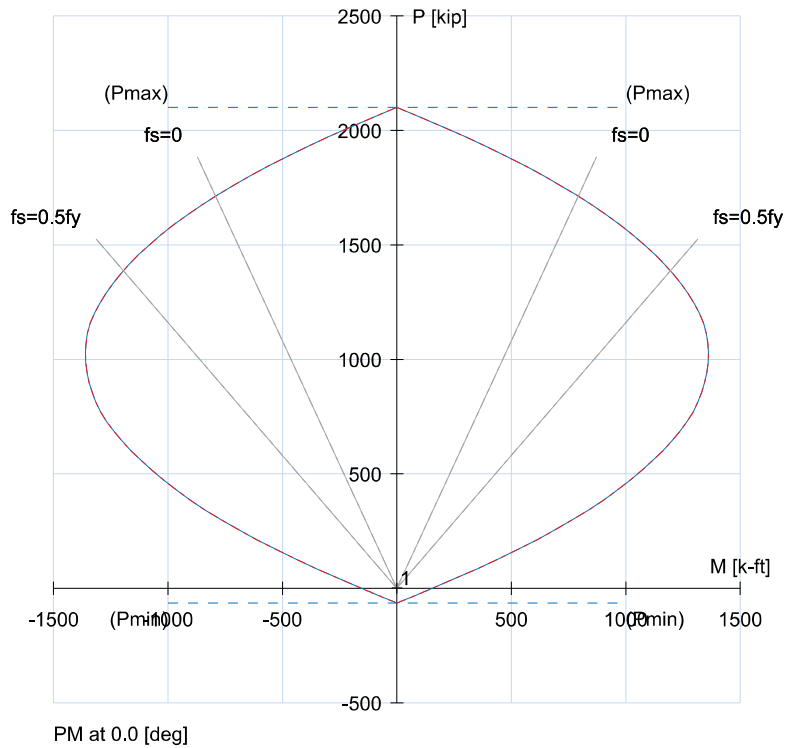
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	60 in
A_g	960 in ²
I_x	288000 in ⁴
I_y	20480 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.60 in ²
Rho	0.17 %
Min. clear spacing	11.25 in

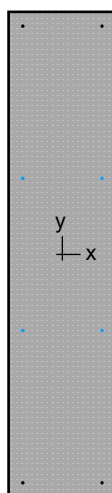


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	42.87	254.54	0.81

Max. Capacity Ratio: 0.81



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J:\2021 All Jobs\21699 - Courthouse Seismic Scope - Dan Hopper\03_Calcs\SPCol\Wall Type G-16.colx

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10/24/2024

11:52 AM

1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type G-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	72 in
A_g	1152 in ²
I_x	497664 in ⁴
I_y	24576 in ⁴
r_x	20.7846 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

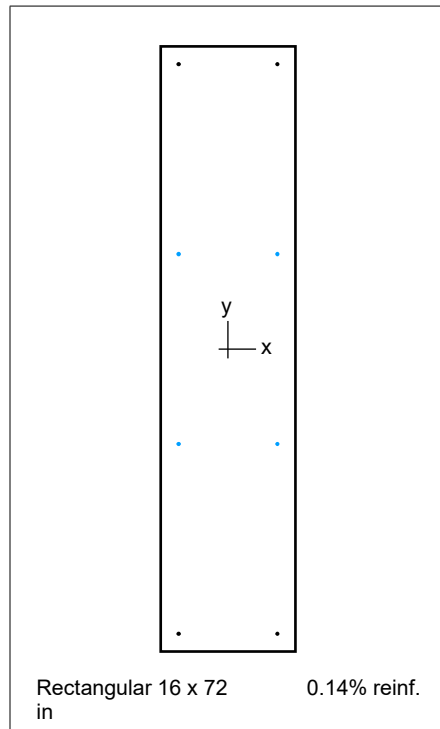


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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10/24/2024

11:52 AM

Total steel area, A_s	1.60 in ²
Rho	0.14 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

	Bars	Clear cover in
Top	2 #4	1.5
Bottom	2 #4	1.5
Left	2 #4	1.5
Right	2 #4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	2508.6	0.00	0.00	129.34	69.88	-0.00138	1.00000
X @ Allowable comp.	2508.6	0.00	0.00	129.34	69.88	-0.00138	1.00000
X @ $f_s = 0.0$	2060.1	1107.94	0.00	69.88	69.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1669.2	1696.86	0.00	56.81	69.88	0.00069	1.00000
X @ Balanced point	1398.1	1906.67	0.00	47.87	69.88	0.00138	1.00000
X @ Tension control	808.6	1744.19	0.00	28.41	69.88	0.00438	1.00000
X @ Pure bending	0.0	186.58	0.00	1.84	69.88	0.11068	1.00000
X @ Max tension	-64.0	0.00	0.00	0.00	69.88	9.99999	1.00000
-X @ Max compression	2508.6	0.00	0.00	129.34	69.88	-0.00138	1.00000
-X @ Allowable comp.	2508.6	0.00	0.00	129.34	69.88	-0.00138	1.00000
-X @ $f_s = 0.0$	2060.1	-1107.94	0.00	69.88	69.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1669.2	-1696.86	0.00	56.81	69.88	0.00069	1.00000
-X @ Balanced point	1398.1	-1906.67	0.00	47.87	69.88	0.00138	1.00000
-X @ Tension control	808.6	-1744.19	0.00	28.41	69.88	0.00438	1.00000
-X @ Pure bending	0.0	-186.58	0.00	1.84	69.88	0.11068	1.00000
-X @ Max tension	-64.0	0.00	0.00	0.00	69.88	9.99999	1.00000

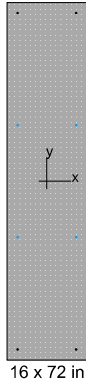
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	51.20	331.29	3.09	0.06490	1.000	0.83

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

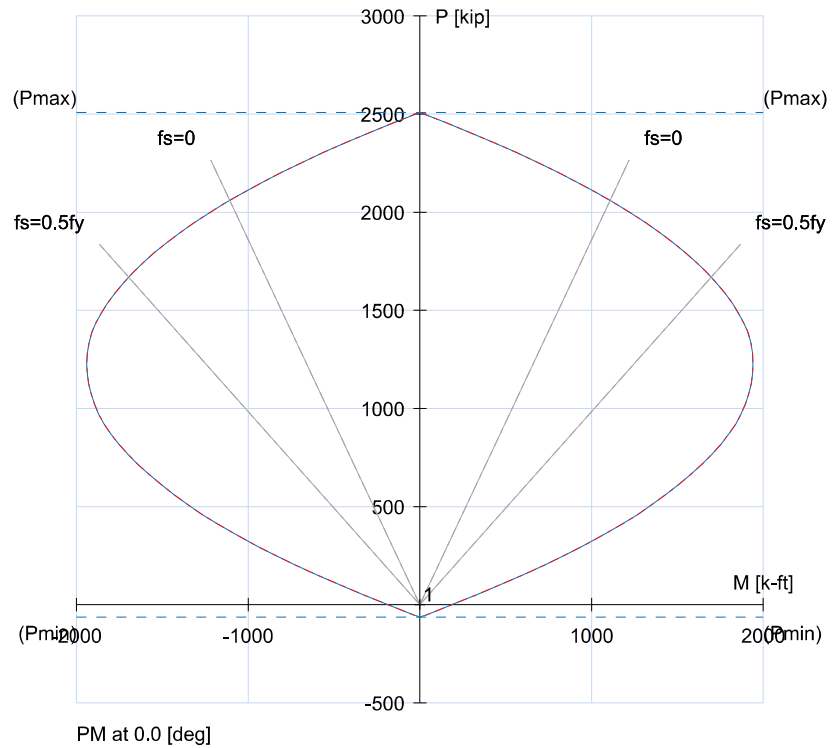
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	72 in
A_g	1152 in ²
I_x	497664 in ⁴
I_y	24576 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.60 in ²
Rho	0.14 %
Min. clear spacing	11.25 in

