## GOVERNING CODES & STANDARDS

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|---|---|---|
| BUILDING CODE: | OBC 2024 | OHIO BUILDING CODE |
| | IBC 2021 | INTERNATIONAL BUILDING CODE |
| STANDARDS: | ASCE 7-16 | AMERICAN SOCIETY OF CIVIL ENGINEERS: MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES |
| | ADM | THE ALUMINUM ASSOCIATION: SPECIFICATION FOR ALUMINUM STRUCTURES |
| | ACI 318 | AMERICAN CONCRETE INSTITUTE: BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE |
| | TMS 402 | THE MASONRY SOCIETY: BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES |
| | ASC 360 | AMERICAN INSTITUTE OF STEEL CONSTRUCTION: SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS |
| | AISC 341 | AMERICAN INSTITUTE OF STEEL CONSTRUCTION: SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS |
| | AWS D1.1 | AMERICAN WELDING SOCIETY: STRUCTURAL WELDING CODE - STEEL |
| | AWS D1.3 | AMERICAN WELDING SOCIETY: STRUCTURAL WELDING CODE - SHEET STEEL |
| | AWS D1.4 | AMERICAN WELDING SOCIETY: STRUCTURAL WELDING CODE - REINFORCING STEEL |
| | AISI S100 | AMERICAN IRON AND STEEL INSTITUTE: NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS |
| | AWC NDS | AMERICAN WOOD COUNCIL: NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION |
| | AWC SPDWS | AMERICAN WOOD COUNCIL: SPECIAL DESIGN PROVISIONS FOR WIND AND SEISMIC |
| | ASTM | AMERICAN SOCIETY FOR TESTING AND MATERIALS |

## DESIGN CRITERIA

1. DEAD LOADING
   A. SUPERIMPOSED DEAD LOAD — 5 PSF (IN ADDITION TO THE STRUCTURE SELF WEIGHT)
2. LIVE LOADING
   A. ROOF LIVE LOAD — 20 PSF (REDUCIBLE)
3. RAIN LOADING
   A. DESIGN RAINFALL: 4.5"/HOUR (100-YEAR, 1-HOUR RAINFALL)
      a. RAINWATER AT LOWEST POINT OF ROOF SHALL NOT POND DURING DESIGN RAINFALL
   B. DESIGN RAIN LOAD, R: — 20 PSF
4. SNOW LOADING
   A. GROUND SNOW LOAD — 20 PSF
   B. MIN ROOF LOAD — 25 PSF
   C. SNOW EXPOSURE FACTOR — 1.0
   D. SNOW LOAD IMPORTANCE FACTOR — 1.0
   E. THERMAL FACTOR — 1.2
5. WIND LOADING INPUTS
   A. RISK CATEGORY — II
   B. ULTIMATE WIND SPEED — 110 MPH (ASD=SQRT(0.6)*Vult)
   C. WIND EXPOSURE FACTOR — C
   D. DIRECTIONALITY/OTHER FACTORS — Kd=0.85, G=0.85, Kz=0.85, Kzt=1.0
   E. METHODOLOGY — OPEN HOST ATTACHED CANOPY
   F. MEAN ROOF HEIGHT — 10' - 0"
   G. SYSTEM MOUNTING HEIGHT — 0' - 0"
6. SEISMIC LOADS
   A. RISK CATEGORY — II
   B. SITE CLASS — D
   C. $S_S$ — 0.136
   D. $S_{DS}$ — 0.145
   E. $S_1$ — 0.049
   F. $S_{D1}$ — 0.078
   G. SEISMIC DESIGN CATEGORY (SDC) — B
   H. LONG TRANSITION PERIOD ($T_L$) — 12
   I. LATERAL RESISTING SYSTEM — NONSTRUCTURAL COMPONENTS (APPENDAGES & ORNAMENTATIONS)
   J. REDUNDANCY FACTOR, ρ: — 1.0
   K. OVERSTRENGTH FACTOR, Ωo: — 2.00
   L. RESPONSE MODIFICATION FACTOR, R: — 2.50
   M. AMPLIFICATION FACTOR: — 2.50
7. SERVICEABILITY:
   a. TOTAL LOAD DEFLECTION: — L/120
   b. LIVE LOAD DEFLECTION: — L/180

## EXISTING CONDITIONS & DEMOLITION

1. EXISTING CONDITIONS
   A. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS OF EXISTING BUILDINGS AT THE CONSTRUCTION SITE AND REPORT ANY DISCREPANCIES FROM THE ASSUMED CONDITIONS SHOWN ON THE DRAWINGS TO THE ARCHITECT/STRUCTURAL ENGINEER OF RECORD PRIOR TO FABRICATION OR ERECTION OF ANY STRUCTURAL MEMBER.
   B. EXISTING CONDITIONS SHALL BE SHOWN HALFTONE ON THE CONTRACT DRAWINGS UNLESS NOTED OTHERWISE.
   C. EXISTING CONDITIONS SHOWN ON THE CONTRACT DRAWINGS WERE OBTAINED FROM EXISTING CONSTRUCTION DOCUMENTS AND LIMITED SITE OBSERVATION. DRAWINGS OF EXISTING CONSTRUCTION ARE AVAILABLE TO THE CONTRACTOR UPON REQUEST TO THE OWNER. HOWEVER, THE AVAILABLE DRAWINGS OF THE EXISTING CONDITIONS ARE NOT NECESSARILY COMPLETE. THE CONTRACTOR SHALL FIELD VERIFY ALL APPLICABLE INFORMATION.
   D. THE CONTRACTOR SHALL VERIFY THE LOCATION OF EXISTING UTILITIES PRIOR TO START OF CONSTRUCTION AND ENSURE PROTECTION OF EXISTING UTILITIES THAT REMAIN IN SERVICE.

## CONCRETE

1. CONCRETE MIXTURES SHALL BE DESIGNED TO REACH A COMPRESSIVE STRENGTH OF 3,000 PSI IN 28 DAYS.
2. NORMAL WEIGHT CONCRETE SHALL BE USED FOR ALL CONCRETE MEMBERS UNLESS NOTED OTHERWISE. NORMAL WEIGHT CONCRETE SHALL HAVE A CURED DENSITY OF 145 PCF ±5 PCF. WHERE LIGHTWEIGHT CONCRETE IS SPECIFIED THE CURED DENSITY SHALL BE 112 PCF ±3 PCF.
3. ALL REINFORCEMENT SHALL BE DEFORMED BARS OF INTERMEDIATE GRADE NEW BILLET STEEL CONFORMING TO CURRENT REQUIREMENTS OF ASTM A615, GRADE 60 (U.O.N.).
4. CLEAR COVER FOR REINFORCEMENT SHALL BE:
   A. FOOTINGS PERMANENTLY EXPOSED TO EARTH: 3"
   B. UNFORMED FACES EXPOSED TO EARTH: 3"
   C. FORMED FACES IN CONTACT WITH EARTH: 2"
5. THE USE OF RECYCLED CONCRETE IS PROHIBITED WITHOUT WRITTEN APPROVAL FROM THE STRUCTURAL ENGINEER OF RECORD.
6. EACH MIX SHALL BE UNIQUELY IDENTIFIED BY MIX NUMBER AND THE INTENDED LOCATION OF PLACEMENT ON THE SPECIFIC PROJECT SHALL BE CLEARLY STATED.
7. WHERE WELDS ARE INDICATED FOR REINFORCING STEEL ON THE DRAWINGS, REINFORCING STEEL SHALL BE A706, GRADE 60 UNLESS OTHERWISE NOTED.
8. WELDED WIRE REINFORCEMENT SHALL CONFORM TO THE MATERIAL REQUIREMENTS OF ASTM A1064.
9. ALL 90°, 135°, AND 180° HOOKED REINFORCEMENT SPECIFIED AND GRAPHICALLY DEPICTED IN THE CONTRACT DOCUMENTS SHALL BE DETAILED IN ACCORDANCE WITH ACI 318 STANDARD HOOK GEOMETRY FOR DEFORMED BARS IN TENSION AND FOR STIRRUPS, TIES, AND HOOPS.
10. FOR EVERY VERTICAL OR HORIZONTAL BAR DISCONTINUED BY AN OPENING, ONE BAR (MINIMUM OF 2 BARS) SHALL BE ADDED AT SIDE OF OPENING (HALF TO EACH SIDE, TYPICAL).
11. ALL LAP SPLICES SHALL BE CLASS B TENSION LAP SPLICES IN ACCORDANCE WITH ACI 318 UNLESS NOTED OTHERWISE. SEE LAP SPLICE SCHEDULE ON SHEET S002 FOR LAP SPLICE LENGTHS. UNLESS NOTED AS CONTINUOUS, REINFORCEMENT SHALL ONLY BE SPLICED AT LOCATIONS SHOWN ON THE CONTRACT DOCUMENTS. SPLICES AT NON-SPECIFIED LOCATIONS SHALL BE SUBMITTED BY THE CONTRACTOR TO THE STRUCTURAL ENGINEER OF RECORD FOR APPROVAL.
12. A MINIMUM LAP SPLICE OF 8" SHALL BE PROVIDED AT ALL END AND SIDE LAP CONDITIONS FOR WELDED WIRE REINFORCEMENT UNLESS NOTED OTHERWISE.

## STRUCTURAL ALUMINUM & ALUMINUM WELDING:

1. ALL COMPONENTS SHALL BE STRUCTURAL ALUMINUM (U.N.O.) AND SHALL BE FABRICATED AND ERECTED ACCORDING TO THE GOVERNING BUILDING CODE AND MATERIAL STANDARDS REFERENCED ON THIS SHEET.
2. ALL STRUCTURAL ALUMINUM SHALL BE MIN 1/8" THICK U.N.O. AND BE OF THE FOLLOWING ALLOY AND TEMPER:
   A. BEAMS, PURLINS, COLUMNS — 6063-T6
   B. ALL OTHER EXTRUSIONS — 6063-T6
   C. FASTENERS — SS 316
3. STRUCTURAL ALUMINUM SHALL BE FRAMED PLUMB AND TRUE AND ADEQUATELY BRACED DURING CONSTRUCTION.
4. WHERE ALUMINUM IS IN CONTACT WITH OTHER METALS EXCEPT 300 SERIES STAINLESS STEEL, ZINC OR CADMIUM AND THE FAYING SURFACES ARE EXPOSED TO MOISTURE, THE OTHER METALS SHALL BE PAINTED OR COATED WITH ZINC, CADMIUM, OR ALUMINUM.
5. UNCOATED ALUMINUM SHALL NOT BE EXPOSED TO MOISTURE OR RUNOFF THAT HAS COME IN CONTACT WITH OTHER UNCOATED METALS EXCEPT 300 SERIES STAINLESS STEEL, ZINC, OR CADMIUM. ALUMINUM SURFACES TO BE PLACED IN CONTACT WITH MASONRY, CONCRETE, WOOD, FIBERBOARD, OR OTHER POROUS MATERIAL THAT ABSORBS WATER SHALL BE PAINTED.
6. FOR ALUMINUM IN CONTACT WITH CONCRETE: ACCEPTABLE PAINTS: PRIMING PAINT (ONE COAT), SUCH AS ZINC MOLYBDATE PRIMER IN ACCORDANCE WITH FEDERAL SPECIFICATION TT-P-645B ("GOOD QUALITY", NO LEAD CONTENT). ALT: HEAVY COATING OF ALKALI-RESISTANT BITUMINOUS PAINT. ALT: WRAP ALUMINUM WITH A SUITABLE PLASTIC TAPE APPLIED IN SUCH A MANNER AS TO PROVIDE ADEQUATE PROTECTION AT THE OVERLAPS.
7. ALUMINUM SHALL NOT BE EMBEDDED IN CONCRETE TO WHICH CORROSIVE COMPONENTS SUCH AS CHLORIDES HAVE BEEN ADDED IF THE ALUMINUM WILL BE ELECTRICALLY CONNECTED TO STEEL. EMBEDDED ALUMINUM ELEMENTS WILL BE COVERED WITH PLASTIC TAPE OR OTHERWISE PROTECTED AS PER 2020 ADM M.7.3.
8. BOLT HOLES SHALL BE DRILLED IN THE SAME NOMINAL DIAMETER AS THE BOLT + 1/16".
9. ALUMINUM WELDING SHALL BE PERFORMED IN ACCORDANCE WITH WELD FILLER ALLOYS MEETING ANSI/AWS A5.10 STANDARDS TO ACHIEVE ULTIMATE DESIGN STRENGTH IN ACCORDANCE WITH THE ALUMINUM DESIGN MANUAL PART I-A, TABLE 7.3.1. ALL ALUMINUM CONSTRUCTION SHALL BE IN CONFORMANCE WITH THE TOLERANCES, QUALITY, AND METHODS OF CONSTRUCTION AS SET FORTH IN THE AMERICAN WELDING SOCIETY'S STRUCTURAL WELDING CODE ALUMINUM (D1.2). MINIMUM WELD IS 1/8" THROAT FULL PERIMETER FILLET WELD UNLESS OTHERWISE NOTED.
10. STAINLESS STEEL FASTENERS SHALL BE ASTM F593 316 SS COLD WORKED CONDITION. PROVIDE (5) PITCHES MINIMUM PAST THE THREAD PLANE FOR ALL SCREW CONNECTIONS. ALL FASTENER CONNECTIONS TO METAL SHALL PROVIDE 2xDIAMETER EDGE DISTANCE AND 3xDIAMETER SPACING.
11. SELF-DRILLING SCREWS SHALL BE TEK BRAND / ALL POINTS FASTENERS OF SIZE #14, STAINLESS STEEL 300 SERIES, WITH MINIMUM 1/2" THREAD ENGAGEMENT BEYOND THE CONNECTED PART, UNLESS OTHERWISE NOTED.
12. THE CONTRACTOR IS RESPONSIBLE TO INSULATE ALL MEMBERS FROM DISSIMILAR MATERIALS TO PREVENT ELECTROLYSIS.

## STRUCTURAL WOOD

1. ALL DIMENSION LUMBER SHALL BE STRUCTURAL GRADE #2 SOUTHERN YELLOW PINE OR BETTER MEETING APPLICABLE REQUIREMENTS OF THE SOUTHERN PINE INSPECTION BUREAU (SPIB) AND PRESSURE-IMPREGNATED (PT) BY AN APPROVED PROCESS (ACQ 0.4 PRESSURE TREATED) PRESERVATIVE IN ACCORDANCE WITH THE APPLICABLE PROVISIONS OF THE BUILDING CODE AND AMERICAN WOOD PRESERVERS ASSN (AWPA) "BOOK OF STANDARDS" OR 0.55 SPECIFIC GRAVITY MIN.
2. MEMBER SIZES SHOWN ARE NOMINAL UNLESS NOTED OTHERWISE.
3. ALL METAL CONNECTORS IN CONTACT WITH WOOD USED IN LOCATIONS EXPOSED TO WEATHER SHALL BE GALVANIZED.
4. NAILS SHALL PENETRATE THE SECOND MEMBER A DISTANCE EQUAL TO THE THICKNESS OF THE MEMBER BEING NAILED THERETO. THERE SHALL BE NOT LESS THAN 2 NAILS IN ANY CONNECTION.
5. MEMBERS SHALL BE FREE OF CRACKS AND KNOTS. MOISTURE CONTENT SHALL BE 19% OR LESS. DRY WOOD MAY SPLIT MORE EASILY. IF WOOD TENDS TO SPLIT, PRE-BORING HOLES SHALL BE USED WITH DIAMETERS NOT EXCEEDING 3/4" OF THE NAIL DIAMETER OR USE A 5/32" BIT FOR SDS SCREWS. A FASTENER THAT SPLITS THE WOOD SHALL BE REEVALUATED PRIOR LOADING THE CONNECTION.
6. WOOD THAT IS IN CONTACT WITH CONCRETE OR MASONRY, AND AT OTHER LOCATIONS AS SHOWN ON STRUCTURAL DRAWINGS, SHALL BE PROTECTED WITH 30 # FELT OR PRESSURE TREATED IN ACCORDANCE WITH AITC-109. MEMBER SIZE SHOWN ARE NOMINAL.

## LOUVERED PERGOLA DESIGN & OPERATION:

1. THE LOUVERED ROOFING SYSTEM SHALL BE INSTALLED WITH THE **AZENCO R-BLADE** PRODUCT.
2. LOUVERS SHALL BE SPACED SUCH THAT THEY ALLOW 50% SYSTEM POROSITY WHEN FULLY OPENED.
3. LOUVERS SHALL BE ROTATED TO A 90 DEGREE 'OPEN' POSITION DURING ANY NAMED STORM OR WEATHER DESIGN EVENT TO PREVENT EXCESSIVE FORCE TO THIS STRUCTURE. THE OWNER SHALL BE NOTIFIED IN WRITING OF THIS AND THAT CARE SHALL BE TAKEN TO AVOID BUILDUP OF SNOW, DEBRIS, CONSTRUCTION LOADS, & ANY OTHER FORCES THAT CAN AFFECT THE INTEGRITY OF THIS DESIGN.
4. THE STRUCTURE SHALL BE POSTED WITH A LEGIBLE AND READILY VISIBLE DECAL OR PAINTED INSTRUCTIONS TO THE OWNER OR TENANT STATING TO REPOSITION THE LOUVERS AND WINDSCREENS DURING WIND OR SNOW ADVISORIES. THE CANOPY OWNER SHALL BE NOTIFIED OF THESE CONDITIONS BY THE PERMIT HOLDER AT THE TIME OF SALE.
5. SYSTEM SHALL BE EQUIPPED AND TELECO CERTIFIED TO OPERATE PROPERLY WITH SENSORS WHICH WILL PROMPT THE LOUVER BLADES TO ROTATE TO THE OPEN (VERTICAL) POSITION WHENEVER THE WIND SPEED REACHES 45 MPH MINIMUM, OR TEMPERATURE DROPS TO 32° FAHRENHEIT OR LOWER, AND/OR INCLUDE THE ABILITY FOR MANUAL OPENING AND LOCKING BY THE USER.
6. LOUVERED ROOF SYSTEM SHALL BE PER MANUFACTURER MAXIMUM SPANS OR BY OTHERS.
7. NO CERTIFICATION IS OFFERED FOR WATERPROOFING, SIZING, OR OPERATION OF GUTTERS. SYSTEM NOT DESIGNED FOR WATERSHED OF RAINFALL FROM ADJACENT ROOFS UNLESS SPECIFICALLY SHOWN HEREIN, TYP.

## GENERAL NOTES

1. ALLOWABLE DESIGN PRESSURES UTILIZED IN THIS DOCUMENT HAVE BEEN CALCULATED PER THE REQUIREMENTS OF THE CODES AND STANDARDS STATED HEREIN USING ASCE 7-16 ALLOWABLE STRESS DESIGN METHODOLOGY WITH THE CRITERIA AS OUTLINED HEREIN. THE CONTRACTOR SHALL CONTACT THE AUTHORITY HAVING JURISDICTION TO ENSURE APPROPRIATE CRITERIA TO BE USED BEFORE CONSTRUCTION BEGINS.
2. DIMENSIONS ARE SHOWN TO ILLUSTRATE DESIGN FORCES AND OTHER DESIGN CRITERIA. IN SOME CASES, DETAILS MAY BE INTENTIONALLY ALTERED FOR PRESENTATION PURPOSES. DO NOT SCALE DIMENSIONS ELECTRONICALLY OR OTHERWISE. FIELD INSTALLATION MAY VARY SLIGHTLY BUT MUST REMAIN WITHIN 5% OF THE INTENDED DESIGN. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS PRIOR TO INSTALLATION.
3. THIS STRUCTURE HAS BEEN DESIGNED AND SHALL BE FABRICATED IN ACCORDANCE WITH THE STRUCTURAL PROVISIONS OF THE ABOVE-REFERENCED BUILDING CODE. STRUCTURE SHALL BE FABRICATED IN ACCORDANCE WITH ALL GOVERNING CODES. THE CONTRACTOR SHALL INVESTIGATE AND CONFORM TO ALL LOCAL BUILDING CODE AMENDMENTS WHICH MAY APPLY AND GOVERN. DESIGN CRITERIA OR SPANS BEYOND STATED HEREIN MAY REQUIRE ADDITIONAL SITE-SPECIFIC SEALED ENGINEERING.
4. THE CONTRACTOR SHALL CAREFULLY CONSIDER POSSIBLE IMPOSING LOADS ON ROOF, INCLUDING BUT NOT LIMITED TO ANY CONCENTRATED LOADS WHICH MAY JUSTIFY GREATER DESIGN CRITERIA. ALL STRUCTURAL MEMBERS AS SHOWN HAVE BEEN DESIGNED TO CARRY IN PLACE DESIGN LOADS ONLY; THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE SUPPORT OF ANY ADDITIONAL LOADS AND FORCES IMPOSED DURING MANUFACTURING, TRUCKING, ERECTING, AND HANDLING. SYSTEM NOT DESIGNED TO HANDLE CONCENTRATED LOADS FROM HUMAN ACTIVITY.
5. SPECIAL INSPECTIONS MAY BE REQUESTED OR REQUIRED AT THE DISCRETION OF THE AUTHORITY HAVING JURISDICTION.
6. GENERAL STRUCTURAL NOTES ARE APPLICABLE TO THE DESIGN AND CONSTRUCTION OF THE ENTIRE PROJECT AND THUS ARE APPLICABLE TO EVERY SHEET WITHIN THIS SET.
7. SHOULD THE CONTRACTOR ENCOUNTER A CONFLICT BETWEEN THESE DRAWINGS AND ANY OTHER CONTRACT DOCUMENT OR APPLICABLE CODE OR STANDARD OF PRACTICE DURING BIDDING, THE PROVISION RESULTING IN THE GREATER COST APPLIES. SHOULD THE CONTRACTOR ENCOUNTER A CONFLICT DURING CONSTRUCTION, THE CONTRACTOR SHALL SUBMIT A WRITTEN REQUEST FOR CLARIFICATION TO THE DESIGN TEAM, WHO WILL PROVIDE A WRITTEN RESPONSE IN RETURN.
8. THE CONTRACTOR SHALL SUPERVISE AND DIRECT ALL WORK AND SHALL BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, PROCEDURES, TECHNIQUES, AND SEQUENCE. THE CONTRACTOR HAS SOLE RESPONSIBILITY FOR THE QUALITY AND CORRECTNESS OF THE WORK.
9. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR COORDINATION OF THE STRUCTURAL WORK WITH OTHER TRADES INCLUDING, BUT NOT LIMITED TO: ARCHITECTURAL, CIVIL, AND MEP FOR FLOOR SLAB STEPS, SLOPES AND CURBS, FLOOR SLAB FINISH, OPENINGS IN STRUCTURAL FLOORS, ROOFS AND WALLS, ETC.
10. THE BUILDING HAS BEEN DESIGNED BY THE STRUCTURAL ENGINEER OF RECORD TO RESIST THE CODE REQUIRED VERTICAL AND LATERAL FORCES IN ITS FULLY COMPLETED CONDITION. THE CONTRACTOR SHALL PROVIDE ALL REQUIRED BRACING, SHORING, AND OTHER CONSTRUCTION SUPPORTS NECESSARY TO ENSURE THE BUILDING'S STABILITY AND SAFETY THROUGHOUT THE DURATION OF CONSTRUCTION. FURTHER, THE CONTRACTOR SHALL NOT OVERLOAD THE STRUCTURE DURING CONSTRUCTION. THE CONTRACTOR SHALL RETAIN A LICENSED PROFESSIONAL ENGINEER TO PROVIDE THE ANALYSIS AND DESIGN NECESSARY TO DETERMINE POTENTIALLY OVERLOADED, UNSTABLE, OR HAZARDOUS CONDITIONS THAT MAY OCCUR AT ANY STAGE DURING CONSTRUCTION.
11. THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS AND COORDINATE WITH THE CONTRACT DOCUMENTS AND SHOP DRAWINGS.
12. THE CONTRACTOR SHALL NOT EMPLOY CONSTRUCTION MEANS OR METHODS THAT MAY DAMAGE UTILITIES, ADJACENT BUILDINGS, OR PROPERTY. DOCUMENTATION OF ADJACENT CONDITIONS PRIOR TO CONSTRUCTION IS RECOMMENDED. FURTHER, THE CONTRACTOR SHALL EITHER ADEQUATELY CONFINE THE SITE OR PROTECT ADJACENT PROPERTY FROM DAMAGE.
13. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROJECT SAFETY AND OSHA REQUIREMENTS. SHOULD THE STRUCTURAL ENGINEER OF RECORD NOTIFY THE CONTRACTOR OF A POTENTIALLY UNSAFE CONDITION, IT IS SOLELY AS A COURTESY FROM ONE PROFESSIONAL TO ANOTHER. IT SHOULD NOT BE INTERPRETED AS THE STRUCTURAL ENGINEER OF RECORD ASSUMING ANY RESPONSIBILITY FOR PROJECT SAFETY.
14. ALL STRUCTURES REQUIRE PERIODIC MAINTENANCE TO EXTEND LIFE SPAN AND ENSURE STRUCTURAL INTEGRITY FROM EXPOSURE TO THE ENVIRONMENT. A PLANNED PROGRAM OF MAINTENANCE SHALL BE ESTABLISHED BY THE BUILDING OWNER. THIS PROGRAM SHALL INCLUDE, BUT NOT BE LIMITED TO: PAINTING OF STRUCTURAL STEEL, PROTECTIVE COATINGS FOR CONCRETE, SEALANTS, CAULKED JOINTS, EXPANSION JOINTS, CONTROL JOINTS, SPALLS AND CRACKS IN CONCRETE, AND PRESSURE WASHING OF EXPOSED STRUCTURAL ELEMENTS EXPOSED TO A SALINE OR OTHER HARSH CHEMICAL ENVIRONMENT.
15. THE BUILDING OWNER SHALL NOT ALTER OR MODIFY ANY STRUCTURAL ELEMENT WITHOUT CONSULTING A LICENSED PROFESSIONAL ENGINEER. FURTHER, BUILDING OWNER SHALL NOT RENOVATE, REPURPOSE, ADD-ON TO, OR OTHERWISE MODIFY THE EXISTING STRUCTURAL SYSTEMS WITHOUT CONSULTING A LICENSED PROFESSIONAL ENGINEER.

## ELECTRONIC DATA/REPRODUCTION

1. ALL INFORMATION CONTAINED IN THE ELECTRONIC FILES OF THE CONTRACT DOCUMENTS ARE INSTRUMENTS OF SERVICE OF THE ARCHITECT/STRUCTURAL ENGINEER OF RECORD AND SHALL NOT BE USED FOR OTHER PROJECTS, ADDITIONS TO THE PROJECT, OR THE COMPLETION OF THE PROJECT BY OTHERS. ELECTRONIC FILES OF THE STRUCTURAL DOCUMENTS REMAIN THE PROPERTY OF AM STRUCTURES AND IN NO CASE SHALL THEIR TRANSFER BE CONSIDERED A SALE.
2. THE USE OF ELECTRONIC FILES OR REPRODUCTIONS OF THESE CONTRACT DOCUMENTS BY ANY CONTRACTOR, SUBCONTRACTOR, ERECTOR, FABRICATOR, OR MATERIAL SUPPLIER IN LIEU OF PREPARATION OF SHOP DRAWINGS SIGNIFIES THEIR ACCEPTANCE OF ALL INFORMATION SHOWN HEREIN AS CORRECT AND OBLIGATES THEMSELVES TO ANY JOB EXPENSE, REAL OR IMPLIED, ARISING DUE TO ANY ERRORS OR OMISSIONS THAT MAY OCCUR HEREIN. THE USE OF ELECTRONIC FILES DOES NOT RELIEVE THE CONTRACTOR'S RESPONSIBILITY FOR PROPER CHECKING AND COORDINATION OF DIMENSIONS, DETAILS, SIZE, AND QUANTITIES.
3. DIMENSIONS AND ELEMENT SIZES AND LOCATIONS IN THE ELECTRONIC FILES MAY NOT BE PRECISE AND, IN SOME CASES, HAVE BEEN INTENTIONALLY ALTERED FOR PRESENTATION PURPOSES. DO NOT SCALE DIMENSIONS ELECTRONICALLY OR OTHERWISE.
4. WHEN USED FOR THE PREPARATION OF SHOP DRAWINGS, ALL INFORMATION NOT APPLICABLE TO THE SUBCONTRACT SHALL BE REMOVED FROM THE DRAWINGS, INCLUDING, BUT NOT LIMITED TO: SHEET NUMBERS, SECTION MARKS, TITLE BLOCKS, AND REFERENCES TO THE CONTRACT DOCUMENTS.

