Addendum No. 1

19 Nov 2020

Project: **Brick Breeden Fieldhouse – West Entrance Roof Retrofit PPA #19-0172**
Montana State University – Bozeman, Montana

ENGINEER: DCI Engineers
TO: All plan holders of record

Acknowledge receipt of this addendum by entering its number and date in the space provided on the Bid Form. This addendum forms a part of the Contract Documents. It modifies them as follows:

SPECIFICATIONS

- **Section 011000 "Project Summary", 1.5.C and 1.5.D:** Revise the allowable construction period to be May 3 to July 30, 2021.

- **Instructions to Bidders, 17.1**: The work window is May 3 to July 30, 2021. Add verbiage that monetary liquidated damages will be assessed at $100/day in addition to the installation and removal of the temporary structure required for egress.

- **Section 075216, 2.5C:** See attached, approved Substitution Request for type IV steep asphalt in lieu of cold adhesive to adhere roofing plies.

STRUCTURAL DRAWINGS

S0.2 Structural General Notes, Metal Roof and Floor Deck:

Add following option for mechanical fasteners at roof deck:

A. Option to fasten roof-deck panels to steel supporting members using mechanical fasteners as follows:
- Fastener Type: Hilti X-HSN24 or equivalent.
- Fastener Spacing: As Indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals indicated.
- Mechanically fasten with Hilti SLC 01 or equivalent screw.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
- End Joints: Lapped 2 inches minimum.

S1.1 Foundation Plan

- Revised note for removal of shoring wall; the wall does not need to remain until construction is complete and can be removed at any time once construction has commenced at the discretion of the contractor.

S2.1 Roof Framing Plan

- Revised note for removal of shoring wall; the wall does not need to remain until construction is complete and can be removed at any time once construction has commenced at the discretion of the contractor.

S5.1 Structural Framing Details

- **2/S5.1:** Added contractor options for connection of new steel beam at the existing concrete beam. Revised note regarding shoring wall removal.
- **3/S5.1**: Added contractor options for connection of new steel beam at the existing concrete beam.
- **4/S5.1:** Added contractor options for field weld connection of new steel beam at existing steel beam.
- **13/S5.1:** Added contractor option for short-slotted holes in shear tab.
- **16/S5.1**: Added new detail showing welded shear tab connection as an option for detail 2/S5.1.

S5.2 Structural Framing Details

- **5/S5.2:** Revised note regarding when the shoring wall may be removed, it can be removed at any time at the discretion of the contractor.
- **6/S5.2:** Revised reference detail to be 4/S5.2 at joist bearing in lieu of 2/S5.2.
- **7/S5.2:** Added new detail showing top chord bracing to be installed at existing joists following removal of the 2x roof decking and 2x4 top chord nailer. This is typical at all existing joists where the new structural beams are installed.

ARCHITECTURAL DRAWINGS

A1.0 Architectural Floor Plan

- **Demolition Notes, #5:** Revised note to reference approximate length of shoring wall to be removed and reference the original shoring drawings included in this addendum.
- **Plan Notes, #1:** Added information on wall construction to include 3-5/8" 25 GA. Metal Studs @ 16" o.c.
- **Plan Notes, #3:** Added reference to A5.1 for finish of floor where patching is required at removed shoring wall.
- **Grid F and G:** Included outline of floor demolition from structural drawings to clarify extents of wall framing to be removed and replaced.

A1.1 Architectural Roof Plan

- **Roof Area C, Alternate #1:** Revised roofing area of removal and replacement to be 4,265 SF.

A5.1 Architectural Finish Plan

- **Finish Notes, #2:** Revised note to address floor finish at patched floor areas where temporary shoring wall has been removed.
- **1/A5.1 Finish Plan, Floor Repair Areas:** Added dashed lines clarify extents of footing work affecting floor finishes.

A9.1 Architectural Reflected Ceiling Plan

- **Reflected Ceiling Legend:** Added shaded note to clearly indicate Demo'd Ceiling areas.
- **Demo Reflected Ceiling Plan:** Added shade to ceiling areas that are to be demo'd.

GENERAL CLARIFICATIONS

- All bidders are encouraged to provide a bid on this contract, the projects HAS NOT BEEN AWARDED to a general contractor.

- Please see attached pre-bid walkthrough attendance sheet.

- Early work in the corridor is a possibility but full, open access is not guaranteed. Access may be needed through west arena doors for games/meets/events. Contractor will be responsible for providing a safe, delineated work area while maintaining code required minimum access. Coordination with the Contractor and MSU is required after bid award.

- The original Shoring Construction Drawings are being included for reference. Please refer to "MSU FIELD HOUSE WEST ENTRY SHORING_20190320" for shoring extents and construction materials to be removed as noted on S1.1 and S2.1.

- The geotechnical report from the 1997 Fieldhouse Renovation has been included for reference. Please refer to "Geotechnical Report - 1997 Fieldhouse Renovation".

- Special Inspections as required by the 2018 IBC, Section 110.3 will be paid for by the Owner, with the Special Inspector retained by the Owner and inspections coordinated with the General Contractor. Special inspections will be required as noted in Specification 33000 "Cast-in-Place Concrete" Section 3.14, Specification 051200 "Structural Steel Framing", Section 3.05, and Specification 53100 "Steel Decking", Section 3.04.

CONSULTING DESIGN SOLUTIONS, INC.
7540 Churchill Road Manhattan, MT 59741
Phone: (406) 282-7082

November 19, 2020

MSU Brick Breeden Fieldhouse West Entrance Roof Retrofit

MEP ADDENDUM #1

Bidders for the above project are hereby informed that the drawings and/or specifications are modified, corrected or supplemented as follows:

SPECIFICATIONS:

1. Specifications 22 0000, 3.9 Operation and Maintenance Manuals:
    a. Delete paragraphs A-E and Replace with the following:
        A. Refer to Division 1 for Operation and Maintenance Manual requirements.

2. Specifications 23 0000, 3.11 Operation and Maintenance Manuals:
    a. Delete paragraphs A-E and Replace with the following:
        A. Refer to Division 1 for Operation and Maintenance Manual requirements.

3. Specifications 23 0523, 2.3 FLOW CONTROL VALVES
    a. Delete paragraph.

4. Specification 23 0540, ANTIFREEZE
    a. Delete specification section. There is no glycol in the heating system in this project.

5. Specification 23 0593, TESTING ADJUSTING AND BALANCING
    a. Refer to Paragraph 1.1, B for scope of work for the project.
    b. Scope is limited to air balancing of the renovated VAV boxes at the completion of the project.
6. Specification 26 0533 “Electrical Materials and Methods” : Replace in its entirety.

DRAWINGS:

1. No items at this time.

END ADDENDUM #1

Submitted by:
Curtis L. Smit, PE, Consulting Design Solutions, Inc.
Scott T. Elders, PE, Consulting Design Solutions, Inc.

MONTANA
STATE UNIVERSITY

CAMPUS PLANNING, DESIGN & CONSTRUCTION
Sixth Avenue and Grant Street • P.O. Box 172760 • Bozeman, Montana 59717-2760
Phone: (406) 994-5413 • Fax: (406) 994-5665

PREBID MEETING SIGN-IN SHEET

Project Name: BBFH West Roof Replacement PPA No.: 19-0172
Building Location: Fieldhouse Date: November 10, 2020

*Please provide the following information . **Please print carefully.***

Name:	Company/ Email	Phone:
Jaclyn Liebscher	jaclyn.liebscher@montana.edu	994-5970
Chelsea Holling	CUSHING TERRELL chelseaholling@cushingterrell.com	922-7135
Jami Lorenz	jlorenz@dci-engineers.com	556-8650
Brady Gamer	bradygamer@cushingterrell.com	896-6142
Daniel Chandler	Sherwin Williams / daniel.a.chandler@sherwin.com	539-1116
DOUG OSKOOD	OSKOOD CONST. DROSKOOD@HOTMAIL.COM	761-1465
STEVE SARAVALI	steves@3econtractors.com	406-475-5391
TRAVIS KABALIN	tkabalin@martelconstruction.com	406-586-8585
Isaac Webb	iwebb@martelconstruction.com	406-570-4729
Tyler Ragen	tragen@martelconstruction.com	406-579-1533
Madison Pedersen	madisonrivercleaning@gmail.com	406-830-7741

MONTANA
STATE UNIVERSITY

CAMPUS PLANNING, DESIGN & CONSTRUCTION
Sixth Avenue and Grant Street
PO Box 172760 • Bozeman, Montana 59717-2760
Phone: (406) 994-5413 • Fax: (406) 994-5665

SUBSTITUTION REQUEST (PRIOR APPROVAL)

Project Title: **Brick Breeden Fieldhouse West Roof Rep** PPA No: **19-0172**

Location: **MSU Bozeman**

Owner: **MONTANA STATE UNIVERSITY** Bidder (Sub-): Maddox Roofing and Const. Inc.

This request is submitted for the approval of the Architect. Bidder / Sub-Bidder shall submit one request in accordance with Bidders' Instructions and Information for each proposed substitution. All blanks are to be completed.

The material, system, or equipment defined by this Substitution Request is proposed as a replacement for the material, system, or equipment originally specified and defined as follows:

SECTION	PARAGRAPH	SPECIFIED MATERIAL, SYSTEM, OR EQUIPMENT
075216	2.5/C	Cold Applied Adhesive for roof membrane attachment

PROPOSED SUBSTITUTION: The material, system, or equipment being proposed is defined as follows:
Requesting to use type IV steep asphalt in lieu of cold adhesive to adhere roofing plies

- What are the differences between the specified material, system, or equipment and the proposed substitution?
  Cold adhesive is sprayed or applied "cold" whereas type IV asphalt is applied "hot" with a mop
- Does the proposed substitution require dimensional changes on the Construction Drawings? (Y/N) no
- Does the proposed substitution require changes to the Work of other trades? (Y/N) no
- Is the warranty for the proposed substitution comparable with that of the specified product? (Y/N) yes

By signing and submitting this request, the Bidder / Sub-Bidder represents that the function, appearance, and quality of the proposed substitution are equivilent or superior to the specified material, system, or equipment.

By signing and submitting this request, the Bidder / Sub-Bidder agrees to pay all costs, including architectural and engineering fees, associated with the incorporation of the proposed substitution into the Project.

Maddox Roofing and Const. Inc. — SUBMITTED BY (BIDDER / SUB-BIDDER)
[signature] — AUTHORIZED AGENT
11.12.20 — DATE

Received: _____ DATE

Architect's Action: ☐ Rejected ☐ Rejected – For reasons as follows:

☒ Approved ☐ Approved as noted:

Cushing Terrell — REVIEWED BY (ARCHITECT)
Brody J. Lauer — AUTHORIZED AGENT
11/12/2020 — DATE

MSU Substitution Request Form 099
(Revised 062911)

SECTION 260533 - ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections including the Related Sections listed below, apply to this Section.

B. Coordinate lock out and tag out methods with the owner, prior to shut down of any electrical gear or circuits.

C. Related Sections:

1. Section 260513 - Medium, Low & Control Voltage Cables
2. Section 260526 - Grounding and Bonding for Electrical

1.2 SUMMARY

A. Provide conduits, cable trays, surface raceways, boxes, fittings and supports to form a complete, coordinated, and continuously grounded raceway system.

1.3 CONDUIT REQUIREMENTS

A. Conduits indoors in general areas shall be electrical metallic tubing (EMT) with steel set screw fittings.

B. Final connections to recessed lighting fixtures and under-counter lights shall be 1/2" minimum flexible metallic conduit, manufactured wiring systems, or galvanized steel Type MC cable, all with steel fittings.

1. Manufactured wiring systems shall
   a. Only be used above accessible ceilings.
   b. Shall not be used in walls or above permanent ceilings.
   c. Shall contain a dedicated, separate, grounding conductor
   d. Be limited to lengths of 6’0” or less.