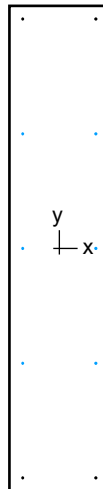


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	51.20	331.29	0.83

Max. Capacity Ratio: 0.83



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type H-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	78 in
A_g	1248 in ²
I_x	632736 in ⁴
I_y	26624 in ⁴
r_x	22.5167 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

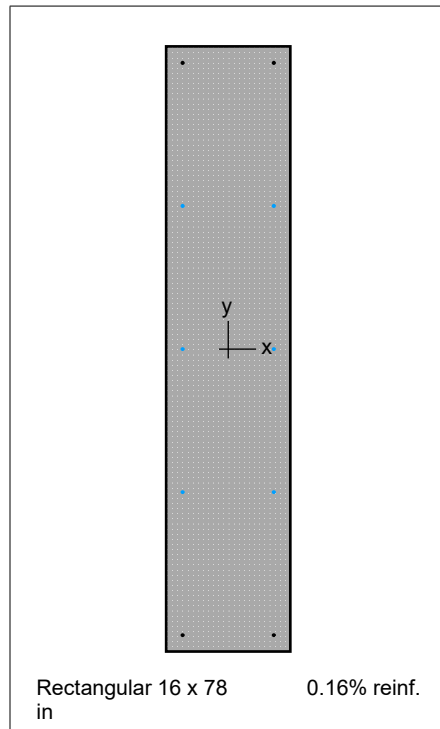


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	2.00 in ²
Rho	0.16 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

	Bars	Clear cover in
Top	2 #4	1.5
Bottom	2 #4	1.5
Left	3 #4	1.5
Right	3 #4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	2727.8	0.00	0.00	140.45	75.88	-0.00138	1.00000
X @ Allowable comp.	2727.8	0.00	0.00	140.45	75.88	-0.00138	1.00000
X @ $f_s = 0.0$	2245.8	1292.16	0.00	75.88	75.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1819.6	1989.62	0.00	61.69	75.88	0.00069	1.00000
X @ Balanced point	1520.6	2241.34	0.00	51.98	75.88	0.00138	1.00000
X @ Tension control	876.2	2060.17	0.00	30.85	75.88	0.00438	1.00000
X @ Pure bending	0.0	252.10	0.00	2.18	75.88	0.10130	1.00000
X @ Max tension	-80.0	0.00	0.00	0.00	75.88	9.99999	1.00000
-X @ Max compression	2727.8	0.00	0.00	140.45	75.88	-0.00138	1.00000
-X @ Allowable comp.	2727.8	0.00	0.00	140.45	75.88	-0.00138	1.00000
-X @ $f_s = 0.0$	2245.8	-1292.16	0.00	75.88	75.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1819.6	-1989.62	0.00	61.69	75.88	0.00069	1.00000
-X @ Balanced point	1520.6	-2241.34	0.00	51.98	75.88	0.00138	1.00000
-X @ Tension control	876.2	-2060.17	0.00	30.85	75.88	0.00438	1.00000
-X @ Pure bending	0.0	-252.10	0.00	2.18	75.88	0.10130	1.00000
-X @ Max tension	-80.0	0.00	0.00	0.00	75.88	9.99999	1.00000

6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	55.67	421.93	3.66	0.05911	1.000	0.81

7. Diagrams

7.1. PM at $\theta=0$ [deg]



16 x 78 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

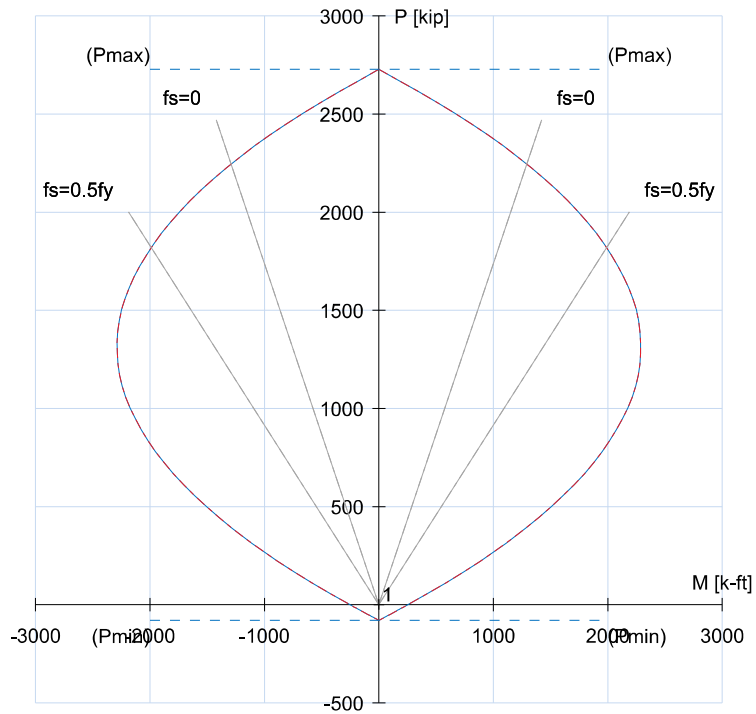
Type	Rectangular
Width	16 in
Depth	78 in
A_g	1248 in ²
I_x	632736 in ⁴
I_y	26624 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Confinement type	Other
------------------	-------

Total steel area, A_s	2.00 in ²
Rho	0.16 %
Min. clear spacing	11.25 in



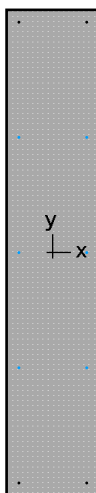
PM at 0.0 [deg]

No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	55.67	421.93	0.81

Max. Capacity Ratio: 0.81



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type J-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	84 in
A_g	1344 in ²
I_x	790272 in ⁴
I_y	28672 in ⁴
r_x	24.2487 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

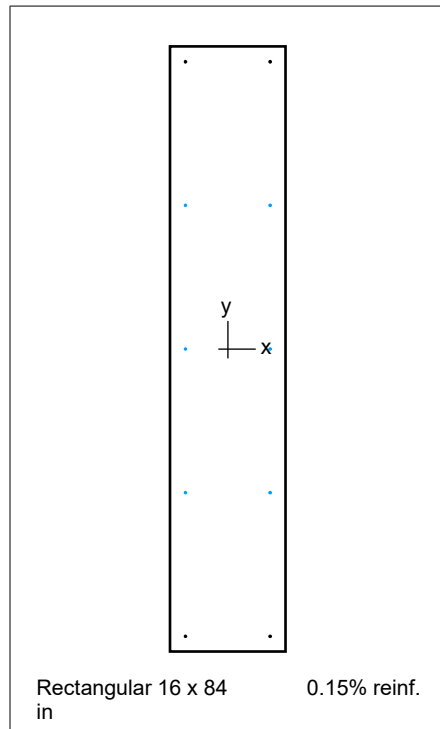


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	2.00 in ²
Rho	0.15 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	3	#4	1.5
Right	3	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	2931.8	0.00	0.00	151.56	81.88	-0.00138	1.00000
X @ Allowable comp.	2931.8	0.00	0.00	151.56	81.88	-0.00138	1.00000
X @ $f_s = 0.0$	2419.3	1483.17	0.00	81.88	81.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	1960.6	2295.69	0.00	66.57	81.88	0.00069	1.00000
X @ Balanced point	1639.5	2588.09	0.00	56.09	81.88	0.00138	1.00000
X @ Tension control	946.9	2381.00	0.00	33.29	81.88	0.00438	1.00000
X @ Pure bending	0.0	272.11	0.00	2.18	81.88	0.10954	1.00000
X @ Max tension	-80.0	0.00	0.00	0.00	81.88	9.99999	1.00000
-X @ Max compression	2931.8	0.00	0.00	151.56	81.88	-0.00138	1.00000
-X @ Allowable comp.	2931.8	0.00	0.00	151.56	81.88	-0.00138	1.00000
-X @ $f_s = 0.0$	2419.3	-1483.17	0.00	81.88	81.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	1960.6	-2295.69	0.00	66.57	81.88	0.00069	1.00000
-X @ Balanced point	1639.5	-2588.09	0.00	56.09	81.88	0.00138	1.00000
-X @ Tension control	946.9	-2381.00	0.00	33.29	81.88	0.00438	1.00000
-X @ Pure bending	0.0	-272.11	0.00	2.18	81.88	0.10954	1.00000
-X @ Max tension	-80.0	0.00	0.00	0.00	81.88	9.99999	1.00000