**STRUCTURAL DRAWING LIST**

| SHEET NUMBER | SHEET NAME |
|---|---|
| S1 | GENERAL NOTES |
| S2 | GENERAL NOTES |
| S3 | FOUNDATION PLAN |
| S4 | ROOF FRAMING PLAN |
| S5 | REFLECTED CEILING PLAN |
| S6 | ELEVATIONS |
| S7.0 | DETAILS |
| S7.1 | DETAILS CONT |
| S7.2 | DETAILS CONT |

AM STRUCTURES

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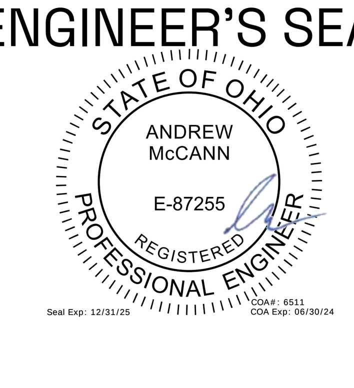
AZENCO



ENGINEER'S SEAL




THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY ANDREW MCCANN, PE, ON 07/19/2024.
PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

TIMAN WINDOW TREATMENTS, INC.
RAYMOND TATKO
1751 E Hines Hill Rd, Hudson, OH 44236

ISSUANCE SCHEDULE

| NO. | DESCRIPTION | DATE |
|---|---|---|
| 0. | INITIAL ISSUANCE | 07/19/2024 |

GENERAL NOTES

| | |
|---|---|
| PROJECT # | 24577 |
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

S1

SCALE: AS INDICATED

**ANCHORS & FASTENERS**

1. ALL BOLTS SHALL BE HOT DIPPED GALVANIZED, OR STAINLESS STEEL & MEET THE REQUIREMENTS OF ASTM A307 GRADE A. WASHERS SHALL BE USED BETWEEN WOOD & BOLT HEAD & BETWEEN WOOD & NUT CONFORMING TO FEDERAL SPECIFICATION FF-W-92 FOR WASHERS. NUTS SHALL BE INSTALLED SUCH THAT THE END OF THE THREADED ROD OR BOLT IS AT LEAST FLUSH WITH THE TOP OF NUT.
2. BOLT HOLES SHALL BE AT LEAST A MINIMUM OF 1/32" AND NO MORE THAN A MAXIMUM OF 1/16" LARGER THAN THE BOLT DIAMETER.
3. NAILS SHALL PENETRATE THE SECOND MEMBER A DISTANCE EQUAL TO THE THICKNESS OF THE MEMBER BEING NAILED THERETO. THERE SHALL BE NOT LESS THAN 2 NAILS IN ANY CONNECTION.
4. DRY WOOD MAY SPLIT MORE EASILY. IF WOOD TENDS TO SPLIT, PRE-BORING HOLES SHALL BE USED WITH DIAMETERS NOT EXCEEDING 3/4" OF THE NAIL DIAMETER OR USE A 5/32" BIT FOR SDS SCREWS. A FASTENER THAT SPLITS THE WOOD SHALL BE REEVALUATED PRIOR LOADING THE CONNECTION.
5. ANCHORS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' RECOMMENDATIONS. MINIMUM EMBEDMENT SHALL BE AS NOTED HEREIN. MINIMUM EMBEDMENT AND EDGE DISTANCE ARE DEPTHS INTO SOLID SUBSTRATE AND DO NOT INCLUDE THICKNESS OF STUCCO, FOAM, BRICK, AND OTHER WALL FINISHES.
6. ANCHOR QUANTITIES INDICATED IN DETAILS ARE FOR GRAPHICAL PURPOSES ONLY. DO NOT SCALE DIAMETER, LENGTH, OR PENETRATION(S). HEAD STYLE(S) ARE FREELY INTERCHANGEABLE.
7. MECHANICAL ANCHORS (EXPANSION ANCHORS/EXPANSION BOLTS) INTO EXISTING CONCRETE AS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ONE OF THE FOLLOWING PRODUCTS:
   A. KWIK BOLT TZ ANCHORS MANUFACTURED BY HILTI FASTENING SYSTEMS
   B. STRONG-BOLT 2 ANCHORS MANUFACTURED BY SIMPSON STRONGTIE COMPANY
   C. POWER-STUD+ SD2 ANCHORS MANUFACTURED BY DEWALT
8. MECHANICAL ANCHORS (EXPANSION ANCHORS/EXPANSION BOLTS) INTO EXISTING CONCRETE MASONRY AS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ONE OF THE FOLLOWING PRODUCTS:
   A. KWIK BOLT 3 ANCHORS MANUFACTURED BY HILTI FASTENING SYSTEMS
   B. WEDGE-ALL ANCHORS MANUFACTURED BY SIMPSON STRONGTIE COMPANY
   C. POWER-STUD+ SD1 ANCHORS MANUFACTURED BY DEWALT
9. SCREW ANCHORS INTO EXISTING CONCRETE AND CONCRETE MASONRY AS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ONE OF THE FOLLOWING PRODUCTS:
   A. KWIK HUS EZ ANCHORS MANUFACTURED BY HILTI FASTENING SYSTEMS
   B. TITEN HD ANCHORS MANUFACTURED BY SIMPSON STRONGTIE COMPANY
   C. SCREW-BOLT+ ANCHORS MANUFACTURED BY DEWALT
10. ADHESIVE ANCHORS (EPOXY ANCHORS/DRILL & EPOXY) INTO EXISTING CONCRETE AS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ONE OF THE FOLLOWING ADHESIVE PRODUCTS:
    A. HIT-HY200 EPOXY ADHESIVE WITH HAS ROD MANUFACTURED BY HILTI FASTENING SYSTEMS
    B. AT-XP ADHESIVE MANUFACTURED BY SIMPSON STRONGTIE COMPANY WITH AN ALL-THREAD F1554 GRADE 36 STEEL ROD
    C. PURE110+ EPOXY ADHESIVE MANUFACTURED BY DEWALT WITH AN ALL-THREAD F1554 GRADE 36 STEEL ROD
11. ADHESIVE ANCHORS (EPOXY ANCHORS/DRILL & EPOXY) INTO EXISTING CONCRETE MASONRY AS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ONE OF THE FOLLOWING ADHESIVE PRODUCTS:
    A. HIT-HY70 INJECTION ADHESIVE WITH HAS ROD MANUFACTURED BY HILTI FASTENING SYSTEMS
    B. AT-XP ADHESIVE MANUFACTURED BY SIMPSON STRONGTIE COMPANY WITH AN ALL-THREAD F1554 GRADE 36 STEEL ROD
    C. AC100+ GOLD MANUFACTURED BY DEWALT WITH AN ALL-THREAD F1554 GRADE 36 STEEL ROD
12. ADHESIVE FOR ANCHORING REINFORCING BARS (REBAR) INTO EXISTING CONCRETE AS SHOWN ON THE STRUCTURAL DRAWINGS SHALL BE ONE OF THE FOLLOWING ADHESIVE PRODUCTS:
    A. HIT-HY200 EPOXY ADHESIVE MANUFACTURED BY HILTI FASTENING SYSTEMS
    B. AT-XP ADHESIVE MANUFACTURED BY SIMPSON STRONGTIE COMPANY
    C. PURE110+ EPOXY ADHESIVE MANUFACTURED BY DEWALT
13. THE GENERAL CONTRACTOR SHALL OBTAIN APPROVAL FROM THE STRUCTURAL ENGINEER OF RECORD PRIOR TO USING POST-INSTALLED ANCHORS FOR MISSING OR MISPLACED CAST-IN-PLACE ANCHORS.
14. SUBSTITUTION REQUESTS FOR ALTERNATIVE PRODUCTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER OF RECORD WITH CALCULATIONS THAT ARE PREPARED AND SEALED BY A LICENSED PROFESSIONAL ENGINEER. CALCULATIONS SHALL SHOW THAT THE SUBSTITUTED PRODUCT WILL ACHIEVE AN EQUIVALENT CAPACITY USING THE APPROPRIATE DESIGN PROCEDURE REQUIRED BY THE REFERENCED BUILDING CODE.
15. LOCATE, BY NON-DESTRUCTIVE MEANS, ALL EXISTING REINFORCEMENT, AND AVOID DURING INSTALLATION OF ANCHORS. IF EXISTING REINFORCEMENT LAYOUT PROHIBITS THE INSTALLATION OF ANCHORS AS INDICATED ON THE STRUCTURAL DRAWINGS, THE CONTRACTOR SHALL NOTIFY THE STRUCTURAL ENGINEER OF RECORD IMMEDIATELY.
16. HOLES SHALL BE DRILLED AND CLEANED, AND ANCHORS SHALL BE INSTALLED PER THE MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS. DEFECTIVE OR ABANDONED HOLES SHALL BE FILLED WITH NON-SHRINK GROUT OR AN INJECTABLE ADHESIVE MATCHING THE ADJACENT CONCRETE COMPRESSIVE STRENGTH.
17. MASONRY ANCHORS SHALL NOT BE INSTALLED IN HOLLOW CORE MASONRY. IF INSTALLATION INTO HOLLOW CORE MASONRY IS DESIRED, SUBMIT ALTERNATIVE PRODUCT FOR REVIEW AND APPROVAL BY THE STRUCTURAL ENGINEER OF RECORD.
18. MASONRY ANCHORS SHALL NOT BE INSTALLED IN HEAD JOINTS.
19. IN ADDITION TO THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS, THE FOLLOWING GUIDELINES SHALL BE FOLLOWED FOR INSTALLATION OF ADHESIVE ANCHORS:
    1. ADHESIVE ANCHORS SHALL BE INSTALLED IN CONCRETE HAVING A MINIMUM AGE OF 21 DAYS AT TIME OF ANCHOR INSTALLATION. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 2,500 PSI AT THE TIME OF INSTALLATION UNLESS HIGHER STRENGTH IS REQUIRED PER THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS.
    2. ADHESIVE ANCHORS SHALL BE INSTALLED IN DRY CONCRETE, AND DURING DRY CONDITIONS.
    3. ADHESIVE ANCHORS SHALL BE INSTALLED IN HOLES PREDRILLED WITH A CARBIDE TIPPED DRILL BIT.
    4. ADHESIVE ANCHORS SHALL BE INSTALLED WITHIN THE TEMPERATURE RANGE SPECIFIED IN THE MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS, BUT NOT OUTSIDE OF THE DESIGN TEMPERATURE RANGE. LOADS SHALL NOT BE APPLIED TO ADHESIVE ANCHORS UNTIL THE FULL CURING TIME ASSOCIATED WITH THE INSTALLATION TEMPERATURE HAS ELAPSED.
20. INSTALLATION OF ADHESIVE ANCHORS SHALL BE PERFORMED BY PERSONNEL CERTIFIED BY AN APPLICABLE CERTIFICATION PROGRAM. CERTIFICATION SHALL INCLUDE WRITTEN AND PERFORMANCE TESTS IN ACCORDANCE WITH THE ACI/CRSI ADHESIVE ANCHOR INSTALLER CERTIFICATION PROGRAM, OR EQUIVALENT.
21. SPECIAL INSPECTIONS SHALL BE PROVIDED FOR POST-INSTALLED ANCHORS IN ACCORDANCE WITH THE ANCHOR MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS AND/OR EVALUATION REPORTS, UNLESS MORE SPECIFIC REQUIREMENTS ARE SPECIFIED IN THE CONSTRUCTION DOCUMENTS.
22. CONTINUOUS INSPECTION SHALL BE PROVIDED FOR ADHESIVE ANCHORS INSTALLED IN HORIZONTAL OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSILE LOADS.
23. HOLE DRILLING AND INSTALLATION OF ADHESIVE ANCHORS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS. ANCHORS SHALL BE INSTALLED IN CONCRETE DRY CONDITION.

**ABBREVIATIONS**

| | |
|---|---|
| ADDL | ADDITIONAL |
| ADJ | ADJACENT |
| AFF | ABOVE FINISHED FLOOR |
| ALT | ALTERNATE |
| APPROX | APPROXIMATE |
| ARCH | ARCHITECT OR ARCHITECTURAL |
| ASD | ALLOWABLE STRESS DESIGN |
| B/ | BOTTOM OF |
| BLDG | BUILDING |
| BLKG | BLOCKING |
| BP | BASE PLATE |
| BOT | BOTTOM |
| BTWN | BETWEEN |
| C | COMPRESSION |
| CFS | COLD-FORMED STEEL |
| CIP | CAST-IN-PLACE |
| CL | CENTER LINE |
| CLR | CLEAR OR CLEARANCE |
| CMU | CONCRETE MASONRY UNIT |
| COL | COLUMN |
| CONC | CONCRETE |
| CONN(S) | CONNECTION(S) |
| CONST | CONSTRUCTION |
| CONT | CONTINUOUS |
| COORD | COORDINATE |
| D&E | DRILL & EPOXY |
| db | REINFORCING BAR DIAMETER |
| ° | DEGREE(S) |
| Ø | DIAMETER |
| DIAG | DIAGONAL |
| DIM(S) | DIMENSION(S) |
| DL | DEAD LOAD |
| DWG(S) | DRAWING(S) |

**ABBREVIATIONS**

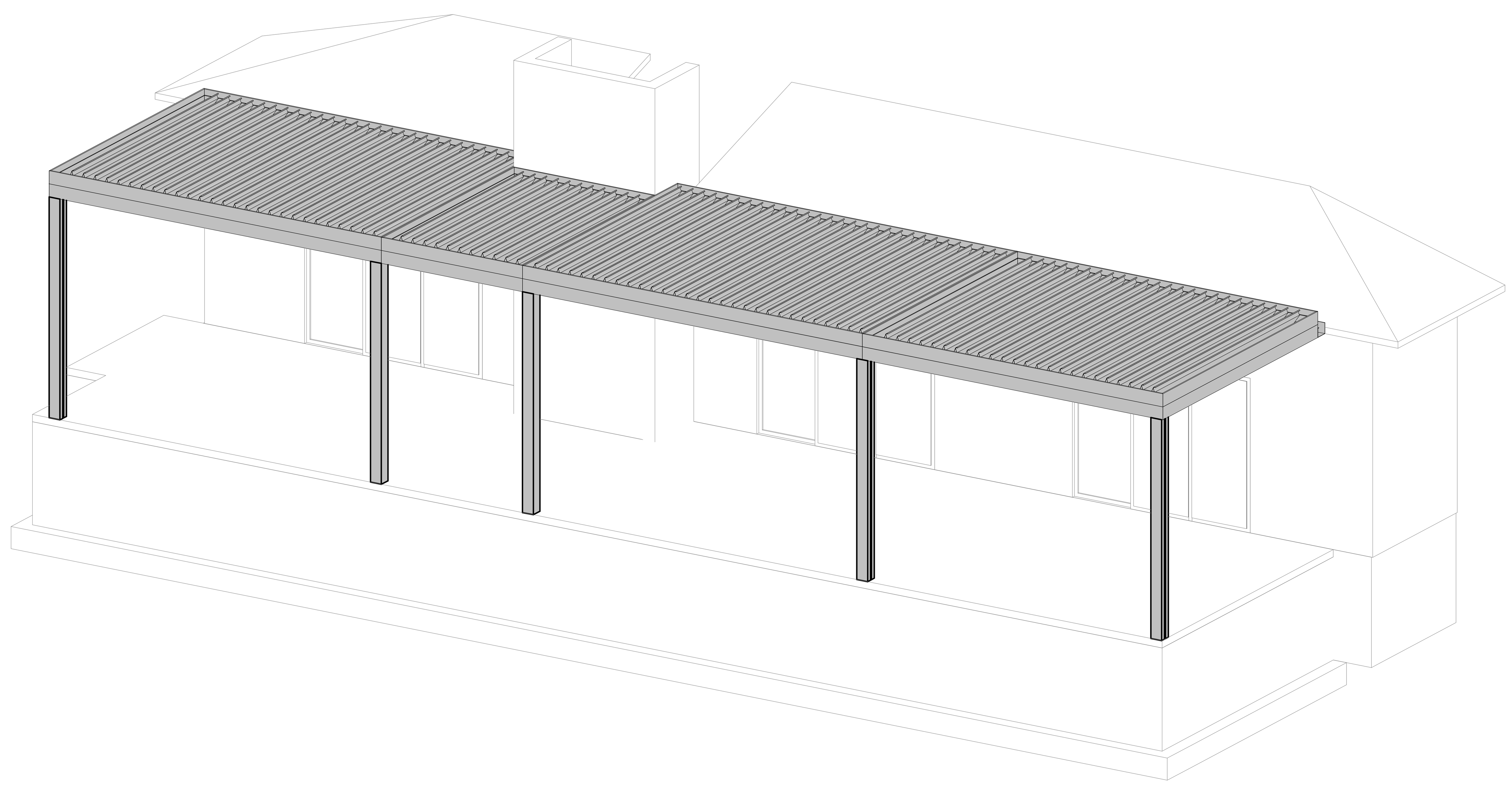
| | |
|---|---|
| EA | EACH |
| EF | EACH FACE |
| EJ | EXPANSION JOINT |
| EL | ELEVATION |
| EMB | EMBED |
| EOS | EDGE-OF-SLAB |
| EQ | EQUAL |
| EW | EACH WAY |
| EXIST | EXISTING |
| EXP | EXPANSION |
| EXT | EXTERIOR |
| F/F | FACE-TO-FACE |
| FF | FINISH FLOOR |
| FND | FOUNDATION |
| FS | FAR SIDE |
| FT | FEET |
| FTG | FOOTING |
| GA | GAGE, GAUGE |
| GALV | GALVANIZED |
| GB | GRADE BEAM |
| GC | GENERAL CONTRACTOR |
| HCA | HEADED CONCRETE ANCHORS |
| HORIZ | HORIZONTAL |
| HSS | HOLLOW STRUCTURAL SECTION |
| ID | INSIDE DIAMETER |
| IF | INSIDE FACE |
| IN | INCH |
| INFO | INFORMATION |
| INT | INTERIOR |
| JST(S) | JOIST(S) |

**ABBREVIATIONS**

| | |
|---|---|
| K | KIPS (1,000 POUNDS) |
| KLF | KIP PER LINEAR FOOT |
| KSF | KIP PER SQUARE FOOT |
| KSI | KIPS PER SQUARE INCH |
| L | LENGTH |
| LB(S) | POUND(S) |
| LL | LIVE LOAD |
| LLH | LONG LEG HORIZONTAL |
| LLV | LONG LEG VERTICAL |
| LRFD | LOAD RESISTANCE FACTORED DESIGN |
| LSH | LONG SIDE HORIZONTAL |
| LSV | LONG SIDE VERTICAL |
| LTS | LAP TENSION SPLICE |
| LWC | LIGHT WEIGHT CONCRETE |
| M | MOMENT |
| MAX | MAXIMUM |
| MC | MOMENT CONNECTION(S) |
| MEP | MECHANICAL, ELECTRICAL, PLUMBING, FIRE PROTECTION |
| MFR | MANUFACTURER |
| MID | MIDDLE |
| MIN | MINIMUM |
| NIC | NOT IN CONTRACT |
| NS | NEAR SIDE |
| NTS | NOT TO SCALE |
| NWC | NORMAL WEIGHT CONCRETE |
| OC | ON CENTER |
| OD | OUTSIDE DIAMETER |
| OF | OUTSIDE FACE |
| OPNG(S) | OPENING(S) |
| OPP | OPPOSITE |

**ABBREVIATIONS**

| | |
|---|---|
| PAF | POWDER ACTUATED FASTENER |
| PERP | PERPENDICULAR |
| PL | PLATE |
| PLF | POUNDS PER LINEAL FOOT |
| PREFAB | PRE-FABRICATED |
| PSF | POUNDS PER SQUARE FOOT |
| PSI | POUNDS PER SQUARE INCH |
| PT | POST-TENSIONED |
| REF | REFERENCE |
| REINF | REINFORCE(D) (ING) OR (MENT) |
| REQ(D) | REQUIRE(D) |
| REV | REVISION |
| RTU | ROOF TOP UNIT |
| SCHED | SCHEDULE(D) |
| SF | SQUARE FOOT (FEET) |
| SIM | SIMILAR |
| SMS | SHEET METAL SCREW |
| SOG | SLAB-ON-GROUND |
| SPEC(S) | SPECIFICATION(S) |
| SS | STAINLESS STEEL |
| STD | STANDARD |
| STIFF | STIFFENER |
| SYM | SYMMETRICAL |
| T | TENSION |
| T&B | TOP AND BOTTOM |
| T/ | TOP OF |
| TYP | TYPICAL |
| UNO | UNLESS NOTED OTHERWISE |
| V | SHEAR |
| VERT | VERTICAL |
| VIF | VERIFY IN FIELD |
| W/ | WITH |
| W/O | WITHOUT |
| WWR | WELDED WIRE REINFORCEMENT |



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STATE OF OHIO
ANDREW McCANN
E-87255
REGISTERED
PROFESSIONAL ENGINEER
Seal Exp: 12/31/25
COA#: 6511
COA Exp: 06/30/24

Andrew McCann



TIMAN WINDOW TREATMENTS, INC.

RAYMOND TATKO

1751 E Hines Hill Rd, Hudson, OH 44236

ISSUANCE SCHEDULE

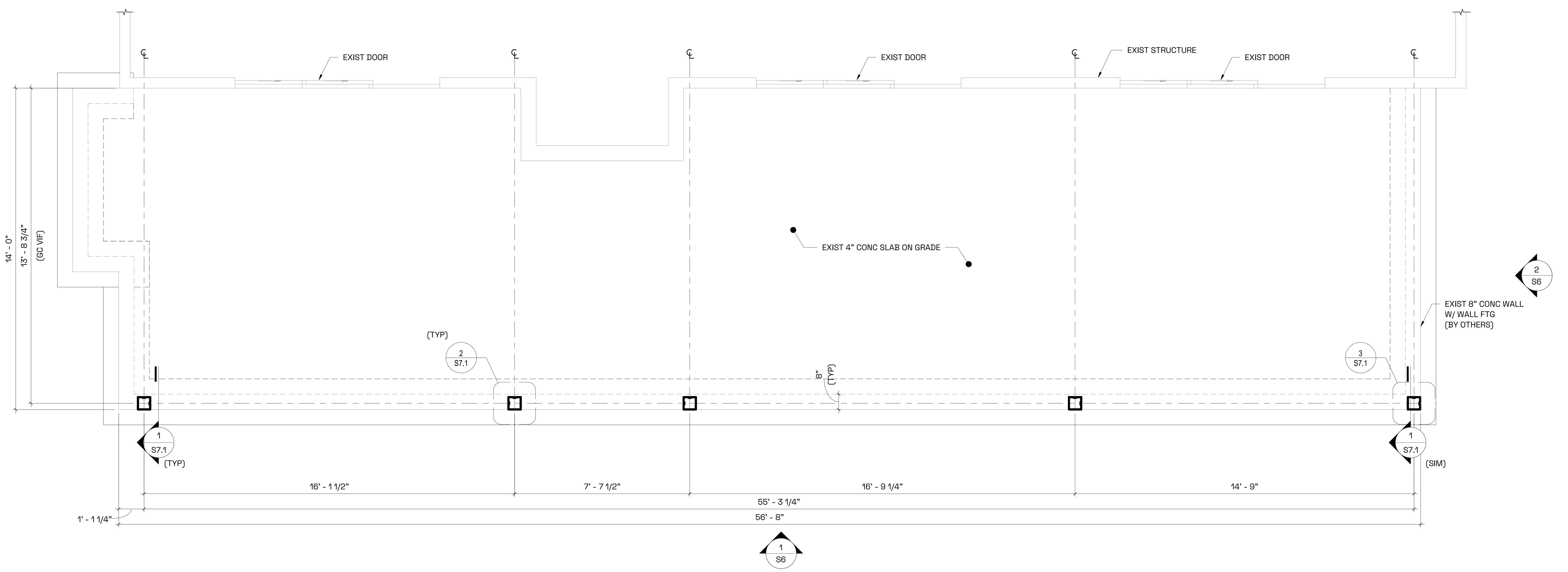
| NO. | DESCRIPTION | DATE |
|---|---|---|
| 0. | INITIAL ISSUANCE | 07/19/2024 |

GENERAL NOTES

| | |
|---|---|
| PROJECT # | 24577 |
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

S2

SCALE: AS INDICATED




1 FOUNDATION PLAN

3/8" = 1'-0"

NOTES:

1. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS.

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FOUNDATION PLAN

| | |
|---|---|
| PROJECT # | 24577 |
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

S3

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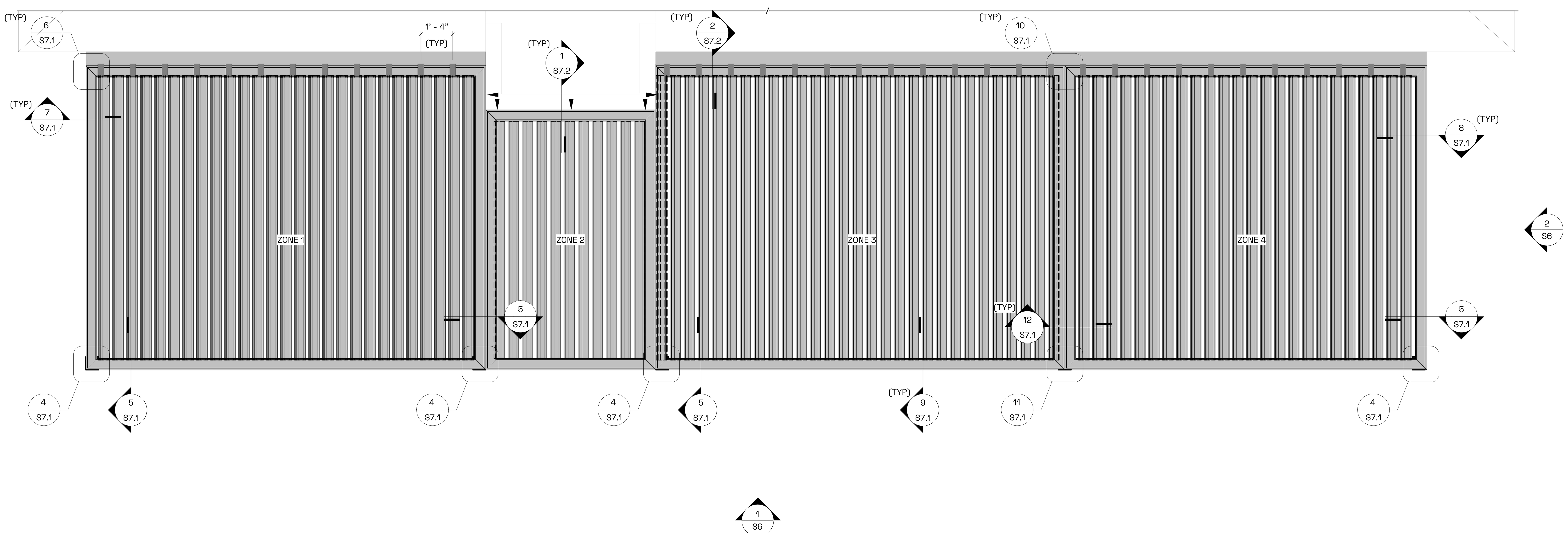


1 ROOF FRAMING PLAN

3/8" = 1'-0"

NOTES:

1. ▮ DENOTES SUPER GUTTER STRAP.
2. ▼ DENOTES (2) (K) BOLTS
3. CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS
4. ZONES 1-4 DENOTE **R-BLADE AZENCO** PRODUCT.


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ROOF FRAMING PLAN

| | |
|---|---|
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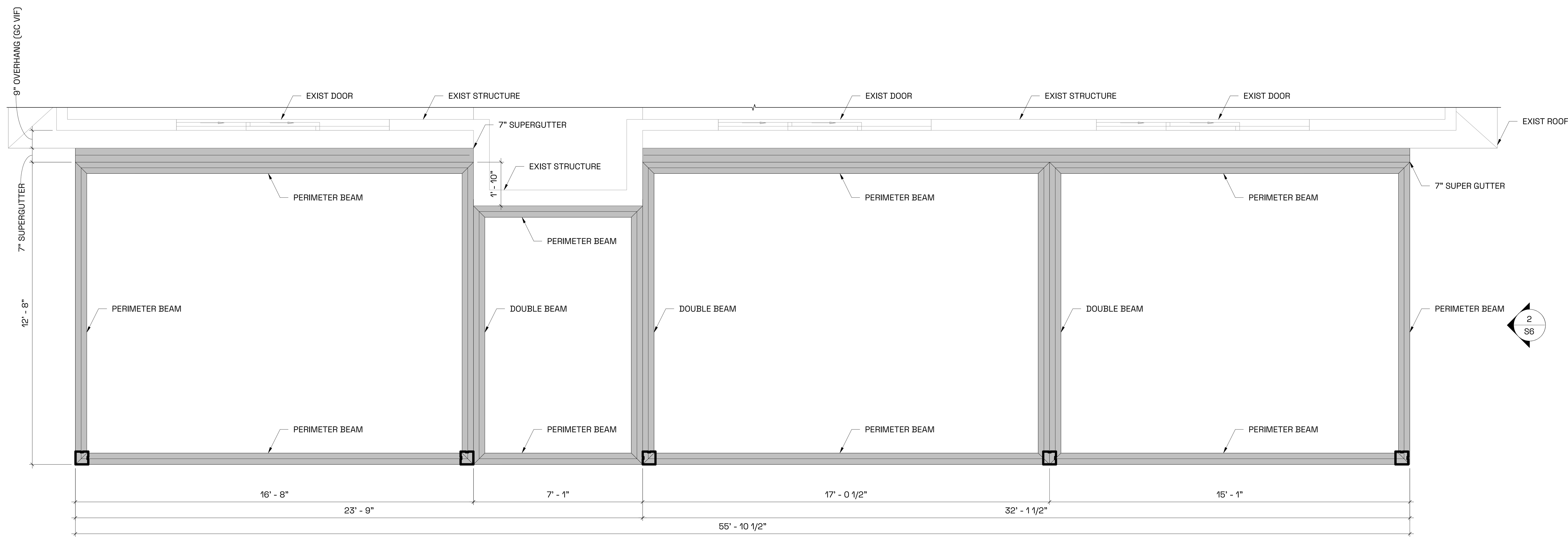
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

S4

SCALE: AS INDICATED




1 REFLECTED CEILING PLAN

3/8" = 1'-0"

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| | | |

REFLECTED CEILING PLAN

| | |
|---|---|
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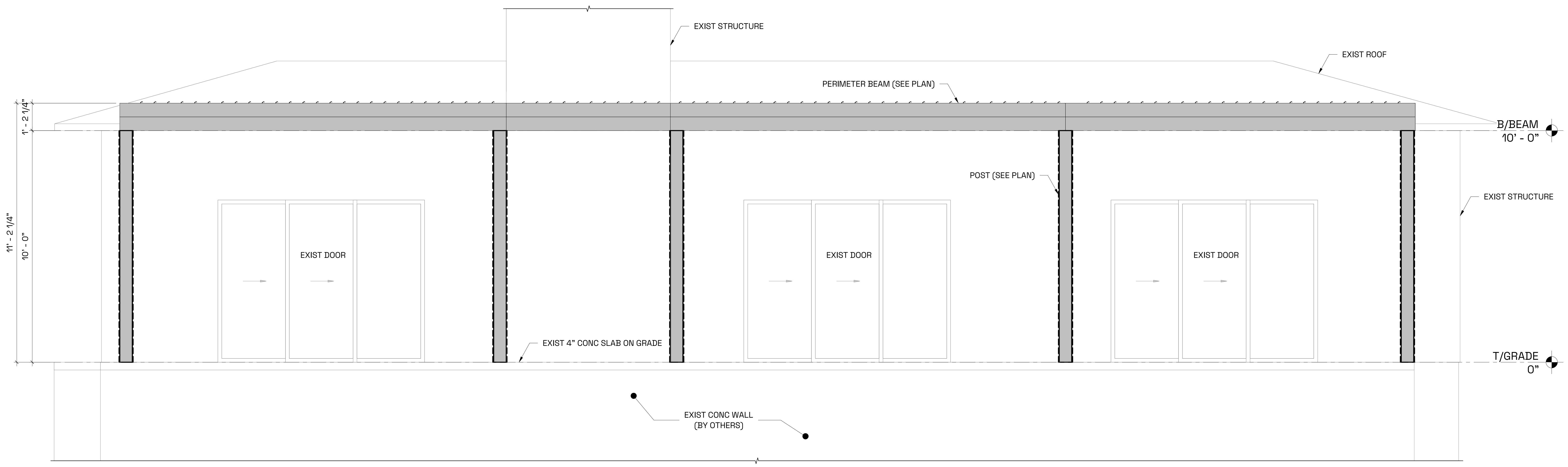
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

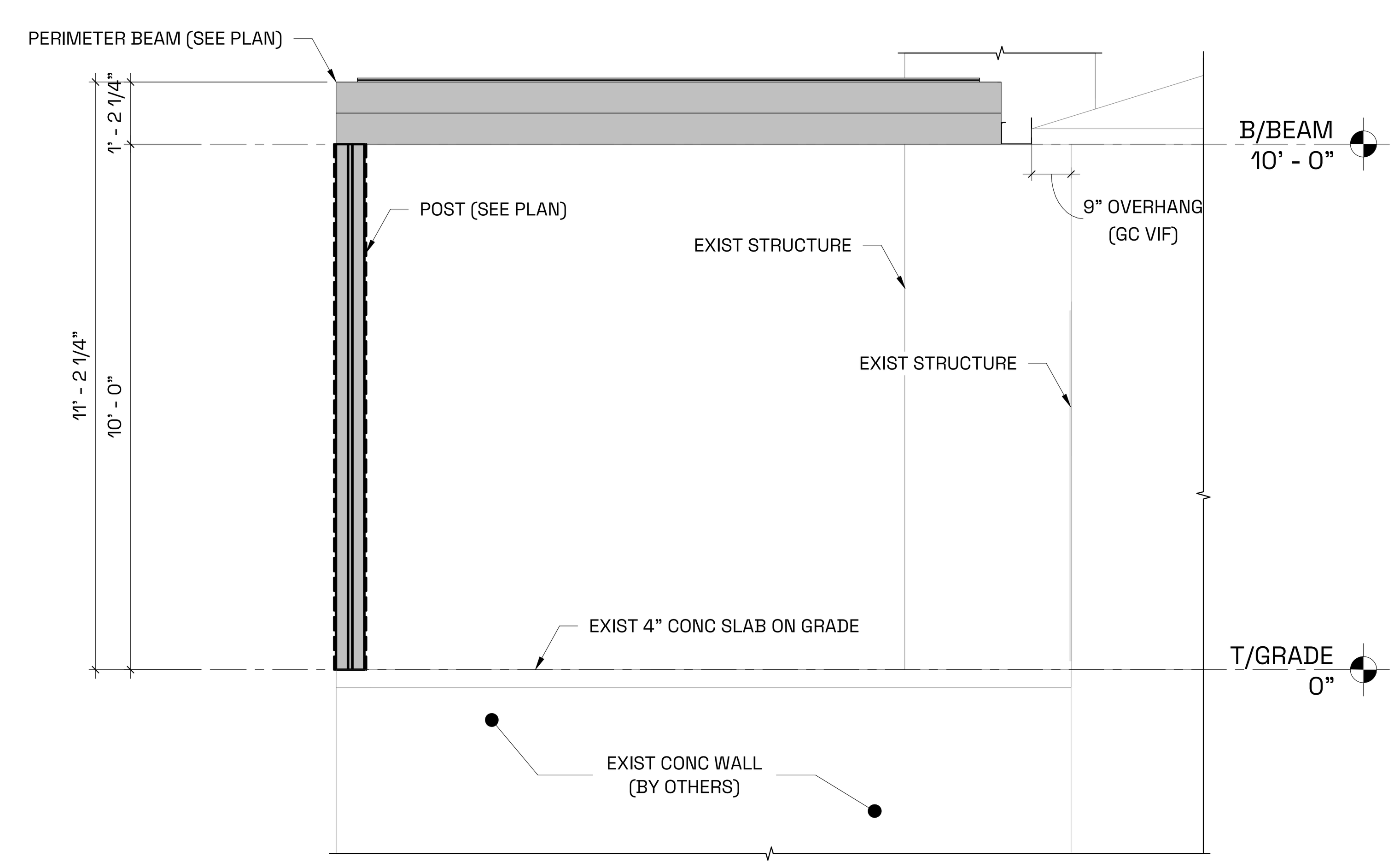
S5

SCALE: AS INDICATED




1 FRONT ELEVATION

3/8" = 1'-0"