2. Type MC cable conductors shall be color coded to match the building color-coding scheme. Type MC cable shall be terminated with steel setscrew connectors that have integral insulating bushings. Self-locking, twist-in type fittings are not acceptable.

C. Final connections to motors, transformers and equipment subject to vibration or removal for maintenance shall be 1/2" minimum liquid tight flexible metallic conduit with steel liquid tight fittings. Transformer connections may be non-liquid tight flexible metallic conduit in electrical rooms only.

D. Connections to recessed power receptacles, and light switches, in areas with accessible ceilings:

1. In new 'metal stud and gypsum board partitions (walls)', the final connections may be made with type MC cable. This MC cable, shall:

a. Be run to a box immediately above the accessible ceiling, and the box size shall not exceed 4-11/16" square.
b. Conduit shall be used for the entire run, from this junction box, to the power source, load (lights), etc.
c. No more than three circuits may be run through any given junction box.
d. Individual conductors making up the MC cable shall be stranded copper, with separate grounding conductor, and steel corrugated armor. Individual conductors shall be color coded as required in section 260513.
e. The MC cable is terminated using UL listed hardware intended for the cable and boxes being used, (and rated for commercial and industrial environments).
f. The MC cable shall be secured in the wall cavity as required by NEC
g. The MC cable shall be as short as it is necessary to serve the need and meet the Code

2. In existing 'metal stud and gypsum board partitions (walls)', where the wall is not being otherwise opened up, the final connections to new devices may be made flexible conduit and standard (separate) conductors. This flexible conduit shall:

a. Be increased in size as necessary to maintain the proper fill for the wiring to be installed.
b. Shall be installed and secured as required by NEC.
c. Shall be as short as it is necessary to serve the need and meet the NEC.

3. In all other wall types and conditions use standard conduit, of the type appropriate for the wall construction.

E. Connections to other recessed devices, (including communication outlet boxes, junction or pull boxes, etc) shall be with standard conduit of the type appropriate for the wall construction.

1.4 BOX REQUIREMENTS

A. Provide sheet steel outlet boxes, extensions, and plaster rings for EMT, flexible metal conduit, and MC cable.

B. Provide cast or malleable iron outlet boxes and covers for galvanized rigid steel conduits, intermediate metal conduits, and liquid tight flexible metal conduits.

C. Boxes shall be sized for all conductors and devices to be contained within. Box extensions shall not be used to correct for undersized boxes. A single extension may be used as follows only if all free conductors extend at least 3 inches outside of the extension opening.

1. On boxes being flush mounted in masonry walls.
2. On existing boxes in walls that are being furred out.
3. On existing boxes for connecting to an existing circuit.
4. On fire alarm, security and clock system boxes where required by the system manufacturer's instructions.

D. Plaster rings shall not be considered box extensions, but their capacities may be included in box fill calculations.

1.5 SUPPORT REQUIREMENTS

A. Surface mounted equipment shall be secured to steel channels. The channels shall be attached with toggle bolts to hollow tile, block or similar surfaces, and attached with screws or bolts and expansion shields to solid masonry or concrete.

PART 2 PRODUCTS

2.1 CONDUITS

A. Electrical metallic tubing shall be thin wall steel tubing, electro-galvanized or hot dipped galvanized inside and outside. Fittings and bushings shall be galvanized steel set screw type with two screws per connection for sizes over 2".

B. Flexible metallic conduit shall be galvanized steel or aluminum. Fittings shall be of steel with cadmium or galvanized finish. Fittings shall be machine screw clamp type, single or two-piece. Self-locking, twist-in type fittings are not acceptable.

2.2 BOXES

A. Boxes for fixtures, outlets, switches, equipment connections and wire pulling shall be

1. Cast or formed from carbon steel sheets of commercial grade steel not less than 14-gauge,
2. One-piece construction, zinc, or cadmium plated,
3. Tapped for mounting plates and covers as required.

B. Pull and junction boxes shall be

1. Fabricated from galvanized or painted code gauge cold rolled carbon steel sheets.
2. Welded construction with flat removable covers fastened to the box with machine screws.
3. Seams and joints shall be closed and reinforced with flanges formed of the same material from which the box is constructed or by continuous welding which will provide equivalent strength to flange construction.
4. Preferably not provided with 'knockouts'.

C. Box covers shall be fastened in place by machine screws or hinges and latches. Self-tapping or sheet metal fasteners are not acceptable.

2.3 SUPPORTS

A. Hangers and brackets shall be made of steel pipe, channel iron, angle iron or prefabricated steel channel. Prefabricated steel channel shall be by B-Line, Hilti, Powerstrut or Unistrut.

B. Anchors shall be lead shield anchors or plastic expansion anchors for small loads, and expansion or epoxy anchors for large loads. Powder-driven anchors shall not be used.

2.4 LABELS AND DIRECTORIES

A. Equipment nameplates shall be engraved .125 inch (1/8") thick laminated plastic, white, with black letters. The engraved letters shall be at least one quarter inch (¼") high.

B. Receptacles and lighting switches shall be labeled using clear adhesive backed nylon or Mylar tape with black text permanently laminated to the tape.

C. Panel directories shall be typed on supplied card stock with panel, or card stock similar in thickness and material as those supplied with the panels. Install supplied clear plastic cover, or one of like material.

PART 3 EXECUTION

3.1 RACEWAYS

A. Size conduits in accordance with the NEC, but not less than the sizes shown on the drawings. Minimum power and control conduit size shall be 1/2". Minimum telecommunications conduit size shall be 3/4"".

B. Install concealed and exposed conduits and cable trays parallel to or at right angles to building lines. Conduits shall not be embedded in concrete slabs except where specifically shown. Install surface raceways as close to room corners or trim features as possible to make the surface raceways less obvious. Where conduits are routed over beams and under corrugated decking, conduits shall be offset 3” below the decking to avoid damage from future decking penetrations.

C. Conceal conduits wherever possible and practical. When conduits cannot be concealed in finished areas, use surface raceways with matching boxes from the same manufacturer as the raceways.

D. Metal conduits, fittings, enclosures and raceways shall be mechanically joined together in a firm assembly to form a continuous electrical conductor providing effective electrical grounding continuity.

E. Provide expansion fittings at the intervals specified in the manufacturer's instructions.

F. Low voltage signal circuits shall be separated or shielded from power circuits to prevent the induction of noise into the signal circuits.

G. EMT entering sheet metal enclosures and outlet boxes shall be secured in place by a connector with a locknut. Rigid conduit shall be secured with locknut inside and outside and a bushing. Sufficient thread on the connector or conduit shall extend into the enclosure so that the bushing will butt tight into the connector or conduit. Bushings shall not be used as jamb nuts or in lieu of locknuts.

H. Flexible metallic conduit to motors and similar equipment shall not exceed 3'-0" in length, and shall have adequate slack to absorb the maximum vibration. Flexible conduit connections to lighting fixtures shall not exceed 6'-0" in length.

3.2 MOUNTING HEIGHTS

A. Except where shown otherwise, install equipment and devices at the same height they were initially provided at, or the following heights:

1. Receptacles (Wall): 18" A.F.F. to center
2. Receptacles (Above Counter): 44" A.F.F. to center
3. Light Switches: 44" A.F.F. to center
4. Telephone/Data Outlets: 18" A.F.F. to center
5. Fire Alarm Pull Stations: 44" A.F.F. to center
6. Fire Alarm Horn/Strobes: 80" A.F.F. to bottom
7. Card Readers: 44" A.F.F. to card slot
8. Security System Controls: 44” A.F.F. to center
9. Thermostats/HVAC Controls: 44” A.F.F. to center
10. Electrical Panels: 72" A.F.F. to top
11. Safety Switches/Motor Starters/Variable Frequency Drives: 72" A.F.F. to top (except top of handle shall not exceed 78" A.F.F.)
12. Motor Control Pushbuttons: 60" A.F.F. to center

3.3 SUPPORTS

A. Support all electrical items independently of supports provided by the other trades.

B. Support conduits and boxes using steel conduit straps or 1/4-inch minimum diameter threaded rod hangers. Suspended ceiling hangers or hanger wire shall not be used (except to support flexible metallic conduit and manufactured wiring systems).

C. Support cable trays with support brackets or 3/8" diameter minimum threaded rod hangers at intervals not exceeding 8'-0" for straight runs. Additional supports shall be provided at tray fittings.

D. Hangers shall be of sufficient strength that their deflection at mid span does not exceed 1/240 of the hanger span length after the cables are installed.

E. Route flexible metallic conduit, manufactured wiring systems and Type MC cable parallel to or perpendicular to building lines, and in a neat and workmanlike manner. Coil the excess manufactured wiring systems and Type MC cable, and support independently of the ceiling grid system at intervals not exceeding 3 feet.

3.4 PENETRATIONS, SLEEVES, AND FIRE SEALS

A. Cut floor and wall penetrations neatly and to the minimum size required for installation of the equipment and raceways.

B. Provide galvanized steel pipe sleeves for all conduits penetrating floors, exterior walls and roofs.

1. Extend floor sleeves above the floor a minimum of 2 inches.
2. Embed sleeves in new concrete or step-core concrete and grout sleeves into existing concrete with epoxy grout.
3. Seal floor sleeves using fire-sealing systems approved by a Nationally Recognized Testing Laboratory.
4. Seal exterior wall and roof penetrations water tight.

C. Patch both sides of wall penetrations cut for electrical equipment and raceways to seal against the passage of air, sound and fire.

1. Seal cable tray penetrations in fire rated walls using fire sealant bags approved by a Nationally Recognized Testing Laboratory.
2. Seal conduit penetrations in fire rated walls using fire-sealing caulk approved by a Nationally Recognized Testing Laboratory.
3. Seal conduit penetrations in non-rated walls using masonry materials that match the wall construction.
4. Fire seal between recessed outlet boxes located on opposite sides of a fire rated wall if the box openings are over 16 square inches and the boxes are less than 24 inches apart.

3.5 EXPANSION FITTINGS

A. Provide expansion fittings at all building expansion joints. Expansion fittings shall be bonded to the raceway on both sides.

B. Provide expansion fittings, in accordance with manufacture recommendations, in all areas subject to swings in temperature of more than 15 degrees C.

C. Install expansion fittings in all locations were expected expansion difference is ¼", or more, between boxes

3.6 IDENTIFICATION

A. Provide nameplates and labels in accordance with Article 2.6.

1. Laminated plastic labels shall be mechanically secured in place with sheet metal screws and/or bolts and nuts
2. Labels shall be neatly centered. Place labels in like positions on similar equipment.

B. Color code wiring as noted in Section 260513

C. Color code junction boxes and box covers of emergency and fire alarm circuits with red paint. Color code junction boxes and box covers of temperature control circuits with blue paint.

D. Mark junction box covers in indelible ink with the panel and breaker numbers of the circuits contained within.

E. Provide a 3" by 5" yellow "Warning Arc Flash Hazard" label on the outside of panels in 'occupant areas' - Brady Type 99454 or equivalent from another manufacturer. Center the label horizontally and vertically on outside of door.