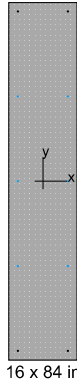
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	59.83	469.40	3.79	0.06187	1.000	0.82

7. Diagrams

7.1. PM at $\theta=0$ [deg]



16 x 84 in

General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

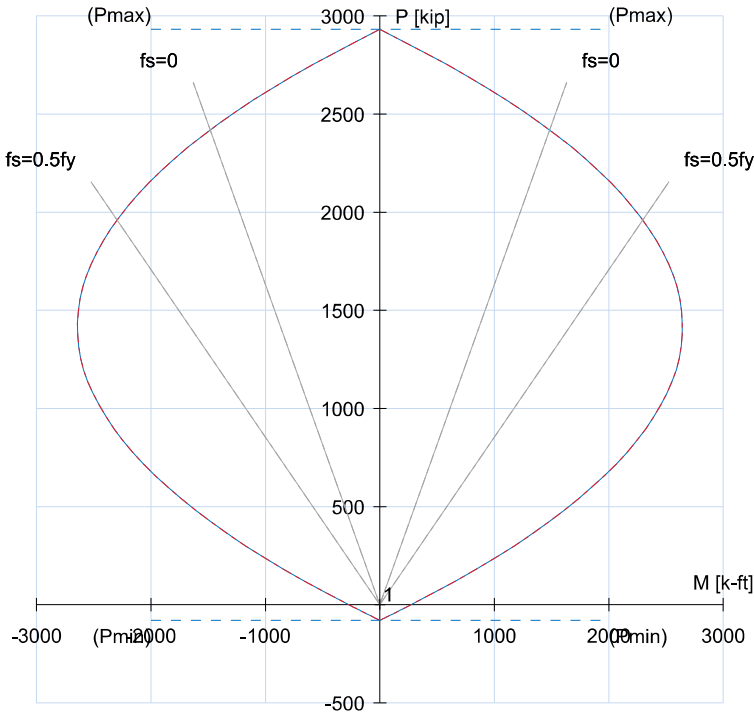
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	84 in
A_g	1344 in ²
I_x	790272 in ⁴
I_y	28672 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	2.00 in ²
Rho	0.15 %
Min. clear spacing	11.25 in



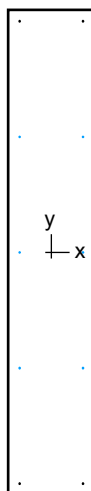
PM at 0.0 [deg]

No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	59.83	469.40	0.82

Max. Capacity Ratio: 0.82



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type K-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	90 in
A_g	1440 in ²
I_x	972000 in ⁴
I_y	30720 in ⁴
r_x	25.9808 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

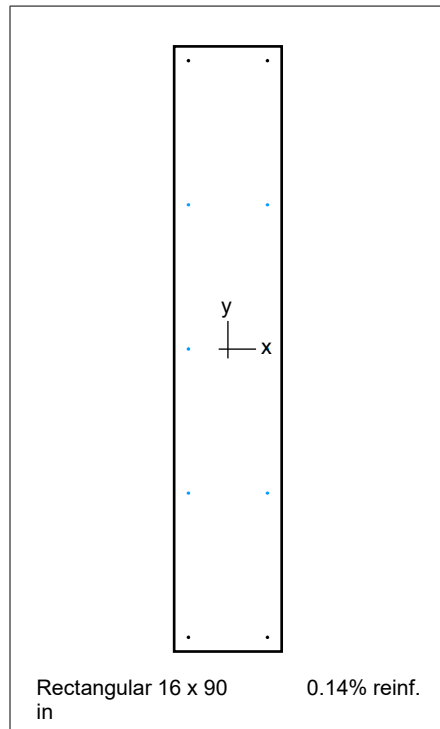


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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Total steel area, A_s	2.00 in ²
Rho	0.14 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	3	#4	1.5
Right	3	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	3135.8	0.00	0.00	162.66	87.88	-0.00138	1.00000
X @ Allowable comp.	3135.8	0.00	0.00	162.66	87.88	-0.00138	1.00000
X @ $f_s = 0.0$	2592.7	1687.19	0.00	87.88	87.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	2101.7	2623.53	0.00	71.45	87.88	0.00069	1.00000
X @ Balanced point	1758.3	2959.66	0.00	60.20	87.88	0.00138	1.00000
X @ Tension control	1017.6	2724.90	0.00	35.72	87.88	0.00438	1.00000
X @ Pure bending	0.0	292.12	0.00	2.18	87.88	0.11778	1.00000
X @ Max tension	-80.0	0.00	0.00	0.00	87.88	9.99999	1.00000
-X @ Max compression	3135.8	0.00	0.00	162.66	87.88	-0.00138	1.00000
-X @ Allowable comp.	3135.8	0.00	0.00	162.66	87.88	-0.00138	1.00000
-X @ $f_s = 0.0$	2592.7	-1687.19	0.00	87.88	87.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	2101.7	-2623.53	0.00	71.45	87.88	0.00069	1.00000
-X @ Balanced point	1758.3	-2959.66	0.00	60.20	87.88	0.00138	1.00000
-X @ Tension control	1017.6	-2724.90	0.00	35.72	87.88	0.00438	1.00000
-X @ Pure bending	0.0	-292.12	0.00	2.18	87.88	0.11778	1.00000
-X @ Max tension	-80.0	0.00	0.00	0.00	87.88	9.99999	1.00000

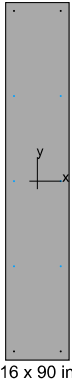
6. Factored Loads and Moments with Corresponding Capacity Ratios

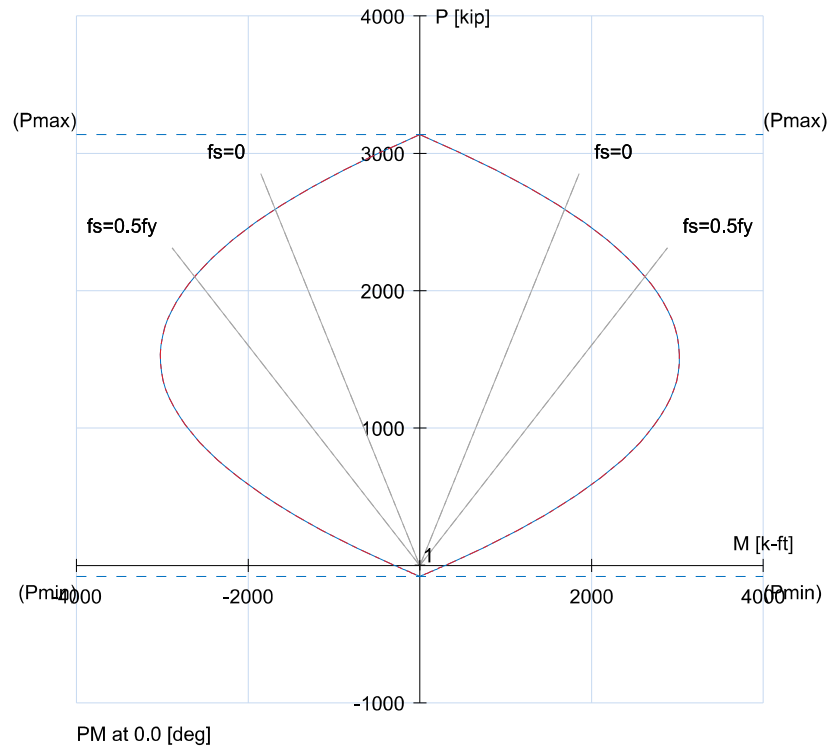
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	1.00	0.00	63.99	518.97	3.91	0.06443	1.000	0.83