2 SIDE ELEVATION

3/8" = 1'-0"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ELEVATIONS

| | |
|---|---|
| PROJECT # | 24577 |
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

S6

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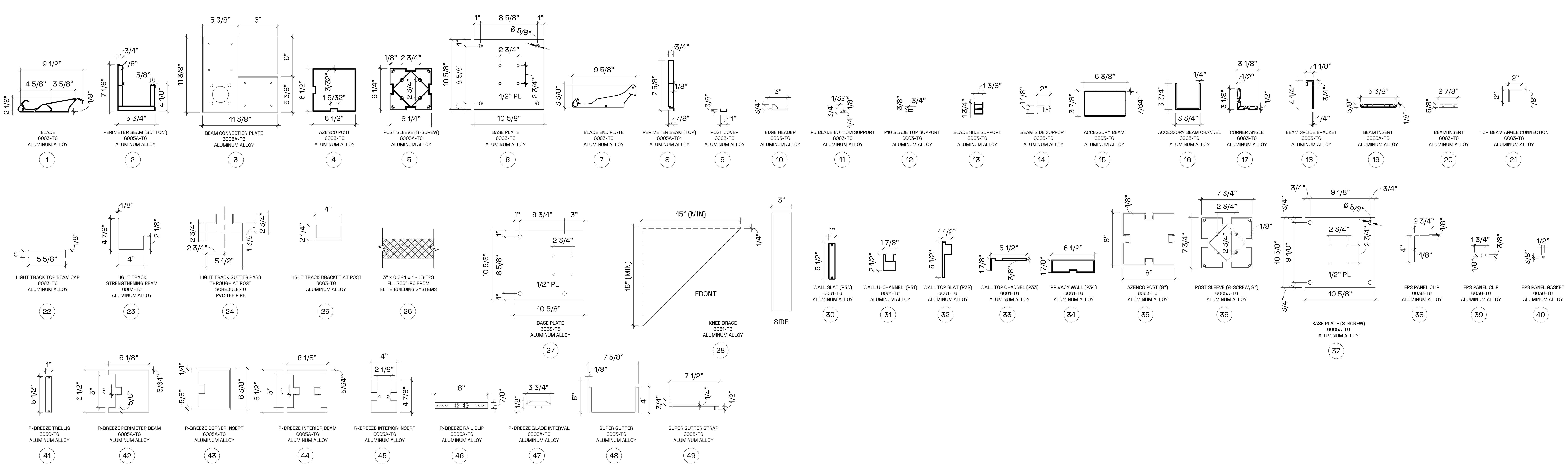


## A STRUCTURAL COMPONENTS

1 1/2" = 1'-0"

| | |
|---|---|
| AA | 5/8" Ø X 5" SIMPSON TITEN HD ANCHORS 316 SS |
| BB | 5/8" Ø X 6" SIMPSON TITEN HD ANCHORS 316 SS |
| CC | 3/8" Ø X 3" SIMPSON TITEN HD ANCHORS 316 SS |
| DD | 1/2" Ø X 4" SIMPSON TITEN HD ANCHORS 316 SS |
| EE | 3/4" Ø X 7" SIMPSON TITEN HD ANCHORS 316 SS |
| A | 1/4" Ø X 1" HWH SDS 410 SS |
| B | 1/4" Ø X 3" HWH SDS 410 SS |
| C | 3/8" Ø X 3" HEX LAG SCREW SS |
| D | 3/8" Ø X 5" HEX LAG SCREW SS |

| | |
|---|---|
| E | 3/8" Ø X 6" HEX LAG SCREW SS |
| F | 5/8" Ø X 6" HEX LAG SCREW SS |
| G | 1/2" Ø X 6" HEX LAG SCREW SS |
| H | 1/4" Ø X 3" HEX LAG SCREW SS |
| I | 3/8" Ø X 5" HEX SCREW ANCHOR 316 SS |
| J | #8 X 1" HWH SDS 410 SS |
| K | 1/2" Ø X 5" DEWALT SCREW BOLT+ 316 SS |
| L | RISER KIT: (1) 3/8"-16 Ø X 7" SS HEX CAP BOLT, (2) 3/8" X 7/8" SS FLAT WASHERS, (1) 3/8"-16 Ø SS HEX NUT |
| M | 1/4" Ø X 4" HWH SDS 410 SS |
| N | 1/2" Ø F1554 THREADED ROD W/ DEWALT PURE110+ EPOXY |
| TS | #14 X 1" HWH SDS 410 SS |

| | |
|---|---|
| Q1 | M12 X 120mm PIN |
| Q2 | M4.8 X 16mm PAN HEAD TORX BIT SHEET METAL SCREW |
| Q3 | #14 X 3/4" HEX HEAD SELF-DRILL 316 SS SCREW |
| Q4 | M8 X 40mm PAN HEAD TORX BIT SHEET METAL SCREW |
| Q5 | HTK10-1.00 HEX SELF-TAPPING 410SS #10 X 1" |
| Q6 | M8 X 40mm FLAT HEAD TORX BIT SHEET METAL SCREW |
| Q7 | M4.8 X 25mm FLAT HEAD TORX BIT SHEET METAL SCREW |
| Q12 | M8 X 80mm SOCKET CAP HEX HEAD PARTIALLY THREADED SCREW |
| Q13 | M8 SS NUT |
| Q14 | M5.5 X 25mm PAN HEAD SCREW |
| Q15 | M9.5 X 60mm PIN |
| Q17 | 1/8"Ø X 3/4" PIN |
| Q18 | #14 X 2" SMS SCREW SS410 |
| Q21 | 1/2" Ø X 2" SS HEX HEAD SCREW |
| Q22 | 1/2" Ø SS NUT |

## B STRUCTURAL CONNECTORS

6" = 1'-0"

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ISSUANCE SCHEDULE

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DETAILS

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| DWN | BZ |
| CHK | AEM |

S7.0

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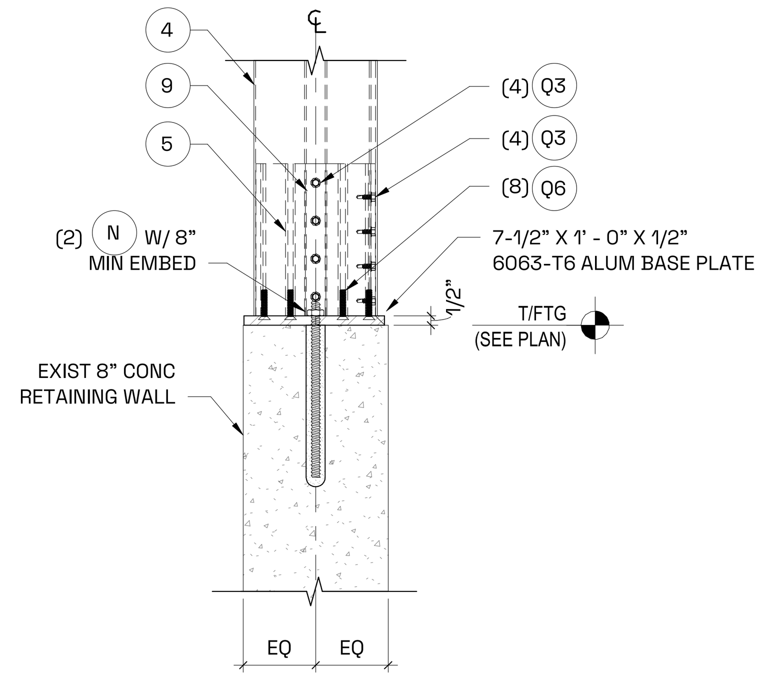
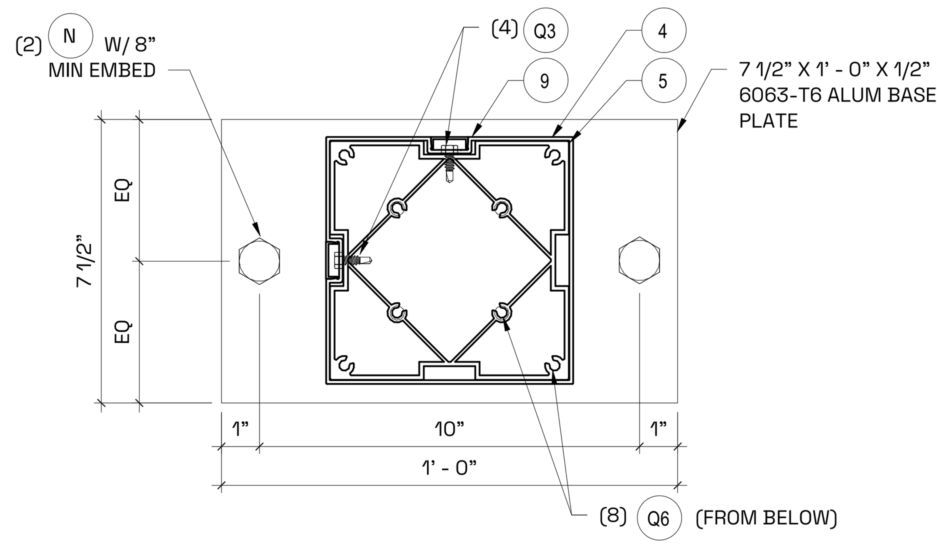


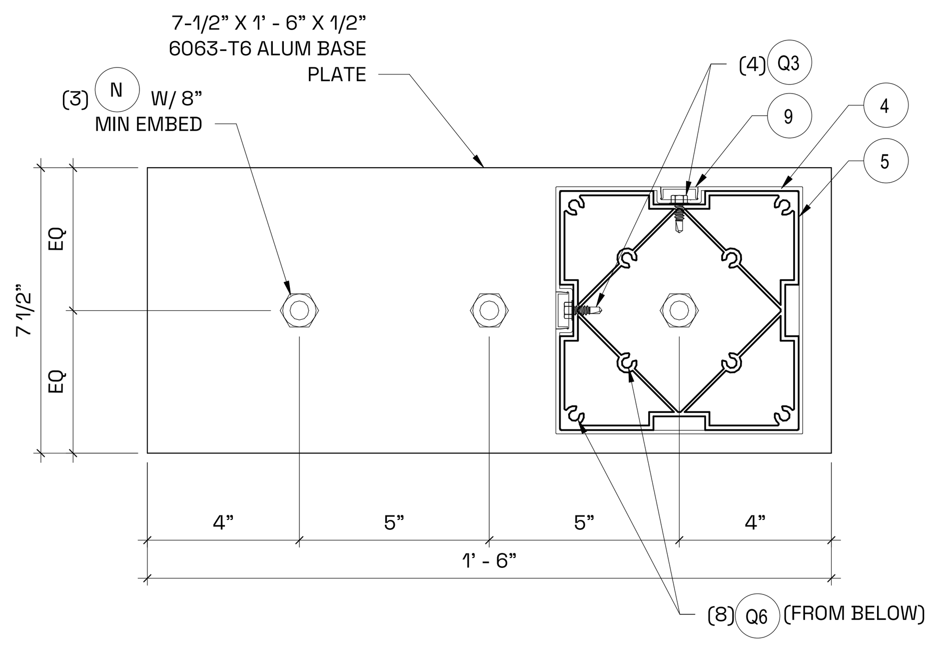

TYPICAL POST BASE TO EXIST FOOTING

1 SECTION
1 1/2" = 1'-0"



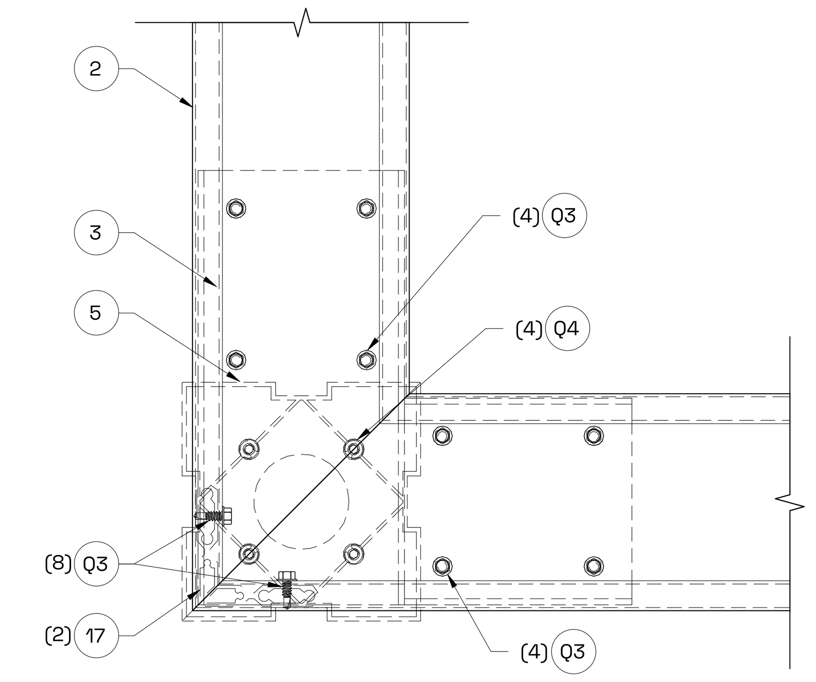

POST AND BASE PLATE

2 DETAIL
3" = 1'-0"



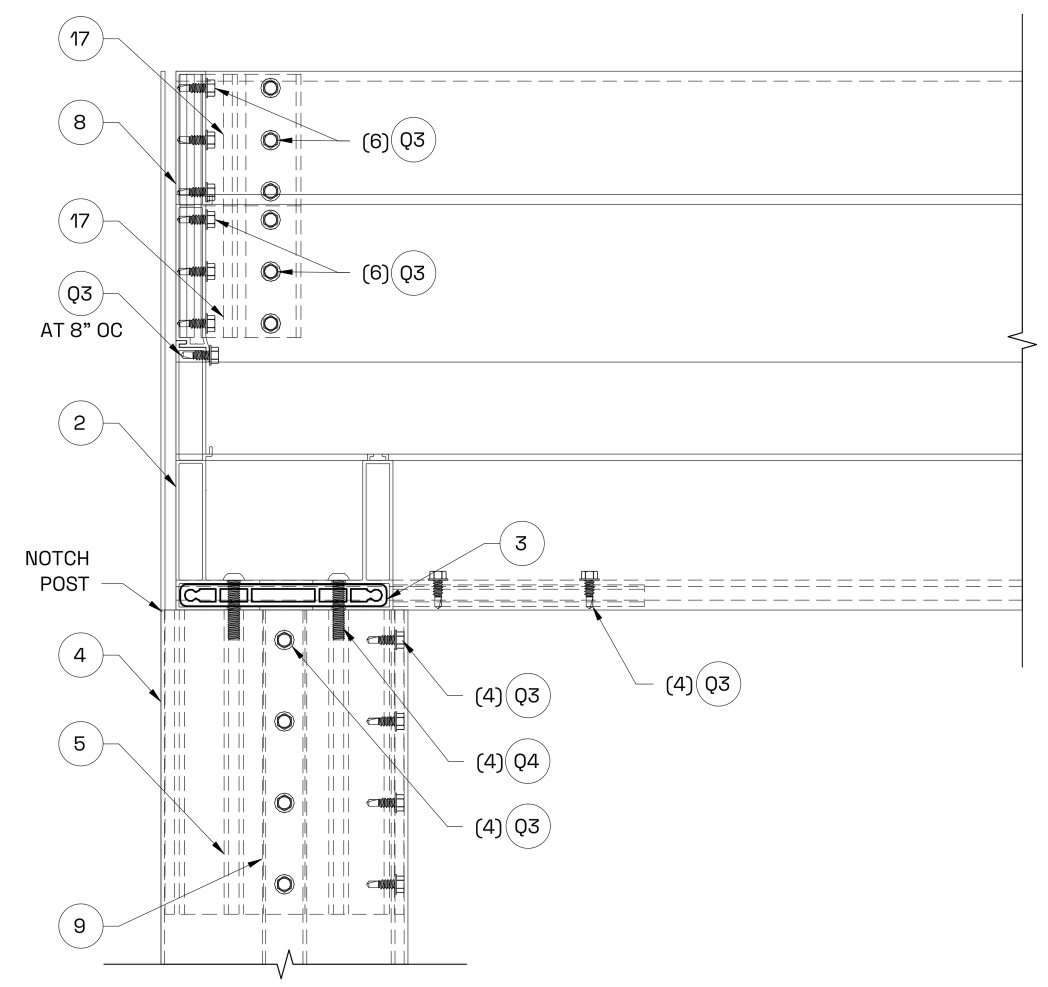

ECCENTRIC POST AND BASE PLATE (8-SCREW) (FLUSH EDGE)

3 DETAIL
3" = 1'-0"



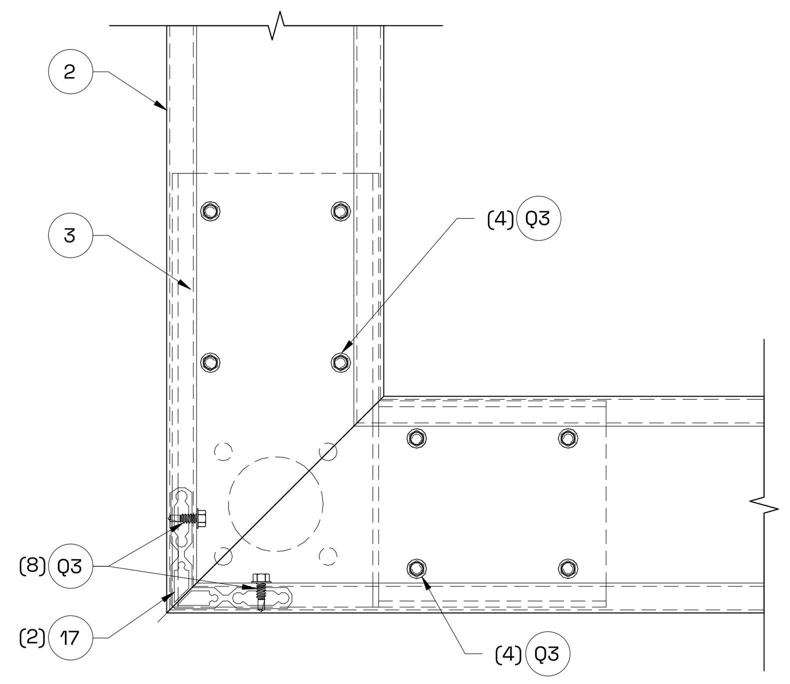

BEAM CORNER ASSEMBLY

4 DETAIL
3" = 1'-0"



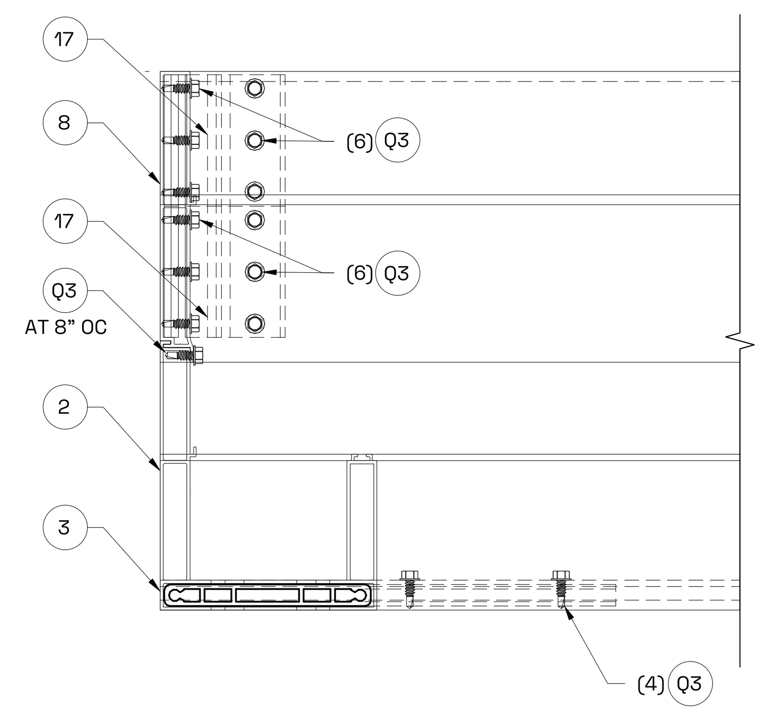

POST TO BEAM AT CORNER

5 SECTION
3" = 1'-0"



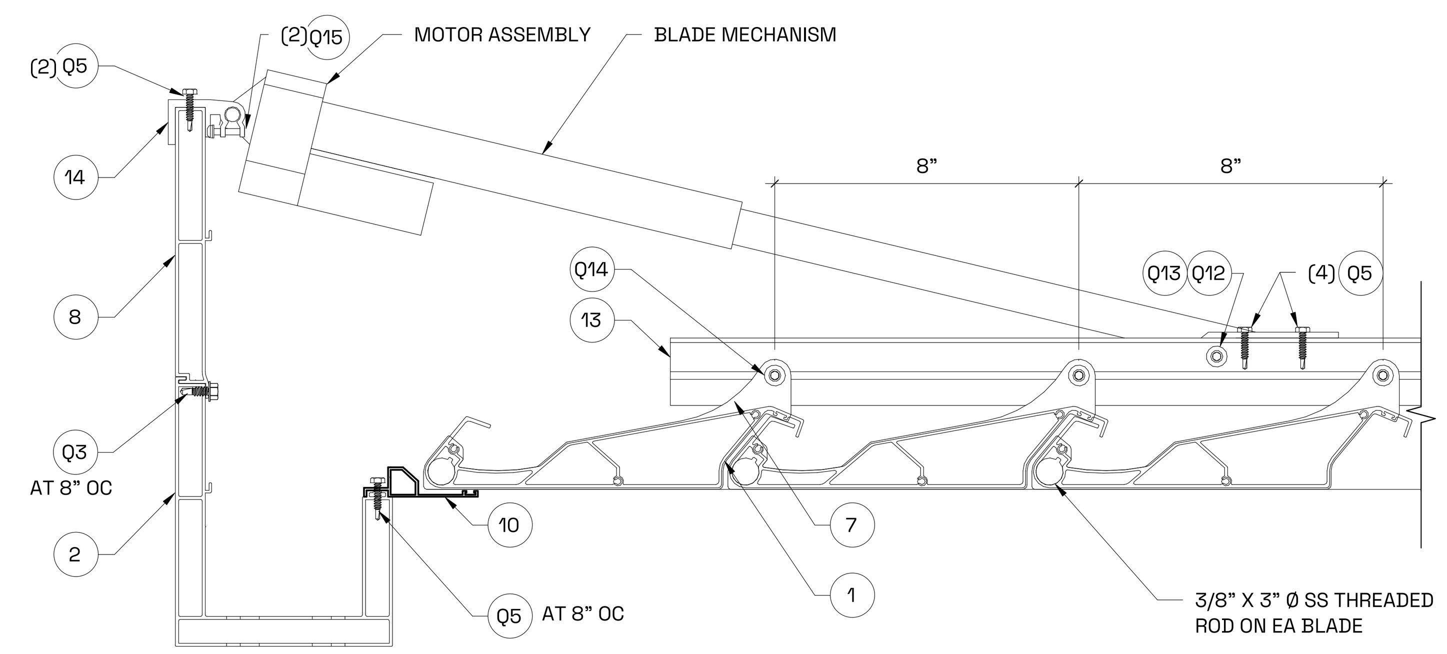

BEAM CORNER ASSEMBLY (NO POST)

6 DETAIL
3" = 1'-0"



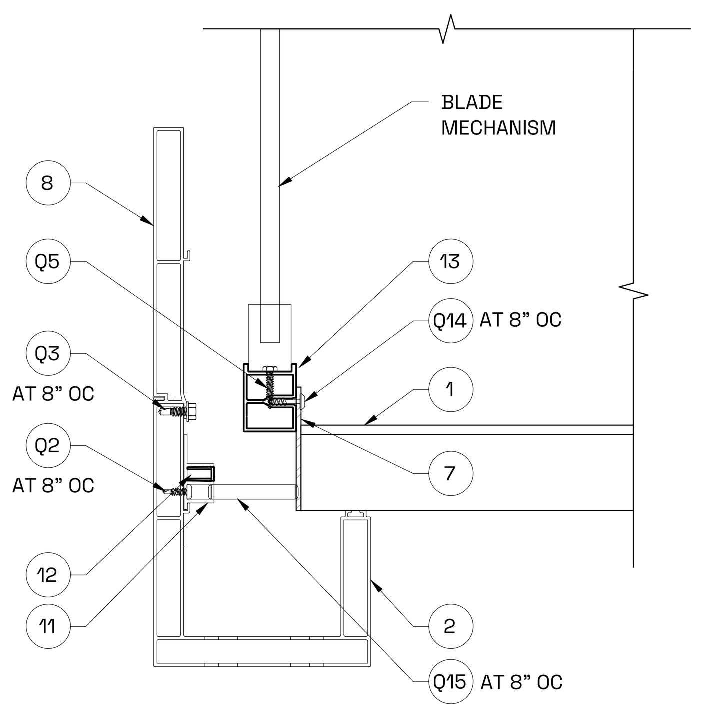

POST TO BEAM AT CORNER (NO POST)

7 SECTION
3" = 1'-0"



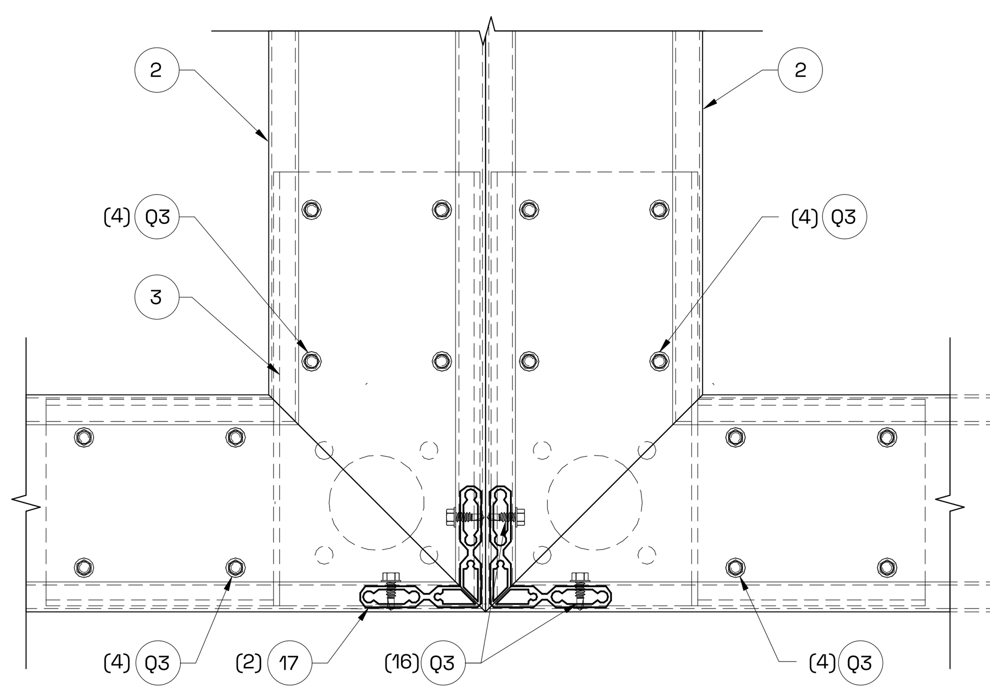

LOUVER ASSEMBLY AT BEAM - PERPENDICULAR

8 DETAIL
3" = 1'-0"



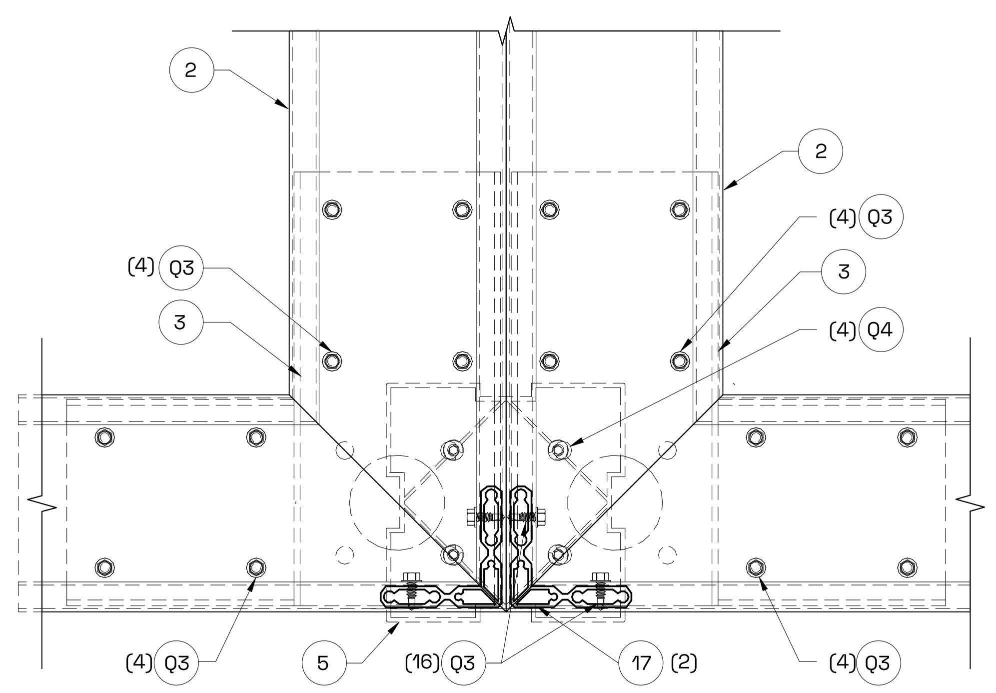

LOUVER ASSEMBLY AT BEAM - PARALLEL

9 SECTION
3" = 1'-0"



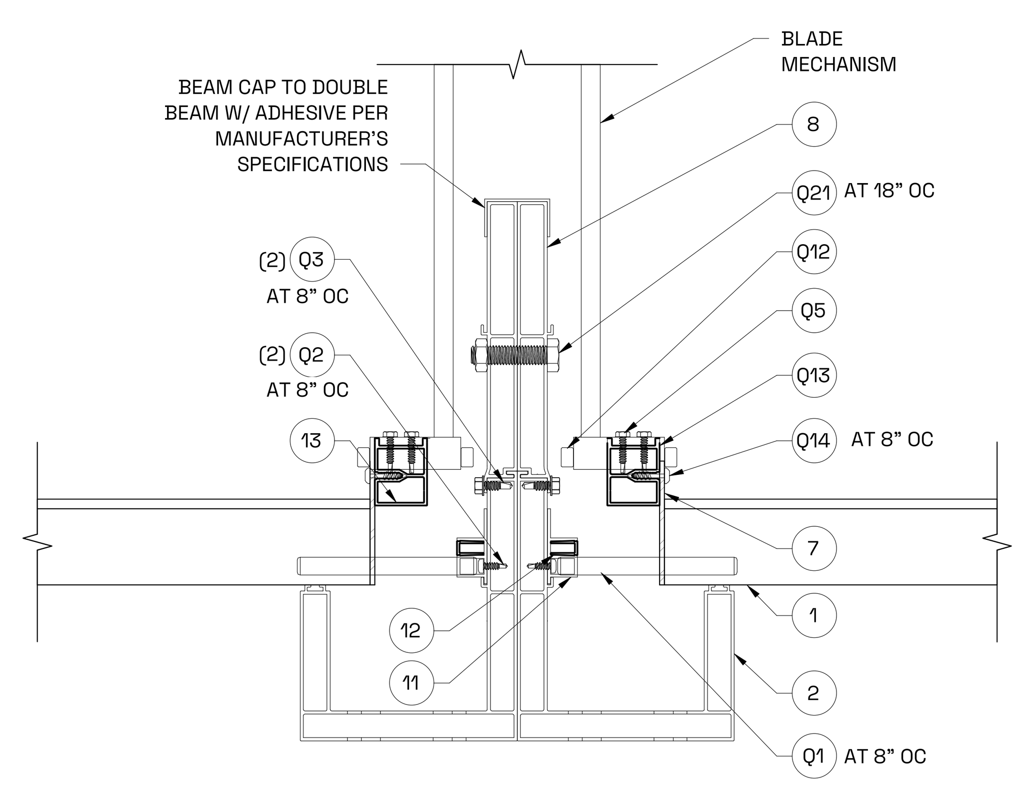

DOUBLE BEAM CORNER ASSEMEBLY - NO POST

10 DETAIL
3" = 1'-0"




DOUBLE BEAM CORNER ASSEMBLY

11 DETAIL
3" = 1'-0"




DOUBLE BEAM ASSEMBLY

12 SECTION
3" = 1'-0"

AM STRUCTURES

1153 TOWN CENTER DRIVE #201
JUPITER, FL 33458
(561) - 951 - 0099
AM-STRUCTURES.COM

AZENCO

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ENGINEER'S SEAL

STATE OF OHIO
ANDREW McCANN
E-87255
REGISTERED
PROFESSIONAL ENGINEER

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TIMAN WINDOW TREATMENTS, INC.
RAYMOND TATKO
1751 E Hines Hill Rd, Hudson, OH 44236