F. Provide a 4" by 6"'red "Danger Arc Flash and Shock Hazard" label on the outside of panels in areas open only to 'qualified personnel', and on the inside panel door of panels in 'occupant areas' - Brady Type 99459. Center label on gutter areas of distribution panels, centered above or below the directory of panels, and otherwise centered in other applications. In all cases, label will be no lower than 48" or above 84" AFF

END OF SECTION 260533

GEOTECHNICAL ENGINEERING REPORT

BRICK BREEDEN FIELDHOUSE RENOVATION
MSU-BOZEMAN, MONTANA

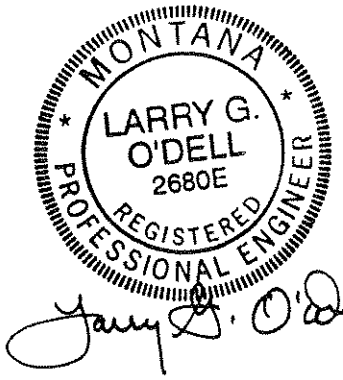
PROJECT NO. 26965060
January 30, 1997

Prepared for:

CTA Architects Engineers
1500 Poly Drive, Suite 201
Billings, MT 59102

Prepared by:

Terracon Consultants Western, Inc.
2110 Overland Avenue, Suite 124
Billings, MT 59102



Terracon

Terracon
CONSULTANTS WESTERN, INC.
2110 Overland Avenue Suite 124
Billings, Montana 59102
(406) 656-3072 Fax (406) 656-3573

January 30, 1997

CTA Architects Engineers
1500 Poly Drive, Suite 201
Billings, MT 59102

Attn: Keith Rupert

Re: **Geotechnical Engineering Report**
Brick Breeden Fieldhouse Renovations
MSU-Bozeman, Montana
Project No. 26965060

Terracon Consultants Western, Inc. (Terracon) has completed a geotechnical engineering exploration for the proposed renovations to the Montana State University Fieldhouse in Bozeman, Montana. This study was performed in general accordance with our proposal number D2696139 dated December 9, 1996.

The results of our engineering study, including the boring location diagram, laboratory test results, test boring records, and the geotechnical recommendations needed to aid in the design and construction of foundations and other earth connected phases of this project are attached. The accompanying geotechnical report presents our findings and recommendations concerning the design and construction of foundations and general site development. Further details are provided in this report.

We appreciate the opportunity to be of service to you on this phase of your project. If you have any questions concerning this report, or if we may be of further service to you, please do not hesitate to contact us.

Sincerely,
TERRACON CONSULTANTS WESTERN, INC.

Prepared by:

Larry G. O'Dell, P.E.
Principal/Office Manager

Reviewed by:

Merle R. Listoe, P.E.
Senior Project Manager

Copies to: Addressee (3)

TABLE OF CONTENTS

Geotechnical Engineering Exploration
Brick Breeden Fieldhouse Renovation
Project No. 26965060

GEOTECHNICAL ENGINEERING REPORT

BRICK BREEDEN FIELDHOUSE RENOVATIONS
MSU-Bozeman, Montana
Project No. 26965060
January 30, 1997

INTRODUCTION

This report contains the results of our geotechnical engineering exploration for the proposed Brick Breeden Fieldhouse Renovations to be located at Montana State University in Bozeman.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- foundation design and construction
- lateral earth pressures
- floor slab design and construction
- pavement design and construction
- earthwork
- drainage

The conclusions and recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and experience with similar soil conditions, structures and our understanding of the proposed project.

PROPOSED CONSTRUCTION

Based on information provided by your structural engineer, the proposed project consists of the following:

- North Entry Area-three to four feet of fill may be required to develop access ramps. Retaining walls will be constructed along with ramps and stairs.

- The north addition will be a single story, slab on grade structure which will house the weight room. There will also be a two story addition containing a lobby, elevators, and stairs.

- The east addition will be single story, slab on grade structure constructed of masonry blocks with a steel roof structure. it will be used for storage and as a loading-unloading area for equipment used in the fieldhouse. Pavements surrounding the addition will be used for truck traffic bringing supplies, props, or equipment to the fieldhouse.

- The south addition will be a two story, slab on grade structure for locker rooms, a new entrance, and offices. It will be constructed with concrete masonry blocks and a steel frame.

- The south regrade area will be constructed to provide access from the parking lot, and may involve three to four feet of fill.

- Runoff detention areas about two to three feet deep will be constructed east of the fieldhouse.

Wall and column loads are reported to be up to 5 kips per linear foot and 200 kips, respectively. A grade beam may be used to support interior columns in the two story additions and will support loads of about 6.2 kips per linear foot. Column loads for the single-story additions are reported to be less than 60 kips.

Final site grading plans were not available prior to preparation of this report. Ground floor level is anticipated to match the existing floor.

SITE EXPLORATION

The scope of the services performed for this project included site reconnaissance by our engineer, a subsurface exploration program, laboratory testing and engineering analysis.

Field Exploration

A total of 15 test borings and 2 percolation holes were drilled on December 18 and 19, 1996 to depths of 5 to 29.7 feet at the locations shown on the Site Plan. The location and approximate depth of borings are summarized as follows:

Feature	Number of Borings	Depth of Borings, feet
North Entry Area	2	10
	2	5
North Addition	2	15
East Addition	2	15
South Addition	1	30
	2	20
South Regrade Area	2	5
Detention Ponds	2	10

Percolation tests were conducted in accordance with Montana Department of Environmental Quality requirements. All borings were advanced with a truck-mounted drilling rig, utilizing 4 inch diameter solid stem augers.

The borings were located in the field by measurements from existing site features. Elevations were taken at each boring location by interpolation from contours indicated on the site plan. The accuracy of boring locations and elevations should only be assumed to the level implied by the methods used.

Continuous lithologic logs of each boring were recorded by our personnel during the drilling operations. At selected intervals, samples of the subsurface materials were taken by pushing thin-walled Shelby tubes, or by driving split-spoon samplers.

Penetration resistance measurements were obtained by driving the split-spoon sampler into the subsurface materials with a 140-pound hammer falling 30 inches. The penetration resistance value is a useful index to the consistency, relative density or hardness of the materials encountered.

Groundwater measurements were made in each boring at the time of site exploration.

Laboratory Testing

All samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer, and were classified in accordance with the Unified Soil Classification System described in Appendix C. At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials. Boring logs were prepared and are presented in Appendix A.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Consolidation
- Compressive strength
- Grain size
- Plasticity Index
- Water soluble sulfate content
- Expansion

The significance and purpose of each laboratory test is described in Appendix C. Laboratory test results are presented in Appendix B, and were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. All laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

SITE CONDITIONS

The site is currently occupied by lawn, parking, sidewalks and stairs. Vegetation consisted of grass. Site drainage is generally away from the fieldhouse, then to the north and west. Other site features included a tennis bubble to the west and the Health and PE Complex to the north.

SUBSURFACE CONDITIONS

Soil and Bedrock Conditions

Beneath a surface layer of topsoil or pavement is a clay which extends to depths of 13 to 13.5 feet in DH-1, 2, and 3, and to the depths penetrated in the other borings. The clay is predominately a lean clay, but varies from a lean clay with sand to a silty clay. Underlying the clay in Borings 1 through 3 is a poorly graded gravel with sand to the depths penetrated.

Field and Laboratory Test Results

Field test results indicate that the clay soils vary from medium stiff to hard in consistency. Typically they are stiff. The poorly graded gravel with sand varies from medium dense to very dense in relative density.

Laboratory test results indicate that clay subsoils exhibit a low expansive potential. Unconfined compressive strength tests and pocket penetrometer test values ranged from 4 to 8 kips per square foot. The clay is moderately compressible when saturated and exhibits a low compressibility at the natural moisture content.

Percolation tests conducted in the area of the proposed detention pond area are summarized as follows:

Percolation Test Results			
Test Hole	Depth (inches)	Soil Classification	Percolation Rate (minutes/inch)
P-1	36	Clay	> 60
P-2	36	Clay	> 60

Field test results indicate the soils in the area of the detention have poor percolation characteristics.

Groundwater Conditions

Groundwater was encountered at depths of 12.3 to 12.7 feet in the test borings 1,2, and 3, and at 14 feet in test boring 6 at the time of field exploration. It was not encountered in the remaining borings during the field exploration. These observations represent only current groundwater conditions, and may not be indicative of other times, or at other locations. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions. Plastic pipe was placed in DH-1 and 9 to allow monitoring water level fluctuations until construction.

CONCLUSIONS AND RECOMMENDATIONS

Geotechnical Considerations

The site appears suitable for the proposed construction. Slightly expansive soils and materials which are compressible upon elevation in moisture content will require particular attention in the design and construction. Calculations indicate that for a 200 kip column load, a spread footing designed for 3000 pounds per square foot will settle over 2 inches under saturated conditions. If the footing abuts an existing footing, about ½ inch of settlement is calculated under the existing footing. For the same conditions except that the in-situ moisture doesn't increase, the calculated settlement is about one inch. Typically, moisture contents increase after a structure is constructed. Therefore, the actual

settlement will likely be between the two values. If the footings are designed for 3000 psf, but the sustained loads are about half (1560psf), the calculated settlements are about 1¾ and ½ inch for saturated and in situ moisture conditions, respectively

For wall and column loads of 5 kips per linear foot and 60 kips, calculated settlements for saturated conditions are in the range of 3/4 and 1/2 inches, respectively.

The following foundation systems were evaluated for use on the site:

- spread footings bearing on undisturbed soils;
- straight shaft piers supported in the gravel stratum; and
- timber pile foundation extended to the gravel

Design criteria for alternative foundation systems is subsequently outlined. Use of the alternative foundation systems is dependent upon an acceptable amount of settlement and the risk associated with the increased moisture contents.

Foundation Systems-Spread Footings

Spread footing foundations bearing upon the clay stratum are recommended for support for the proposed structure, provided settlements as outlined in the Geotechnical Considerations Section are acceptable. The footings may be designed for a maximum bearing pressure of 3000 psf. The design bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions.

Exterior footings should be placed a minimum of 48 inches below finished grade for frost protection. Interior footings should bear a minimum of 12 inches below finished grade. Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

Footings should be proportioned to minimize differential foundation movement. Proportioning on the basis of equal total settlement is recommended; however, proportioning to relative constant dead-load pressure will also reduce differential settlement between adjacent footings. Proper drainage should be provided in the final design and during construction to reduce the settlement potential.

It is recommended that the proposed addition be constructed structurally independent of the existing building. The influence and interaction of existing and proposed footings on

the foundation soils should be evaluated. This should be taken into account in the design of the proposed structure. Care should be taken during construction to avoid affecting the foundation of the existing structure. This may require shoring of excavations adjacent to existing foundations to protect the structural integrity of the existing building.

Foundation Systems-Drilled Shafts

If the settlements as outlined previously for the heavy loads are not acceptable, a drilled pier foundation system is recommended for support of the proposed structure. Straight shaft piers, drilled into the gravel stratum at least 2 feet are recommended.

For axial compression loads, piers may be designed for a maximum end-bearing pressure of 15,000 pounds per square foot (psf), and skin friction of 800 psf for the portion of the pier in gravel. Skin friction for the portion of the pier in clay can be designed for 1250 psf.

Piers should be considered to work in group action if the horizontal spacing is less than three pier diameters. A minimum practical horizontal spacing between piers of at least three diameters should be maintained, and adjacent piers should bear at about the same elevation. The capacity of individual piers must be reduced when considering the effects of group action. Capacity reduction is a function of pier spacing and the number of piers within a group. If group action analyses are necessary, capacity reduction factors can be provided for the analyses.

To satisfy forces in the horizontal direction, piers may be designed for lateral loads using a lateral bearing pressure of 250 psf/ft and 500 psf/ft for the portion of the pier in the clay and gravel respectively.

Drilling to design depth should be possible with conventional single flight power augers on the majority of the site. However, areas of cobbles and boulders may be encountered in the gravel stratum where specialized drilling equipment may be required. Groundwater conditions indicate that temporary steel casing will be required to properly drill and clean piers prior to concrete placement. Groundwater should be removed from each pier hole prior to concrete placement. Pier concrete should be placed immediately after completion of drilling and cleaning. If pier concrete cannot be placed in dry conditions or in 3 inches or less of water, a tremie should be used for concrete placement.

If casing is used for pier construction, it should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent infiltration of water or the creation of voids in pier concrete. Pier concrete should have relatively high fluidity when placed in

cased pier holes and/or through a tremie. Pier concrete with slump in the range of 5 to 7 inches is recommended.

Free-fall concrete placement in piers will only be acceptable if provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an elephant's trunk discharging near the bottom of the hole where concrete segregation will be minimized, is recommended.