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>16 x 90 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	16 in
Depth	90 in
A_g	1440 in ²
I_x	972000 in ⁴
I_y	30720 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	2.00 in ²
Rho	0.14 %
Min. clear spacing	11.25 in

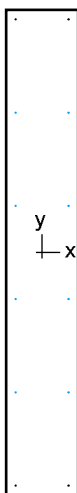


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	63.99	518.97	0.83

Max. Capacity Ratio: 0.83



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type L-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	108 in
A_g	1728 in ²
I_x	1.67962e+006 in ⁴
I_y	36864 in ⁴
r_x	31.1769 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

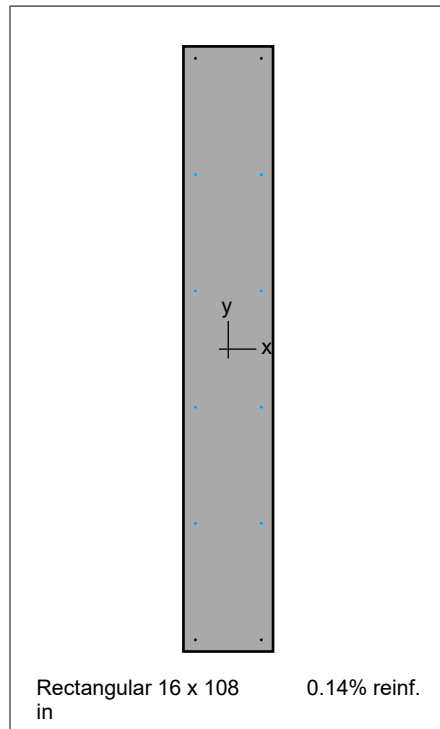


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	2.40 in ²
Rho	0.14 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	4	#4	1.5
Right	4	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	3762.9	0.00	0.00	195.98	105.88	-0.00138	1.00000
X @ Allowable comp.	3762.9	0.00	0.00	195.98	105.88	-0.00138	1.00000
X @ $f_s = 0.0$	3124.0	2386.98	0.00	105.88	105.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	2533.6	3754.87	0.00	86.09	105.88	0.00069	1.00000
X @ Balanced point	2121.3	4245.61	0.00	72.53	105.88	0.00138	1.00000
X @ Tension control	1225.8	3930.29	0.00	43.04	105.88	0.00438	1.00000
X @ Pure bending	0.0	421.44	0.00	2.58	105.88	0.11992	1.00000
X @ Max tension	-96.0	0.00	0.00	0.00	105.88	9.99999	1.00000
-X @ Max compression	3762.9	0.00	0.00	195.98	105.88	-0.00138	1.00000
-X @ Allowable comp.	3762.9	0.00	0.00	195.98	105.88	-0.00138	1.00000
-X @ $f_s = 0.0$	3124.0	-2386.98	0.00	105.88	105.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	2533.6	-3754.87	0.00	86.09	105.88	0.00069	1.00000
-X @ Balanced point	2121.3	-4245.61	0.00	72.53	105.88	0.00138	1.00000
-X @ Tension control	1225.8	-3930.29	0.00	43.04	105.88	0.00438	1.00000
-X @ Pure bending	0.0	-421.44	0.00	2.58	105.88	0.11992	1.00000
-X @ Max tension	-96.0	0.00	0.00	0.00	105.88	9.99999	1.00000

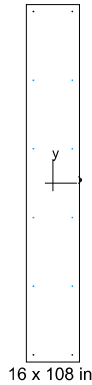
6. Factored Loads and Moments with Corresponding Capacity Ratios

NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	76.79	747.52	4.90	0.06180	1.000	0.83

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

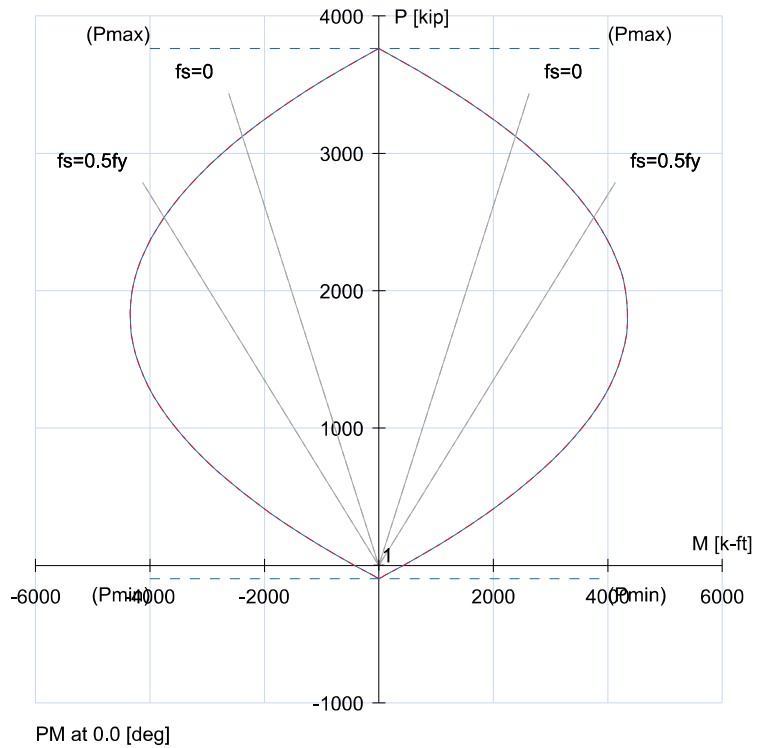
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	16 in
Depth	108 in
A_g	1728 in ²
I_x	1.67962e+006 in ⁴
I_y	36864 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	2.40 in ²
Rho	0.14 %
Min. clear spacing	11.25 in

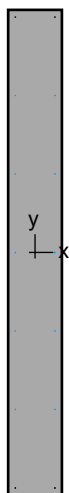


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	76.79	747.52	0.83

Max. Capacity Ratio: 0.83



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type M-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	144 in
A_g	2304 in ²
I_x	3.98131e+006 in ⁴
I_y	49152 in ⁴
r_x	41.5692 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