ISSUANCE SCHEDULE

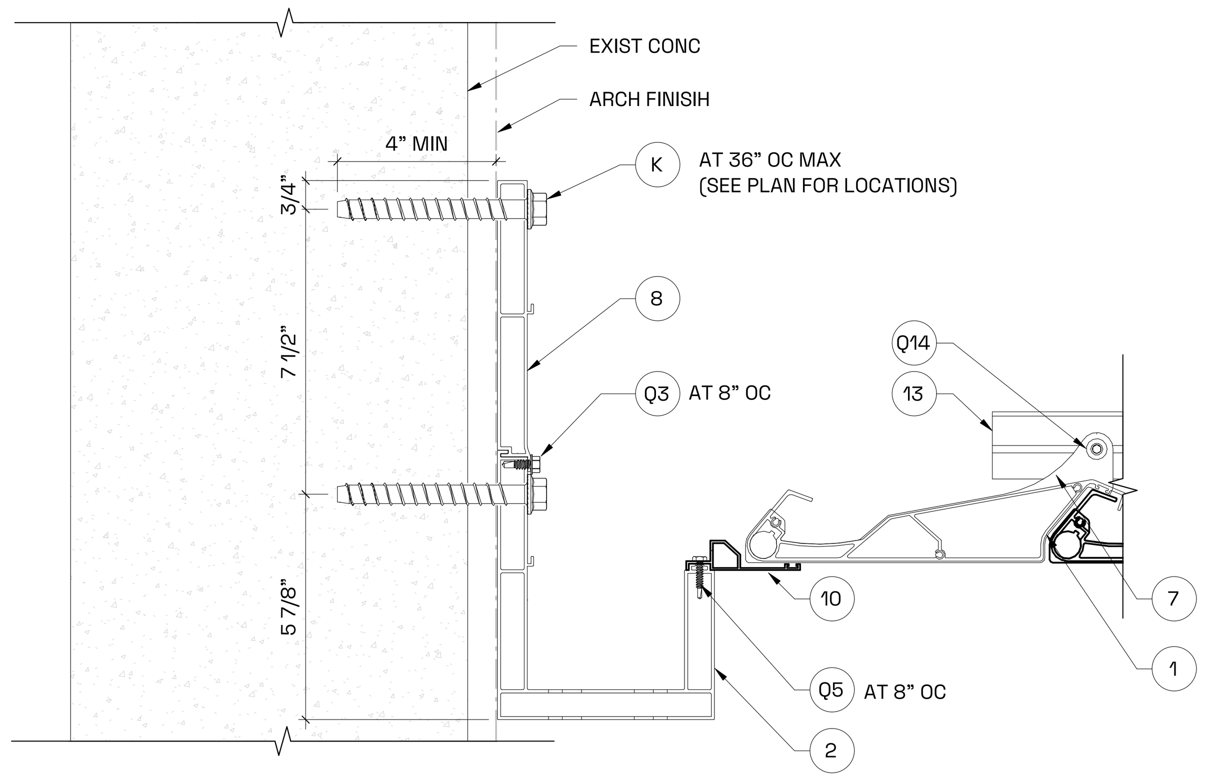
| NO. | DESCRIPTION | DATE |
|---|---|---|
| 0. | INITIAL ISSUANCE | 07/19/2024 |

DETAILS CONT

PROJECT # 24577
DATE 07/19/2024
DWN BZ
CHK AEM

S7.1

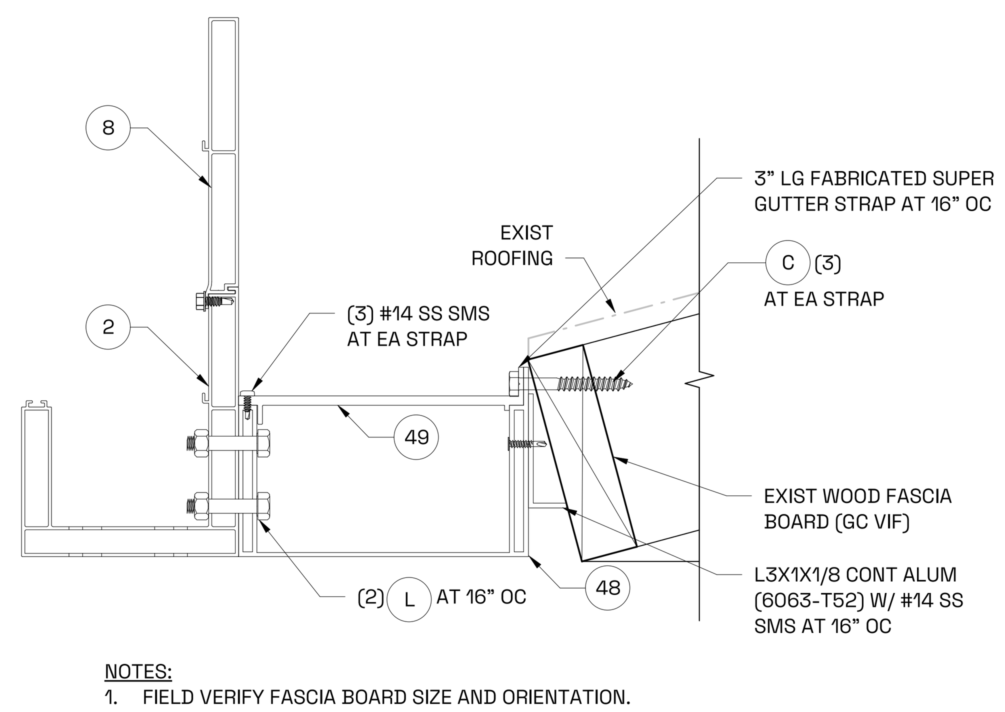
SCALE: AS INDICATED

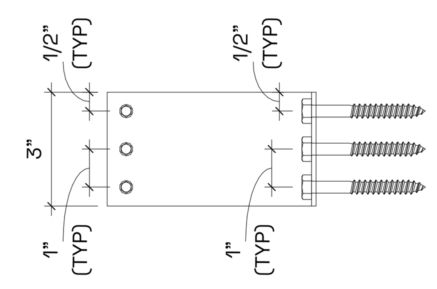



MAIN BEAM CONNECTION TO HOST STRUCTURE

1 SECTION

3" = 1'-0"




TRUSS STRAP PLAN

BEAM TO SUPER GUTTER CONNECTION

2 SECTION

3" = 1'-0"

AM STRUCTURES

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ISSUANCE SCHEDULE

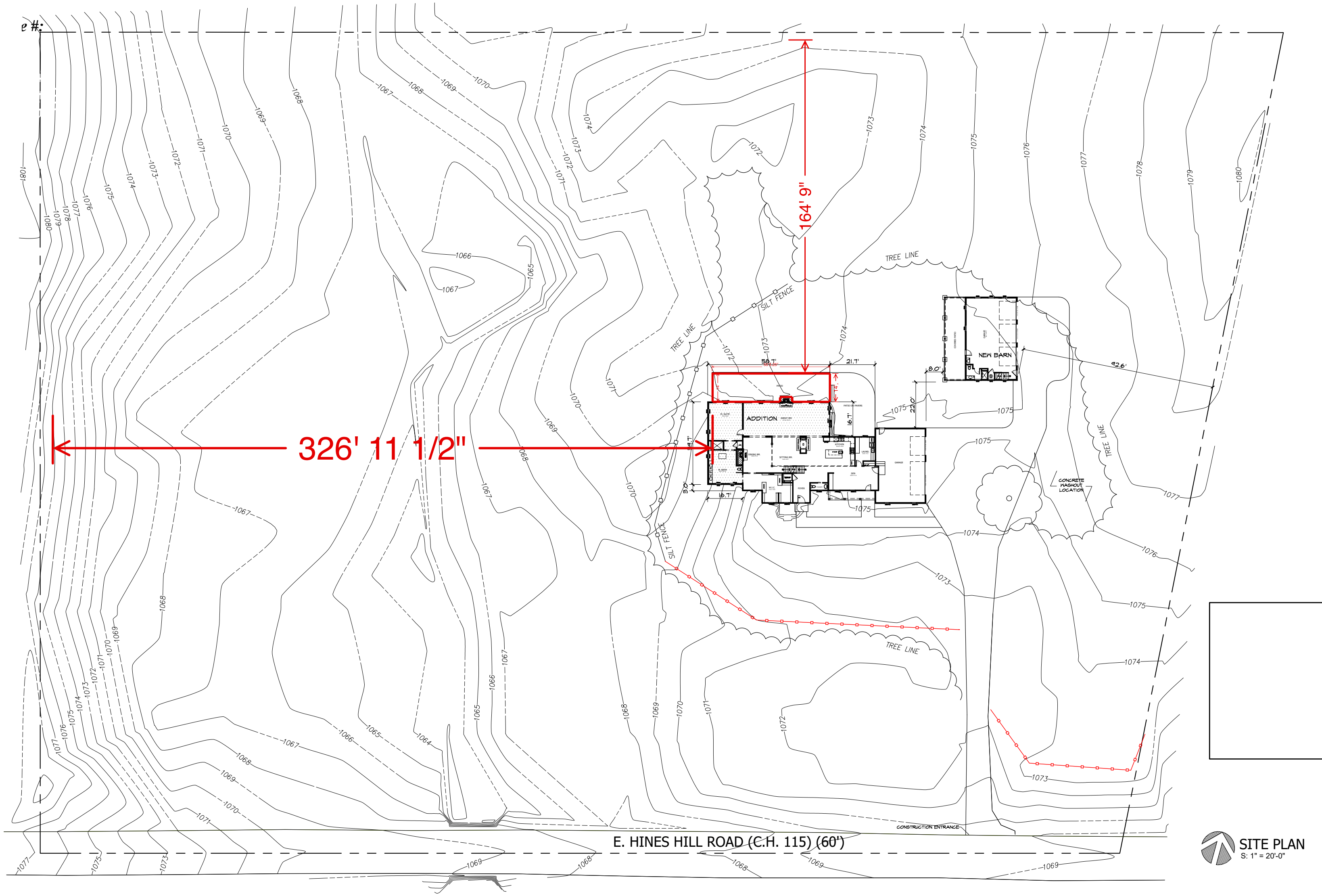
| NO. | DESCRIPTION | DATE |
|---|---|---|
| 0. | INITIAL ISSUANCE | 07/19/2024 |

DETAILS CONT

| | |
|---|---|
| PROJECT # | 24577 |
| DATE | 07/19/2024 |
| DWN | BZ |
| CHK | AEM |

S7.2

SCALE: AS INDICATED




SITE PLAN
S: 1" = 20'-0"

J. KAPELA designs
TRADITIONAL RESIDENTIAL ARCHITECTURE


CONTACT:
J. KAPELA DESIGNS & CONST.
4302 John Avenue
Cleveland, Ohio 44113
216-862-3525
www.jkapela.com


# TATKO RESIDENCE
1751 E. HINES HILL RD.
HUDSON, OH 44236

SITE PLAN

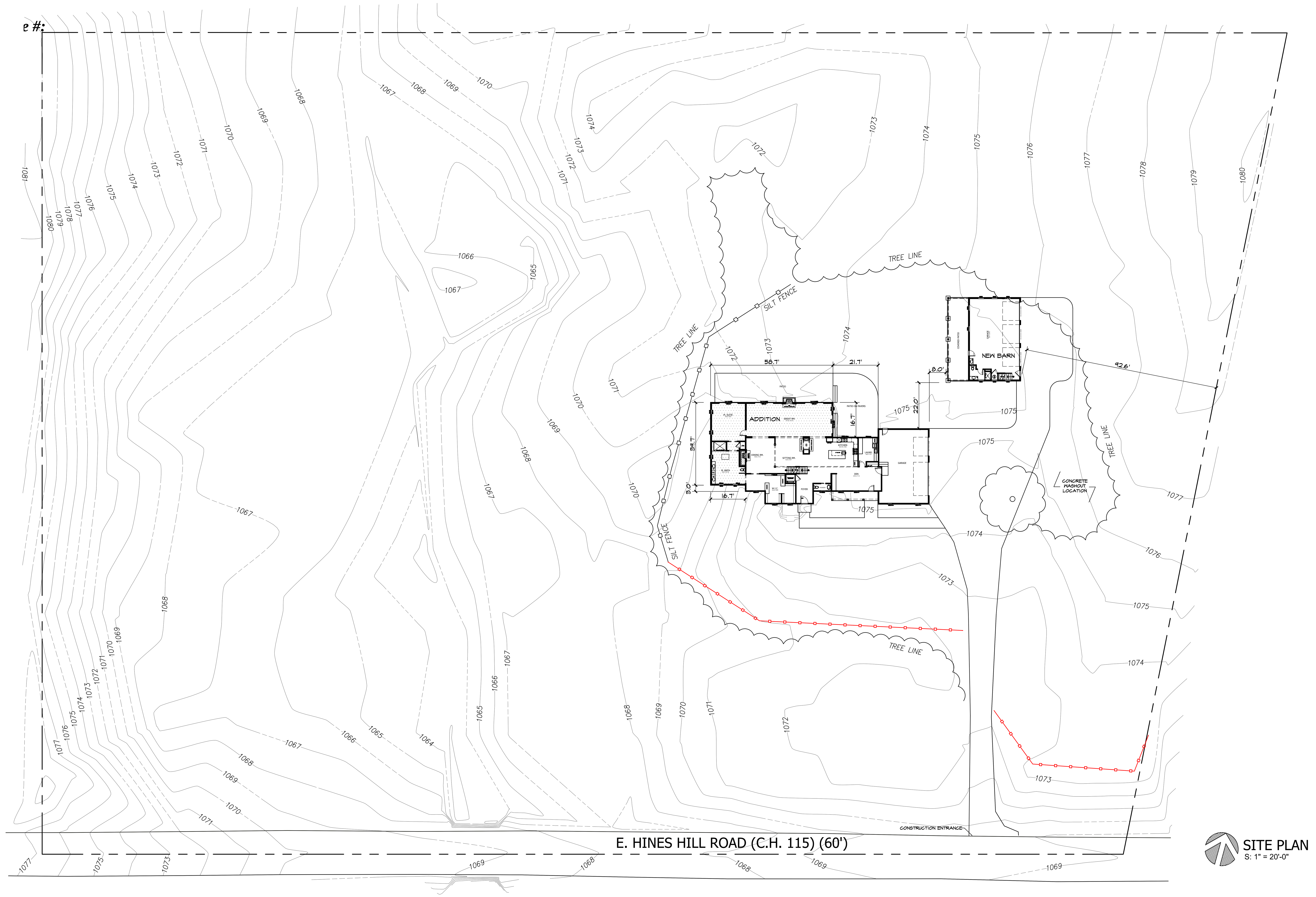
DATE
2021-08-26 LAYOUT EXISTING
2021-11-02 AHBR SUBMISSION
2021-11-09 AHBR REVISION
2021-11-12 CONSTR. DOC

11-12-21



JOB # 2021-49

S101




SITE PLAN
S: 1" = 20'-0"

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## SITE PLAN

DATE
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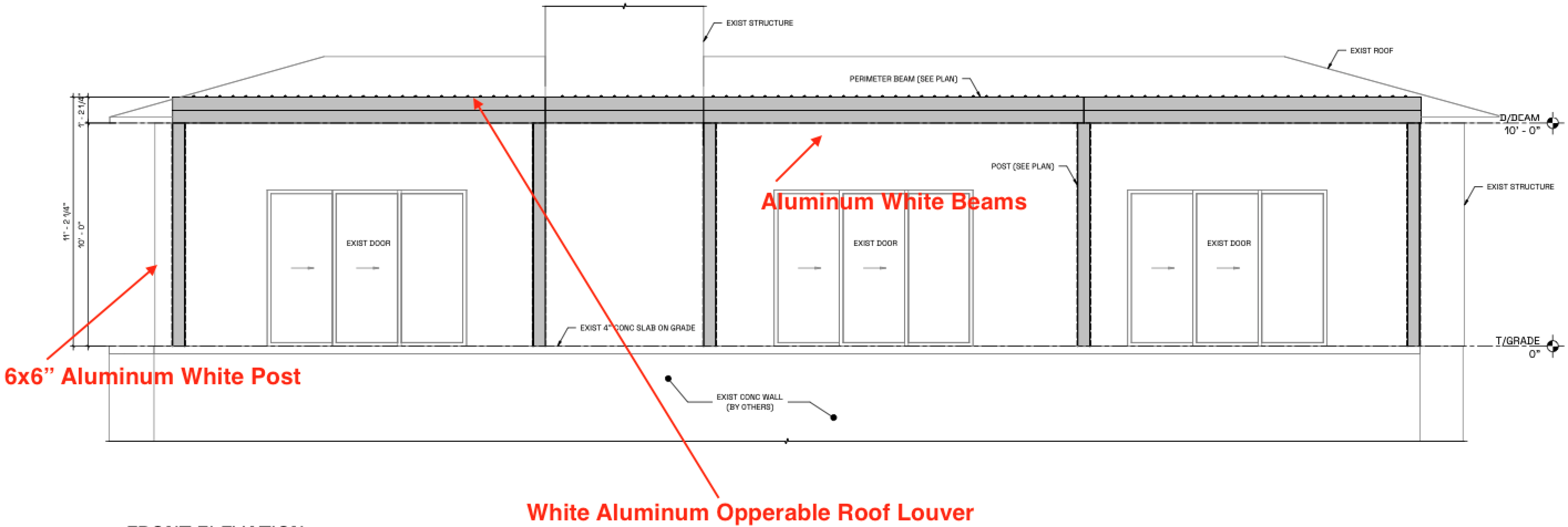
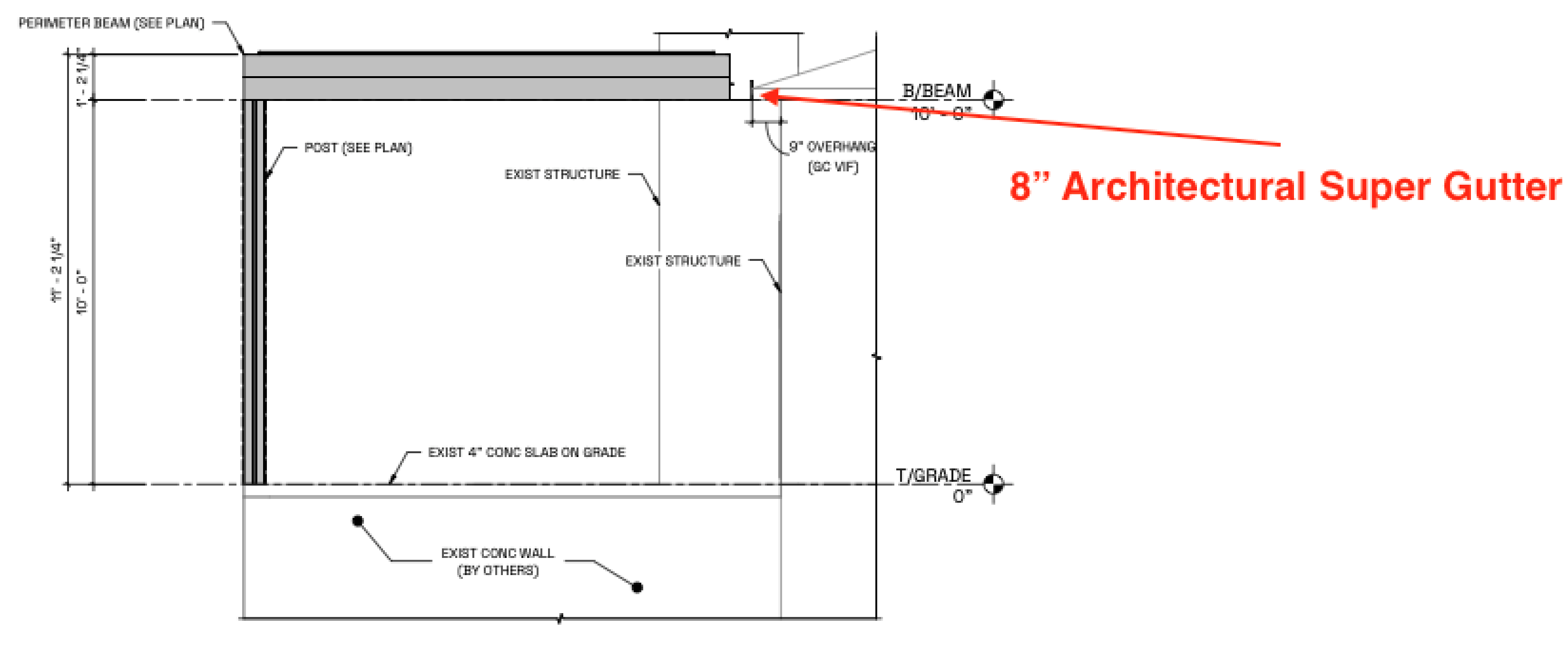
JOB # 2021-49

S101




1 FRONT ELEVATION

3/8" = 1'-0"



ΛM | STRUCTURΞS

Project # 24577

# CALCULATION COVER SHEET

Calculations Prepared For:

TIMAN WINDOW TREATMENTS, INC
4533 WILLOW PARKWAY
CLEVELAND, OH

Project:

RAYMOND TATKO
1751 E HINES HILL RD
HUDSON, OH

Subject:

CANOPY CALCULATIONS

REFERENCE SEALED DRAWING BY BELOW-SIGNED ENGINEER FOR ALL NOTES AND DETAILS INCORPORATED HEREIN

This item has been digitally signed and sealed by Andrew McCann P.E. On 07/19/24

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Engineer's Seal Valid For Pages
1 Through 57

STATE OF OHIO
ANDREW
McCANN
E-87255
REGISTERED
PROFESSIONAL ENGINEER

Seal Exp: 12/31/25
COA#: 6511
COA Exp: 06/30/24

Andrew McCann

OH

07/19/24

ANDREW McCANN
PE 87255
Cert Auth 6511

ΛM | STRUCTURΞS

Project # 24577

**Timan Window Treatments, Inc**
**Raymond Tatko**

| | | | | | |
|---|---|---|---|---|---|
| **Wind Loading Criteria (ASCE 7-16)** | | | ASCE | 7-16 | |
| Basic Wind Speed | 110 | MPH | | ASD | |
| Wind Velocity (Vasd) | 86 | MPH | | Residential | |
| Risk Category | II | | | | |
| Importance Factor | 1.00 | | | | |
| Exposure Category | C | | | | |
| **Snow Loading Criteria (ASCE 7-16)** | | | | | |
| Ground Snow Load | 20 | PSF | | | |
| Flat Roof Snow Load | 25.00 | PSF | | | |
| Snow Exposure Factor | 1.00 | | | | |
| Snow Thermal Factor | 1.20 | | | | |
| Snow Importance Factor | 1.00 | | | | |
| **Live Loading Criteria (ASCE 7-16)** | | | | | |
| Roof Live Load | 20 | PSF | | | |
| **Dead Loading Criteria (ASCE 7-16)** | | | | | |
| Dead Load | 5 | PSF | Azenco | | |
| **Seismic Load Criteria (ASCE 7-16)** | | | | | |
| Site Class | D | | Host Attached? | Y | ONE SIDE |
| Occupancy Category | II | | Host Supported? | N | |
| Mapped Spectral Response Accelerations: | | | | | |
| $S_S$ | 0.136 | | | | |
| $S_1$ | 0.049 | | | | |
| Spectral Response Coefficients: | | | | | |
| $S_{DS}$ | 0.145 | | | | |
| $S_{D1}$ | 0.078 | | | | |
| P | 1.0 | | | | |
| SDC | B | | | | |
| TL | 12 | | | | |
| **Load Combinations (ASCE 7-16)** | | | | | |
| Gravity | D + (Lr or S or R) | | | | |
| Uplift | 0.6D + 0.7E | | | | |

AM STRUCTURES
1153 Town Center Drive #201 Jupiter, FL 33458
PH: 561-951-0099

AM | STRUCTURES

Project # 24577 - Raymond Tatko

**Timan Window Treatments, Inc**
**Raymond Tatko**

## DESIGN CRITERIA:

**Enter custom loads:**

| | | | |
|---|---|---|---|
| Vult = | 110 mph | | |
| Exposure: | C | | |
| Ground Snow Load: | 20.00 psf | | |
| Live Load: | 20.00 psf | Type of project: | Residential |
| Dead Load: | 5.0 psf | | |
| Wind Porosity: | 50% | | |
| Roof Type: | Louvered | | |

**These are the loads that this calculator will utilize:**

| | | | |
|---|---|---|---|
| Vult = | 110 mph | | |
| Exposure: | C | Deflection criteria: | L / 180 |
| Ground Snow Load: | 20.00 psf | | |
| Design Live Load: | 20.00 psf | | |
| Design Dead Load: | 5.00 psf | | |
| Wind Porosity: | 50% | | |
| **Critical positive grav comb. (+):** | 30.00 psf | | |
| **Critical negative uplift comb. (-):** | - 3.00 psf | | |
| **Critical lateral pressure (+):** | 16.76 psf | | |

## SYSTEM CONFIGURATION:

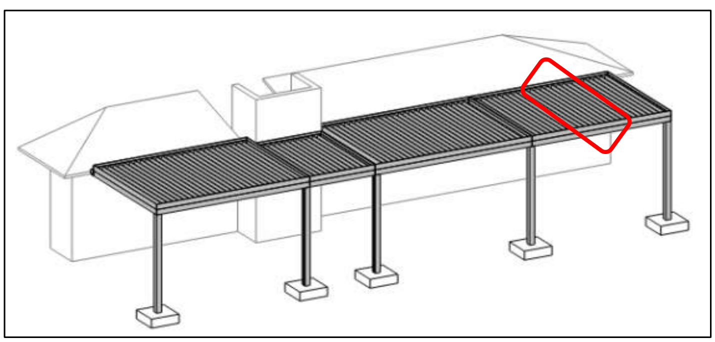
**Louvers:**

| | |
|---|---|
| Overall Canopy Length: | 55.9 ft |
| Overall Canopy Width: | 12.7 ft |
| Roof Slope: | 0.0 ° |

**LOUVER BLADES CLOSED CHECK** 6063-T6

| | | | | | |
|---|---|---|---|---|---|
| Sx | 2.9166 | in^3 | Mmax | 499.53 | **lb-ft** |
| Sy | 1.26438 | in^3 | Stress | 7.71 | **ksi** |
| Length of Longest Louver Blade: | 12 ft | 8 in | | | |

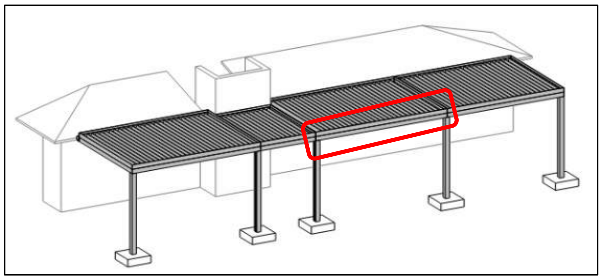
| | |
|---|---|
| Stress Check: | 85.0% |
| Louver Length: | 12.7 ft |



## Louver Support Beam

Check intermediate or edge? Edge *(Intermediate uses full louver blade tributary)*

**Edge Louver Beam Configuration**



## Louver Support Beam - Edge Condition Analysis

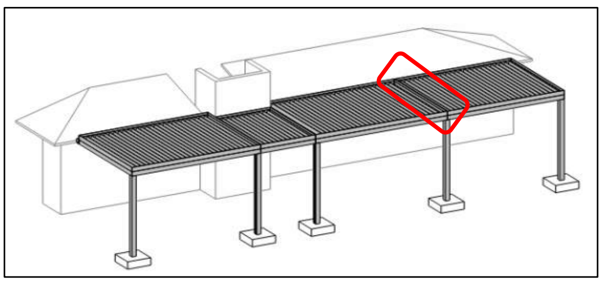
| | | | | |
|---|---|---|---|---|
| Support Spacing (Louver Beam Length): | 17 ft | 1 in | Reinf: | N |
| Single/Double/Triple/Quad: | Single | | | |

| | |
|---|---|
| Louver Beam Span: | 17.0 ft |
| Louver Beam Trib: | 6.3 ft |
| Shear at Ends: | 1619 lb |
| Moment Check | 59% |
| Deflection Check | 39% |

## Main Beam

Check intermediate, edge, or none? Intermediate *(Intermediate doubles point loads from louver beams)*

**Intermediate Main Beam Configuration**



## Main Beam - Intermediate Condition Analysis

| | | | | |
|---|---|---|---|---|
| Post Spacing (Main Beam Length): | 12 ft | 8 in | Reinf: | N |
| Single/Double/Triple/Quad: | Double | | | |

Quantity of louver between a set of posts: 0 *(0 indicates Louver Beam line up directly over posts)*

Assumed offset distance "a" of Louver Beam, measured from post (see diagram): 0.0 ft

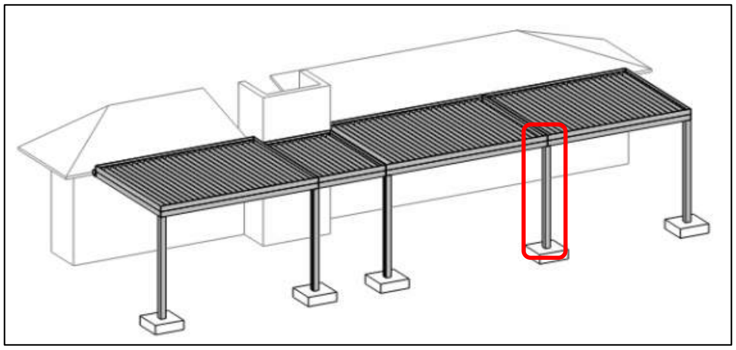
Louver beams line up directly on posts. No vertical load acting on main beam. Self-weight negligible.