Driven Pile Foundation Systems

Driven piles can be considered as a foundation alternative for the proposed structure. Piles used for foundation support transmit structural loads to a stratum of high bearing capacity and should experience relatively small amounts of movement.

Timber piles driven into the dense granular soils to virtual refusal should be designed for an allowable capacity of 25 tons per pile.

Estimated pile tip depth to develop the allowable pile capacity is about two feet into the gravel stratum. Individual pile settlement should be less than 1/2-inch when designed according to the criteria presented in this report.

Piles should be designed to resist lateral loads using a lateral bearing pressure of 250 and 500 psf/ft for the clay and gravel, respectively. The upper five feet of pile penetration should be neglected in the lateral load analysis. The modulus calculated from the subgrade reaction increases linearly with depth by an amount equal to the subgrade reaction to a maximum value of 2000 psf in the clay.

Groups of piles required to support concentrated loads will require appropriate reductions of the axial, uplift and lateral capacities based on the effective envelope of the pile group. This reduction can be avoided by spacing piles at a minimum distance of at least three diameters center to center. Piles spaced less than three diameters center to center should be evaluated on an individual basis to determine appropriate reductions in axial, uplift and lateral capacities.

The contractor should select a driving hammer and cushion combination which is capable of installing the selected piling without overstressing the pile material. The contractor should submit the pile driving plan and the pile hammer-cushion combination to the engineer for evaluation of the driving stresses in advance of pile installation.

Dynamic analysis should be used to evaluate the driving resistance required to obtain the predicted design load.

The pile hammer should be operated at the manufacturer's recommended stroke when measuring penetration resistance. All piles should be provided with driving shoes to protect the pile tip from damage when penetrating the dense granular soils. A representative of the geotechnical engineer should observe pile driving operations on a full-time basis. Each pile should be observed and checked for penetration resistance, depth of embedment and general pile driving operations.

Lateral Earth Pressures

For soils above any free water surface, recommended equivalent fluid pressures for the in-situ clay are as follows:

	Imported Granular Fill	Clay
• Active	30 psf/ft	45 psf/ft.
• Passive	500 psf/ft	320 psf/ft.
• At Rest	50 psf/ft	65 psf/ft.

The lateral earth pressures herein are not applicable for submerged soils. Additional recommendations may be necessary if such conditions are to be included in the design.

Fill against grade beams and retaining walls should be compacted to densities specified in "Earthwork". Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures which could result in wall movement.

Seismic Considerations

The project site is located in Seismic Risk Zone 3 of the Seismic Zone Map of the United States as indicated by the 1994 Uniform Building Code. Based upon the nature of the subsurface materials, a seismic site coefficient, "s" of 1.0 should be used for the design of structures for the proposed project (1994 Uniform Building Code, Table No. 16-J).

Floor Slab Design and Construction

Natural soils or engineered fill will support the floor slab. Some differential movement of a slab-on-grade floor system is possible should the subgrade soils increase in moisture

content. To reduce any potential slab movements, the subgrade soils should be prepared as outlined in the "Earthwork" section of this report.

Additional floor slab design and construction recommendations are as follows:

- Positive separations and/or isolation joints should be provided between slabs and all foundations, columns or utility lines to allow independent movement.
- Contraction joints should be provided in slabs to control the location and extent of cracking.
- Interior trench backfill placed beneath slabs should be compacted in accordance with recommended specifications outlined below.
- In areas subjected to normal loading, a minimum 4-inch layer of clean-graded gravel should be placed beneath interior slabs. For heavy loading, reevaluation of slab and/or base course thickness may be required.
- Floor slabs should not be constructed on frozen subgrade.
- Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

For structural design of concrete slabs-on-grade, a modulus of subgrade reaction of 100 pounds per cubic inch (pci) may be used for floors supported on existing or engineered fill consisting of on-site soils.

Pavement Design and Construction

Design of pavements for the project have been based on the procedures outlined in the 1986 Guideline for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO). Traffic criteria provided for pavement thickness designs include equivalent 18-kip single axle loads (ESAL's) of 7 for drive bays/truck access.

For flexible pavement design, a terminal serviceability index of 2.0 was utilized along with an inherent reliability of 80%, and a design life of 20 years. Using the correlated design R-value of 5, appropriate ESAL/day, environmental criteria and other factors, the structural numbers (SN) of the pavement sections were determined on the basis of the 1986 AASHTO design equation.

Recommended alternatives for flexible and rigid pavements, summarized for each traffic area, are as follows:

Traffic Area	Alternative	Recommended Pavement Section Thickness (inches)					
		Asphalt Concrete Surface	Aggregate Base Course	Select Subbase	Plant-Mixed Bituminous Base	Portland Cement Concrete	Total
Main Traffic Corridors	A	3			$4^1/_2$		$7^1/_2$
	B	3	12				15

Each alternative should be investigated with respect to current material availability and economic conditions.

The pavement sections presented herein are based on design parameters selected by Terracon based on experience with similar projects and soils conditions. Design parameters such as design life, terminal serviceability index, and inherent reliability may vary with specific project. Variation of these parameters may change the thickness of the pavement sections presented. Terracon is prepared to discuss the details of these parameters and their effects on pavement design and reevaluate pavement design as appropriate.

Aggregate base course (if used on the site) should consist of a blend of sand and gravel which meets strict specifications for quality and gradation. Use of materials meeting Montana Department of Transportation or Montana Public Works specifications is recommended for base course.

Aggregate base course should be placed in lifts not exceeding six inches and should be compacted to a minimum of 95% Standard Proctor Density (ASTM D698).

Asphalt concrete and/or plant-mixed bituminous base course should be composed of a mixture of aggregate, filler and additives, if required, and approved bituminous material. The bituminous base and/or asphalt concrete should conform to approved mix designs stating the Marshall properties, optimum asphalt content, job mix formula and recommended mixing and placing temperatures. Aggregate used in plant-mixed bituminous base course and/or asphalt concrete should meet particular gradations. Material meeting Montana Department of Transportation or Montana Public Works specification is recommended for asphalt concrete. Mix designs should be submitted prior

to construction to verify their adequacy. Asphalt material should be placed in maximum 3-inch lifts and should be compacted to a minimum of 97% Marshall density.

Earthwork

- Site Clearing and Subgrade Preparation:

  1. Strip and remove existing vegetation, debris, and other deleterious materials from proposed building and pavement areas. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

  2. If unexpected fills or underground facilities are encountered during site clearing, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction. All excavations should be observed by the geotechnical engineer prior to backfill placement.

  3. Stripped materials consisting of vegetation and organic materials should be wasted from the site or used to revegetate exposed slopes after completion of grading operations. If it is necessary to dispose of organic materials on-site, they should be placed in non-structural areas and in fill sections not exceeding 5 feet in height.

- **Excavation:**

  1. It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

  2. Some additional effort may be necessary to extract boulder sized materials, particularly in deep narrow excavations such as utility trenches.

  3. Depending upon depth of excavation and seasonal conditions, groundwater may be encountered in excavations on the site. Pumping from sumps may be utilized to control water within excavations. Well points may be required for significant groundwater flow or where excavations penetrate groundwater to a significant depth.

  4. On-site clay soils in proposed pavement areas may pump or become unstable or unworkable at high water contents. Workability may be improved by scarifying and drying. Overexcavation of wet zones and replacement with granular materials may be necessary.

- **Fill Materials**:

1. Select granular materials should be used as backfill behind retaining walls.

2. Frozen soils should not be used as fill or backfill.

3. Imported soils (if required) should conform to the following or be approved by the Project Geotechnical Engineer:

Gradation	Percent finer by weight ASTM C136)
3"	100
No. 4 Sieve	50-80
No. 200 Sieve	10 (max)
• Liquid Limit	25 (max)
• Plasticity Index	10 (max)

- **Placement and Compaction:**

1. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift.

2. No fill should be placed over frozen ground.

3. Materials should be compacted to the following:

Material	Minimum Percent (ASTM D698)
Subgrade soils beneath fill areas	95
On-site soils or approved imported fill:	
Beneath foundations	98
Beneath slabs	95
Beneath pavements	95

Utilities.....95

Aggregate base (beneath slabs).....95

4. Clay soils placed around or beneath foundations should be compacted within a moisture content range of optimum to 2 percent above optimum. Clay soils placed beneath pavement should be compacted within a moisture content range of 2 percent below to 2 percent above optimum.

- **Slopes:**

1. For permanent slopes in compacted fill or cut areas, recommended maximum slope angles of 3:1 (horizontal to vertical) for on-site materials are recommended. If steeper slopes are required for site development, stability analyses should be completed to design the grading plan.

- **Compliance**

Performance of slabs-on-grade, foundations and pavement elements supported on compacted fills or prepared subgrade depend upon compliance with "Earthwork" recommendations. To assess compliance, observation and testing should be performed under the direction of the geotechnical engineer.

- **Excavation and Trench Construction**

Excavations into the on-site soils will encounter a variety of conditions. Excavations into the clays can be expected to stand on relatively steep temporary slopes during construction. However, caving soils and/or groundwater may also be encountered. The individual contractor(s) should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

The soils to be penetrated by the proposed excavations may vary significantly across the site. The preliminary soil classifications are based solely on the materials encountered in widely spaced exploratory test borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual

conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

As a safety measure, it is recommended that all vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. The exposed slope face should be protected against the elements.

Drainage:

- **Surface Drainage:**

1. Positive drainage should be provided during construction and maintained throughout the life of the proposed facility. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated.

2. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 10 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

3. Downspouts, roof drains or scuppers should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving.

4. Sprinkler systems should not be installed within 5 feet of foundation walls. Landscaped irrigation adjacent to the foundation system should be minimized or eliminated.

- **Subsurface Drainage**

Free-draining, granular soils containing less than five percent fines (by weight) passing a No. 200 sieve should be placed adjacent to retaining walls. A drainage system consisting of either weep holes or perforated drain lines (placed near the base of the wall) should be used to intercept and discharge water which would tend to saturate the backfill. Where used, drain lines should be embedded in a uniformly graded filter material and provided with adequate clean-outs for periodic

maintenance. An impervious soil should be used in the upper layer of backfill to reduce the potential for water infiltration.

- **Corrosion Protection**

Results of soluble sulfate testing indicate that ASTM Type I-II Portland Cement is suitable for all concrete on and below grade. Foundation concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

GENERAL COMMENTS

It is recommended that the Geotechnical Engineer be retained to provide a general review of final design plans and specifications in order to confirm that grading and foundation recommendations have been interpreted and implemented. In the event that any changes of the proposed project are planned, the conclusions and recommendations contained in this report should be reviewed and the report modified or supplemented as necessary.

The Geotechnical Engineer should also be retained to provide services during excavation, grading, foundation and construction phases of the work. Observation of footing excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present and is considered a necessary part of continuing geotechnical engineering services for the project. Construction testing, including field and laboratory evaluation of fill, backfill, pavement materials, concrete and steel should be performed to determine whether applicable project requirements have been met. It would be logical for Terracon to provide these additional services for continuing from design through construction and to determine the consistency of field conditions with those data used in our analyses.