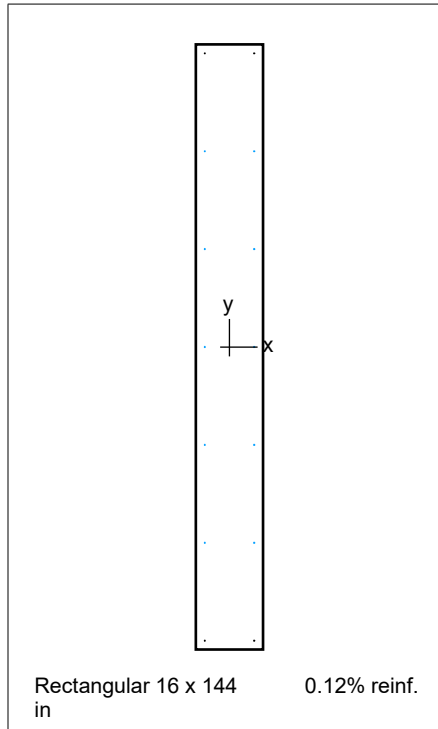


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

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Total steel area, A_s	2.80 in ²
Rho	0.12 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	5	#4	1.5
Right	5	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	5002.0	0.00	0.00	262.62	141.88	-0.00138	1.00000
X @ Allowable comp.	5002.0	0.00	0.00	262.62	141.88	-0.00138	1.00000
X @ $f_s = 0.0$	4176.2	4135.78	0.00	141.88	141.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	3387.7	6599.13	0.00	115.36	141.88	0.00069	1.00000
X @ Balanced point	2839.4	7482.50	0.00	97.19	141.88	0.00138	1.00000
X @ Tension control	1645.1	6938.52	0.00	57.68	141.88	0.00438	1.00000
X @ Pure bending	0.0	658.31	0.00	3.00	141.88	0.13887	1.00000
X @ Max tension	-112.0	0.00	0.00	0.00	141.88	9.99999	1.00000
-X @ Max compression	5002.0	0.00	0.00	262.62	141.88	-0.00138	1.00000
-X @ Allowable comp.	5002.0	0.00	0.00	262.62	141.88	-0.00138	1.00000
-X @ $f_s = 0.0$	4176.2	-4135.78	0.00	141.88	141.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	3387.7	-6599.13	0.00	115.36	141.88	0.00069	1.00000
-X @ Balanced point	2839.4	-7482.50	0.00	97.19	141.88	0.00138	1.00000
-X @ Tension control	1645.1	-6938.52	0.00	57.68	141.88	0.00438	1.00000
-X @ Pure bending	0.0	-658.31	0.00	3.00	141.88	0.13887	1.00000
-X @ Max tension	-112.0	0.00	0.00	0.00	141.88	9.99999	1.00000

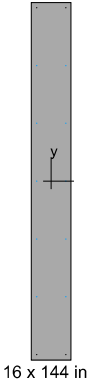
6. Factored Loads and Moments with Corresponding Capacity Ratios

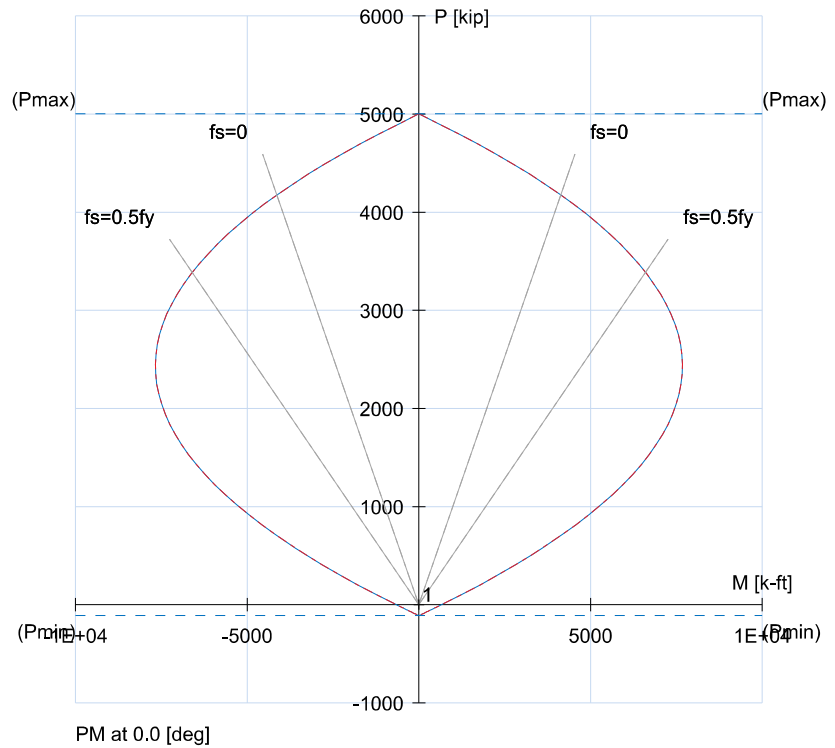
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	102.08	1238.00	6.33	0.06424	1.000	0.84

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>16 x 144 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	16 in
Depth	144 in
A_g	2304 in ²
I_x	3.98131e+006 in ⁴
I_y	49152 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	2.80 in ²
Rho	0.12 %
Min. clear spacing	11.25 in

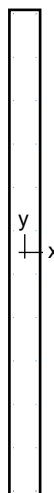


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	102.08	1238.00	0.84

Max. Capacity Ratio: 0.84



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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type N-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	252 in
A_g	4032 in ²
I_x	2.13373e+007 in ⁴
I_y	86016 in ⁴
r_x	72.7461 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

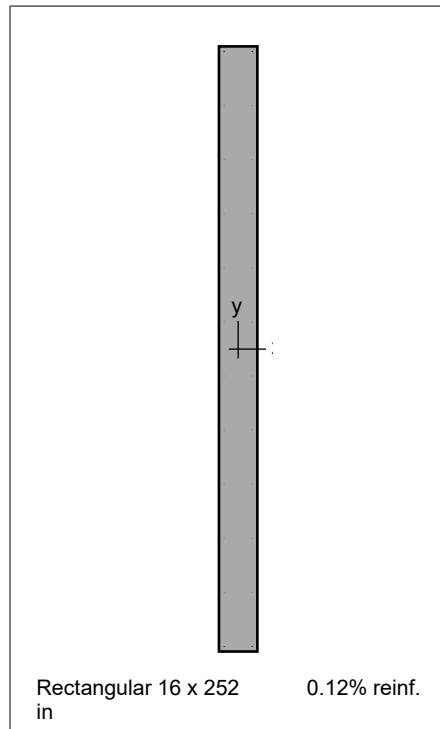


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	4.80 in ²
Rho	0.12 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	10	#4	1.5
Right	10	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	8749.8	0.00	0.00	462.53	249.88	-0.00138	1.00000
X @ Allowable comp.	8749.8	0.00	0.00	462.53	249.88	-0.00138	1.00000
X @ $f_s = 0.0$	7355.9	12279.87	0.00	249.88	249.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	5969.8	19987.58	0.00	203.17	249.88	0.00069	1.00000
X @ Balanced point	5005.1	22765.00	0.00	171.17	249.88	0.00138	1.00000
X @ Tension control	2897.8	21236.44	0.00	101.58	249.88	0.00438	1.00000
X @ Pure bending	0.0	1978.78	0.00	5.57	249.88	0.13169	1.00000
X @ Max tension	-192.0	0.00	0.00	0.00	249.88	9.99999	1.00000
-X @ Max compression	8749.8	0.00	0.00	462.53	249.88	-0.00138	1.00000
-X @ Allowable comp.	8749.8	0.00	0.00	462.53	249.88	-0.00138	1.00000
-X @ $f_s = 0.0$	7355.9	-12279.87	0.00	249.88	249.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	5969.8	-19987.58	0.00	203.17	249.88	0.00069	1.00000
-X @ Balanced point	5005.1	-22765.00	0.00	171.17	249.88	0.00138	1.00000
-X @ Tension control	2897.8	-21236.44	0.00	101.58	249.88	0.00438	1.00000
-X @ Pure bending	0.0	-1978.78	0.00	5.57	249.88	0.13169	1.00000
-X @ Max tension	-192.0	0.00	0.00	0.00	249.88	9.99999	1.00000

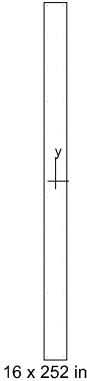
6. Factored Loads and Moments with Corresponding Capacity Ratios