| | |
|---|---|
| Main Beam Span: | 12.7 ft |
| Load from Louver Beam: | 0 lb |
| Shear at Ends: | 0 lb |
| Moment Check | 0% |
| Deflection Check | 0% |

## Support Posts

Check intermediate, edge, or none? Edge

**Edge Support Post Configuration**



| | | | | |
|---|---|---|---|---|
| Mounting Height Above Grade: | 0.0 ft | *(Enter 0 for installations at ground level)* | | |
| Height of Posts: | 10.0 ft | | Total Mean Roof Height: | 10.0 ft |
| Attached to host? | Y | Roof Eave Height= | 20.0 ft OPEN | |

## Support Posts - Edge Condition Analysis

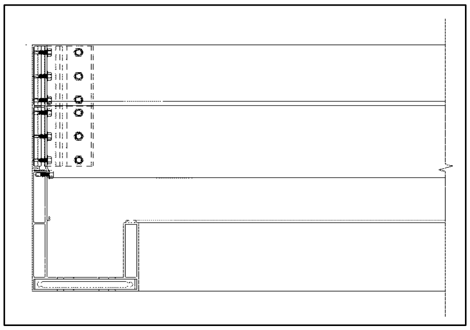
Post Size: 6.5" x 6.5" x 0.125"

*X - AXIS Post Trib =* 6.33 ft
*Y - AXIS Post Trib =* 16.08 ft Host Attached
*FH1 =* 14.13 *in, (side fascia height at HT1, normal to lateral windload)*

| | | |
|---|---|---|
| | Max Moment/Axial/Shear | 34% |
| | Moment/Axial Check: | 34% |
| | Shear Check | 4% |
| ASD Method | Required Tension: | 306 lb |
| | Required Compression: | 3056 lb |
| | Required Shear: | 462 lb |
| | Required Moment | 1.7 kip-ft |

**Beam to Beam (Clip in Shear)**

*Qty* 6 Anchor Qty at Connection per Beam



| | |
|---|---|
| Required Tension: | 0 lb |
| Required Shear: | 1619 lb |

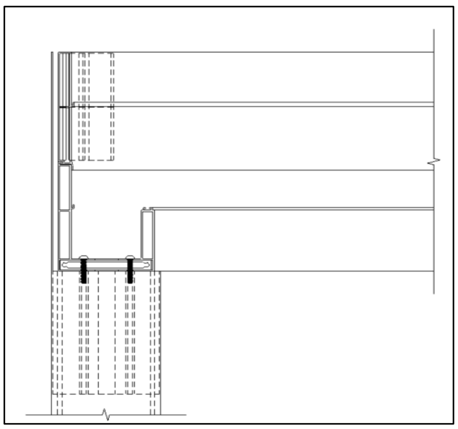
*(Analyzing 1/4-14 SMS, 316 SS, Steel Screw to 0.125" x 0.125" connecting parts thicknesses)*

52%

**OK, (6) anchors sufficient**

**Beam to Post Insert Connection**

*Qty* 4 Anchor Qty at Connection



| | | |
|---|---|---|
| F | 5148.59 lb | Ω = 4 |
| Fsu | 60000.00 | |
| Ats | 0.34 in^2 | |
| n | 20.00 threads/in | |
| LE | 1.57 in | |
| Dsmin | 0.31 in | |
| Enmax | 0.28 in | |

| | |
|---|---|
| Required Tension: | 306 lb |
| Capacity Shear: | 20594 lb |

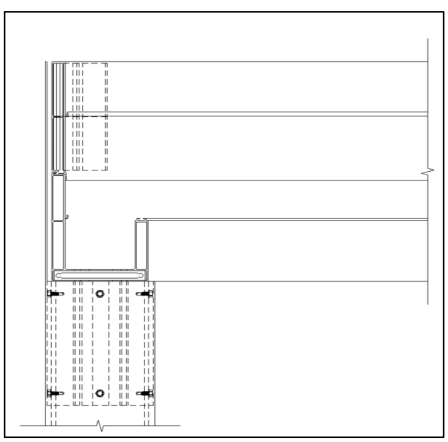
*Analyzing Beam to Post Insert with (4) M8x40 Machine screws*

1%

**OK**

**Post Insert to Post Connection**

*Qty* 6 Anchor Qty at Connection



| | |
|---|---|
| Required Tension: | 0 lb |
| Required Shear: | 462 lb |

*(Analyzing 1/4-14 SMS, 316 SS, Steel Screw to 0.125" x 0.125" connecting parts thicknesses)*

15%

**OK, (6) anchors sufficient**

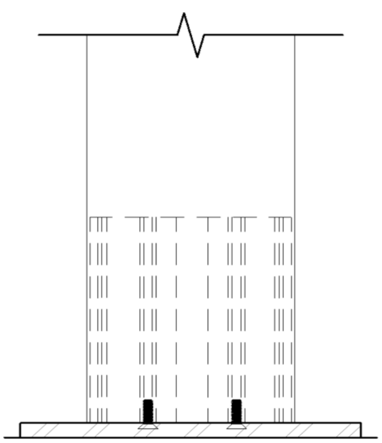
**Foundation**

| SEE SKYCIV | | | |
|---|---|---|---|
| Foundation Reactions (K,K-FT) | | | |
| | P | V | *M* |
| D | 0.509 | 0.000 | 0.000 |
| W | 0.683 | 0.680 | 2.839 |
| E | 0.015 | 0.042 | 0.296 |
| Lr | 1.222 | 0.000 | 0.000 |
| S | 2.547 | 0.000 | 0.000 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Baseplate** | 4-Bolt | | **Spacing:** | 8.625 | in | | SEE ANCHOR CALC |
| **Plate Thickness:** | 0.5 | in | **Width:** | 10.625 | in | 31% | **Okay** |

**Post Insert to Base Plate Connection**

*Qty* 4 Anchor Qty at Connection



| | | |
|---|---|---|
| F | 5148.59 lb | Ω = 4 |
| Fsu | 60000.00 | |
| Ats | 0.34 in^2 | |
| n | 20.00 threads/in | |
| LE | 1.57 in | |
| Dsmin | 0.31 in | |
| Enmax | 0.28 in | |

| | |
|---|---|
| Required Tension: | 8608 lb |
| Capacity Shear: | 20594 lb |

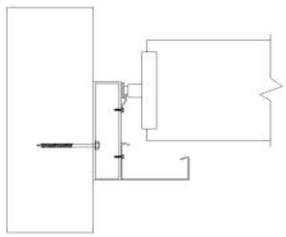
*Analyzing Beam to Post Insert with (4) M8x40 Machine screws*

42%

**OK**

**Ledger Connection**

Ledger Connection? Y



| | | |
|---|---|---|
| S= | 16 inches | Anchor spacing along ledger |
| # of Screws= | 3 pcs | Number of anchors per location |
| Required Tension: | 9 lb | |
| Required Shear: | 84 lb | |

**These are the ledger tributaries that this calculator will utilize:**

| | | |
|---|---|---|
| *W =* | *6.33 ft* | *Tributary Width* |
| *RL =* | *30.00 psf* | *Vert. Load on Tributary (LL, WL, DL, etc)* |
| *FL =* | *16.76 psf* | *Lateral Load on Tributary (Fascia Load)* |
| *DL =* | *0.00 lb/ft* | *Additional Beam Load (Weight or Service Loads)* |
| *Pv =* | *190.00 lb/ft* | *Total Vert. Loading on Beam* |
| *Pf =* | *19.73 lb/ft* | *Total Lat. Loading on Beam* |

3/8" diameter stainless steel lag screw with minimum 3" thread penetration, 3/4" edge distance, into southern yellow pine #2 wood (G = 0.55)

| | | |
|---|---|---|
| $V_{allow}$ = | *147 lb* | *Shear Capacity per Anchor* |
| $T_{allow}$ = | *405 lb* | *Tension Capacity per Anchor* |

60%

**Ledger Connection OK**

Work Prepared For: Timan Window Treatments, Inc
Project: 24577 - Raymond Tatko

## DESIGN CRITERIA:

| | | | | | |
|---|---|---|---|---|---|
| H = | 10.00 | ft, Mean Roof Height | | ASCE: | 7-16 |
| Θ = | 0.0 º | Roof Slope F= 0.0000 | | Exposure: | C |
| Vult = | 110 | mph, Wind Velocity (3-Second Gust) | | Building Category: | II |
| Kd = | 0.85 | Directionality Factor | | | |
| G = | 0.85 | Gust Effect Factor | | Snow: | Y |
| Kz = | 0.85 | Velocity Pressure Coefficient | | Ground Snow Load: | 20.00 psf |
| Kzt = | 1 | Topographic Factor | | Design Snow Load: | 25.00 psf |
| | | | | Design Live Load: | 20.00 psf |
| | | | | Design Dead Load: | 5.0 psf |
| Wind Flow: | | Clear | | Wind Porosity: | 50% |
| L = | 55.88 | ft, Overall Canopy Length | | Method: | ASD |
| W = | 12.67 | ft, Overall Canopy Width | Live Load | Lr: | 12.00 psf |
| a = | 3.00 ft | | Reduction Per | Lo: | 20.00 psf |
| | | | IBC | R1: | 0.6 |
| | | | 1607.13.2.1 | R2: | 1 |

## LOADS ON COMPONENTS & CLADDING:

(Roof Decking and Decking Fasteners)

| | | | |
|---|---|---|---|
| L1 = | 12.67 | ft, Effective Deck Panel Length | |
| W1 = | 4.22 ft | Effective Deck Panel Width | |
| A = | 53.48 ft^2 | Effective Wind Area, L1*W1 | A > 4.0*a^2 |
| CNp = | 0.6 | Positive Pressure Coefficient | |
| CNn = | -0.5 | Negative Pressure Coefficient | |
| qz = | 11.18 psf | Velocity Pressure w/ Porosity | |
| WLp = | 6.71 psf | Positive Wind Load, = qz*G*CNp | |
| WLn = | -5.36 psf | Negative Wind Load, = qz*G*CNn | |
| **Grav =** | **30.00 psf** | **D + (Lr or S or R)** | **Critical positive DP** |
| **Uplift =** | **-3.00 psf** | **0.6D + 0.7E** | **Critical negative DP** |

## LOADS ON MAIN WIND FORCE RESISTING SYSTEM:

(Beams, Columns, Foundations)

| Wind Direction, γ = 0º | | | Wind Direction, γ = 180º | | |
|---|---|---|---|---|---|
| CNWa = | 1.2 | Cnw value, load case A | CNWa = | 1.2 | Cnw value, load case A |
| CNWb = | -1.1 | Cnw value, load case B | CNWb = | -1.1 | Cnw value, load case B |
| CNLa = | 0.3 | Cnl value, load case A | CNLa = | 0.3 | Cnl value, load case A |
| CNLb = | -0.1 | Cnl value, load case B | CNLb = | -0.1 | Cnl value, load case B |

Wind Direction, γ = 90º

| | | | | | |
|---|---|---|---|---|---|
| CNa = | -0.8 | Cn value, load case A | CNb = | 0.8 | Cn value, load case B |

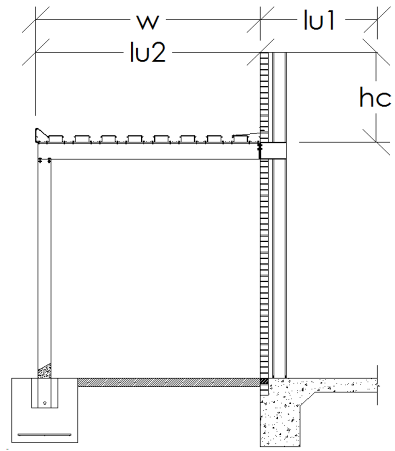
| | | | |
|---|---|---|---|
| CNp = | 0.6 | Critical Positive Pressure Coefficient | |
| CNn = | -0.5 | Critical Negative Pressure Coefficient | |
| WLp = | 6.71 psf | Critical Positive Wind Load, = qz*G*CNp | |
| WLn = | -5.36 psf | Critical Negative Wind Load, = qz*G*CNn | |
| **Grav =** | **30.00 psf** | **D + (Lr or S or R)** | **Critical positive DP** |
| **Uplift =** | **-3.00 psf** | **0.6D + 0.7E** | **Critical negative DP** |

## LOADS ON CANOPY FASCIA:

| | | |
|---|---|---|
| GCpn1 = | 1.5 | Combined Net Pressure Coefficient on windward fascia |
| GCpn1 = | -1 | Combined Net Pressure Coefficient on leeward fascia |
| **WL =** | **16.76 psf** | **Average Wind Load on Fascia, qz*GCpn*.06** |

AM | STRUCTURES

Work Prepared For: Timan Window Treatments, Inc
Project: 24577 - Raymond Tatko




**Snow Loads**

| | | |
|---|---|---|
| Pg = | 20 | psf, Ground snow load |
| Ce = | 1.0 | Exposure factor (Table 7-2) |
| Ct = | 1.2 | Thermal factor (Table 7-3) |
| Is = | 1.0 | Importance factor (Table 7-4) |
| Evs = | 1.00 ° | Eave slope |
| S = | 57.29 | Roof slope run for a rise of one |
| W = | 15.00 | ft, Horizontal distance from eave to ridge |
| γ = | 16.60 pcf | Snow density Eq. 7-3: 0.13(Pg)+14 < 30 psf |
| Cs = | 1.00 | Slope factor at 1° (Figure 7-2) |

**Balanced Snow Loads**

| | | |
|---|---|---|
| Pf = | 20.00 psf | Snow load on flat roofs (slope < 5°): Pf = max[(I)(Pg),(0.7)(Ce)(Ct)(I)(Pg)] |
| Ps = | 20.00 psf | Sloped roof snow loads (slope > 5°): Ps = (Cs)(Pf) |

**Drifts on Lower Roofs (Aerodynamic Shade)**

| | | |
|---|---|---|
| lu1= | 20.00 | ft, Length of upper roof |
| lu2= | 15.00 ft | Length of lower roof projection |
| hc= | 10.00 | ft, Height from top of lower roof to top of eave |

***Drift snow required, hc/hb>0.2***

| | | |
|---|---|---|
| hb= | 1.20 ft | Height of balanced snow: Ps/(γ) |
| hd1= | 1.23 ft | Height of snow drift (Fig 7-9): 0.43(lu)^(1/3)(Pg+10)^(1/4)-1.5 (Leeward) |
| hd2= | 0.74 ft | Height of snow drift (Fig 7-9): 0.43(lu)^(1/3)(Pg+10)^(1/4)-1.5 (Windward) |

**ASCE 7-10/7-16 - Rain-On-Snow Surcharge (7.10)**

Is Pg 20 PSF or less? YES

| | |
|---|---|
| Unreducible Snow Load | Yes |
| Include Uniform Dist. Ice Load? | Yes |
| Include surcharge load? | Yes |

| | | |
|---|---|---|
| | 5.00 psf | Rain-On-Snow Surcharge |
| hd= | 1.23 ft | Governing drift height |
| w= | 4.93 ft | Governing drift width |
| hend= | 0.00 ft | Drift height at edge of lower roof |
| pd= | 10.22 psf | Surcharge load Uniform Distribution Over Drift Width |
| | 3.36 psf | Surcharge Load Distributed over Tributary Area |

**SL= 25.00 psf Unreducible Roof Snow Load**

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Project: 24577 - Raymond Tatko

**Ice Load Due to Freezing Rain (per ASCE 7-16 - Chapter 10)**

Acounting for Accumulating Ice on Louver Blades

| | | | | |
|---|---|---|---|---|
| $t_i$ = | 0.00 | Nominal Ice Thickness (in.) | Louver (6" O.C.) | |
| $K_{zt}$ = | 1.0 | Topographic Factor | Depth (d) | 6.000 in. |
| Z = | 10.00 ft | System Height | Width (bf) | 1.866 in. |
| $I_i$ = | 1.00 | Importance Factor | Thickness | .065 in. |
| $I_d$ = | 56.00 | Ice Density (56 pcf default) | Length | 12.67 ft |
| | II | Occupancy Category | | |

**Per Table 10-1**

| | | | |
|---|---|---|---|
| $t_d$ = | 0.00 | in, Design Ice Thickness | $t_d = t_i{*}I_i{*}f_z{*}(K_{zt})^{0.35}$ |
| $W_i$ = | 0.00 psf | Weight of Ice (for td) | $W_i = (td/12){*}I_d$ |
| $F_z$ = | 0.8875 | | $F_z = (Z/33)^{0.1}$ |

**Ice Loading** Ch 10.4

Louver Ice Loading

$D_c$ = 6.32 in Circumscribing Diameter of Louver $D_c = \sqrt{d^2+bf^2}$

$A_i$ = .00 in^2 Area of Ice = $\pi t_d{*}(D_c+t_d)$

$W_{i(Louver)}$ = 0.00 plf Uniform Distributed Ice Load (Single Louver Blade)

$W_i = (A_i/144){*}I_d$

Louver Beam Ice Loading from Louver Blades

$W_{i(Louver)}$ = 0.00 plf Distributed Ice Load on Louver Blade

L= 12.67 ft Length of Longest Louver Blade

$W_{i(Beam)}$= 0.0 plf Calculated Ice Load on Louver Beam

$W_{i(Beam)} = W_{i(Louver)}$*Louver Length*(1.866"/6")

(6" O.C. Louvers In Open Position)

**$Wi_{(Louver)}$= 0.00 plf Uniform Linear Ice Load (Louver Blade)**

**$W_{i(Beam)}$= 0.00 plf Uniform Linear Ice Load (Louver Beam)**

($W_{i(Beam)}$ doubled for intermediate Louver Beams)

AM | STRUCTURES

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Project: 24577 - Raymond Tatko

## Seismic Loads Criteria

| | | | |
|---|---|---|---|
| $S_s$ = | 0.136 | Max considered response acceleration for a period of 0.2 s | |
| $S_1$ = | 0.049 | Max response acceleration at period of 1 s | |

Height of Structure = 10.00 ft    Attached to host structure? Y

| | | | |
|---|---|---|---|
| Site Class | | D | |
| $F_a$ = | 1.6 | short period amplification factor | |
| $F_v$ = | 2.4 | long period amplification factor | |
| $S_{MS}$ = | 0.218 | modified spectral response acceleration at a period of 0.2 s | $F_a$*$S_s$ |
| $S_{M1}$= | 0.118 | modified spectral response acceleration at a period of 1.0 s | $F_v$*$S_1$ |

## Spectral Response Acceleration Parameters

| | | | |
|---|---|---|---|
| $S_{DS}$ = | 0.145 | Design spectral response acceleration at a period of 0.2 s | (2/3)*$S_{ms}$ |
| $S_{D1}$= | 0.078 | design spectral response acceleration at a period of 1.0 s | (2/3)*$S_{M1}$ |

## Structural Design Requirements

| | | | |
|---|---|---|---|
| $T_a$ = | 0.112 | Approximate fundamental period (s) | $C_t$*$h_n^x$ |
| $T_L$ = | 12.0 | Long Transition Period (s) | |
| $E_V$= | 0.102 | Vertical Seismic Loads (PSF) | |
| Rp = | 2.50 | | |
| ap= | 2.500 | | |
| Ip= | 1.000 | | |

| | | | |
|---|---|---|---|
| Wp= | 509.31 lbs | Tributary Weight | |
| Fp= | 29.55 lbs | Seismic Design Force | 0.4ap*SDS*Wp/(Rp/Ip)*(1+2(z/h)) |
| FpMAX= | 118.21 lbs | | |
| FpMIN= | 22.16 lbs | Ω= | 2.00 |
| P= | 1 | **SERVICE =** | **0.7** |
| 206.87 lb-ft | | Effective Seismic Moment | (H*Fp) |
| | | SDF OK? | OK |

AM STRUCTURES
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Work Prepared For: Timan Window Treatments, Inc
Project: 24577 - Raymond Tatko

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

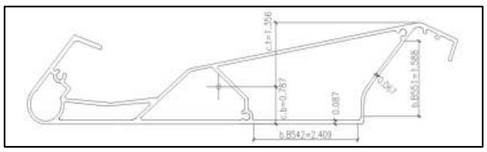
**LOUVER BLADE CHECK**

**Design Check of Azenco Louver Blade0.087"x0.087"x2.14727"/1.0406" 6063-T6 Aluminum Tube**

*Per 2020 Aluminum Design Manual*

| Alloy: | 6063 | Temper: | T6 | Critically Welded: | N |
|---|---|---|---|---|---|

**MEMBER PROPERTIES**



| | |
|---|---|
| Flange width | 9.963" |
| Flange thickness | 0.087" |
| Web height | 2.147" |
| Web thickness | 0.087" |
| Moment of inertia about axis parallel to flange | 1.04 in^4 |
| Moment of inertia about axis parallel to web | 17.38 in^4 |
| Section modulus compression x-axis | 0.78 in^3 |
| Section modulus tension x-axis | 1.31 in^3 |
| Section modulus tension y-axis | 3.16 in^3 |
| Section modulus compression y-axis | 3.95 in^3 |
| Radius of gyration about centroidal axis parallel to flange | 0.71 in |
| Radius of gyration about centroidal axis parallel to web | 2.92 in |
| Torsion constant | 1.26 in^4 |
| Cross sectional area of member | 2.04 in^2 |
| Plastic section modulus | 1.30 in^3 |
| Warping constant | 5.73 in^6 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 12.67 ft |
| Unbraced length for bending (between bracing against side-sway) | *Lb* = | 12.67 ft |
| Effective length factor | *k* = | 1.0 |
| Tensile ultimate strength | Ftu = | 30 ksi |
| Tensile yield strength | Fty = | 25 ksi |
| Compressive yield strength | Fcy = | 25 ksi |
| Shear ultimate strength | Fsu = | 18 ksi |
| Shear yield strength | Fsy = | 15 ksi |
| Compressive modulus of elasticity | E = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | | | |
|---|---|---|---|---|
| Compression in columns & beam flanges (Intercept) | | *Bc =* | 27.64 ksi | |
| Compression in columns & beam flanges (Slope) | | *Dc =* | 0.14 ksi | |
| Compression in columns & beam flanges (Intersection) | | *Cc =* | 78.38 ksi | |
| Compression in flat plates (Intercept) | | *Bp =* | 31.39 ksi | |
| Compression in flat plates (Slope) | | *Dp =* | 0.17 ksi | |
| Compression in flat plates (Intersection) | | *Cp =* | 73.55 ksi | |
| Compressive bending stress in solid rectangular bars (Intercept) | | *Bbr =* | 46.12 ksi | |
| Compressive bending stress in solid rectangular bars (Slope) | | *Dbr =* | 0.38 ksi | |
| Shear stress in flat plates (Intercept) | | *Bs =* | 18.98 ksi | |
| Shear stress in flat plates (Slope) | | *Ds =* | 0.08 ksi | |
| Shear stress in flat plates (Intersection) | | *Cs =* | 94.57 ksi | |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | | *k1c =* | 0.35 | |
| ltimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | | *k2c =* | 2.27 | |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | | *k1b =* | 0.50 | |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | | *k2b =* | 2.04 | |
| Tension coefficient | | *kt =* | 1.0 | |

**D.2 Axial Tension**

| | | | | |
|---|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | Fty_n = | 25.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fty_n/Ω =** | 15.15 ksi | |
| Tensile Rupture - Unwelded Members | *[Ftu]* | *Ftu_n =* | 30.00 ksi | |
| | | Ω = | 1.95 | |
| | | **Ftu_n/Ωt =** | 15.38 ksi | |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

| | | | | |
|---|---|---|---|---|
| Axial, gross section subject to buckling | Lower slenderness limit | *λ1 =* | 18.23 | |
| | Upper slenderness limit | *λ2 =* | 78.38 | |
| | Slenderness | *λ(max) =* | 212.97 | ≥ λ2 |
| | *[0.85π²E/λ²]* | *Fc_n =* | 1.87 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 1.13 ksi | |

**E.3 Local Buckling**

For column elements in uniform compression subject to local buckling, the uniform compressive strength is addressed in Section B.5.4 calculated below.

*B.5.4.2 - Flat elements supported on both edges (Flang*

*B.5.4.2 - Flat elements supported on both edges (Web)*

**E.4 Buckling Interaction**

| | | | | |
|---|---|---|---|---|
| Per Table B.5.1 | *[π²*E/ (1.6*b/tb)²]* | *Fe(flange) =* | 3.08 ksi | |
| | *[Fc_n]* | *Fc_n =* | 1.87 ksi | |
| | Fe(flange) > Fc_n (E.2 Member Buckling) | *Ω =* | 1.65 | |
| | | **Fc_n/Ω =** | 1.13 ksi | |
| | *[π²*E/ (1.6*h/th)²]* | *Fe(web) =* | 75.69 ksi | |
| | *[Fc_n]* | *Fc_n =* | 1.87 ksi | |
| | *Fe(web) > Fc_n (E.2 Member Buckling)* | *Ω =* | 1.65 | |
| | | **Fc_n/Ω =** | 1.13 ksi | |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | | |
|---|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[Sc*Fcy]* | Mnp = | 19.43 k-in | |
| | *[Mnp/Sx]* | Fb_n = | 14.97 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 9.07 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 38.93 k-in | |
| | *[Mnu/Z]* | Fb_n = | 30.00 ksi | |
| | | Ω = | 1.95 | |
| | | **Fb_n/Ω =** | 15.38 ksi | |

**F.4 Lateral-Torsional Buckling**

| | | | | |
|---|---|---|---|---|
| Unsymmetric shape subject to lateral-torsional buckling | | | | |
| | Slenderness for closed shape about the bending axis | *λ F.4.2.5 =* | 11.55 | |
| | Maximum slenderness | *λ(max) =* | 11.55 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 18.42 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 23.71 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 14.37 ksi | |

**UNIFORM COMPRESSION ELEMENTS**

**B.5.4.2 Flat Elements Supported on Both Edges - Web & Flange**

| | | | | |
|---|---|---|---|---|
| Uniform compression strength, flat elements supported on both edges | | | | |
| | Lower slenderness limit | *λ1 =* | 22.8 | |
| | Upper slenderness limit | *λ2 =* | 39.2 | |
| | Flange Slenderness | *b/tb =* | 112.52 | ≥ λ2 |
| | Web Slenderness | *h/th =* | 22.68 | ≤ λ1 |
| | *[k2c*√(Bp*E)/(1.6*b/tb)]* | *Fc_n1 =* | 7.10 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n1/Ω =** | 4.30 ksi | |
| | *[Fcy]* | *Fc_n2 =* | 25.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n2/Ω =** | 15.15 ksi | |

**FLEXURAL COMPRESSION ELEMENTS**

**B.5.5.1 Flat Elements Supported on Both Edges - Web**

Flexural compression strength, flat elements supported on both edges

| | | | | |
|---|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 34.73 | |
| Upper slenderness limit | *λ2 =* | 92.95 | |
| Slenderness | *h/th =* | 22.68 | ≤ λ1 |
| *[1.5*Fcy]* | *Fb_n =* | 37.50 ksi | |
| | Ω = | 1.65 | |
| | **Fb_n/Ω =** | 22.73 ksi | |

**SHEAR**

**G.2 Shear Supported on Both Edges - Web**

| | | | | |
|---|---|---|---|---|
| Members with flat elements supported on both edges | Lower slenderness limit | *λ1 =* | 38.73 | |
| | Upper slenderness limit | *λ2 =* | 75.65 | |
| | Slenderness | *h/th =* | 22.68 | ≤ λ1 |
| | *[Fsy]* | *Fv_n =* | 15.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fv_n/Ω =** | 9.09 ksi | |

**ALLOWABLE STRESSES**

| | | |
|---|---|---|
| Allowable bending stress | Fb = | 9.07 ksi |
| Allowable axial stress, compression | Fac = | 1.13 ksi |
| Allowable shear stress; webs | Fv = | 9.09 ksi |

| | | |
|---|---|---|
| Elastic buckling stress | *Fe =* | 1.13 ksi |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 6.12 ksi |

| | | | |
|---|---|---|---|
| Mmax | 499.53 | lb-ft | |
| Stress | 7.71 | ksi | |
| Fb | 9.07 ksi | | 85.032% |

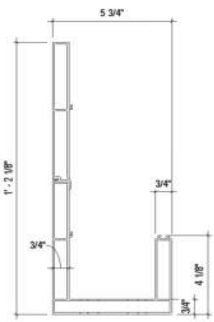
| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Louver Beam |

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 5.75"x14.125"x0.125"/0.125" 6005A-T6 Aluminum Tube**
*Per 2020 Aluminum Design Manual*

| Alloy: | 6005A | Temper: | T6 | Critically Welded: | N |
|---|---|---|---|---|---|

**MEMBER PROPERTIES**



| | | |
|---|---|---|
| Flange width | *b* = | 5.750" |
| Flange thickness | *tb* = | 0.125" |
| Web height | *h* = | 14.125" |
| Web thickness | *th* = | 0.125" |
| Moment of inertia about axis parallel to flange | *Ix* = | 80.77 in^4 |
| Moment of inertia about axis parallel to web | *Iy* = | 17.42 in^4 |
| Section modulus compression x-axis | *Sxc* = | 8.94 in^3 |
| Section modulus tension x-axis | *Sxt* = | 15.88 in^3 |
| Section modulus tension y-axis | *Syt* = | 4.34 in^3 |
| Section modulus compression y-axis | *Syc* = | 10.03 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx* = | 4.36 in |
| Radius of gyration about centroidal axis parallel to web | *ry* = | 2.02 in |
| Torsion constant | *J* = | 1.90 in^4 |
| Cross sectional area of member | *A* = | 4.25 in^2 |
| Plastic section modulus | *Z* = | 16.60 in^3 |
| Warping constant | Cw = | 5.75 in^6 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 17.04 ft |
| Unbraced length for bending (between bracing against side-sway) | *Lb* = | 17.04 ft |
| Effective length factor | *k* = | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu* = | 38 ksi |
| Tensile yield strength | *Fty* = | 35 ksi |
| Compressive yield strength | *Fcy* = | 35 ksi |
| Shear ultimate strength | *Fsu* = | 23 ksi |
| Shear yield strength | *Fsy* = | 21 ksi |
| Compressive modulus of elasticity | *E* = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc* = | 39.37 ksi |
| Compression in columns & beam flanges (Slope) | *Dc* = | 0.25 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc* = | 65.67 ksi |
| Compression in flat plates (Intercept) | *Bp* = | 45.00 ksi |
| Compression in flat plates (Slope) | *Dp* = | 0.30 ksi |
| Compression in flat plates (Intersection) | *Cp* = | 61.42 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr* = | 66.82 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr* = | 0.67 ksi |
| Shear stress in flat plates (Intercept) | *Bs* = | 27.24 ksi |
| Shear stress in flat plates (Slope) | *Ds* = | 0.14 ksi |
| Shear stress in flat plates (Intersection) | *Cs* = | 78.95 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c* = | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c* = | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b* = | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b* = | 2.04 |
| Tension coefficient | *kt* = | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | Fty_n = | 35.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 21.21 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n* = | 38.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ωt =** | 19.49 ksi |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

| | | | | |
|---|---|---|---|---|
| Axial, gross section subject to buckling | Lower slenderness limit | *λ1 =* | 17.76 | |
| | Upper slenderness limit | *λ2 =* | 65.67 | |
| | Slenderness | *λ(max) =* | 101.03 | ≥ λ2 |
| | *[0.85π²E/λ²]* | *Fc_n =* | 8.30 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 5.03 ksi | |

**E.3 Local Buckling**

For column elements in uniform compression subject to local buckling, the uniform compressive strength is addressed in Section B.5.4 calculated below.