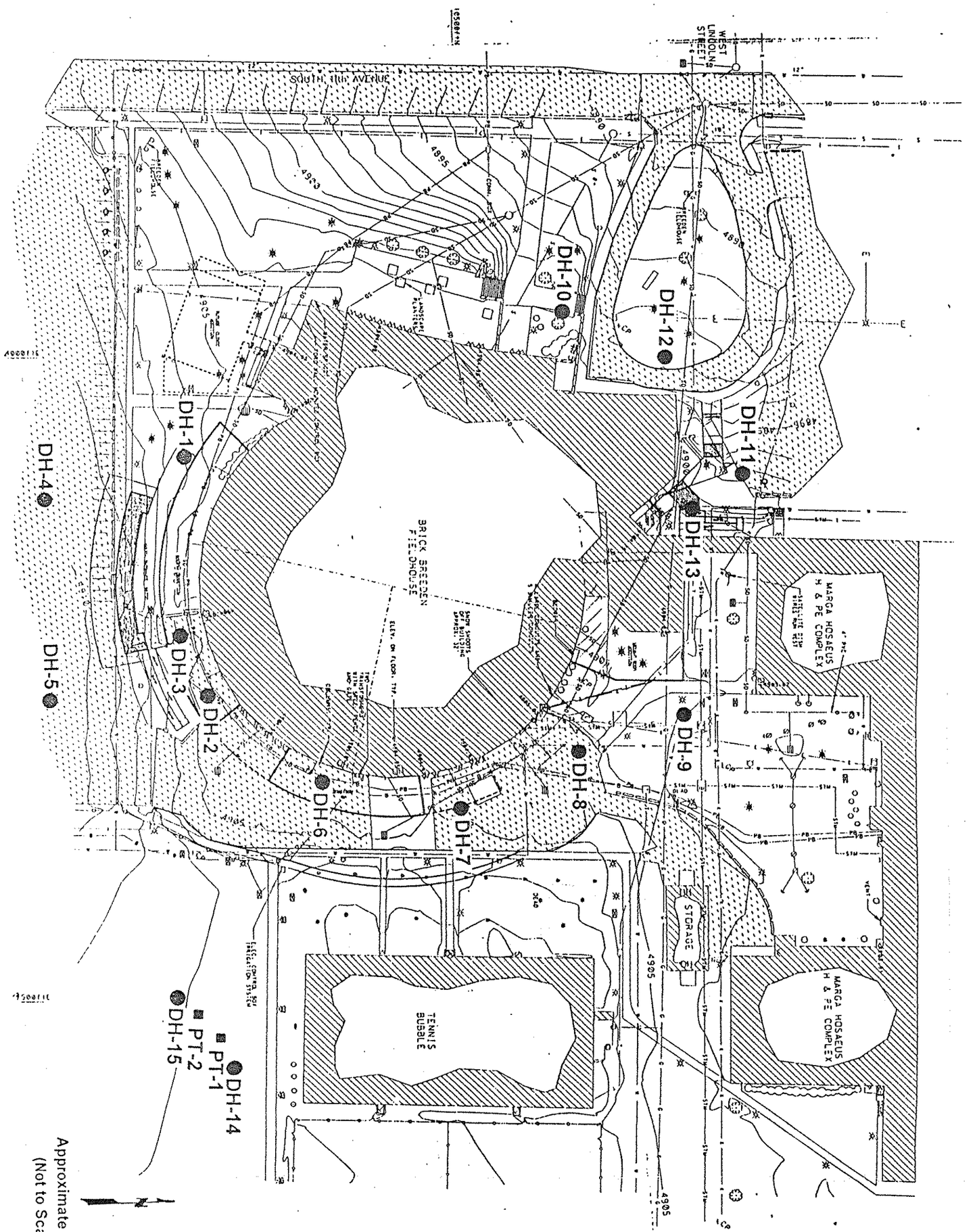
The analyses and recommendations in this report are based in part upon data obtained from the field exploration. The nature and extent of variations beyond the location of test borings may not become evident until construction. If variations then appear evident, it may be necessary to re-evaluate the recommendations of this report.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by reputable geotechnical engineers practicing in this or similar localities. No warranty, express or implied, is made. We prepared the report as an aid in design of the proposed project. This report is not a bidding document.

Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction techniques to be used on this project.

This report is for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. The scope of services for this project does not include, either specifically or by implication, any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

APPENDIX A



THE BRICK BREEDEN FIELDHOUSE ADDITIONS & RENOVATIONS
MONTANA STATE UNIVERSITY - BOZEMAN, MONTANA
SITE PLAN AND BORING LOCATION DIAGRAM

Job #	Date	Drawn	Scale
26965060	1/27/97	Copy/TDH Survey	Not to Scale

Terracon

Form 149—10-85

LOG OF BORING NO. DH-1

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4906.1									
	0.4 **TOPSOIL**, organic matter 4905.7									
	LEAN CLAY, brown, moist, medium stiff to stiff, some fine sand, scattered gravels at 8'.				SSS		7	25.3		
		5								
					SSS		40	25.8		
		10								
	13.0 ▽ 4893.1				SSS		50/0.2			
	POORLY GRADED GRAVEL with SAND, saturated, dense to very dense, angular gravel to 1" size, silty sand seams.	15								
					SSS		78			
	20.0 4886.1	20								
	Bottom of Boring (Installed slotted water level observation pipe, 16' to surface.)									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	▽ 12.3	WD	▼
WL			
WL			

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-2

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4905.0									
	0.4 **BITUMINOUS SURFACING** 4904.6									
	2.0 **FILL**, Lean Clay with Gravel. 4903.0				SSS		12	38.4		
	LEAN CLAY, brown, moist, grading to Fat Clay with depth, medium to high plasticity, some fine sand.	5			SSS		30	23.6		
	13.5 4891.5	10			SSS		56			
	POORLY GRADED GRAVEL with SAND, saturated, dense to very dense, angular gravel to 1" size, silty sand seams.	15			SSS		50/0.3			
	18.3 4886.7									
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	▽ 12.5	WD	▼
WL			
WL			

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-3

OWNER	ARCHITECT/ENGINEER
MONTANA STATE UNIVERSITY	CTA ARCHITECTS ENGINEERS
SITE BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	**PROJECT** BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF	
	Elev.: 4905.3										
	0.3 BITUMINOUS SURFACING — 4905.0 0.5 GRAVEL BASE COURSE — 4904.8										
	LEAN CLAY with SAND, brown, moist, medium stiff to soft, wet at 12.5'.				ST			27.6		>4.5*	
		5			SSS		5	36.1			Sulfate < 0.01%
					ST			23.9		2.0**	
	13.3 — ▽ 4892.0	10			SSS		11	28.4		>4.5*	
	POORLY GRADED GRAVEL with SAND, saturated, dense to very dense, angular gravel to 1" size, silty sand seams.	15			SSS		30	25.8			
		20			SSS		41	17.4			
		25									
	29.7 — 4875.6				SSS		50/0.2	15.3			
	Bottom of Boring										

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	▽ 12.7	WD	▼
WL			
WL			

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-4

OWNER: MONTANA STATE UNIVERSITY

ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS

SITE: BRICK BREEDEN FIELDHOUSE
BOZEMAN, MT

PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4910.4									
	0.3 BITUMINOUS SURFACING 4910.1									
	0.6 GRAVEL BASE COURSE 4909.8				SSS		17	20.7		
	LEAN CLAY, brown, moist, stiff to medium stiff.				SSS		18			
					SSS		8	22.0		
	5.5 4904.9	5								
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	NONE	WD	
WL			
WL			

Terracon

BORING STARTED	12-18-96		
BORING COMPLETED	12-18-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-5

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4910.5									
	0.4 BITUMINOUS SURFACING 4910.1 0.7 GRAVEL BASE COURSE 4909.8				SSS		30	20.7		
	LEAN CLAY, brown, moist, stiff to very stiff.									
					SSS		11	22.4		
	5.0 4905.5 Bottom of Boring	5								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	NONE	WD	
WL			
WL			

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-6

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY	SAMPLES: SPT - N BLOWS / FT.	TESTS: MOISTURE, %	TESTS: DRY DENSITY PCF	TESTS: UNCONFINED STRENGTH, PSF
	Elev.: 4905.4									
	0.4 **BITUMINOUS SURFACING** 4905.0									
	FILL, lean clay with gravel									
	2.5 4902.9				SSS		14	25.1		
	SILTY CLAY, light brown, stiff to very stiff, moist, scattered gravel at 12.5', wet at 14'.	5			SSS		14	26.2		
		10			SSS		27	23.0		
	14.0 4891.4 ▽				SSS		37			
	15.0 **POORLY GRADED GRAVEL**, black, sub-angular, saturated. 4890.4	15								
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	▽ 14.0	WD	▼
WL			
WL			

Terracon

BORING STARTED	12-18-96		
BORING COMPLETED	12-18-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-7

OWNER	ARCHITECT/ENGINEER
MONTANA STATE UNIVERSITY	CTA ARCHITECTS ENGINEERS
SITE BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	**PROJECT** BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4905.0									
	0.4 **BITUMINOUS SURFACING** 4904.6									
	FILL, lean clay with gravel, dark brown, moist									
	4.0 4901.0									
					ST			28.3		4.0**
		5			SSS		11	33.8		>4.5*
	LEAN CLAY, brown, moist, stiff.									
		10			SSS		40			
					SSS		50/0.2	23.5		
	14.7 4890.3									
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS		
WL ▽	NONE	WD ▼
WL		
WL		

Terracon

BORING STARTED	12-18-96		
BORING COMPLETED	12-18-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-8

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4905.3									
	0.4 **BITUMINOUS SURFACING** 4904.9									
	FILL, Lean Clay with Gravel, dark brown, moist 2.5 4902.8				SSS		11			
		5			SSS		20	22.6		
	LEAN CLAY, brown, moist, stiff.				SSS		6	28.6		
		10			SSS		11	27.1		
					SSS		33	28.1		
	15.0 4890.3	15								
	Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	NONE	WD	
WL			
WL			

Terracon

BORING STARTED	12-18-96		
BORING COMPLETED	12-18-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-9

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4905.5									
	0.5 **TOPSOIL**, organic matter 4905.0									
	2.0 **FILL**, Lean Clay with Gravel, dark brown, moist 4903.5				SSS		41	22.7		
					SSS		9	25.6		
	LEAN CLAY, brown, moist, stiff.	5								
					SSS		12	28.7		
		10			SSS		5	38.8		
					SSS		14	28.9		
		15			SSS		13	29.0		
	16.5 4889.0									
	Bottom of Boring (Installed slotted water level observation pipe, 15' to surface.)									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	NONE	WD	
WL			
WL			

Terracon

BORING STARTED	12-18-96		
BORING COMPLETED	12-18-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-10

OWNER	ARCHITECT/ENGINEER
MONTANA STATE UNIVERSITY	CTA ARCHITECTS ENGINEERS
SITE BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	**PROJECT** BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4895.8									
	0.5 **TOPSOIL** 4895.3									
	LEAN CLAY, brown, moist, medium stiff.				SSS		6	26.1		
		5								
					SSS		5	35.2		
	10.0 4885.8 Bottom of Boring	10								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS		
WL	NONE	WD
WL		
WL		

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-11

OWNER	ARCHITECT/ENGINEER
MONTANA STATE UNIVERSITY	CTA ARCHITECTS ENGINEERS
SITE BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	**PROJECT** BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4897.4									
	0.3 BITUMINOUS SURFACING 4897.1									
	1.5 LEAN CLAY with GRAVEL, dense, dark brown, moist 4895.9									
	LEAN CLAY, brown, moist, medium stiff to stiff.				SSS		12	25.5		
		5								
					SSS		14			
	10.0 4887.4 Bottom of Boring	10								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS		
WL	NONE	WD
WL		
WL		

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-12

OWNER: MONTANA STATE UNIVERSITY

ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS

SITE: BRICK BREEDEN FIELDHOUSE
BOZEMAN, MT

PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4893.0									
	0.5 **TOPSOIL**, organic matter 4892.5									
	LEAN CLAY, brown, moist, medium stiff to stiff.				SSS		10	29.2		
					SSS		13	33.0		
	5.5 4887.5 Bottom of Boring	5								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	▽ NONE	WD	▼
WL			
WL			

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-13

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY	SAMPLES SPT - N BLOWS / FT.	TESTS MOISTURE, %	TESTS DRY DENSITY PCF	TESTS UNCONFINED STRENGTH, PSF
	Elev.: 4900.0									
	0.5 **TOPSOIL**, organic matter 4899.5									
	LEAN CLAY, brown, moist, medium stiff.				SSS		6	26.5		
		5			SSS		6	26.0		
	6.5 4893.5 Bottom of Boring									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS			
WL	▽ NONE	WD	▼
WL			
WL			