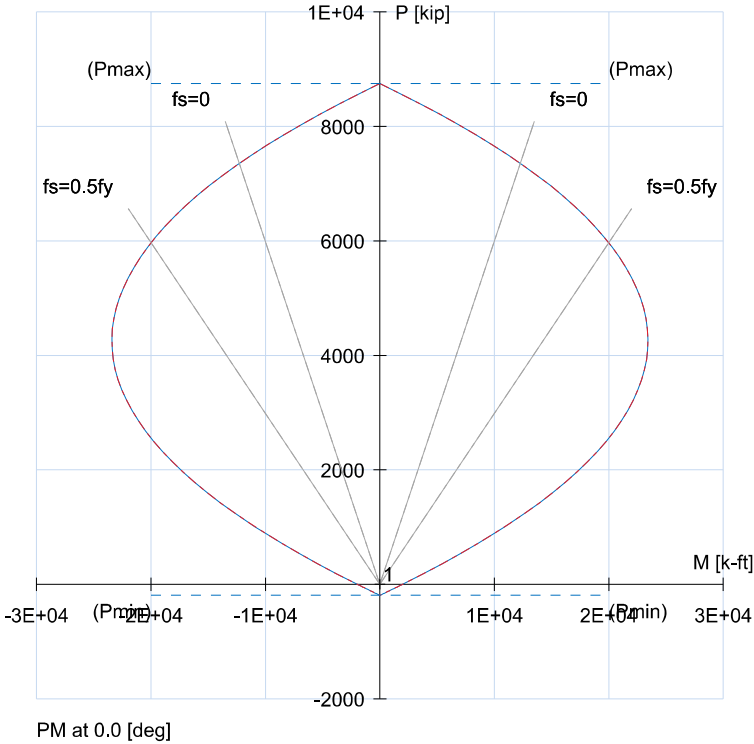
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	178.57	3744.10	11.74	0.06083	1.000	0.84

7. Diagrams

7.1. PM at $\theta=0$ [deg]

 <p>16 x 252 in</p>	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	16 in
Depth	252 in
A_g	4032 in ²
I_x	2.13373e+007 in ⁴
I_y	86016 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	4.80 in ²
Rho	0.12 %
Min. clear spacing	11.25 in

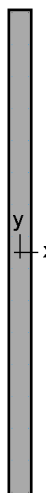


No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	178.57	3744.10	0.84

Max. Capacity Ratio: 0.84



spColumn v10.00 (TM)
 Computer program for the Strength Design of Reinforced Concrete Sections
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1. General Information

File Name	J:\2021 All Jobs\21699 - C...\Wall Type P-16.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	16 in
Depth	348 in
A_g	5568 in ²
I_x	5.61923e+007 in ⁴
I_y	118784 in ⁴
r_x	100.459 in
r_y	4.6188 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

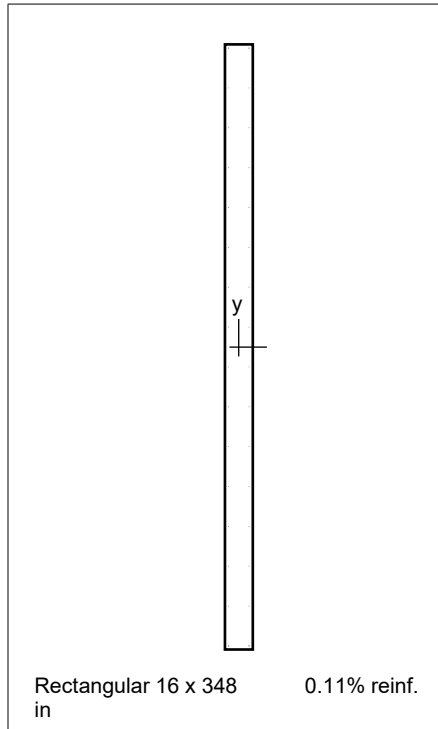


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	6.40 in ²
Rho	0.11 %
Minimum clear spacing	11.25 in

(Note: Rho < 0.50%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#4	1.5
Bottom	2	#4	1.5
Left	14	#4	1.5
Right	14	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	12074.4	0.00	0.00	640.24	345.88	-0.00138	1.00000
X @ Allowable comp.	12074.4	0.00	0.00	640.24	345.88	-0.00138	1.00000
X @ $f_s = 0.0$	10177.2	23131.13	0.00	345.88	345.88	0.00000	1.00000
X @ $f_s = 0.5 f_y$	8260.2	37939.58	0.00	281.23	345.88	0.00069	1.00000
X @ Balanced point	6927.3	43272.36	0.00	236.94	345.88	0.00138	1.00000
X @ Tension control	4011.8	40445.30	0.00	140.61	345.88	0.00438	1.00000
X @ Pure bending	0.0	3644.53	0.00	7.78	345.88	0.13037	1.00000
X @ Max tension	-256.0	0.00	0.00	0.00	345.88	9.99999	1.00000
-X @ Max compression	12074.4	0.00	0.00	640.24	345.88	-0.00138	1.00000
-X @ Allowable comp.	12074.4	0.00	0.00	640.24	345.88	-0.00138	1.00000
-X @ $f_s = 0.0$	10177.2	-23131.17	0.00	345.88	345.88	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	8260.2	-37939.60	0.00	281.23	345.88	0.00069	1.00000
-X @ Balanced point	6927.3	-43272.37	0.00	236.94	345.88	0.00138	1.00000
-X @ Tension control	4011.8	-40445.31	0.00	140.61	345.88	0.00438	1.00000
-X @ Pure bending	0.0	-3644.53	0.00	7.78	345.88	0.13037	1.00000
-X @ Max tension	-256.0	0.00	0.00	0.00	345.88	9.99999	1.00000

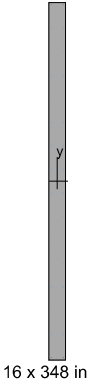
6. Factored Loads and Moments with Corresponding Capacity Ratios

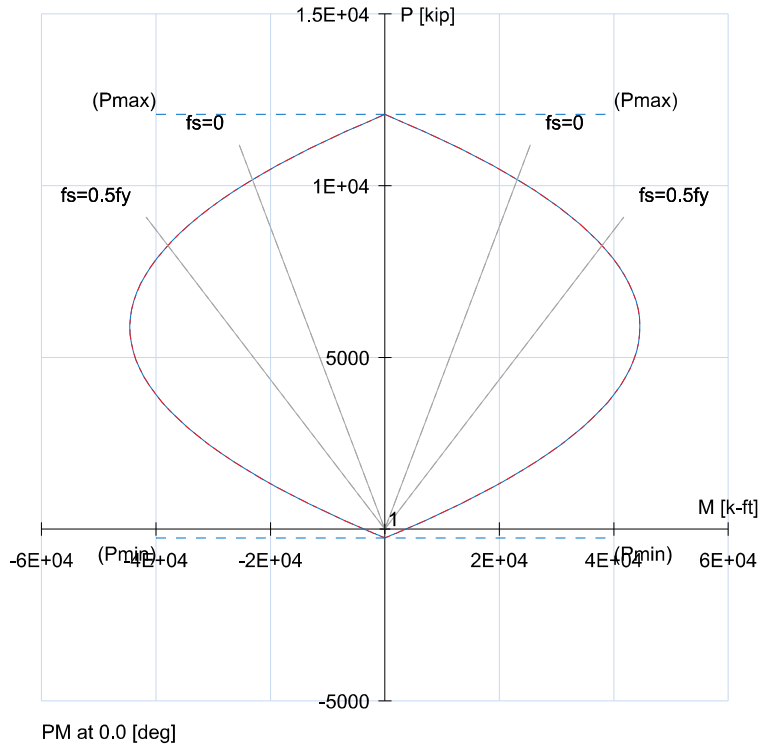
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand P_u kip	M_{ux} k-ft	Capacity ϕP_n kip	ϕM_{nx} k-ft	Parameters at Capacity NA Depth in	ϵ_t	ϕ	Capacity Ratio
1	1.00	0.00	246.42	7007.05	16.31	0.06063	1.000	0.84