*B.5.4.2 - Flat elements supported on both edges (Flange)*

*B.5.4.2 - Flat elements supported on both edges (Web)*

**E.4 Buckling Interaction**

| | | | | |
|---|---|---|---|---|
| Per Table B.5.1 | *[π²*E/ (1.6*b/tb)²]* | *Fe(flange) =* | 20.11 ksi | |
| | *[Fc_n]* | *Fc_n =* | 8.30 ksi | |
| | Fe(flange) > Fc_n (E.2 Member Buckling) | *Ω =* | 1.65 | |
| | | **Fc_n/Ω =** | 5.03 ksi | |
| | *[π²*E/ (1.6*h/th)²]* | *Fe(web) =* | 3.16 ksi | |
| | *[0.85π²E/λ(max)²]^1/3 * [Fe^2/3]* | *Fc_n =* | 4.36 ksi | |
| | *Fe(web) < Fc_n (E.2 Member Buckling)* | *Ω =* | 1.65 | |
| | | **Fc_n/Ω =** | 2.64 ksi | |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | | |
|---|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[1.5*Sc*Fcy]* | Mnp = | 312.73 k-in | |
| | *[Mnp/Sx]* | Fb_n = | 35.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 21.21 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 839.60 k-in | |
| | *[Mnu/Z]* | Fb_n = | 38.00 ksi | |
| | | Ω = | 1.95 | |
| | | **Fb_n/Ω =** | 19.49 ksi | |

**F.4 Lateral-Torsional Buckling**

| | | | | |
|---|---|---|---|---|
| Unsymmetric shape subject to lateral-torsional buckling | | | | |
| | Slenderness for shapes any shape about the bending axis | *λ F.4.2.5 =* | 44.83 | |
| | Maximum slenderness | *λ(max) =* | 44.83 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 240.22 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 26.88 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 16.29 ksi | |

**UNIFORM COMPRESSION ELEMENTS**

**B.5.4.2 Flat Elements Supported on Both Edges - Web & Flange**

| | | | | |
|---|---|---|---|---|
| Uniform compression strength, flat elements supported on both edges | | | | |
| | Lower slenderness limit | *λ1 =* | 20.8 | |
| | Upper slenderness limit | *λ2 =* | 32.8 | |
| | Flange Slenderness | *b/tb =* | 44.0 | ≥ λ2 |
| | Web Slenderness | *h/th =* | 111.0 | ≥ λ2 |
| | *[k2c*√(Bp*E)/(1.6*b/tb)]* | *Fc_n1 =* | 21.74 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n1/Ω =** | 13.17 ksi | |
| | *[k2c*√(Bp*E)/(1.6*h/th)]* | *Fc_n2 =* | 8.62 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n2/Ω =** | 5.22 ksi | |

**FLEXURAL COMPRESSION ELEMENTS**

**B.5.5.1 Flat Elements Supported on Both Edges - Web**

Flexural compression strength, flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 33.10 | |
| Upper slenderness limit | *λ2 =* | 77.22 | |
| Slenderness | *h/th =* | 111.00 | ≥ λ2 |
| *[k2b*SQRT(Bbr*E)/(m*h/th)]* | *Fb_n =* | 23.23 ksi | |
| | Ω = | 1.65 | |
| | **Fb_n/Ω =** | 14.08 ksi | |

**SHEAR**

**G.2 Shear Supported on Both Edges - Web**

Members with flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 35.29 | |
| Upper slenderness limit | *λ2 =* | 63.16 | |
| Slenderness | *h/th =* | 111.00 | ≥ λ2 |
| *[π²E/(1.25*h/th)²]* | *Fv_n =* | 5.18 ksi | |
| | Ω = | 1.65 | |
| | **Fv_n/Ω =** | 3.14 ksi | |

**ALLOWABLE STRESSES**

| | | |
|---|---|---|
| Allowable bending stress | Fb = | 16.29 ksi |
| Allowable axial stress, compression | Fac = | 3.32 ksi |
| Allowable shear stress; webs | Fv = | 3.14 ksi |

| | | |
|---|---|---|
| Elastic buckling stress | *Fe =* | 5.01 ksi |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 7.48 ksi |

**MEMBER LOADING**

**Bending Moments**

| | | | |
|---|---|---|---|
| Bending moment developed in member | *Mz =* | 6.9 kip-ft | |
| Bending stress developed in member | fb = | 9.26 ksi | |
| Allowable bending stress of member | Fb = | 16.29 ksi | < 1.0 |

**Axial Loads**

| | | | |
|---|---|---|---|
| Axial load developed in member | *Fx =* | 0 lb | |
| Axial stress developed in member | fa = | 0.00 ksi | |
| Allowable compressive axial stress of member | Fac = | 3.32 ksi | < 1.0 |

**Shear Loads**

| | | | |
|---|---|---|---|
| Shear load developed in member | *Vz =* | 1,619 lb | |
| Shear stress developed in member | fv = | 0.47 ksi | |
| Allowable shear stress of member webs | Fv = | 3.14 ksi | < 1.0 |

**Interaction Equations**

| | | | |
|---|---|---|---|
| | √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.59 | < 1.0 |
| Eq H.1-1 | fa/Fa + fb/Fb = | 0.00 | < 1.0 |
| Eq H.3-2 | fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.00 | < 1.0 |

**CONFIGURATION AND MOMENT TABULATION TOOLS**

# of beam= 1

| | | |
|---|---|---|
| Support Type | Beam = | Simple |
| Beam Length | L = | 17.04 ft |
| Tributary Width | W = | 6.33 ft |
| Load on Tributary (LL, WL, DL, etc) | RL = | 30.00 psf |
| Additional Beam Load (Weight or Service Loads) | DL = | 0.00 lb/ft |
| Total Loading on Beam | w = | 190.00 lb/ft |
| Shear Loading at End of Beam | Vy = | 1619 lbs |
| **CALCULATED MOMENT** | **Mmax =** | **6.9 kip-ft** |

**Deflection Check**

| | | | |
|---|---|---|---|
| | *Support =* | Simple | |
| | *Deflection Limit =* | L / 180 | |
| | *w =* | 190.00 lb/ft | |
| **ALLOWABLE DEFLECTION** | **∆Allow =** | **1.14 in** | |
| **MAXIMUM DEFLECTION** | **∆Max =** | **0.44 in** | 39% |

Simple Max Deflection = 5wl^4/384EI

**OK, Allowable Deflection Sufficient**

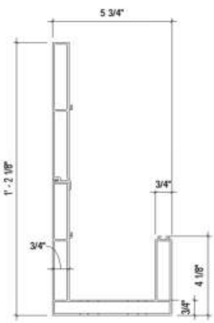
| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Main Beam |

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 5.75"x14.125"x0.125"/0.125" 6005A-T6 Aluminum Tube**
*Per 2020 Aluminum Design Manual*

| | | | | | |
|---|---|---|---|---|---|
| Alloy: | 6005A | Temper: | T6 | Critically Welded: | N |

**MEMBER PROPERTIES**




| | | |
|---|---|---|
| Flange width | *b* = | 5.750" |
| Flange thickness | *tb* = | 0.125" |
| Web height | *h* = | 14.125" |
| Web thickness | *th* = | 0.125" |
| Moment of inertia about axis parallel to flange | *Ix* = | 80.77 in^4 |
| Moment of inertia about axis parallel to web | *Iy* = | 17.42 in^4 |
| Section modulus compression x-axis | *Sxc* = | 8.94 in^3 |
| Section modulus tension x-axis | *Sxt* = | 15.88 in^3 |
| Section modulus tension y-axis | *Syt* = | 4.34 in^3 |
| Section modulus compression y-axis | *Syc* = | 10.03 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx* = | 4.36 in |
| Radius of gyration about centroidal axis parallel to web | *ry* = | 2.02 in |
| Torsion constant | *J* = | 1.90 in^4 |
| Cross sectional area of member | *A* = | 4.25 in^2 |
| Plastic section modulus | *Z* = | 16.60 in^3 |
| Warping constant | Cw = | 5.75 in^6 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 12.67 ft |
| Unbraced length for bending (between bracing against side-sway) | *Lb* = | 12.67 ft |
| Effective length factor | *k* = | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu* = | 38 ksi |
| Tensile yield strength | *Fty* = | 35 ksi |
| Compressive yield strength | *Fcy* = | 35 ksi |
| Shear ultimate strength | *Fsu* = | 23 ksi |
| Shear yield strength | *Fsy* = | 21 ksi |
| Compressive modulus of elasticity | *E* = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc* = | 39.37 ksi |
| Compression in columns & beam flanges (Slope) | *Dc* = | 0.25 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc* = | 65.67 ksi |
| Compression in flat plates (Intercept) | *Bp* = | 45.00 ksi |
| Compression in flat plates (Slope) | *Dp* = | 0.30 ksi |
| Compression in flat plates (Intersection) | *Cp* = | 61.42 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr* = | 66.82 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr* = | 0.67 ksi |
| Shear stress in flat plates (Intercept) | *Bs* = | 27.24 ksi |
| Shear stress in flat plates (Slope) | *Ds* = | 0.14 ksi |
| Shear stress in flat plates (Intersection) | *Cs* = | 78.95 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c* = | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c* = | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b* = | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b* = | 2.04 |
| Tension coefficient | *kt* = | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | Fty_n = | 35.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 21.21 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n* = | 38.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ωt =** | 19.49 ksi |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

| | | | | |
|---|---|---|---|---|
| Axial, gross section subject to buckling | Lower slenderness limit | *λ1 =* | 17.76 | |
| | Upper slenderness limit | *λ2 =* | 65.67 | |
| | Slenderness | *λ(max) =* | 75.09 | ≥ λ2 |
| | *[0.85π²E/λ²]* | *Fc_n =* | 15.03 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 9.11 ksi | |

**E.3 Local Buckling**

For column elements in uniform compression subject to local buckling, the uniform compressive strength is addressed in Section B.5.4 calculated below.

*B.5.4.2 - Flat elements supported on both edges (Flange)*

*B.5.4.2 - Flat elements supported on both edges (Web)*

**E.4 Buckling Interaction**

| | | | | |
|---|---|---|---|---|
| Per Table B.5.1 | *[π²*E/ (1.6*b/tb)²]* | *Fe(flange) =* | 20.11 ksi | |
| | *[Fc_n]* | *Fc_n =* | 15.03 ksi | |
| | Fe(flange) > Fc_n (E.2 Member Buckling) | *Ω =* | 1.65 | |
| | | **Fc_n/Ω =** | 9.11 ksi | |
| | *[π²*E/ (1.6*h/th)²]* | *Fe(web) =* | 3.16 ksi | |
| | *[0.85π²E/λ(max)²]^1/3 * [Fe^2/3]* | *Fc_n =* | 5.31 ksi | |
| | *Fe(web) < Fc_n (E.2 Member Buckling)* | *Ω =* | 1.65 | |
| | | **Fc_n/Ω =** | 3.22 ksi | |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | | |
|---|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[1.5*Sc*Fcy]* | Mnp = | 312.73 k-in | |
| | *[Mnp/Sx]* | Fb_n = | 35.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 21.21 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 839.60 k-in | |
| | *[Mnu/Z]* | Fb_n = | 38.00 ksi | |
| | | Ω = | 1.95 | |
| | | **Fb_n/Ω =** | 19.49 ksi | |

**F.4 Lateral-Torsional Buckling**

| | | | | |
|---|---|---|---|---|
| Unsymmetric shape subject to lateral-torsional buckling | | | | |
| | Slenderness for shapes any shape about the bending axis | *λ F.4.2.5 =* | 40.04 | |
| | Maximum slenderness | *λ(max) =* | 40.04 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 247.98 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 27.75 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 16.82 ksi | |

**UNIFORM COMPRESSION ELEMENTS**

**B.5.4.2 Flat Elements Supported on Both Edges - Web & Flange**

| | | | | |
|---|---|---|---|---|
| Uniform compression strength, flat elements supported on both edges | | | | |
| | Lower slenderness limit | *λ1 =* | 20.8 | |
| | Upper slenderness limit | *λ2 =* | 32.8 | |
| | Flange Slenderness | *b/tb =* | 44.0 | ≥ λ2 |
| | Web Slenderness | *h/th =* | 111.0 | ≥ λ2 |
| | *[k2c*√(Bp*E)/(1.6*b/tb)]* | *Fc_n1 =* | 21.74 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n1/Ω =** | 13.17 ksi | |
| | *[k2c*√(Bp*E)/(1.6*h/th)]* | *Fc_n2 =* | 8.62 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n2/Ω =** | 5.22 ksi | |

**FLEXURAL COMPRESSION ELEMENTS**

**B.5.5.1 Flat Elements Supported on Both Edges - Web**

Flexural compression strength, flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 33.10 | |
| Upper slenderness limit | *λ2 =* | 77.22 | |
| Slenderness | *h/th =* | 111.00 | ≥ λ2 |
| *[k2b*SQRT(Bbr*E)/(m*h/th)]* | *Fb_n =* | 23.23 ksi | |
| | Ω = | 1.65 | |
| | **Fb_n/Ω =** | 14.08 ksi | |

**SHEAR**

**G.2 Shear Supported on Both Edges - Web**

Members with flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 35.29 | |
| Upper slenderness limit | *λ2 =* | 63.16 | |
| Slenderness | *h/th =* | 111.00 | ≥ λ2 |
| *[π²E/(1.25*h/th)²]* | *Fv_n =* | 5.18 ksi | |
| | Ω = | 1.65 | |
| | **Fv_n/Ω =** | 3.14 ksi | |

**ALLOWABLE STRESSES**

| | | |
|---|---|---|
| Allowable bending stress | Fb = | 16.82 ksi |
| Allowable axial stress, compression | Fac = | 4.89 ksi |
| Allowable shear stress; webs | Fv = | 3.14 ksi |

| | | |
|---|---|---|
| Elastic buckling stress | *Fe =* | 9.07 ksi |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 7.48 ksi |

**MEMBER LOADING**

**Bending Moments**

| | | | |
|---|---|---|---|
| Bending moment developed in member | *Mz =* | 0.0 kip-ft | |
| Bending stress developed in member | fb = | 0.00 ksi | |
| Allowable bending stress of member | Fb = | 16.82 ksi | < 1.0 |

**Axial Loads**

| | | | |
|---|---|---|---|
| Axial load developed in member | *Fx =* | 0 lb | |
| Axial stress developed in member | fa = | 0.00 ksi | |
| Allowable compressive axial stress of member | Fac = | 4.89 ksi | < 1.0 |

**Shear Loads**

| | | | |
|---|---|---|---|
| Shear load developed in member | *Vz =* | 0 lb | |
| Shear stress developed in member | fv = | 0.00 ksi | |
| Allowable shear stress of member webs | Fv = | 3.14 ksi | < 1.0 |

**Interaction Equations**

| | | | |
|---|---|---|---|
| | √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.00 | < 1.0 |
| Eq H.1-1 | fa/Fa + fb/Fb = | 0.00 | < 1.0 |
| Eq H.3-2 | fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.00 | < 1.0 |

**CONFIGURATION AND MOMENT TABULATION TOOLS**

| | |
|---|---|
| # of beam= | 1 |
| # P load= | 0 |
| a= | 0.00 ft |

| | | |
|---|---|---|
| Support Type | Beam = | Simple |
| Beam Length | L = | 12.67 ft |
| Tributary Width | W = | 0.00 ft |
| | P Load= | 3237.9 lb |
| Load on Tributary (LL, WL, DL, etc) | RL = | 0.00 psf |
| Additional Beam Load (Weight or Service Loads) | DL = | 0.00 lb/ft |
| Total Loading on Beam | w = | 0.00 lb/ft |
| Shear Loading at End of Beam | Vy = | 0 lbs |
| **CALCULATED MOMENT** | **Mmax =** | **0.00 kip-ft** |

**Deflection Check**

| | | | |
|---|---|---|---|
| | *Support =* | Simple | |
| | *Deflection Limit =* | L / 180 | |
| | *w =* | 0.00 lb/ft | |
| **ALLOWABLE DEFLECTION** | **∆Allow =** | **0.84 in** | |
| **MAXIMUM DEFLECTION** | **∆Max =** | **0.00 in** | 0% |

**OK, Allowable Deflection Sufficient**

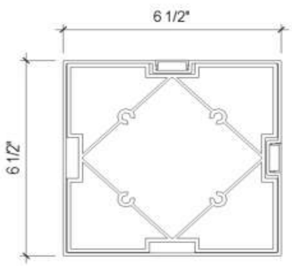
| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Post Design |

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 6.5"x6.5"x0.125"/0.125" 6063-T6 Aluminum Tube**
*Per 2020 Aluminum Design Manual*

Alloy: 6063 Temper: T6 Critically Welded: N

**MEMBER PROPERTIES**




| | | |
|---|---|---|
| Flange width | *b =* | 6.500" |
| Flange thickness | *tb =* | 0.125" |
| Web height | *h =* | 6.500" |
| Web thickness | *th =* | 0.125" |
| Moment of inertia about axis parallel to flange | *Ix =* | 40.50 in^4 |
| Moment of inertia about axis parallel to web | *Iy =* | 40.50 in^4 |
| Section modulus about the x-axis | *Sx =* | 12.46 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx =* | 2.33 in |
| Radius of gyration about centroidal axis parallel to web | *ry =* | 2.33 in |
| Torsion constant | *J =* | 32.39 in^4 |
| Cross sectional area of member | *A =* | 7.44 in^2 |
| Plastic section modulus | *Z =* | 6.05 in^3 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L =* | 10.0 ft |
| Unbraced length for bending (between bracing against side-sway X-Axis) | *Lbx =* | 10.0 ft |
| Unbraced length for bending (between bracing against side-sway Y-Axis) | *Lby =* | 10.0 ft |
| Effective length factor | *kx =* | 2.0 |
| | *ky =* | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu =* | 30 ksi |
| Tensile yield strength | *Fty =* | 25 ksi |
| Compressive yield strength | *Fcy =* | 25 ksi |
| Shear ultimate strength | *Fsu =* | 18 ksi |
| Shear yield strength | *Fsy =* | 15 ksi |
| Compressive modulus of elasticity | *E =* | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc =* | 27.64 ksi |
| Compression in columns & beam flanges (Slope) | *Dc =* | 0.14 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc =* | 78.38 ksi |
| Compression in flat plates (Intercept) | *Bp =* | 31.39 ksi |
| Compression in flat plates (Slope) | *Dp =* | 0.17 ksi |
| Compression in flat plates (Intersection) | *Cp =* | 73.55 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr =* | 46.12 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr =* | 0.38 ksi |
| Shear stress in flat plates (Intercept) | *Bs =* | 18.98 ksi |
| Shear stress in flat plates (Slope) | *Ds =* | 0.08 ksi |
| Shear stress in flat plates (Intersection) | *Cs =* | 94.57 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c =* | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c =* | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b =* | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b =* | 2.04 |
| Tension coefficient | *kt =* | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | Fty_n = | 25.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 15.15 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n =* | 30.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ωt =** | 15.38 ksi |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

| | | | | |
|---|---|---|---|---|
| Axial, gross section subject to buckling | Lower slenderness limit | *λ1 =* | 18.23 | |
| | Upper slenderness limit | *λ2 =* | 78.38 | |
| | Slenderness | *λ(max) =* | 102.89 | ≥ λ2 |
| | *[0.85π²E/λ²]* | *Fc_n =* | 8.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 4.85 ksi | |

**E.3 Local Buckling**

For column elements in uniform compression subject to local buckling, the uniform compressive strength is addressed in Section B.5.4 calculated below.

*B.5.4.2 - Flat elements supported on both edges (Flange)*

*B.5.4.2 - Flat elements supported on both edges (Web)*

**E.4 Buckling Interaction**

| | | | |
|---|---|---|---|
| Per Table B.5.1 | *[π²*E/ (1.6*b/tb)²]* | *Fe(flange) =* | 15.58 ksi |
| | *[Fc_n]* | *Fc_n =* | 8.00 ksi |
| | Fe(flange) > Fc_n (E.2 Member Buckling) | Ω = | 1.65 |
| | | **Fc_n/Ω =** | 4.85 ksi |
| | *[π²*E/ (1.6*h/th)²]* | *Fe(web) =* | 15.58 ksi |
| | *[Fc_n]* | *Fc_n =* | 8.00 ksi |
| | *Fe(web) > Fc_n (E.2 Member Buckling)* | Ω = | 1.65 |
| | | **Fc_n/Ω =** | 4.85 ksi |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | |
|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | |
| | *[Z*Fcy]* | Mnp = | 151.29 k-in |
| | *[Mnp/Z]* | Fb_n = | 25.00 ksi |
| | | Ω = | 1.65 |
| | | **Fb_n/Ω =** | 15.15 ksi |
| | Limit State of Rupture | | |
| | *[Z*Ftu/kt]* | Mnu = | 181.55 k-in |
| | *[Mnu/Z]* | Fb_n = | 30.00 ksi |
| | | Ω = | 1.95 |
| | | **Fb_n/Ω =** | 15.38 ksi |

**F.4 Lateral-Torsional Buckling**

| | | | | |
|---|---|---|---|---|
| Square or rectangular tubes subject to lateral-torsional buckling | | | | |
| | Slenderness for shapes symmetric about the bending axis | *λ F.4.2.1 =* | 15.13 | |
| | Slenderness for closed shapes | *λ F.4.2.3 =* | 14.78 | |
| | Slenderness for any shape | *λ F.4.2.5 =* | 15.13 | |
| | Maximum slenderness | *λ(max) =* | 15.13 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 161.12 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 12.93 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 7.84 ksi | |

**UNIFORM COMPRESSION ELEMENTS**

**B.5.4.2 Flat Elements Supported on Both Edges - Web & Flange**

| | | | | |
|---|---|---|---|---|
| Uniform compression strength, flat elements supported on both edges | | | | |
| | Lower slenderness limit | *λ1 =* | 22.8 | |
| | Upper slenderness limit | *λ2 =* | 39.2 | |
| | Flange Slenderness | *b/tb =* | 50.0 | ≥ λ2 |
| | Web Slenderness | *h/th =* | 50.0 | ≥ λ2 |
| | *[k2c*√(Bp*E)/(1.6*b/tb)]* | *Fc_n1 =* | 15.98 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n1/Ω =** | 9.68 ksi | |
| | *[k2c*√(Bp*E)/(1.6*h/th)]* | *Fc_n2 =* | 15.98 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n2/Ω =** | 9.68 ksi | |

**FLEXURAL COMPRESSION ELEMENTS**

**B.5.5.1 Flat Elements Supported on Both Edges - Web**

Flexural compression strength, flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 34.73 | |
| Upper slenderness limit | *λ2 =* | 92.95 | |
| Slenderness | *h/th =* | 50.00 | λ1 - λ2 |
| *[Bbr-m*Dbr*h/th]* | *Fb_n =* | 33.71 ksi | |
| | Ω = | 1.65 | |
| | **Fb_n/Ω =** | 20.43 ksi | |

**SHEAR**

**G.2 Shear Supported on Both Edges - Web**

Members with flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 38.73 | |
| Upper slenderness limit | *λ2 =* | 75.65 | |
| Slenderness | *h/th =* | 50.00 | λ1 - λ2 |
| *[Bs-1.25Ds*h/th]* | *Fv_n =* | 13.84 ksi | |
| | Ω = | 1.65 | |
| | **Fv_n/Ω =** | 8.39 ksi | |

**ALLOWABLE STRESSES**

| | | |
|---|---|---|
| Allowable bending stress | Fb = | 6.54 ksi |
| Allowable axial stress, compression | Fac = | 4.85 ksi |
| Allowable shear stress; webs | Fv = | 8.39 ksi |
| Allowable axial stress, Tension | Fat = | 15.15 ksi |
| Elastic buckling stress | *Fe =* | 4.83 ksi |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 9.68 ksi |

**MEMBER LOADING**

**Bending Moments**

| | | | |
|---|---|---|---|
| Bending moment developed in member | *Mz =* | 1.7 kip-ft | |
| Bending stress developed in member | fb = | 1.64 ksi | |
| Allowable bending stress of member | Fb = | 6.54 ksi | < 1.0 |

**Compression Loads**

| | | | |
|---|---|---|---|
| Compression load developed in member | *P =* | 3,056 lb | |
| Compression stress developed in member | fc = | 0.41 ksi | |
| Allowable compressive axial stress of member | Fac = | 4.85 ksi | < 1.0 |

**Tension Loads**

| | | | |
|---|---|---|---|
| Tension load developed in member | *T =* | 306 lb | |
| Tension stress developed in member | ft = | 0.03 ksi | |
| Allowable Tension axial stress of member | Fat = | 15.15 ksi | < 1.0 |

**Shear Loads**

| | | | |
|---|---|---|---|
| Shear load developed in member | *Vz =* | 462 lb | |
| Shear stress developed in member | fv = | 0.30 ksi | |
| Allowable shear stress of member webs | Fv = | 8.39 ksi | < 1.0 |

**Interaction Equations**

| | | |
|---|---|---|
| √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.25 | < 1.0 |
| fa/Fa + fb/Fb = | 0.34 | < 1.0 |
| fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.34 | < 1.0 |

**CONFIGURATION AND MOMENT TABULATION TOOLS**

***Member Loads:***

| | | | | |
|---|---|---|---|---|
| Mx = | 20.44 kip-in | Applied Moment Per Member | 30 PSF | Total Gravity Load |
| My = | 1.36 kip-in | Applied moment Per Member | 6.3 FT | Post Trib Area in X-Axis |
| Tn = | 0.33 kip-in | Applied Torsion Per Member | 16.1 FT | Post Trib Area in Y-Axis |
| Vx = | 216 lbs | Applied Shear Load Per Member | 3 PSF | Uplift |
| Vy = | 408 lbs | Applied Shear Load Per Member | 17 PSF | Lateral Load |
| V = | 462 lbs | Applied Resultant Shear Load Per Member | | |
| P = | 3,056 lbs | Applied axial compression load | | |
| T = | 306 lbs | Applied axial tension load | 2.48 kip-in | Seismic Moment |

| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Member/Detail: | Beam To Beam |

## Steel Spaced Thread Tapping Screw to Aluminum Connections

†2020 Aluminum Design Manual, *AMMA TIR-A9-2014

Anchor: 1/4-14 SMS, 316 SS, Steel Screw

| | | |
|---|---|---|
| Size: | 1/4-14 SMS | Nominal Anchor Size Designation |
| Alloy: | 316 SS | Screw Material |
| Ftu= | 100 ksi | Anchor Ultimate Tensile Strength |
| Fy = | 65 ksi | Anchor Yield Strength |
| D = | 0.250'' | Nominal Screw Diameter (*Table 20.1,20.2) |
| Dmin = | 0.185'' | Basic Minor Diameter (*Table 20.1,20.2) |
| As = | 0.027 in² | Tensile Stress Area (*Table 20.1,20.2) |
| Ar = | 0.027 in² | Thread Root Area (*Table 20.1,20.2) |
| n = | 14 | Thread Per Inch |
| Dw= | 0.625'' | Washer Diameter ☐ Consider Washer? |
| Dws = | 0.500'' | Anchor Head Diameter |
| Dh = | 0.250'' | Nominal Hole Diameter |
| Screw Boss? | No | Is anchor placed in a screw boss/chase/slot? |
| Countersunk? | No | Yes or No? |
| CS Depth = | | Countersink depth |
| de = | 0.500'' | Aluminum Edge Distance |

Member in Contact with Screw Head:

| | | |
|---|---|---|
| Alloy 1: | 6063-T6 | |
| t1 = | 0.125'' | Thickness of Member 1 |
| Ftu1 = | 30 ksi | Tensile Ultimate Strength of Member 1 |
| Fty1 = | 25 ksi | Tensile Yield Strength of Member 1 |

Member not in Contact with Screw Head:

| | | |
|---|---|---|
| Alloy 2: | 6063-T6 | |
| t2 = | 0.125'' | Thickness of Member 2 |
| Le = | 0.125'' | Depth of Full Thread Engagement Into *t2* (Not Including Tapping/Drilling Point) |
| Ftu2 = | 30 ksi | Tensile Ultimate Strength of Member 2 |
| Fty2 = | 25 ksi | Tensile Yield Strength of Member 2 |
| t3 = | 0.125'' | Screw Boss Wall Thickness |
| Le1 = | 0.500'' | Minimum Depth of Full Thread Engagement Into S*crew Boss If Applicable* (Not Including Tapping/Drilling Point) |

Allowable Tension

| | | |
|---|---|---|
| C= | 1.0 | Coeff. Dependent On Screw Location (†Sect. J.5.4.2) |
| Ks= | 1.2 | Coeff. Dependent On Member 2 Thickness (†Sect. J.5.4.1.1b) |
| Rn_t1 = | 937.5 lb | Nominal Pull-Out Strength Of Screw (†Sect. J.5.4.1.1b) |
| Rn_t2 = | 937.5 lb | Nominal Pull-Over Strength Of Screw (†Sect. J.5.4.2) |
| Rn_t3 = | N/A | Nominal Pull-Out Strength From Screw Boss (if applicable) (†Sect. J.5.4.1.2) |
| Pnt = | 896.0 lb | Allowable Tensile Capacity Of Screw (*Eqn. 10.4-10.7) |
| Ω = | 3.0 | Safety Factor For Connections; Building Type Structures |
| Ω = | 3.0 | Safety Factor For Anchor |

**Allowable Tension = 313 lb**

Allowable Shear:

| | | |
|---|---|---|
| Rn_v1 = | 1875.0 lb | Bearing On Member 1 (†Sect. J.5.5.1) |
| Rn_v2 = | 1875.0 lb | Bearing On Member 2 (†Sect. J.5.5.1) |
| Rn_v3 = | 2784.2 lb | Screw Tilting (†Sect. J.5.5.2) |
| Rn_v4 = | N/A | Shear Capacity Of Screw Boss Wall |
| Pnv = | 517.3 lb | Allowable Shear Capacity Of Screw (*Eqn. 7.5) |
| Ω = | 3.0 | Safety Factor For Connections; Building Type Structures |
| Ω = | 3.0 | Safety Factor For Anchor |

**Allowable Shear = 517 lb**

Alternate Options:

☐ Disregard the limiting allowable capacities from Member 1 (member in contact with screw head)

☐ Disregard the limiting allowable capacities from Member 2 (member in NOT in contact with screw head)

**Concentrated Shear & Tensile Reactions** ☑ (Select this connection type)

| | | |
|---|---|---|
| *Qty* | 6 | Anchor Qty at Connection |
| *Treq* | 0 lb | Required Tensile Loading on Connection |
| *Vreq* | 1619 lb | Required Shear Loading on Connection |
| *n* | 1.00 | Exponent factor |
| *Tcap* | 1875 lb | Tensile capacity of connection (Qty * Rz) |
| *Vcap* | 3104 lb | Shear capacity of connection (Qty * Rx) |

$$\frac{R_Z}{T_{CAP}} + \frac{R_X}{V_{CAP}} = \quad 0.52$$

**OK, (6) anchors sufficient**

AM | STRUCTURES

| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Member/Detail: | CLIP TO POST CONNECTION |

## Steel Spaced Thread Tapping Screw to Aluminum Connections

†2020 Aluminum Design Manual, *AMMA TIR-A9-2014

| | | |
|---|---|---|
| Anchor: | 1/4-14 SMS, 316 SS, Steel Screw | |
| Size: | 1/4-14 SMS | Nominal Anchor Size Designation |
| Alloy: | 316 SS | Screw Material |
| Ftu= | 100 ksi | Anchor Ultimate Tensile Strength |
| Fy = | 65 ksi | Anchor Yield Strength |
| D = | 0.250'' | Nominal Screw Diameter (*Table 20.1,20.2) |
| Dmin = | 0.185'' | Basic Minor Diameter (*Table 20.1,20.2) |
| As = | 0.027 $in^2$ | Tensile Stress Area (*Table 20.1,20.2) |
| Ar = | 0.027 $in^2$ | Thread Root Area (*Table 20.1,20.2) |
| n = | 14 | Thread Per Inch |
| Dw= | 0.625'' | Washer Diameter ☐ Consider Washer? |
| Dws = | 0.500'' | Anchor Head Diameter |
| Dh = | 0.250'' | Nominal Hole Diameter |
| Screw Boss? | No | Is anchor placed in a screw boss/chase/slot? |
| Countersunk? | No | Yes or No? |
| CS Depth = | | Countersink depth |
| de = | 0.500'' | Aluminum Edge Distance |