Terracon

BORING STARTED	12-19-96		
BORING COMPLETED	12-19-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-14

OWNER: MONTANA STATE UNIVERSITY

ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS

SITE: BRICK BREEDEN FIELDHOUSE
BOZEMAN, MT

PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY	SAMPLES: SPT - N BLOWS / FT.	TESTS: MOISTURE, %	TESTS: DRY DENSITY PCF	TESTS: UNCONFINED STRENGTH, PSF
	Elev.: 4908.3									
	0.5 **TOPSOIL**, organic matter 4907.8				SSS		14	23.6		
	LEAN CLAY, brown, moist, medium stiff to stiff.	5			SSS		9	24.6		
					SSS		15	25.3		
					SSS		21	23.8		
	10.0 4898.3 Bottom of Boring	10								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS		
WL	NONE	WD
WL		
WL		

Terracon

BORING STARTED	12-18-96		
BORING COMPLETED	12-18-96		
RIG	D-50	FOREMAN	PRR
APPROVED	MRL	JOB #	26965060

LOG OF BORING NO. DH-15

OWNER: MONTANA STATE UNIVERSITY	ARCHITECT/ENGINEER: CTA ARCHITECTS ENGINEERS
SITE: BRICK BREEDEN FIELDHOUSE, BOZEMAN, MT	PROJECT: BRICK BREEDEN FIELDHOUSE RENOVATIONS

GRAPHIC LOG	DESCRIPTION	DEPTH (FT.)	USCS SYMBOL	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: RECOVERY	SAMPLES: SPT - N BLOWS / FT.	TESTS: MOISTURE, %	TESTS: DRY DENSITY PCF	TESTS: UNCONFINED STRENGTH, PSF
	Elev.: 4908.7									
	0.5 **TOPSOIL** 4908.2									
					SSS		8	23.9		
	LEAN CLAY, brown, moist, medium stiff to stiff.	5			SSS		13			
					SSS		23			
					SSS		30	27.6		
	10.0 4898.7 Bottom of Boring	10								

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL AND ROCK TYPES: IN-SITU, THE TRANSITION MAY BE GRADUAL.

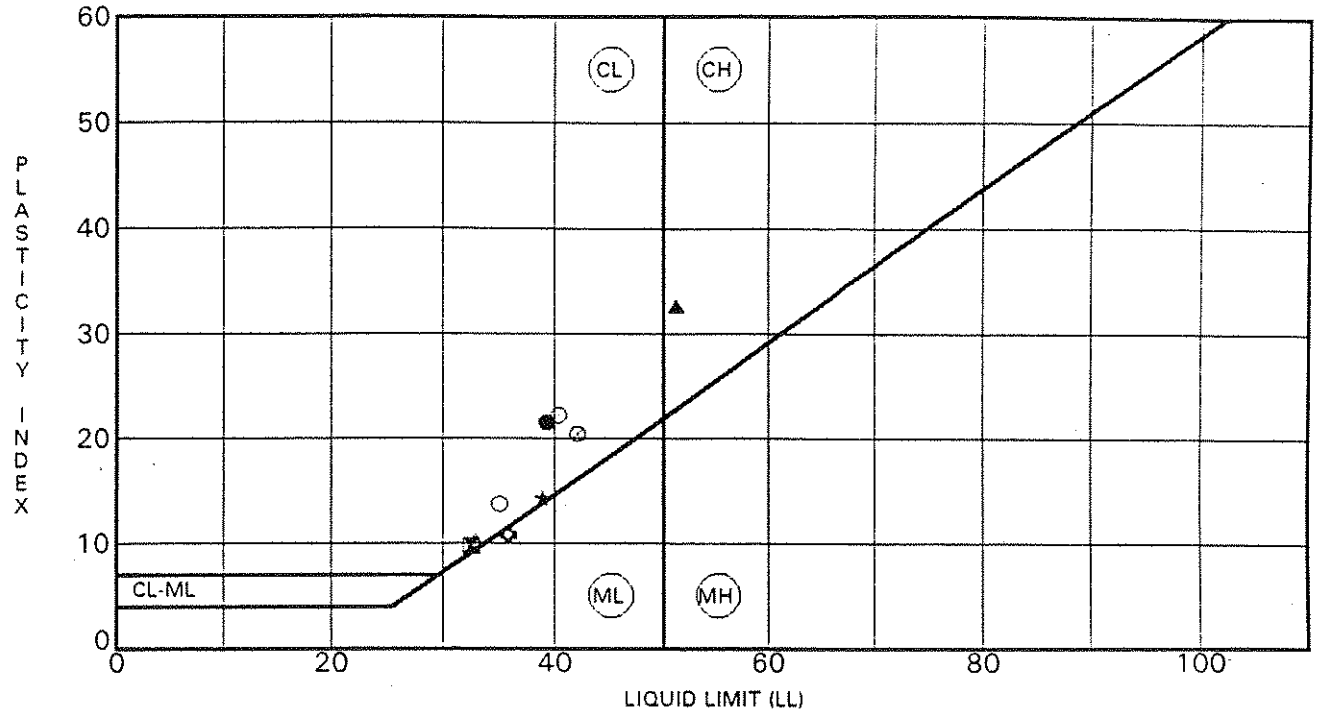
Calibrated Hand Penetrometer*
Unconfined Test Value**

WATER LEVEL OBSERVATIONS		
WL	NONE	WD
WL		
WL		

Terracon

BORING STARTED	12-18-96
BORING COMPLETED	12-18-96
RIG: D-50	FOREMAN: PRR
APPROVED: MRL	JOB #: 26965060

APPENDIX B



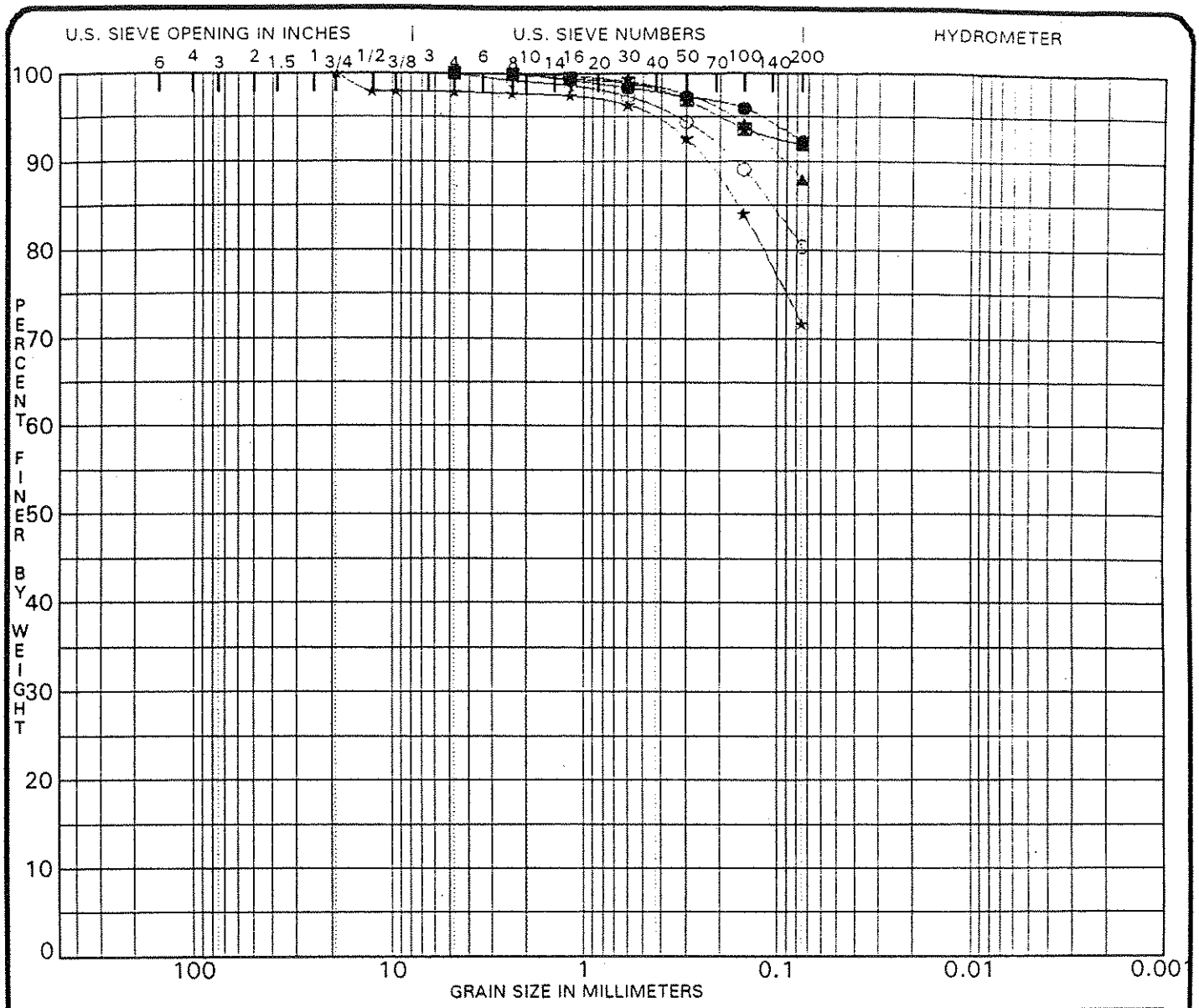
Specimen Identification			LL	PL	PI	Fines	Classification
●	DH-1	2.5	39	18	22	92.1	LEAN CLAY CL
⊠	DH-12	2.5	33	23	10	91.8	LEAN CLAY CL
▲	DH-2	8.0	51	19	33	87.9	FAT CLAY CH
★	DH-3	3.0	39	25	14	71.6	LEAN CLAY with SAND CL
○	DH-3	10.0	40	18	22	80.3	LEAN CLAY with SAND CL
◇	DH-3	23.0	36	25	11	23.4	SILTY SAND SM
○	DH-7	4.0	35	21	14	94.8	LEAN CLAY CL
△	DH-9	4.0	33	23	10	92.0	LEAN CLAY CL
⊘	DH-9	12.5	42	22	20	90.7	LEAN CLAY CL

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

ATTERBERG LIMITS' RESULTS

Terracon
Billings, Montana



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	DH-1	2.5	LEAN CLAY CL	25	39	18	22		
⊠	DH-12	2.5	LEAN CLAY CL	29	33	23	10		
▲	DH-2	8.0	FAT CLAY CH	24	51	19	33		
★	DH-3	3.0	LEAN CLAY with SAND CL	28	39	25	14		
○	DH-3	10.0	LEAN CLAY with SAND CL	24	40	18	22		