7. Diagrams

7.1. PM at $\theta=0$ [deg]

	
General Information	
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity
Materials	
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi
Section	
Type	Rectangular
Width	16 in
Depth	348 in
A_g	5568 in ²
I_x	5.61923e+007 in ⁴
I_y	118784 in ⁴
Reinforcement	
Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	6.40 in ²
Rho	0.11 %
Min. clear spacing	11.25 in



No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	1.0	0.0	246.42	7007.05	0.84

Max. Capacity Ratio: 0.84



Job: 21699 - Old Courthouse Seismic Assessment - Deschutes County

Existing Concrete Column Analysis

ASCE 41-17

ASCE 41-17 Existing Column Analysis for:

(E) Concrete Columns

Column Type	Plan x (in)	Plan y (in)	Clear (in)	Mn (k-ft)	Ties	# of Ties	Tie Spacing (in)	α_{Col} (10.4.2.3.1)
A	12	12	1.5	31	#2	2	12	0
B	12	12	1.5	48	#2	2	12	0
C	12	12	1.5	48	#2	2	12	0



Job: **21699 - Old Courthouse Seismic Assessment - Deschutes County**

ASCE 41-17 Existing Column Analysis for:

(E) Concrete Columns

Approximate Column Type Capacity (Mn)			
A	31 k-ft	F	k-ft
B	48 k-ft	G	k-ft
C	48 k-ft	H	k-ft
D	k-ft	J	k-ft
E	k-ft	K	k-ft

$f'_c =$ **2500** psi
 $\lambda =$ **1** [ASCE 41-17, 10.4.2.3.1]
 $\kappa =$ **1** [ASCE 41-17, 6.2.4]
 $k =$ **1** [ASCE 41-17, 10.4.2.3.1]

f_y (Long) = **40** ksi
 f_y (Trans) = **40** ksi

Existing Concrete Column Analysis
 ASCE 41-17
Table 10-10a

Concrete Column Shape
Other than Circular

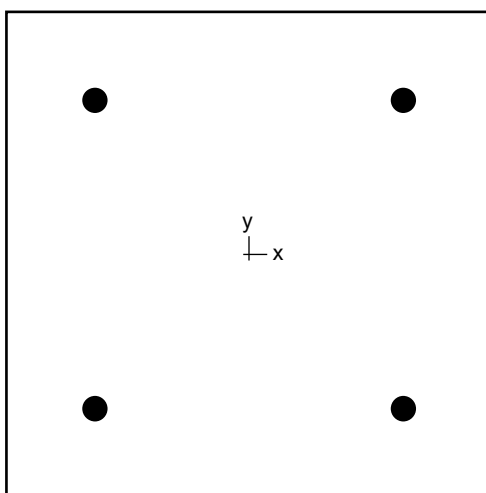
Developing or Splicing Length:
Non-Conforming

Performance Level:
Life Safety

Label	Type	P_{MAX} (k)	P_{DEAD} (k)	P_{LIVE} (k)	V_{MAX} (k)	M_{MAX} (k-ft)	M_{UD}/V_{UD}	V_{CLOSE} (k)	$N_{UD}/A_g f'_c$	V_u/V_{CLOSE}	m (f)	# of Ties	ρ_t	V_c	V_s	κV_n	$M/(\kappa M_n)$
C1-3	A	52.1	44.6	7.4	2.9	22.0	4	12.8	0.14	0.23	1.10	2	0.00160	4.80084	32.00	36.80	0.71
C1-2	B	108.6	89.3	19.3	4.4	32.7	4	16.1	0.30	0.28	1.07	2	0.00160	5.843988	32.00	37.84	0.68
C1-1	C	165.1	133.9	31.2	5.0	37.8	4	18.9	0.46	0.27	1.04	2	0.00160	6.727282	32.00	38.73	0.79



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Computer program for the Strength Design of Reinforced Concrete Sections
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1. General Information

File Name	J:\2021 All Jobs\21699 - Courthous...\Column.colx
Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

2. Material Properties

2.1. Concrete

Type	Standard
f'_c	2.5 ksi
E_c	2850 ksi
f_c	2.125 ksi
ϵ_u	0.003 in/in
β_1	0.85

2.2. Steel

Type	Standard
f_y	40 ksi
E_s	29000 ksi
ϵ_{ty}	0.00137931 in/in

3. Section

3.1. Shape and Properties

Type	Rectangular
Width	12 in
Depth	12 in
A_g	144 in ²
I_x	1728 in ⁴
I_y	1728 in ⁴
r_x	3.4641 in
r_y	3.4641 in
X_o	0 in
Y_o	0 in

3.2. Section Figure

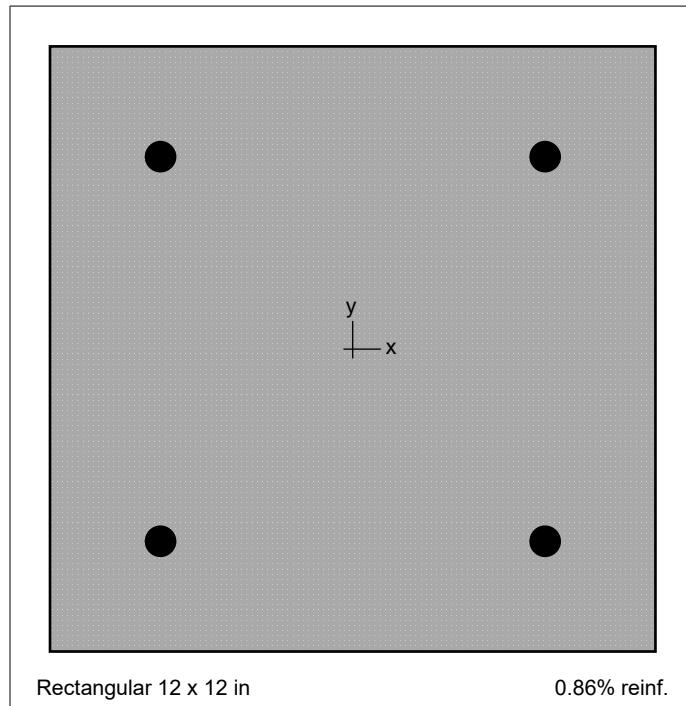


Figure 1: Column section

4. Reinforcement

4.1. Bar Set: ASTM A615

Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²	Bar	Diameter in	Area in ²
#3	0.38	0.11	#4	0.50	0.20	#5	0.63	0.31
#6	0.75	0.44	#7	0.88	0.60	#8	1.00	0.79
#9	1.13	1.00	#10	1.27	1.27	#11	1.41	1.56
#14	1.69	2.25	#18	2.26	4.00			

4.2. Confinement and Factors

Confinement type	Other
For #10 bars or less	#3 ties
For larger bars	#4 ties
Capacity Reduction Factors	
Axial compression, (a)	1
Tension controlled ϕ , (b)	1
Compression controlled ϕ , (c)	1

4.3. Arrangement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---

Total steel area, A_s	1.24 in ²
Rho	0.86 %
Minimum clear spacing	7.00 in

(Note: Rho < 1.0%)