Member in Contact with Screw Head:

| | | |
|---|---|---|
| Alloy 1: | 6063-T6 | |
| t1 = | 0.125'' | Thickness of Member 1 |
| Ftu1 = | 30 ksi | Tensile Ultimate Strength of Member 1 |
| Fty1 = | 25 ksi | Tensile Yield Strength of Member 1 |

Member not in Contact with Screw Head:

| | | |
|---|---|---|
| Alloy 2: | 6063-T6 | |
| t2 = | 0.125'' | Thickness of Member 2 |
| Le = | 0.125'' | Depth of Full Thread Engagement Into *t2* (Not Including Tapping/Drilling Point) |
| Ftu2 = | 30 ksi | Tensile Ultimate Strength of Member 2 |
| Fty2 = | 25 ksi | Tensile Yield Strength of Member 2 |
| t3 = | 0.125'' | Screw Boss Wall Thickness |
| Le1 = | 0.500'' | Minimum Depth of Full Thread Engagement Into S*crew Boss If Applicable* (Not Including Tapping/Drilling Point) |

Allowable Tension

| | | |
|---|---|---|
| C= | 1.0 | Coeff. Dependent On Screw Location (†Sect. J.5.4.2) |
| Ks= | 1.2 | Coeff. Dependent On Member 2 Thickness (†Sect. J.5.4.1.1b) |
| Rn_t1 = | 937.5 lb | Nominal Pull-Out Strength Of Screw (†Sect. J.5.4.1.1b) |
| Rn_t2 = | 937.5 lb | Nominal Pull-Over Strength Of Screw (†Sect. J.5.4.2) |
| Rn_t3 = | N/A | Nominal Pull-Out Strength From Screw Boss (if applicable) (†Sect. J.5.4.1.2) |
| Pnt = | 896.0 lb | Allowable Tensile Capacity Of Screw (*Eqn. 10.4-10.7) |
| Ω = | 3.0 | Safety Factor For Connections; Building Type Structures |
| Ω = | 3.0 | Safety Factor For Anchor |

**Allowable Tension = 313 lb**

Allowable Shear:

| | | |
|---|---|---|
| Rn_v1 = | 1875.0 lb | Bearing On Member 1 (†Sect. J.5.5.1) |
| Rn_v2 = | 1875.0 lb | Bearing On Member 2 (†Sect. J.5.5.1) |
| Rn_v3 = | 2784.2 lb | Screw Tilting (†Sect. J.5.5.2) |
| Rn_v4 = | N/A | Shear Capacity Of Screw Boss Wall |
| Pnv = | 517.3 lb | Allowable Shear Capacity Of Screw (*Eqn. 7.5) |
| Ω = | 3.0 | Safety Factor For Connections; Building Type Structures |
| Ω = | 3.0 | Safety Factor For Anchor |

**Allowable Shear = 517 lb**

Alternate Options:

- ☐ Disregard the limiting allowable capacities from Member 1 (member in contact with screw head)
- ☐ Disregard the limiting allowable capacities from Member 2 (member in NOT in contact with screw head)

**Concentrated Shear & Tensile Reactions** ☑ (Select this connection type)

| | | |
|---|---|---|
| *Qty* | 6 | Anchor Qty at Connection |
| *Treq* | 0 lb | Required Tensile Loading on Connection |
| *Vreq* | 462 lb | Required Shear Loading on Connection |
| *n* | 1.00 | Exponent factor |
| *Tcap* | 1875 lb | Tensile capacity of connection (Qty * Rz) |
| *Vcap* | 3104 lb | Shear capacity of connection (Qty * Rx) |

$$\frac{R_Z}{T_{CAP}} + \frac{R_X}{V_{CAP}} = \quad 0.15$$

**OK, (6) anchors sufficient**

| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Detail: | Ledger connection to Host |

## Loading

Design Uplift (WL) = 3.00 psf

Design Gravity Load ("Grav") = 24.00 psf

Governing Load

*Ledger Configuration*

| | | |
|---|---|---|
| W = | 6.33 ft | Tributary Width |
| RL = | 30.00 psf | Load on Tributary (LL, WL, DL, etc) |
| FL = | 30.00 psf | Load on Tributary (LL, WL, DL, etc) |
| DL = | 0.00 lb/ft | Additional Beam Load (Weight or Service Loads) |
| Pv = | 190.00 lb/ft | Total Vertical Loading on Beam |
| Pf = | 19.73 lb/ft | Total Lateral Loading on Beam |
| S= | 1.33 ft | Anchor spacing |
| # of Screws= | 3 pcs | Number of anchors per location |

| | | |
|---|---|---|
| Shear required= | 84.44 lb | Per anchor |
| Tension required= | 9.38 lb | Per anchor |

| | | | |
|---|---|---|---|
| Shear Connection Capacity= | 147.00 lb | Tension Connection Capacity= | 405.00 lb |

Connection Check= 0.60 **Ledger Connection OK**

| | | |
|---|---|---|
| Bracket Spacing= | 16 | in |
| Shear required= | 253.33 lb | Bracket |
| Tension required= | 26.31 lb | Bracket |
| Gutter Size= | 7.625 | in |
| Moment Arm= | 1931.6667 | lb-in |
| Beam Depth= | 5.3125 | in |
| T/C Required= | 390 | lb |

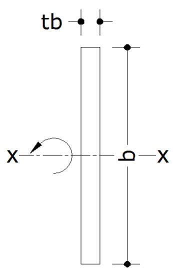
| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Top Bent Plate |

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 0.25"x3" 6063-T6 Aluminum Flat Plate**
*Per 2020 Aluminum Design Manual*

| | | | | | |
|---|---|---|---|---|---|
| Alloy: | 6063 | Temper: | T6 | Critically Welded: | N |

**MEMBER PROPERTIES**




| | | |
|---|---|---|
| Flat Plate Height | *b* = | 0.250" |
| Flat Plate Thickness | *tb* = | 3.000" |
| Moment of inertia about axis parallel to flange | *Ix* = | 0.00 in^4 |
| Moment of inertia about axis parallel to web | *Iy* = | 0.56 in^4 |
| Section modulus about the x-axis | *Sx* = | 0.03 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx* = | 0.07 in |
| Radius of gyration about centroidal axis parallel to web | *ry* = | 0.87 in |
| Torsion constant | *J* = | 2.25 in^4 |
| Cross sectional area of member | *A* = | 0.75 in^2 |
| Plastic section modulus | *Z* = | 0.05 in^3 |
| Warping constant | Cw = | 0.00 in^6 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 0.64 ft |
| Unbraced length for bending (between bracing against side-sway) | *Lb* = | 0.64 ft |
| Effective length factor | *k* = | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu* = | 30 ksi |
| Tensile yield strength | *Fty* = | 25 ksi |
| Compressive yield strength | *Fcy* = | 25 ksi |
| Shear ultimate strength | *Fsu* = | 18 ksi |
| Shear yield strength | *Fsy* = | 15 ksi |
| Compressive modulus of elasticity | *E* = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc* = | 27.64 ksi |
| Compression in columns & beam flanges (Slope) | *Dc* = | 0.14 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc* = | 78.38 ksi |
| Compression in flat plates (Intercept) | *Bp* = | 31.39 ksi |
| Compression in flat plates (Slope) | *Dp* = | 0.17 ksi |
| Compression in flat plates (Intersection) | *Cp* = | 73.55 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr* = | 46.12 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr* = | 0.38 ksi |
| Compressive bending stress in solid rectangular bars (Intersection) | *Cbr* = | 80.56 ksi |
| Shear stress in flat plates (Intercept) | *Bs* = | 18.98 ksi |
| Shear stress in flat plates (Slope) | *Ds* = | 0.08 ksi |
| Shear stress in flat plates (Intersection) | *Cs* = | 94.57 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c* = | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c* = | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b* = | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b* = | 2.04 |
| Tension coefficient | *kt* = | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | *Fty_n* = | 25.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 15.15 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n* = | 30.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ω =** | 15.38 ksi |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

| | | | | |
|---|---|---|---|---|
| Axial, gross section subject to buckling | Lower slenderness limit | $\lambda 1$ = | 18.23 | |
| | Upper slenderness limit | $\lambda 2$ = | 78.38 | |
| | Slenderness | $\lambda(max)$ = | 105.66 | ≥ $\lambda 2$ |
| | *[0.85π²E/λ²]* | *Fc_n* = | 7.59 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 4.60 ksi | |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | | |
|---|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[Z*Fcy]* | Mnp = | 1.17 k-in | |
| | *[Mnp/Z]* | Fb = | 25.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 15.15 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 1.41 k-in | |
| | *[Mnu/Z]* | Fb = | 30.00 ksi | |
| | | Ω = | 1.95 | |
| | | **Fb_n/Ω =** | 15.38 ksi | |

**F.4 Lateral-Torsional Buckling**

| | | | | |
|---|---|---|---|---|
| Rectangular bars subject to lateral-torsional buckling | | | | |
| | Slenderness for shapes symmetric about the bending axis | *λ F.4.2.1* = | 1.05 | |
| | Slenderness for rectangular bars | *λ F.4.2.4* = | 1.06 | |
| | Slenderness for any shape | *λ F.4.2.5* = | 1.05 | |
| | Maximum slenderness | *λ(max)* = | 1.06 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 1.16 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 37.21 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 22.55 ksi | |

**SHEAR**

**G.2 Shear Supported on Both Edges**

| | | | | |
|---|---|---|---|---|
| Members with flat elements supported on both edges | | | | |
| | Lower slenderness limit | *λ1* = | 38.73 | |
| | Upper slenderness limit | *λ2* = | 75.65 | |
| | Slenderness | *b/tb* = | 0.08 | ≤ λ1 |
| | *[Fsy]* | *Fv_n* = | 15.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fv_n/Ω =** | 9.09 ksi | |

**ALLOWABLE STRESSES**

| | | | |
|---|---|---|---|
| Allowable bending stress | Fb = | 15.15 ksi | |
| Allowable axial stress, compression | Fac = | 4.60 ksi | |
| Allowable shear stress | Fv = | 9.09 ksi | |
| Elastic buckling stress | *Fe* = | 4.58 ksi | |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao* = | 4.60 ksi | |

**MEMBER LOADING**

**Bending Moments**

| | | | |
|---|---|---|---|
| Bending moment developed in member | *Mz* = | 0.0 kip-ft | |
| Bending stress developed in member | fb = | 0.00 ksi | |
| Allowable bending stress of member | Fb = | 15.15 ksi | < 1.0 |

**Axial Loads**

| | | | |
|---|---|---|---|
| Axial load developed in member | *Fx* = | 390 lb | |
| Axial stress developed in member | fa = | 0.52 ksi | |
| Allowable compressive axial stress of member | Fac = | 4.60 ksi | < 1.0 |

**Shear Loads**

| | | | |
|---|---|---|---|
| Shear load developed in member | *Vz* = | 253 lb | |
| Shear stress developed in member | fv = | 0.34 ksi | |
| Allowable shear stress of member | Fv = | 9.09 ksi | < 1.0 |

**Interaction Equations**

| | | | |
|---|---|---|---|
| | √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.00 | < 1.0 |
| Eq H.1-1 | fa/Fa + fb/Fb = | 0.00 | < 1.0 |
| Eq H.3-2 | fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.00 | < 1.0 |

| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Member/Detail: | Gutter Connection Check |

## Steel Spaced Thread Tapping Screw to Aluminum Connections

†2020 Aluminum Design Manual, *AMMA TIR-A9-2014

Anchor: 1/4-14 SMS, 316 SS, Steel Screw

| | | |
|---|---|---|
| Size: | 1/4-14 SMS | Nominal Anchor Size Designation |
| Alloy: | 316 SS | Screw Material |
| Ftu= | 100 ksi | Anchor Ultimate Tensile Strength |
| Fy = | 65 ksi | Anchor Yield Strength |
| D = | 0.250'' | Nominal Screw Diameter (*Table 20.1,20.2) |
| Dmin = | 0.185'' | Basic Minor Diameter (*Table 20.1,20.2) |
| As = | 0.027 in² | Tensile Stress Area (*Table 20.1,20.2) |
| Ar = | 0.027 in² | Thread Root Area (*Table 20.1,20.2) |
| n = | 14 | Thread Per Inch |
| Dw= | 0.625'' | Washer Diameter ☐ Consider Washer? |
| Dws = | 0.500'' | Anchor Head Diameter |
| Dh = | 0.250'' | Nominal Hole Diameter |
| Screw Boss? | No | Is anchor placed in a screw boss/chase/slot? |
| Countersunk? | No | Yes or No? |
| CS Depth = | | Countersink depth |
| de = | 0.500'' | Aluminum Edge Distance |

Member in Contact with Screw Head:

| | | |
|---|---|---|
| Alloy 1: | 6063-T6 | |
| t1 = | 0.141'' | Thickness of Member 1 |
| Ftu1 = | 30 ksi | Tensile Ultimate Strength of Member 1 |
| Fty1 = | 25 ksi | Tensile Yield Strength of Member 1 |

Member not in Contact with Screw Head:

| | | |
|---|---|---|
| Alloy 2: | 6063-T6 | |
| t2 = | 0.125'' | Thickness of Member 2 |
| Le = | 0.125'' | Depth of Full Thread Engagement Into *t2* (Not Including Tapping/Drilling Point) |
| Ftu2 = | 30 ksi | Tensile Ultimate Strength of Member 2 |
| Fty2 = | 25 ksi | Tensile Yield Strength of Member 2 |
| t3 = | 0.125'' | Screw Boss Wall Thickness |
| Le1 = | 0.500'' | Minimum Depth of Full Thread Engagement Into S*crew Boss If Applicable* (Not Including Tapping/Drilling Point) |

Allowable Tension

| | | |
|---|---|---|
| C= | 1.0 | Coeff. Dependent On Screw Location (†Sect. J.5.4.2) |
| Ks= | 1.2 | Coeff. Dependent On Member 2 Thickness (†Sect. J.5.4.1.1b) |
| Rn_t1 = | 937.5 lb | Nominal Pull-Out Strength Of Screw (†Sect. J.5.4.1.1b) |
| Rn_t2 = | 1054.7 lb | Nominal Pull-Over Strength Of Screw (†Sect. J.5.4.2) |
| Rn_t3 = | N/A | Nominal Pull-Out Strength From Screw Boss (if applicable) (†Sect. J.5.4.1.2) |
| Pnt = | 896.0 lb | Allowable Tensile Capacity Of Screw (*Eqn. 10.4-10.7) |
| Ω = | 3.0 | Safety Factor For Connections; Building Type Structures |
| Ω = | 3.0 | Safety Factor For Anchor |

**Allowable Tension = 313 lb**

Allowable Shear:

| | | |
|---|---|---|
| Rn_v1 = | 2109.4 lb | Bearing On Member 1 (†Sect. J.5.5.1) |
| Rn_v2 = | 1875.0 lb | Bearing On Member 2 (†Sect. J.5.5.1) |
| Rn_v3 = | 2784.2 lb | Screw Tilting (†Sect. J.5.5.2) |
| Rn_v4 = | N/A | Shear Capacity Of Screw Boss Wall |
| Pnv = | 517.3 lb | Allowable Shear Capacity Of Screw (*Eqn. 7.5) |
| Ω = | 3.0 | Safety Factor For Connections; Building Type Structures |
| Ω = | 3.0 | Safety Factor For Anchor |

**Allowable Shear = 517 lb**

Alternate Options:

☐ Disregard the limiting allowable capacities from Member 1 (member in contact with screw head)

☐ Disregard the limiting allowable capacities from Member 2 (member in NOT in contact with screw head)

**Concentrated Shear & Tensile Reactions** ☑ (Select this connection type)

| | | |
|---|---|---|
| *Qty* | 4 | Anchor Qty at Connection |
| *Treq* | 390 lb | Required Tensile Loading on Connection |
| *Vreq* | 0 lb | Required Shear Loading on Connection |
| *n* | 1.00 | Exponent factor |
| *Tcap* | 1250 lb | Tensile capacity of connection (Qty * Rz) |
| *Vcap* | 2069 lb | Shear capacity of connection (Qty * Rx) |

$$\frac{R_Z}{T_{CAP}} + \frac{R_X}{V_{CAP}} = \quad 0.31$$

**OK, (4) anchors sufficient**

| | |
|---|---|
| Work Prepared For: | Hudson |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Base Plate Design |

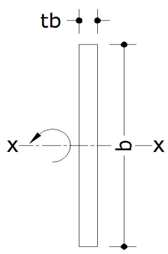
**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 10.625"x0.5" 6063-T6 Aluminum Flat Plate**

*Per 2020 Aluminum Design Manual*

Alloy: 6063 Temper: T6 Critically Welded: N

**MEMBER PROPERTIES**




| | | |
|---|---|---|
| Flat Plate Height | *b* = | 10.625" |
| Flat Plate Thickness | *tb* = | 0.500" |
| Moment of inertia about axis parallel to flange | *Ix* = | 49.98 in^4 |
| Moment of inertia about axis parallel to web | *Iy* = | 0.11 in^4 |
| Section modulus about the x-axis | *Sx* = | 9.41 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx* = | 3.07 in |
| Radius of gyration about centroidal axis parallel to web | *ry* = | 0.14 in |
| Torsion constant | *J* = | 0.44 in^4 |
| Cross sectional area of member | *A* = | 5.31 in^2 |
| Plastic section modulus | *Z* = | 14.11 in^3 |
| Warping constant | Cw = | 0.00 in^6 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 0.72 ft |
| Unbraced length for bending (between bracing against side-sway) | *Lb* = | 0.72 ft |
| Effective length factor | *k* = | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu* = | 30 ksi |
| Tensile yield strength | *Fty* = | 25 ksi |
| Compressive yield strength | *Fcy* = | 25 ksi |
| Shear ultimate strength | *Fsu* = | 18 ksi |
| Shear yield strength | *Fsy* = | 15 ksi |
| Compressive modulus of elasticity | *E* = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc* = | 27.64 ksi |
| Compression in columns & beam flanges (Slope) | *Dc* = | 0.14 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc* = | 78.38 ksi |
| Compression in flat plates (Intercept) | *Bp* = | 31.39 ksi |
| Compression in flat plates (Slope) | *Dp* = | 0.17 ksi |
| Compression in flat plates (Intersection) | *Cp* = | 73.55 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr* = | 46.12 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr* = | 0.38 ksi |
| Compressive bending stress in solid rectangular bars (Intersection) | *Cbr* = | 80.56 ksi |
| Shear stress in flat plates (Intercept) | *Bs* = | 18.98 ksi |
| Shear stress in flat plates (Slope) | *Ds* = | 0.08 ksi |
| Shear stress in flat plates (Intersection) | *Cs* = | 94.57 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c* = | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c* = | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b* = | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b* = | 2.04 |
| Tension coefficient | *kt* = | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | *Fty_n* = | 25.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 15.15 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n* = | 30.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ω =** | 15.38 ksi |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

Axial, gross section subject to buckling

| | | | | |
|---|---|---|---|---|
| | Lower slenderness limit | *λ1 =* | 18.23 | |
| | Upper slenderness limit | *λ2 =* | 78.38 | |
| | Slenderness | *λ(max) =* | 59.76 | < λ2 |
| | *[(Bc-Dc*λ)(0.85+0.15*((Cc-λ)/(Cc-λ1))]* | *Fc_n =* | 17.03 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 10.32 ksi | |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | | |
|---|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[Z*Fcy]* | Mnp = | 352.78 k-in | |
| | *[Mnp/Z]* | Fb = | 25.00 ksi | |
| | | *Ω =* | 1.65 | |
| | | **Fb_n/Ω =** | 15.15 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 423.34 k-in | |
| | *[Mnu/Z]* | Fb = | 30.00 ksi | |
| | | *Ω =* | 1.95 | |
| | | **Fb_n/Ω =** | 15.38 ksi | |

**F.4 Lateral-Torsional Buckling**

Rectangular bars subject to lateral-torsional buckling

| | | | | |
|---|---|---|---|---|
| | Slenderness for shapes symmetric about the bending axis | *λ F.4.2.1 =* | 62.30 | |
| | Slenderness for rectangular bars | *λ F.4.2.4 =* | 44.04 | |
| | Slenderness for any shape | *λ F.4.2.5 =* | 62.30 | |
| | Maximum slenderness | *λ(max) =* | 62.30 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 193.69 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 20.59 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 12.48 ksi | |

**G.2 Shear Supported on Both Edges**

Members with flat elements supported on both edges

| | | | | |
|---|---|---|---|---|
| | Lower slenderness limit | *λ1 =* | 38.73 | |
| | Upper slenderness limit | *λ2 =* | 75.65 | |
| | Slenderness | *b/tb =* | 21.25 | ≤ λ1 |
| | *[Fsy]* | *Fv_n =* | 15.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fv_n/Ω =** | 9.09 ksi | |

**ALLOWABLE STRESSES**

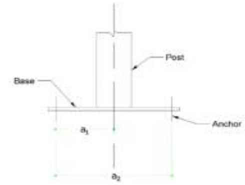
| | | |
|---|---|---|
| Allowable bending stress | Fb = | 12.48 ksi |
| Allowable axial stress, compression | Fac = | 10.32 ksi |
| Allowable shear stress | Fv = | 9.09 ksi |

| | | |
|---|---|---|
| Elastic buckling stress | *Fe =* | 14.32 ksi |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 10.32 ksi |

| | | | | |
|---|---|---|---|---|
| **MEMBER LOADING** | | | | |
| **Bending Moments** | | | | |
| | Bending moment developed in member | *Mz* = | 2.9 kip-ft | |
| | Bending stress developed in member | fb = | 3.70 ksi | |
| | Allowable bending stress of member | Fb = | 12.48 ksi | < 1.0 |
| **Axial Loads** | | | | |
| | Axial load developed in member | *Fx* = | 462 lb | |
| | Axial stress developed in member | fa = | 0.09 ksi | |
| | Allowable compressive axial stress of member | Fac = | 10.32 ksi | < 1.0 |
| **Shear Loads** | | | | |
| | Shear load developed in member | *Vz* = | 3,056 lb | |
| | Shear stress developed in member | fv = | 0.58 ksi | |
| | Allowable shear stress of member | Fv = | 9.09 ksi | < 1.0 |
| **Interaction Equations** | | | | |
| | | √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.30 | < 1.0 |
| | Eq H.1-1 | fa/Fa + fb/Fb = | 0.31 | < 1.0 |
| | Eq H.3-2 | fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.10 | < 1.0 |

AM | STRUCTURES

Work Prepared For: Timan Window Treatments, Inc
Project: 24577 - Raymond Tatko
Mark/Detail: Post anchors to concrete



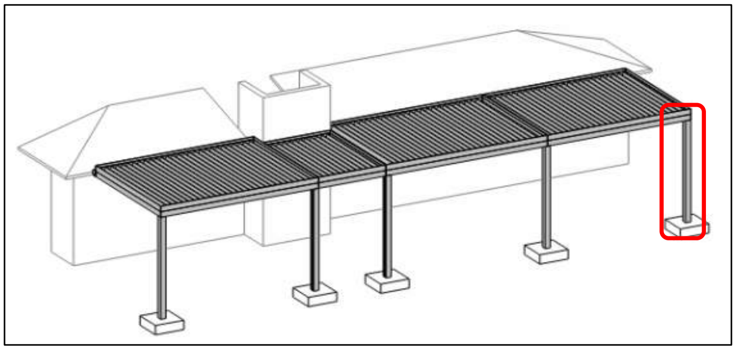

| Design Loads (LRFD) | | |
|---|---|---|
| **M** | **32710** | **lb-in** |
| **T** | **489** | **lb** |
| **C** | **4889** | **lb** |
| **V** | **739** | **lb** |

AM STRUCTURES
1153 Town Center Drive #201 Jupiter, FL 33458
PH: 561-951-0099

## Support Posts

Check intermediate, edge, or none? Edge

**Edge Support Post Configuration**



| | | | |
|---|---|---|---|
| Mounting Height Above Grade: | 0.0 ft | *(Enter 0 for installations at ground level)* | |
| | | Total Mean Roof Height: | 10.0 ft |
| Height of Posts: | 10.0 ft | | |
| Attached to host? | Y | Roof Eave Height= | 20.0 ft<br>OPEN |

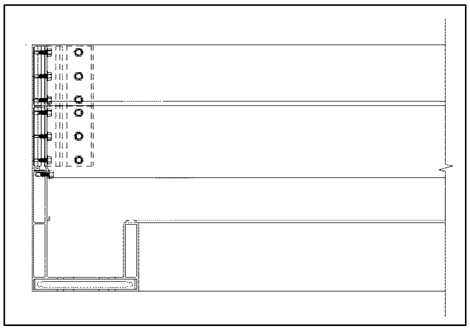
## Support Posts - Edge Condition Analysis

Post Size: 6.5" x 6.5" x 0.125"

| | | |
|---|---|---|
| *X - AXIS Post Trib =* | *6.33* | *ft* |
| *Y - AXIS Post Trib =* | *7.38* | *ft* Host Attached |
| *FH1 =* | *14.13* | *in, (side fascia height at HT1, normal to lateral windload)* |

| | | |
|---|---|---|
| | Max Moment/Axial/Shear | 29% |
| | Moment/Axial Check: | 29% |
| | Shear Check | 2% |
| **ASD Method** | Required Tension: | 140 lb |
| | Required Compression: | 1401 lb |
| | Required Shear: | 320 lb |
| | Required Moment | 1.7 kip-ft |

**Beam to Beam (Clip in Shear)**



| | | |
|---|---|---|
| *Qty* | 6 | Anchor Qty at Connection per Beam |

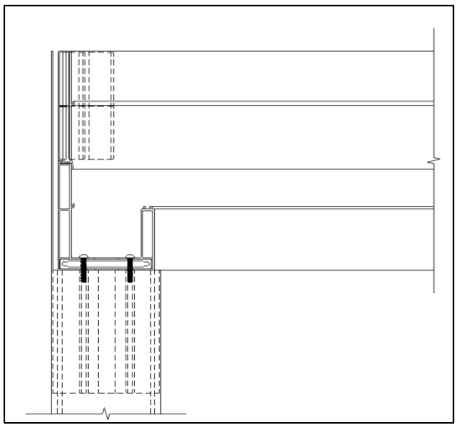
| | |
|---|---|
| Required Tension: | 0 lb |
| Required Shear: | 1619 lb |

*(Analyzing 1/4-14 SMS, 316 SS, Steel Screw to 0.125" x 0.125" connecting parts thicknesses)*

52%

**OK, (6) anchors sufficient**

**Beam to Post Insert Connection**



| | | |
|---|---|---|
| *Qty* | 4 | Anchor Qty at Connection |

| | | |
|---|---|---|
| F | 5148.59 lb | Ω = 4 |
| Fsu | 60000.00 | |
| Ats | 0.34 in^2 | |
| n | 20.00 threads/in | |
| LE | 1.57 in | |
| Dsmin | 0.31 in | |
| Enmax | 0.28 in | |

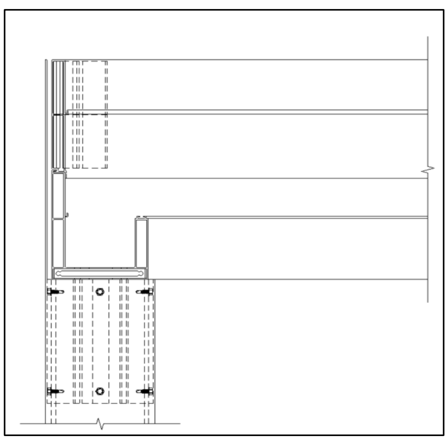
| | |
|---|---|
| Required Tension: | 140 lb |
| Capacity Shear: | 20594 lb |

*Analyzing Beam to Post Insert with (4) M8x40 Machine screws*

1%

**OK**

**Post Insert to Post Connection**



| | | |
|---|---|---|
| *Qty* | 6 | Anchor Qty at Connection |

| | |
|---|---|
| Required Tension: | 0 lb |
| Required Shear: | 320 lb |

*(Analyzing 1/4-14 SMS, 316 SS, Steel Screw to 0.125" x 0.125" connecting parts thicknesses)*

10%

**OK, (6) anchors sufficient**

AM | STRUCTURES

## Foundation

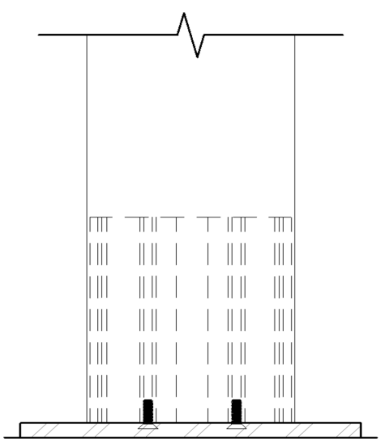
| SEE SKYCIV | | | |
|---|---|---|---|
| Foundation Reactions (K,K-FT) | | | |
| | P | V | *M* |
| D | 0.234 | 0.000 | 0.000 |
| W | 0.313 | 0.394 | 2.839 |
| E | 0.007 | 0.019 | 0.136 |
| Lr | 0.561 | 0.000 | 0.000 |
| S | 1.168 | 0.000 | 0.000 |

| | | | | | |
|---|---|---|---|---|---|
| **Baseplate** | 4-Bolt | | **Spacing:** | 8.625 | in |
| **Plate Thickness:** | 0.5 | in | **Width:** | 10.625 | in |

| | |
|---|---|
| | SEE ANCHOR CALC |
| 30% | **Okay** |

**Post Insert to Base Plate Connection**

*Qty* 4 Anchor Qty at Connection



| | | | |
|---|---|---|---|
| F | 5148.59 | lb | $\Omega$ = 4 |
| Fsu | 60000.00 | | |
| Ats | 0.34 | in^2 | |
| n | 20.00 | threads/in | |
| LE | 1.57 | in | |
| Dsmin | 0.31 | in | |
| Enmax | 0.28 | in | |

| | |
|---|---|
| Required Tension: | 8608 lb |
| Capacity Shear: | 20594 lb |

*Analyzing Beam to Post Insert with (4) M8x40 Machine screws*

42%

**OK**

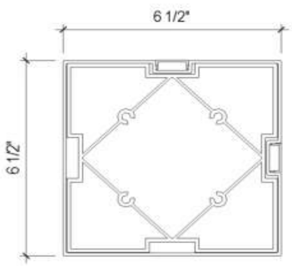
| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Post Design |

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 6.5"x6.5"x0.125"/0.125" 6063-T6 Aluminum Tube**
*Per 2020 Aluminum Design Manual*

Alloy: 6063 Temper: T6 Critically Welded: N

**MEMBER PROPERTIES**




| | | |
|---|---|---|
| Flange width | *b* = | 6.500" |
| Flange thickness | *tb* = | 0.125" |
| Web height | *h* = | 6.500" |
| Web thickness | *th* = | 0.125" |
| Moment of inertia about axis parallel to flange | *Ix* = | 40.50 in^4 |
| Moment of inertia about axis parallel to web | *Iy* = | 40.50 in^4 |
| Section modulus about the x-axis | *Sx* = | 12.46 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx* = | 2.33 in |
| Radius of gyration about centroidal axis parallel to web | *ry* = | 2.33 in |
| Torsion constant | *J* = | 32.39 in^4 |
| Cross sectional area of member | *A* = | 7.44 in^2 |
| Plastic section modulus | *Z* = | 6.05 in^3 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 10.0 ft |
| Unbraced length for bending (between bracing against side-sway X-Axis) | *Lbx* = | 10.0 ft |
| Unbraced length for bending (between bracing against side-sway Y-Axis) | *Lby* = | 10.0 ft |
| Effective length factor | *kx* = | 2.0 |
| | *ky* = | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu* = | 30 ksi |
| Tensile yield strength | *Fty* = | 25 ksi |
| Compressive yield strength | *Fcy* = | 25 ksi |
| Shear ultimate strength | *Fsu* = | 18 ksi |
| Shear yield strength | *Fsy* = | 15 ksi |
| Compressive modulus of elasticity | *E* = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc* = | 27.64 ksi |
| Compression in columns & beam flanges (Slope) | *Dc* = | 0.14 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc* = | 78.38 ksi |
| Compression in flat plates (Intercept) | *Bp* = | 31.39 ksi |
| Compression in flat plates (Slope) | *Dp* = | 0.17 ksi |
| Compression in flat plates (Intersection) | *Cp* = | 73.55 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr* = | 46.12 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr* = | 0.38 ksi |
| Shear stress in flat plates (Intercept) | *Bs* = | 18.98 ksi |
| Shear stress in flat plates (Slope) | *Ds* = | 0.08 ksi |
| Shear stress in flat plates (Intersection) | *Cs* = | 94.57 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c* = | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c* = | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b* = | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b* = | 2.04 |
| Tension coefficient | *kt* = | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | Fty_n = | 25.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 15.15 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n* = | 30.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ωt =** | 15.38 ksi |

**AXIAL COMPRESSION MEMBERS**

**E.2 Compression Member Buckling**

Axial, gross section subject to buckling

| | | | | |
|---|---|---|---|---|
| | Lower slenderness limit | *λ1 =* | 18.23 | |
| | Upper slenderness limit | *λ2 =* | 78.38 | |
| | Slenderness | *λ(max) =* | 102.89 | ≥ λ2 |
| | *[0.85π²E/λ²]* | *Fc_n =* | 8.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 4.85 ksi | |

**E.3 Local Buckling**

For column elements in uniform compression subject to local buckling, the uniform compressive strength is addressed in Section B.5.4 calculated below.