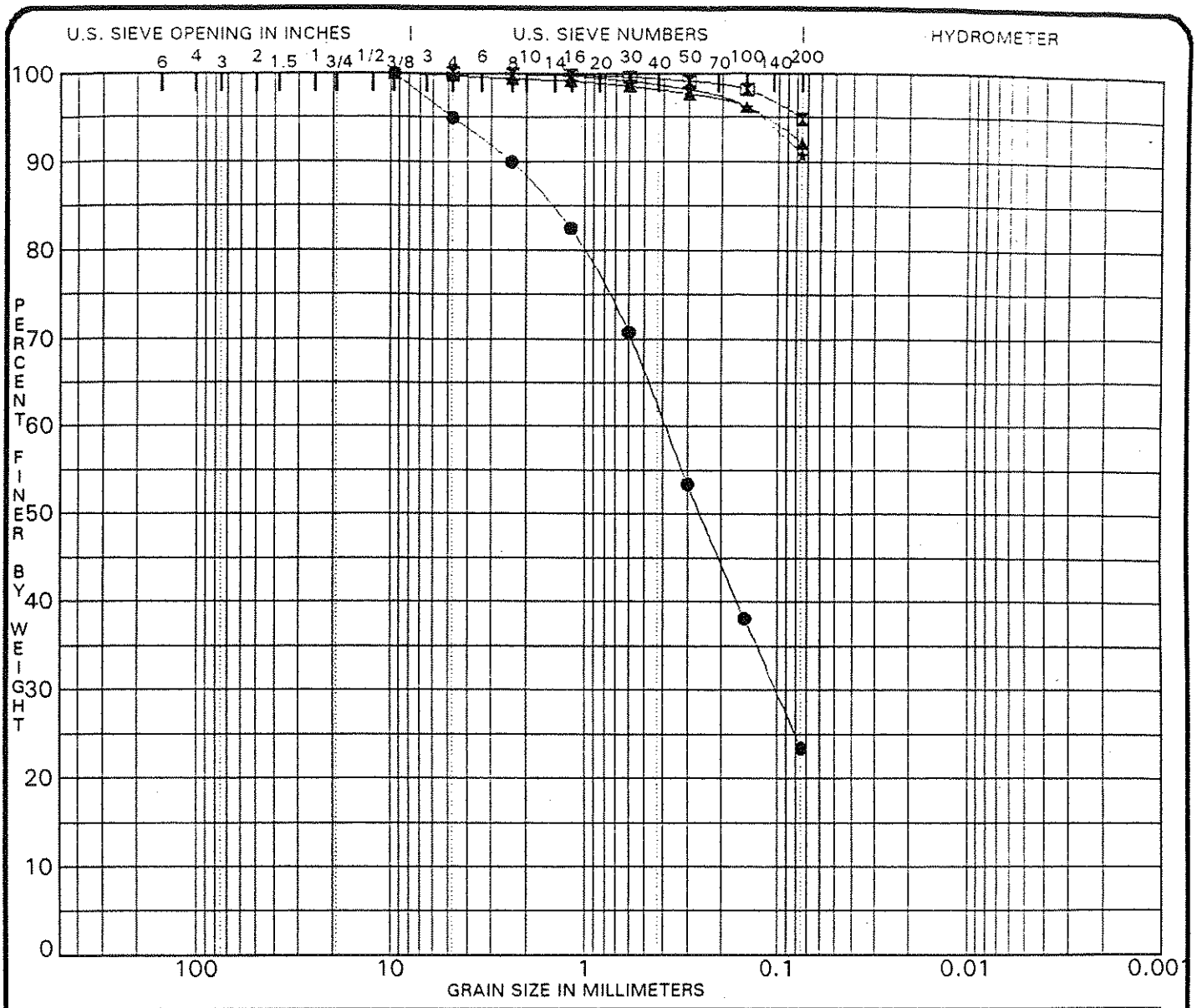
Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DH-1	2.5	4.75				0.0	7.9	92.1	
⊠	DH-12	2.5	4.75				0.0	8.2	91.8	
▲	DH-2	8.0	4.75				0.0	12.1	87.9	
★	DH-3	3.0	19.00				2.1	26.3	71.6	
○	DH-3	10.0	4.75				0.0	19.7	80.3	

PROJECT BRICK BREEDEN FIELDHOUSE RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

GRADATION CURVES

Terracon
Billings, Montana



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	DH-3	23.0	SILTY SAND SM	17	36	25	11		
⊠	DH-7	4.0	LEAN CLAY CL	28	35	21	14		
▲	DH-9	4.0	LEAN CLAY CL	26	33	23	10		
★	DH-9	12.5	LEAN CLAY CL	29	42	22	20		

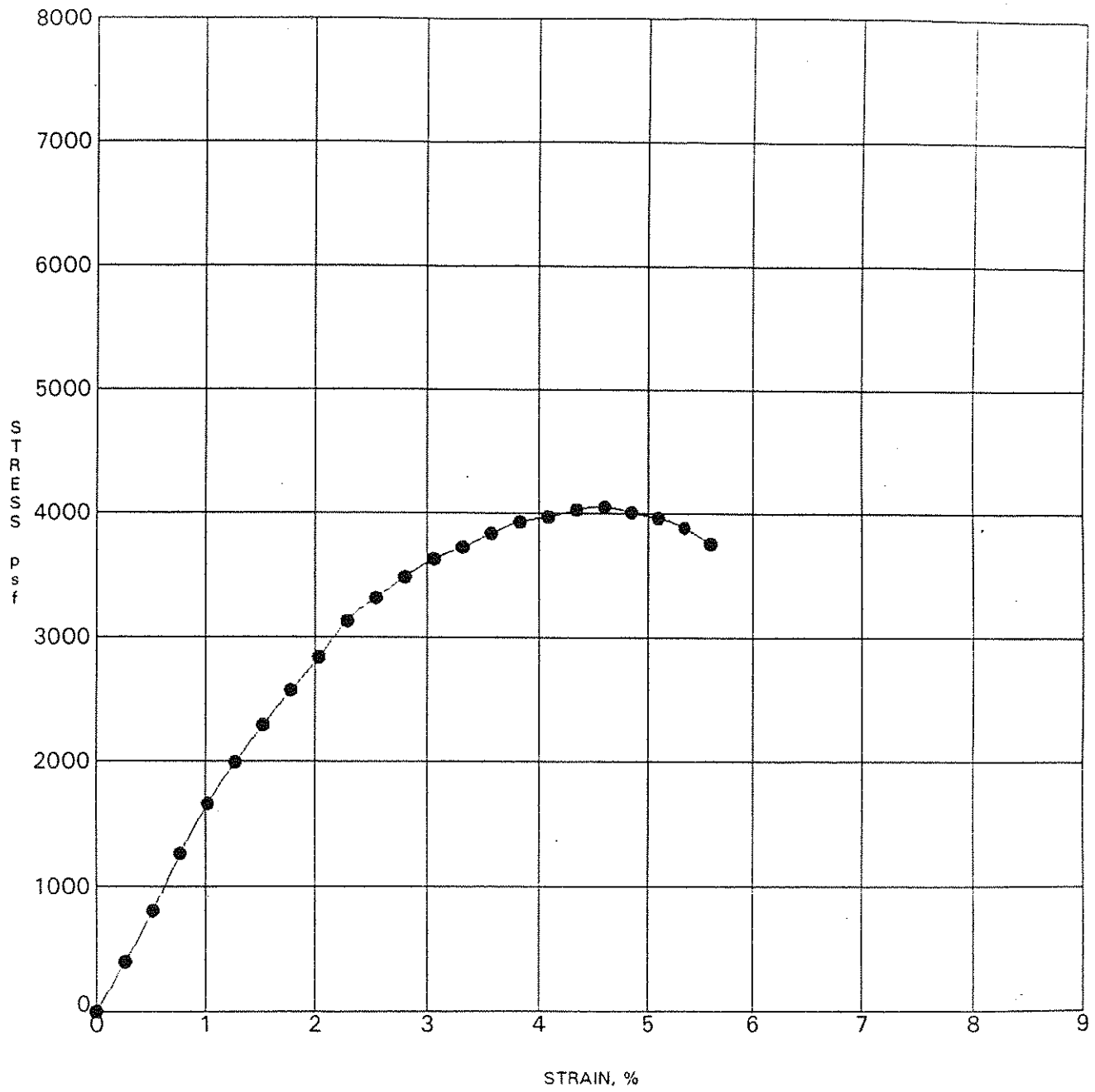
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	DH-3	23.0	9.50	0.39	0.102		5.1	71.5	23.4	
⊠	DH-7	4.0	4.75				0.0	5.2	94.8	
▲	DH-9	4.0	9.50				0.3	7.7	92.0	
★	DH-9	12.5	4.75				0.0	9.3	90.7	

PROJECT BRICK BREEDEN FIELDHOUSE RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

GRADATION CURVES

Terracon
Billings, Montana



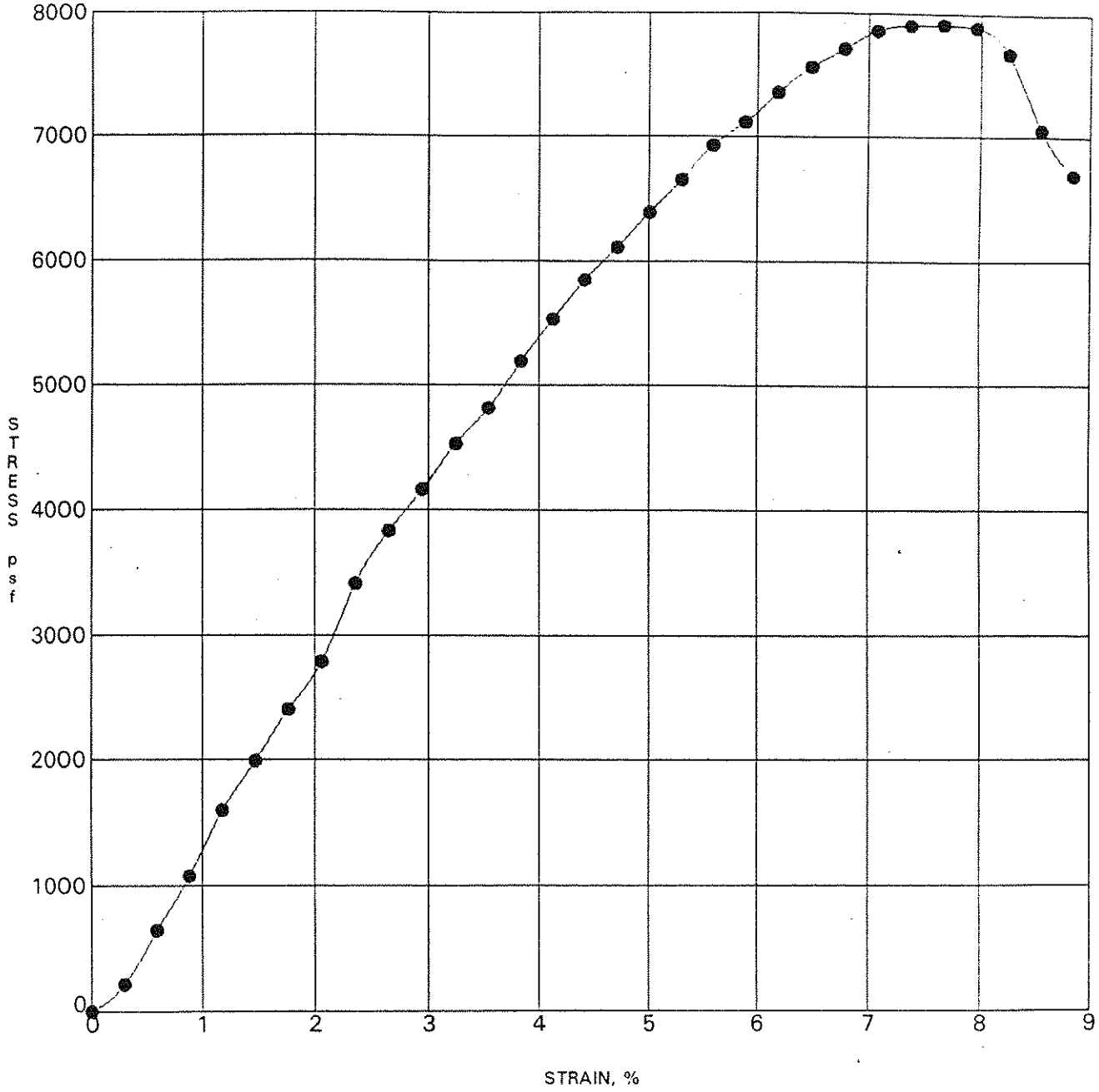
Specimen Identification		Classification	DD	MC%
● DH-3 10.0		LEAN CLAY with SAND CL	96	24