4.4. Bars Provided

		Bars	Clear cover in
Top	2	#5	1.5
Bottom	2	#5	1.5
Left	0	#4	1.5
Right	0	#4	1.5

5. Control Points

About Point	P kip	X-Moment k-ft	Y-Moment k-ft	NA Depth in	d _t Depth in	ϵ_t	ϕ
X @ Max compression	353.0	0.00	0.00	18.16	9.81	-0.00138	1.00000
X @ Allowable comp.	353.0	0.00	0.00	18.16	9.81	-0.00138	1.00000
X @ $f_s = 0.0$	236.2	39.89	0.00	9.81	9.81	0.00000	1.00000
X @ $f_s = 0.5 f_y$	184.0	49.00	0.00	7.98	9.81	0.00069	1.00000
X @ Balanced point	144.4	53.50	0.00	6.72	9.81	0.00138	1.00000
X @ Tension control	84.7	46.22	0.00	3.99	9.81	0.00438	1.00000
X @ Pure bending	0.0	20.33	0.00	1.76	9.81	0.01377	1.00000
X @ Max tension	-49.6	0.00	0.00	0.00	9.81	9.99999	1.00000
-X @ Max compression	353.0	0.00	0.00	18.16	9.81	-0.00138	1.00000
-X @ Allowable comp.	353.0	0.00	0.00	18.16	9.81	-0.00138	1.00000
-X @ $f_s = 0.0$	236.2	-39.89	0.00	9.81	9.81	0.00000	1.00000
-X @ $f_s = 0.5 f_y$	184.0	-49.00	0.00	7.98	9.81	0.00069	1.00000
-X @ Balanced point	144.4	-53.50	0.00	6.72	9.81	0.00138	1.00000
-X @ Tension control	84.7	-46.22	0.00	3.99	9.81	0.00438	1.00000
-X @ Pure bending	0.0	-20.33	0.00	1.76	9.81	0.01377	1.00000
-X @ Max tension	-49.6	0.00	0.00	0.00	9.81	9.99999	1.00000

6. Factored Loads and Moments with Corresponding Capacity Ratios

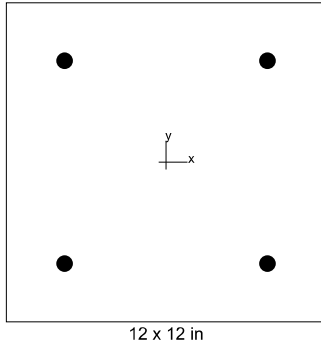
NOTE: Calculations are based on "Critical Capacity" Method.

No.	Demand		Capacity		Parameters at Capacity			Capacity Ratio
	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	NA Depth in	ϵ_t	ϕ	
1	52.10	58.00	105.42	50.08	4.93	0.00298	1.000	1.21 #

Section capacity exceeded. Revise design!

7. Diagrams

7.1. PM at $\theta=0$ [deg]



General Information

Project	---
Column	---
Engineer	---
Code	ACI 318-19
Bar Set	ASTM A615
Units	English
Run Option	Investigation
Run Axis	X - axis
Slenderness	Not Considered
Column Type	Structural
Capacity Method	Critical capacity

Materials

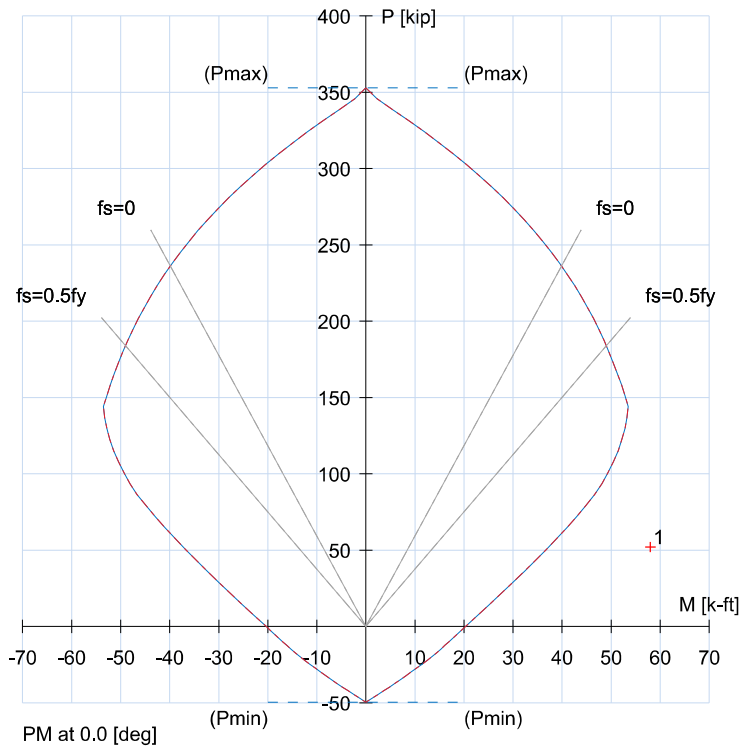
f'_c	2.5 ksi
E_c	2850 ksi
f_y	40 ksi
E_s	29000 ksi

Section

Type	Rectangular
Width	12 in
Depth	12 in
A_g	144 in ²
I_x	1728 in ⁴
I_y	1728 in ⁴

Reinforcement

Pattern	Sides different
Bar layout	Rectangular
Cover to	Transverse bars
Clear cover	---
Bars	---
Confinement type	Other
Total steel area, A_s	1.24 in ²
Rho	0.86 %
Min. clear spacing	7.00 in



No.	P_u kip	M_{ux} k-ft	ϕP_n kip	ϕM_{nx} k-ft	Capacity Ratio
1	52.1	58.0	105.42	50.08	1.21

Max. Capacity Ratio: 1.21

FOR REFERENCE ONLY

CORE COMPRESSIVE STRENGTH REPORT

ASTM D-7012

Client: Deschutes County
Project Name: Deschutes County Courthouse
Technician: MNT
Reviewed By: PJF

Date Sampled: 4/10/2024
Project No. : 22142-1
Lab No. : WGC5505
Date Tested: 4/15/2024

Location	Storage South	Storage North	Stairs South
Date Prepared	4/11/2024	4/11/2024	4/11/2024
Length (in.)	7.81	7.61	7.7
Diameter (in.)	3.72	3.72	3.72
Area (sq in.)	10.86	10.86	10.86
Ultimate Load (lbs.)	36330	28360	45660
Compressive Strength (psi)	3350	2610	4200
Cap Thickness (in.)	0.28	0.21	0.14
Break Type	1	2	5

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FOR REFERENCE ONLY

CONCRETE CORE COMPRESSIVE STRENGTH REPORT

ASTM C42 / C39

Client:	Deschutes County	Date Sampled:	9/19/2024
Project Name:	Deschutes County Courthouse	Project No. :	22142 - 1
Technician:	PJH & MNT	Lab No. :	WGC5777
Reviewed By:	PJF	Date Tested:	9/25/2024

Core ID	A	B	C			
Placement Date	Unknown	Unknown	Unknown			
Location	South Stair 1	South Stair 2	Middle Stair			
Date Prepared	9/20/2024	9/20/2024	9/20/2024			
Initial Length	8.25"	8.0"	7.75"			
Length (in.)	7.60"	7.70"	7.70"			
Diameter (in.)	3.71	3.71	3.71			
L/D Ratio	2.05	2.07	2.08			
Area (sq in.)	10.80	10.80	10.80			
Ultimate Load (lbs.)	26980	25330	30560			
Compressive Strength (psi)	2500	2340	2830			
Correction Factor *	N/A	N/A	N/A			
Corrected Strength (psi)	2500	2340	2830			
Cap Thickness (in)	0.10	0.10	0.11			
Density (pcf)	Not Tested	Not Tested	Not Tested			
Fracture Type	1	3	4			

Remarks: Length of Cores as Drilled: A :8.25", B: 8.0", C: 7.75" | Length as Sawwed: A, B, & C: 7.50"

Application of Load on specimen was perpendicular to the horizontal plane of placement

Cores obtained on 9/19/24 @ 5:30 pm and placed in sealed bag by 5:45 pm

Cores cut with a wet saw on 9/20 @ 9:15 am.

Cores were tested on 9/25/24 @ 12:00 pm.

Nominal Max. Size Agg: 3/4"

1/2" of Cement Mortar Paste with Fiber trimmed off each end of cores.

* **7.9.1** If ratio of length to diameter (L/D) of the specimen is ≤ 1.75 , compressive strength is corrected by multiplying the result by the appropriate correction factor

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