*B.5.4.2 - Flat elements supported on both edges (Flange)*

*B.5.4.2 - Flat elements supported on both edges (Web)*

**E.4 Buckling Interaction**

| | | | | |
|---|---|---|---|---|
| Per Table B.5.1 | *[π²*E/ (1.6*b/tb)²]* | *Fe(flange) =* | 15.58 ksi | |
| | *[Fc_n]* | *Fc_n =* | 8.00 ksi | |
| | Fe(flange) > Fc_n (E.2 Member Buckling) | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 4.85 ksi | |
| | *[π²*E/ (1.6*h/th)²]* | *Fe(web) =* | 15.58 ksi | |
| | *[Fc_n]* | *Fc_n =* | 8.00 ksi | |
| | *Fe(web) > Fc_n (E.2 Member Buckling)* | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 4.85 ksi | |

**FLEXURAL MEMBERS**

**F.2 Yielding and Rupture**

| | | | | |
|---|---|---|---|---|
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[Z*Fcy]* | Mnp = | 151.29 k-in | |
| | *[Mnp/Z]* | Fb_n = | 25.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 15.15 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 181.55 k-in | |
| | *[Mnu/Z]* | Fb_n = | 30.00 ksi | |
| | | Ω = | 1.95 | |
| | | **Fb_n/Ω =** | 15.38 ksi | |

**F.4 Lateral-Torsional Buckling**

Square or rectangular tubes subject to lateral-torsional buckling

| | | | | |
|---|---|---|---|---|
| | Slenderness for shapes symmetric about the bending axis | *λ F.4.2.1 =* | 15.13 | |
| | Slenderness for closed shapes | *λ F.4.2.3 =* | 14.78 | |
| | Slenderness for any shape | *λ F.4.2.5 =* | 15.13 | |
| | Maximum slenderness | *λ(max) =* | 15.13 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 161.12 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 12.93 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 7.84 ksi | |

**UNIFORM COMPRESSION ELEMENTS**

**B.5.4.2 Flat Elements Supported on Both Edges - Web & Flange**

Uniform compression strength, flat elements supported on both edges

| | | | | |
|---|---|---|---|---|
| | Lower slenderness limit | *λ1 =* | 22.8 | |
| | Upper slenderness limit | *λ2 =* | 39.2 | |
| | Flange Slenderness | *b/tb =* | 50.0 | ≥ λ2 |
| | Web Slenderness | *h/th =* | 50.0 | ≥ λ2 |
| | *[k2c*√(Bp*E)/(1.6*b/tb)]* | *Fc_n1 =* | 15.98 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n1/Ω =** | 9.68 ksi | |
| | *[k2c*√(Bp*E)/(1.6*h/th)]* | *Fc_n2 =* | 15.98 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n2/Ω =** | 9.68 ksi | |

**FLEXURAL COMPRESSION ELEMENTS**

**B.5.5.1 Flat Elements Supported on Both Edges - Web**

Flexural compression strength, flat elements supported on both edges

| | | | | |
|---|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 34.73 | | |
| Upper slenderness limit | *λ2 =* | 92.95 | | |
| Slenderness | *h/th =* | 50.00 | λ1 - λ2 | |
| *[Bbr-m*Dbr*h/th]* | *Fb_n =* | 33.71 ksi | | |
| | Ω = | 1.65 | | |
| | **Fb_n/Ω =** | 20.43 ksi | | |

**SHEAR**

**G.2 Shear Supported on Both Edges - Web**

Members with flat elements supported on both edges

| | | | |
|---|---|---|---|
| Lower slenderness limit | *λ1 =* | 38.73 | |
| Upper slenderness limit | *λ2 =* | 75.65 | |
| Slenderness | *h/th =* | 50.00 | λ1 - λ2 |
| *[Bs-1.25Ds*h/th]* | *Fv_n =* | 13.84 ksi | |
| | Ω = | 1.65 | |
| | **Fv_n/Ω =** | 8.39 ksi | |

**ALLOWABLE STRESSES**

| | | |
|---|---|---|
| Allowable bending stress | Fb = | 6.54 ksi |
| Allowable axial stress, compression | Fac = | 4.85 ksi |
| Allowable shear stress; webs | Fv = | 8.39 ksi |
| Allowable axial stress, Tension | Fat = | 15.15 ksi |
| Elastic buckling stress | *Fe =* | 4.83 ksi |
| Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 9.68 ksi |

**MEMBER LOADING**

**Bending Moments**

| | | | |
|---|---|---|---|
| Bending moment developed in member | *Mz =* | 1.7 kip-ft | |
| Bending stress developed in member | fb = | 1.64 ksi | |
| Allowable bending stress of member | Fb = | 6.54 ksi | < 1.0 |

**Compression Loads**

| | | | |
|---|---|---|---|
| Compression load developed in member | *P =* | 1,401 lb | |
| Compression stress developed in member | fc = | 0.19 ksi | |
| Allowable compressive axial stress of member | Fac = | 4.85 ksi | < 1.0 |

**Tension Loads**

| | | | |
|---|---|---|---|
| Tension load developed in member | *T =* | 140 lb | |
| Tension stress developed in member | ft = | 0.01 ksi | |
| Allowable Tension axial stress of member | Fat = | 15.15 ksi | < 1.0 |

**Shear Loads**

| | | | |
|---|---|---|---|
| Shear load developed in member | *Vz =* | 320 lb | |
| Shear stress developed in member | fv = | 0.20 ksi | |
| Allowable shear stress of member webs | Fv = | 8.39 ksi | < 1.0 |

**Interaction Equations**

| | | |
|---|---|---|
| √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.25 | < 1.0 |
| fa/Fa + fb/Fb = | 0.29 | < 1.0 |
| fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.29 | < 1.0 |

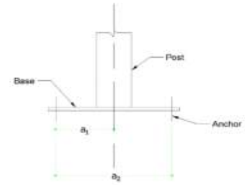
**CONFIGURATION AND MOMENT TABULATION TOOLS**

***Member Loads:***

| | | | | |
|---|---|---|---|---|
| Mx = | 20.44 kip-in | Applied Moment Per Member | 30 PSF | Total Gravity Load |
| My = | 1.36 kip-in | Applied moment Per Member | 6.3 FT | Post Trib Area in X-Axis |
| Tn = | 0.09 kip-in | Applied Torsion Per Member | 7.4 FT | Post Trib Area in Y-Axis |
| Vx = | 216 lbs | Applied Shear Load Per Member | 3 PSF | Uplift |
| Vy = | 236 lbs | Applied Shear Load Per Member | 17 PSF | Lateral Load |
| V = | 320 lbs | Applied Resultant Shear Load Per Member | | |
| P = | 1,401 lbs | Applied axial compression load | | |
| T = | 140 lbs | Applied axial tension load | 1.14 kip-in | Seismic Moment |

AM | STRUCTURES

| | |
|---|---|
| Work Prepared For: | Timan Window Treatments, Inc |
| Project: | 24577 - Raymond Tatko |
| Mark/Detail: | Post anchors to concrete |




| Design Loads (LRFD) | | |
|---|---|---|
| **M** | **32710** | **lb-in** |
| **T** | **224** | **lb** |
| **C** | **2242** | **lb** |
| **V** | **512** | **lb** |

AM | STRUCTURES

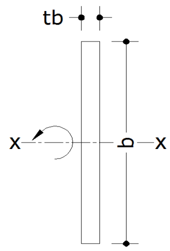
| | |
|---|---|
| Work Prepared For: | Hudson |
| Project: | 24577 - Raymond Tatko |
| Detail/Member: | Base Plate Design |

**ALUMINUM DESIGN MANUAL (2020 EDITION)**
**Specifications for Aluminum Structures (Buildings)**
**Allowable Stress Design**

**Design Check of 10.625"x0.5" 6063-T6 Aluminum Flat Plate**
*Per 2020 Aluminum Design Manual*

| | | | | | |
|---|---|---|---|---|---|
| Alloy: | 6063 | Temper: | T6 | Critically Welded: | N |

**MEMBER PROPERTIES**




| | | |
|---|---|---|
| Flat Plate Height | *b* = | 10.625" |
| Flat Plate Thickness | *tb* = | 0.500" |
| Moment of inertia about axis parallel to flange | *Ix* = | 49.98 in^4 |
| Moment of inertia about axis parallel to web | *Iy* = | 0.11 in^4 |
| Section modulus about the x-axis | *Sx* = | 9.41 in^3 |
| Radius of gyration about centroidal axis parallel to flange | *rx* = | 3.07 in |
| Radius of gyration about centroidal axis parallel to web | *ry* = | 0.14 in |
| Torsion constant | *J* = | 0.44 in^4 |
| Cross sectional area of member | *A* = | 5.31 in^2 |
| Plastic section modulus | *Z* = | 14.11 in^3 |
| Warping constant | Cw = | 0.00 in^6 |

**MEMBER SPANS**

| | | |
|---|---|---|
| Unsupported member length (between supports) | *L* = | 0.72 ft |
| Unbraced length for bending (between bracing against side-sway) | *Lb* = | 0.72 ft |
| Effective length factor | *k* = | 1.0 |

**MATERIAL PROPERTIES**

| | | |
|---|---|---|
| Tensile ultimate strength | *Ftu* = | 30 ksi |
| Tensile yield strength | *Fty* = | 25 ksi |
| Compressive yield strength | *Fcy* = | 25 ksi |
| Shear ultimate strength | *Fsu* = | 18 ksi |
| Shear yield strength | *Fsy* = | 15 ksi |
| Compressive modulus of elasticity | *E* = | 10,100 ksi |

**BUCKLING CONSTANTS**

| | | |
|---|---|---|
| Compression in columns & beam flanges (Intercept) | *Bc* = | 27.64 ksi |
| Compression in columns & beam flanges (Slope) | *Dc* = | 0.14 ksi |
| Compression in columns & beam flanges (Intersection) | *Cc* = | 78.38 ksi |
| Compression in flat plates (Intercept) | *Bp* = | 31.39 ksi |
| Compression in flat plates (Slope) | *Dp* = | 0.17 ksi |
| Compression in flat plates (Intersection) | *Cp* = | 73.55 ksi |
| Compressive bending stress in solid rectangular bars (Intercept) | *Bbr* = | 46.12 ksi |
| Compressive bending stress in solid rectangular bars (Slope) | *Dbr* = | 0.38 ksi |
| Compressive bending stress in solid rectangular bars (Intersection) | *Cbr* = | 80.56 ksi |
| Shear stress in flat plates (Intercept) | *Bs* = | 18.98 ksi |
| Shear stress in flat plates (Slope) | *Ds* = | 0.08 ksi |
| Shear stress in flat plates (Intersection) | *Cs* = | 94.57 ksi |
| Ultimate strength coefficient of flat plates in compression (slenderness limit λ2) | *k1c* = | 0.35 |
| Ultimate strength coefficient of flat plates in compression (stress for slenderness > λ2) | *k2c* = | 2.27 |
| Ultimate strength of flat plates in bending (slenderness limit λ2) | *k1b* = | 0.50 |
| Ultimate strength of flat plates in bending (stress for slenderness > λ2) | *k2b* = | 2.04 |
| Tension coefficient | *kt* = | 1.0 |

**D.2 Axial Tension**

| | | | |
|---|---|---|---|
| Tensile Yielding - Unwelded Members | *[Fty]* | *Fty_n* = | 25.00 ksi |
| | | Ω = | 1.65 |
| | | **Fty_n/Ω =** | 15.15 ksi |
| Tensile Rupture - Unwelded Members | *[Ftu/kt]* | *Ftu_n* = | 30.00 ksi |
| | | Ω = | 1.95 |
| | | **Ftu_n/Ω =** | 15.38 ksi |

AM | STRUCTURES

| | | | | |
|---|---|---|---|---|
| **AXIAL COMPRESSION MEMBERS** | | | | |
| **E.2 Compression Member Buckling** | | | | |
| Axial, gross section subject to buckling | Lower slenderness limit | *λ1 =* | 18.23 | |
| | Upper slenderness limit | *λ2 =* | 78.38 | |
| | Slenderness | *λ(max) =* | 59.76 | < λ2 |
| | *[(Bc-Dc*λ)(0.85+0.15*((Cc-λ)/(Cc-λ1))]* | *Fc_n =* | 17.03 ksi | |
| | | Ω = | 1.65 | |
| | | **Fc_n/Ω =** | 10.32 ksi | |
| **FLEXURAL MEMBERS** | | | | |
| **F.2 Yielding and Rupture** | | | | |
| Nominal flexural strength for yielding and rupture | Limit State of Yielding | | | |
| | *[Z*Fcy]* | Mnp = | 352.78 k-in | |
| | *[Mnp/Z]* | Fb = | 25.00 ksi | |
| | | *Ω =* | 1.65 | |
| | | **Fb_n/Ω =** | 15.15 ksi | |
| | Limit State of Rupture | | | |
| | *[Z*Ftu/kt]* | Mnu = | 423.34 k-in | |
| | *[Mnu/Z]* | Fb = | 30.00 ksi | |
| | | *Ω =* | 1.95 | |
| | | **Fb_n/Ω =** | 15.38 ksi | |
| **F.4 Lateral-Torsional Buckling** | | | | |
| Rectangular bars subject to lateral-torsional buckling | | | | |
| | Slenderness for shapes symmetric about the bending axis | *λ F.4.2.1 =* | 62.30 | |
| | Slenderness for rectangular bars | *λ F.4.2.4 =* | 44.04 | |
| | Slenderness for any shape | *λ F.4.2.5 =* | 62.30 | |
| | Maximum slenderness | *λ(max) =* | 62.30 | < Cc |
| Nominal flexural strength - lateral-torsional buckling | | | | |
| | *[Mnp(1-(λ/Cc))+(π²*E*λ*Sx/Cc^3)]* | Mnmb = | 193.69 k-in | |
| | *[Mnmb/Sx]* | Fb_n = | 20.59 ksi | |
| | | Ω = | 1.65 | |
| | | **Fb_n/Ω =** | 12.48 ksi | |
| **G.2 Shear Supported on Both Edges** | | | | |
| Members with flat elements supported on both edges | | | | |
| | Lower slenderness limit | *λ1 =* | 38.73 | |
| | Upper slenderness limit | *λ2 =* | 75.65 | |
| | Slenderness | *b/tb =* | 21.25 | ≤ λ1 |
| | *[Fsy]* | *Fv_n =* | 15.00 ksi | |
| | | Ω = | 1.65 | |
| | | **Fv_n/Ω =** | 9.09 ksi | |
| **ALLOWABLE STRESSES** | | | | |
| | Allowable bending stress | Fb = | 12.48 ksi | |
| | Allowable axial stress, compression | Fac = | 10.32 ksi | |
| | Allowable shear stress | Fv = | 9.09 ksi | |
| | Elastic buckling stress | *Fe =* | 14.32 ksi | |
| | Weighted average allowable compressive stress (per Section E.3.1) | *Fao =* | 10.32 ksi | |

**MEMBER LOADING**

**Bending Moments**

| | | | | |
|---|---|---|---|---|
| Bending moment developed in member | | *Mz* = | 2.9 kip-ft | |
| Bending stress developed in member | | fb = | 3.70 ksi | |
| Allowable bending stress of member | | Fb = | 12.48 ksi | < 1.0 |

**Axial Loads**

| | | | | |
|---|---|---|---|---|
| Axial load developed in member | | *Fx* = | 320 lb | |
| Axial stress developed in member | | fa = | 0.06 ksi | |
| Allowable compressive axial stress of member | | Fac = | 10.32 ksi | < 1.0 |

**Shear Loads**

| | | | | |
|---|---|---|---|---|
| Shear load developed in member | | *Vz* = | 1,401 lb | |
| Shear stress developed in member | | fv = | 0.26 ksi | |
| Allowable shear stress of member | | Fv = | 9.09 ksi | < 1.0 |

**Interaction Equations**

| | | | | |
|---|---|---|---|---|
| | | √ [(fb/Fb)^2 + (fv/Fv)^2] = | 0.30 | < 1.0 |
| | Eq H.1-1 | fa/Fa + fb/Fb = | 0.30 | < 1.0 |
| | Eq H.3-2 | fa/Fa + (fb/Fb)^2 + (fv/Fv)^2 = | 0.09 | < 1.0 |

24577 - Raymond Tatko

7/12/2024

## 1.Project Information

**Company:**

**Project Engineer:** - -

**Address:** Jupiter, FL 33458

**Phone:** M: - P: -

**Email:** amccann@am-structures.com

**Project Name:** Raymond Tatko

**Project Address:** 1751 E Hines Hill Rd, Hudson, OH 44236

**Notes:**

## 2.Selected Anchor Information

**Selected Anchor :** Screw-Bolt+

**Brand:** DEWALT

**Material:** 5/8" Ø Low Carbon Steel

**Embedment:** $h_{ef}$ 3.73 in $h_{nom}$ 5 in

**Approval:** ICC-ES ESR-3889

**Issued/Revision:** Nov,2023 -

**Drill method:** Hammer Drilled

## 3.Design Principles

**Design Method:** ACI 318-19

**Load Combinations:** IBC 2018 User Defined Loads

**Seismic Loading:** Tension None Shear None $\Omega_o$= 2.5

## 4.Base Material Information

**Concrete:**

| | | | | |
|---|---|---|---|---|
| Type: | Cracked | Normal Weight Concrete | | |
| Strength | 3000 psi | | | |

**Reinforcement:**

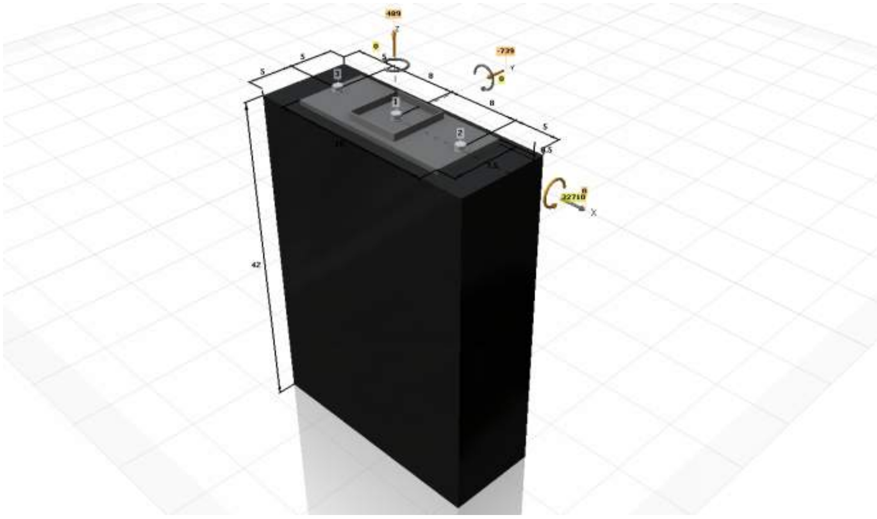
| | | | | |
|---|---|---|---|---|
| Edge Reinforcement | None or < #4 Rebar | | | |
| Spacing | Tension | No (Condition B) | Shear | No (Condition B) |
| Controls Breakout | Tension | False | Shear | False |

**Base Plate:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Sizing | Thickness | 0.5 | in | Length | 7.5 | in | Width | 18 in |
| Standoff | None | | | Height | 0 | in | | |
| Strength | 36000 psi | | | | | | | |

**Profile:** HSS Rectangular 6 X 6 X 0.125

## 5.Geometric Conditions



| | | | | | |
|---|---|---|---|---|---|
| $h_{slab}$ | 42 | in | $h_{min}$ | 7.000 | in |
| Edge Cx- | 5 | in | $c_{min}$ | 1.750 | in |
| Edge Cx+ | 5 | in | $c_{ac}$ | 10.100 | in |
| Edge Cy- | 5 | in | $s_{min}$ | 2.750 | in |
| Edge Cy+ | 5 | in | | | |

## 6.Summary Results

**Tension Loading**

| Design Proof | Demand(lb) | Capacity(lb) | Utilization | Status | Critical |
|---|---|---|---|---|---|
| Steel Strength: | 3429.77 | 17069.00 | 0.201 | OK | |
| Concrete Breakout Strength: | 10289.00 | 11829.00 | 0.870 | OK | Controls |
| Pullout Strength: | 3430.00 | 4913.00 | 0.698 | OK | |

**Shear Loading**

| Design Proof | Demand(lb) | Capacity(lb) | Utilization | Status | Critical |
|---|---|---|---|---|---|
| Steel Strength | 246.00 | 9351.00 | 0.026 | OK | |
| Concrete Breakout Strength: | 739.00 | 5290.00 | 0.140 | OK | Controls |
| Pryout Strength | 739.00 | 25478.00 | 0.029 | OK | |

Input data and results must be checked for agreement with the existing conditions, the standards and guidelines and must be checked for plausibility

## 7.Warnings and Remarks

ANCHOR DESIGN CRITERIA IS SATISFIED

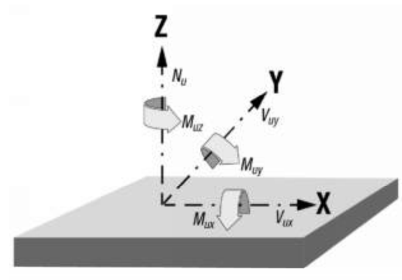
- The results of the calculations carried out by means of the DDA Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an design professional/engineer, particularly with regard to compliance with applicable standards, norms and permits, prior to using them for your specific project. The DDA Software serves only as an aid to interpret standards, norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.

## 8.Load Condition

**Design Loads / Actions**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Nu | 489 | lb | Vux | 0 | lb | Vuy | -739 | lb |
| Muz | 0 | in-lb | Mux | 32710 | in-lb | Muy | 0 | in-lb |

Consider Load Reversal X Direction 0% Y Direction 0%




Input data and results must be checked for agreement with the existing conditions, the standards and guidelines and must be checked for plausibility

## 9.Load Distribution

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Max. concrete compressive strain: | 0.202 | % | Anchor Eccentricity | | | | | |
| Max. concrete compressive stress: | 880.265 | psi | ex | 0 | in | ey | 0 | in |
| Resulting tension force: | 10289.297 | lb | Profile Eccentricity | | | | | |
| Resulting compression force: | 9800.299 | lb | ex | 0 | in | ey | 0 | in |

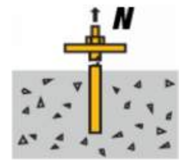
Resulting anchor forces / Load distribution

| Anchor | Tension Load (lb) | Shear Load (lb) | Component Shear Load (lb) Shear X | Shear Y | Anchor Coordinates (in) X | Y |
|---|---|---|---|---|---|---|
| 1 | 3429.77 | 246.3 | 0.0 | -246.3 | 0.000 | 0.000 |
| 2 | 3429.77 | 246.3 | 0.0 | -246.3 | 8.000 | 0.000 |
| 3 | 3429.77 | 246.3 | 0.0 | -246.3 | -8.000 | 0.000 |

Input data and results must be checked for agreement with the existing conditions, the standards and guidelines and must be checked for plausibility

## 10.Design Proof Tension Loading

### Steel Strength




### ACI 318-19 17.6.1

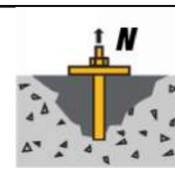
**Variables**

| $N_{sa}$ (lb) | $\varphi$ |
|---|---|
| 26260.000 | 0.65 |

**Results**

| | | | | |
|---|---|---|---|---|
| $\varphi N_{sa}$ | = | 17069.0 | lb | Table 17.5.2 |
| $N_{ua}$ | = | 3429.8 | lb | |
| Utilization | = | 20.1% | | |

### Concrete Breakout Strength




### ACI 318-19 17.6.2

**Equations**

$$N_{cbg} = ( A_{Nc} / A_{Nc0} ) . \Psi_{ec,N} . \Psi_{ed,N} . \Psi_{c,N} . \Psi_{cp,N} . N_b$$ Eqn. 17.6.2.1b

$$N_b = k_c . \lambda_a . ( f'_c )^{0.5} . h_{ef}^{1.5}$$ Eqn. 17.6.2.2.1

**Variables**

| $A_{Nc}$ (in²) | $A_{Nc0}$ (in²) | $\Psi_{ec,N}$ | $\Psi_{ed,N}$ | $\Psi_{c,N}$ | $\Psi_{cp,N}$ |
|---|---|---|---|---|---|
| 259.964 | 99.980 | 1.000 | 1.000 | 1.000 | 1.000 |

| $c_{ac}$ (in) | $k_c$ | $\lambda_a$ | $f'_c$ (psi) | $h'_{ef}$ (in) | $C_{amin}$ (in) |
|---|---|---|---|---|---|
| 10.100 | 21.000 | 1.000 | 3000 | 3.33 | 5 |

| $N_b$ (lb) | $\varphi$ |
|---|---|
| 6998.950 | 0.65 |

**Results**

| | | | | |
|---|---|---|---|---|
| $\varphi N_{cbg}$ | = | 11829 | lb | Table 17.5.2 |
| $N_{ua}$ | = | 10289.0 | lb | |
| Utilization | = | 87.0% | | |

**Pullout Strength:**

**ACI 318-19 17.6.3**


**Equations**

$N_{pn} = \Psi_{c,P} \cdot N_p \cdot ( f'_c / 2500 )^n$ Eqn. 17.6.3.1

**Variables**

| $\Psi_{c,P}$ | $N_{p,eq}$ (lb) | $f'_c$ (psi) | n | φ |
|---|---|---|---|---|
| 1.000 | 7559.000 | 3000 | 0.500 | 0.65 |

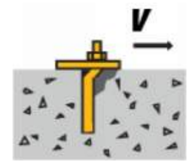
**Results**

| | | | | |
|---|---|---|---|---|
| $\varphi N_{pn}$ | = | 4913 | lb | |
| $N_{ua}$ | = | 3430 | lb | Table 17.5.2 |
| Utilization | = | 69.8% | | |

## 11.Design Proof Shear Loading

Reference

### Steel Strength:




**ACI 318-19 17.7.1**

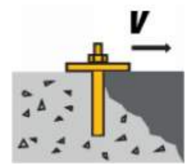
**Variables**

| $V_{sa}$ (lb) | φ |
|---|---|
| 15585.00 | 0.60 |

**Results**

| | | | | |
|---|---|---|---|---|
| $\varphi V_{sa}$ | = | 9351 | lb | |
| $V_{ua}$ | = | 246 | lb | Table 17.5.2 |
| Utilization | = | 2.6% | | |

### Concrete Breakout Strength




**ACI 318-19 17.7.2**

**Equations**

$V_{cbg} = ( A_{Vc} / A_{Vc0} ) \cdot \psi_{ec,V} \cdot \psi_{ed,V} \cdot \psi_{c,V} \cdot \psi_{h,v} \cdot V_b$ Eqn. 17.7.2.1b

$V_b = ( 7 \cdot ( l_e / d_a )^{0.2} \cdot (d_a)^{0.5} ) \cdot \lambda_a \cdot (f'_c)^{0.5} \cdot (c_{a1})^{1.5}$ Eqn. 17.7.2.2.1a

**Variables**

| $A_{Vc}$ (in²) | $A_{Vc0}$ (in²) | $\Psi_{ec,V}$ | $\Psi_{ed,V}$ | $\Psi_{c,V}$ | $\Psi_{h,V}$ |
|---|---|---|---|---|---|
| 195.000 | 112.500 | 1.000 | 0.900 | 1.000 | 1.000 |

| $\Psi_{\alpha,V}$ | $l_e$ (in) | $d_a$ (in) | $\lambda_a$ | $f'_c$ (psi) | $c_{a1}$ (in) |
|---|---|---|---|---|---|
| 1.000 | 3.730 | 0.625 | 1.000 | 3000 | 5.000 |

| $V_b$ (lb) | φ | $V_{cbg}$ (lb) |
|---|---|---|
| 4844.171 | 0.70 | 7556.907 |

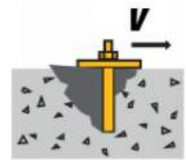
**Results**

| | | | | |
|---|---|---|---|---|
| $\varphi V_{cbg}$ | = | 5290 | lb | |
| Direction | = | Y- | | |
| $V_{ua}$ | = | 739 | lb | Table 17.5.2 |
| Utilization | = | 14.0% | | |

Shear Breakout Case 2 Controls

**Pryout Strength**

**ACI 318-19 17.7.3**




**Equations**

$V_{cpg} = k_{cp} \cdot N_{cpg}$ — Eqn. 17.7.3.1b

$N_{cbg} = ( A_{Nc} / A_{Nc0} ) \cdot \Psi_{ec,N} \cdot \Psi_{ed,N} \cdot \Psi_{c,N} \cdot \Psi_{cp,N} \cdot N_b$ — Eqn. 17.6.2.1b

$N_b = k_c \cdot \lambda_a \cdot ( f'_c )^{0.5} \cdot h_{ef}^{1.5}$ — Eqn. 17.6.2.2.1

**Variables**

| $A_{Nc}$ (in²) | $A_{Nc0}$ (in²) | $\Psi_{ec,N}$ | $\Psi_{ed,N}$ | $\Psi_{c,N}$ | $\Psi_{cp,N}$ |
|---|---|---|---|---|---|
| 259.964 | 99.980 | 1.000 | 1.000 | 1.000 | 1.000 |

| $c_{ac}$ (in) | $k_c$ | $\lambda_a$ | $h'_{ef}$ (in) | $f'_c$ (psi) | $C_{amin}$ (in) |
|---|---|---|---|---|---|
| 10.100 | 21.000 | 1.000 | 3.33 | 3000.000 | 5.000 |

| $N_b$ (lb) | $k_{cp}$ | $N_{cpg}$ (lb) | φ |
|---|---|---|---|
| 6998.950 | 2.000 | 18198.390 | 0.70 |

**Results**

| | | | | |
|---|---|---|---|---|
| $\varphi V_{cpg}$ | = | 25478.00 | lb | Table 17.5.2 |
| $V_{ua}$ | = | 739 | lb | |
| Utilization | = | 2.9% | | |

## 12.Interaction of Tension and Shear Loads

Reference

**ACI 318-19 17.8**

**Equations**

$( ( ( N_{ua} / \varphi . N_n ) + ( V_{ua} / \varphi . V_n ) ) / 1.2 ) <= 1.0$ Eqn. 17.8.3

**Variables**

| $N_{ua} / \varphi \cdot N_n$ | $V_{ua} / \varphi \cdot V_n$ |
|---|---|
| 0.870 | 0.140 |

**Results**

| | | |
|---|---|---|
| 0.870 | ≤ | 1.0 |
| Status | : | OK |

ANCHOR DESIGN CRITERIA IS SATISFIED