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

UNCONFINED COMPRESSION TEST

Terracon
Billings, Montana



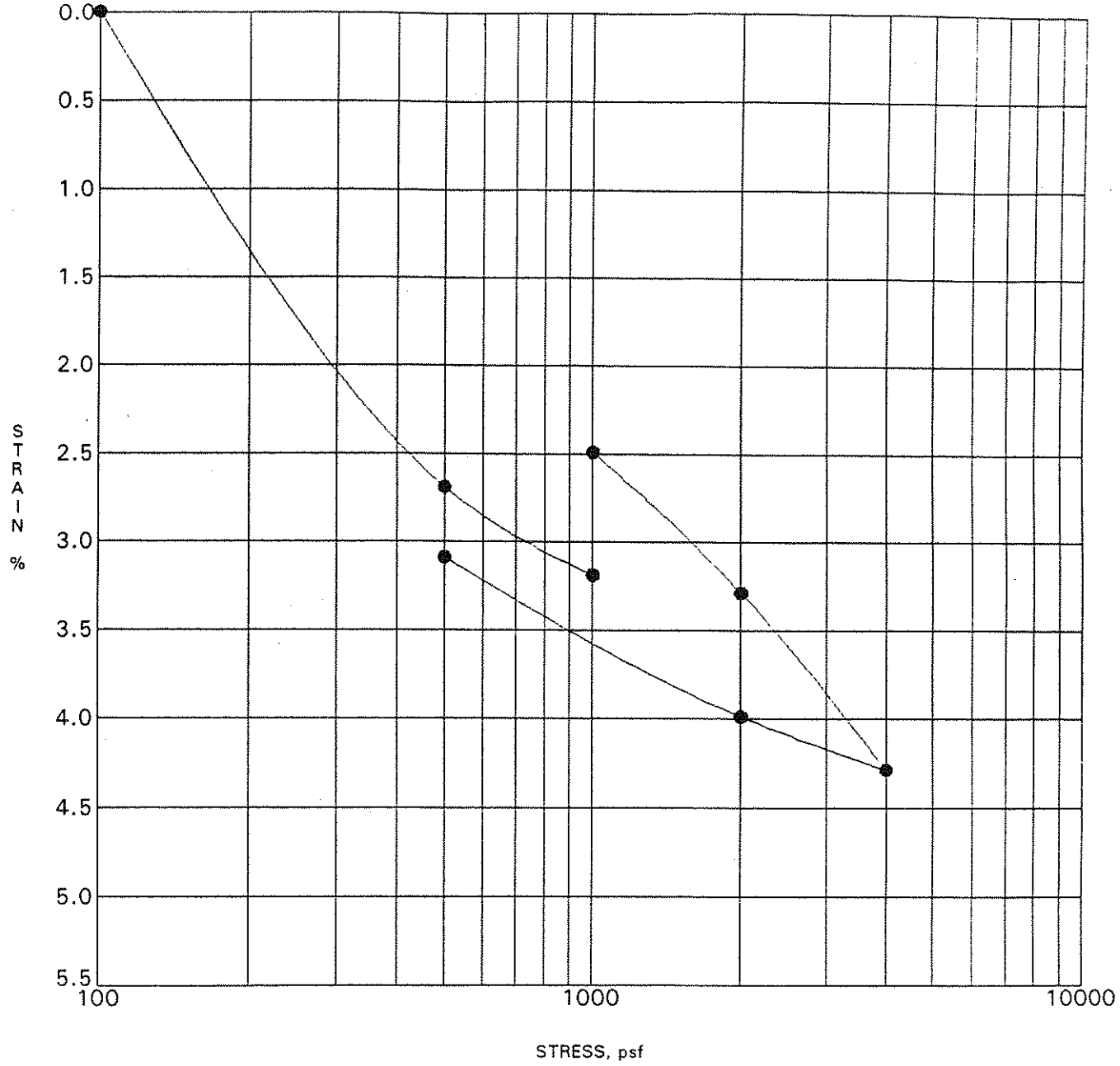
Specimen Identification		Classification	DD	MC%
● DH-7 4.0		LEAN CLAY CL	110	28

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

UNCONFINED COMPRESSION TEST

Terracon
Billings, Montana



Saturated at 1000 psf

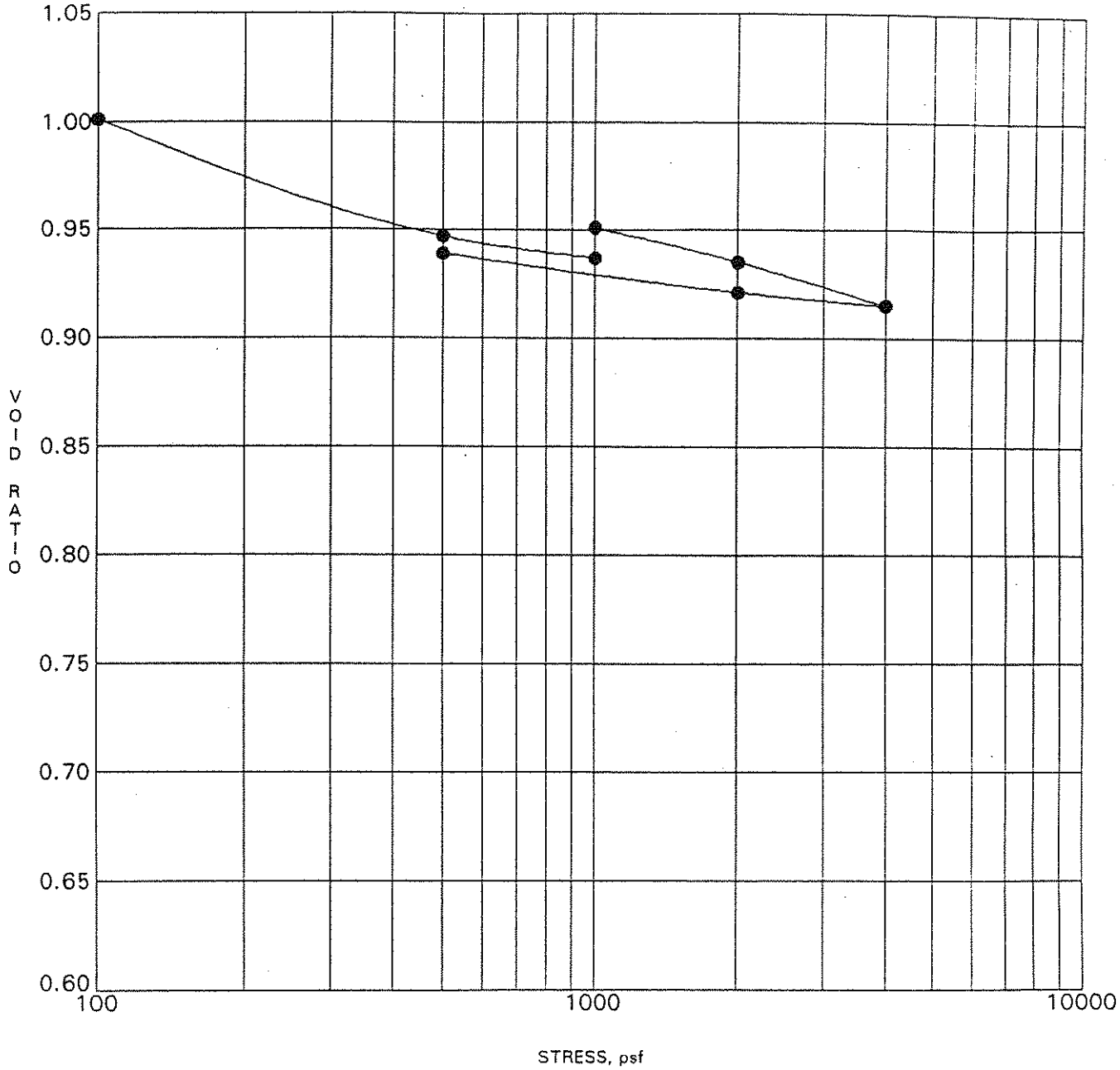
	Specimen Identification		Classification	DD	MC%
●	DH-3	3.0	LEAN CLAY with SAND CL	84	28

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



Saturated at 1000 psf

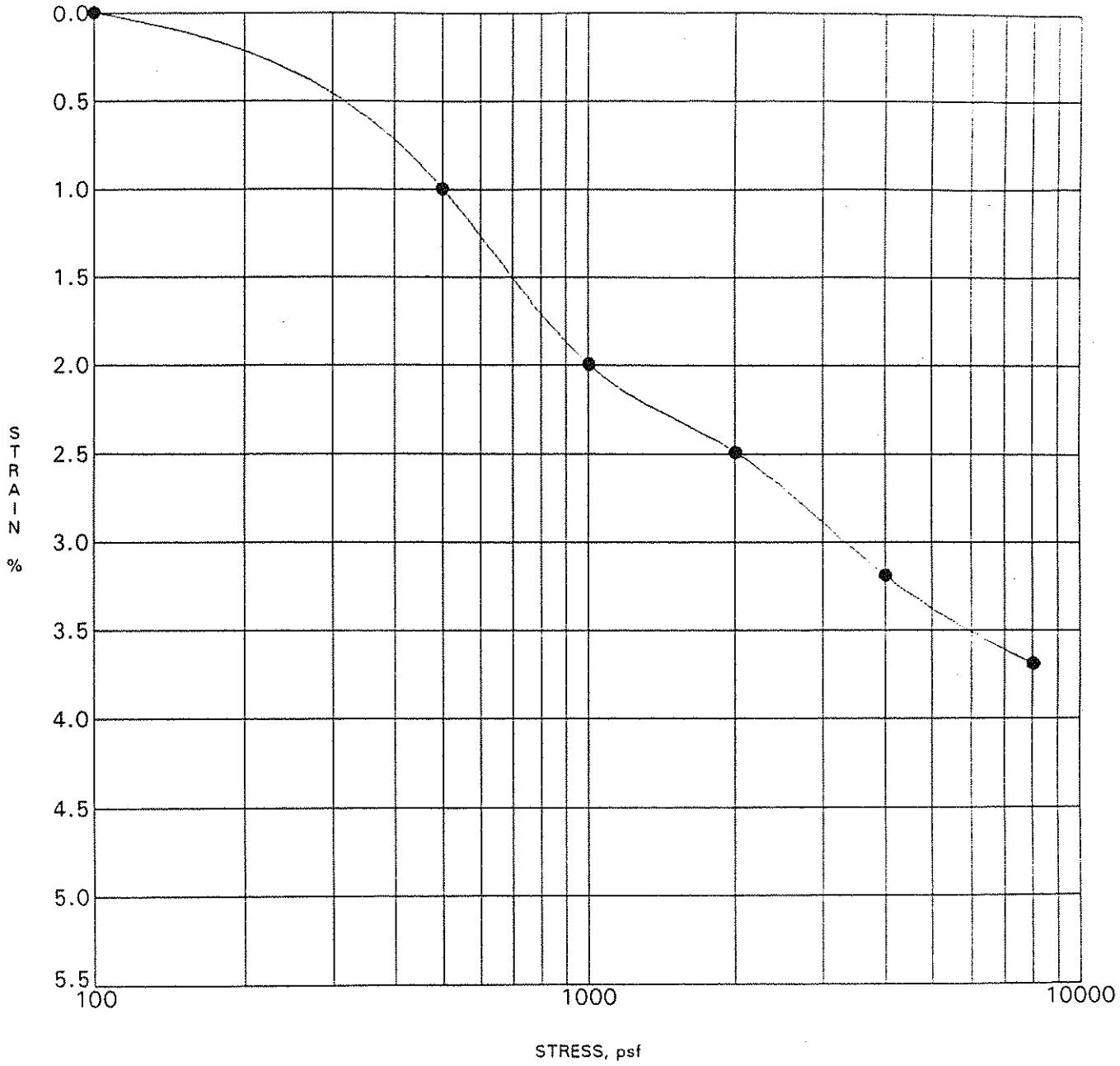
Specimen Identification		Classification	DD	MC%
● DH-3 3.0		LEAN CLAY with SAND CL	84	28

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



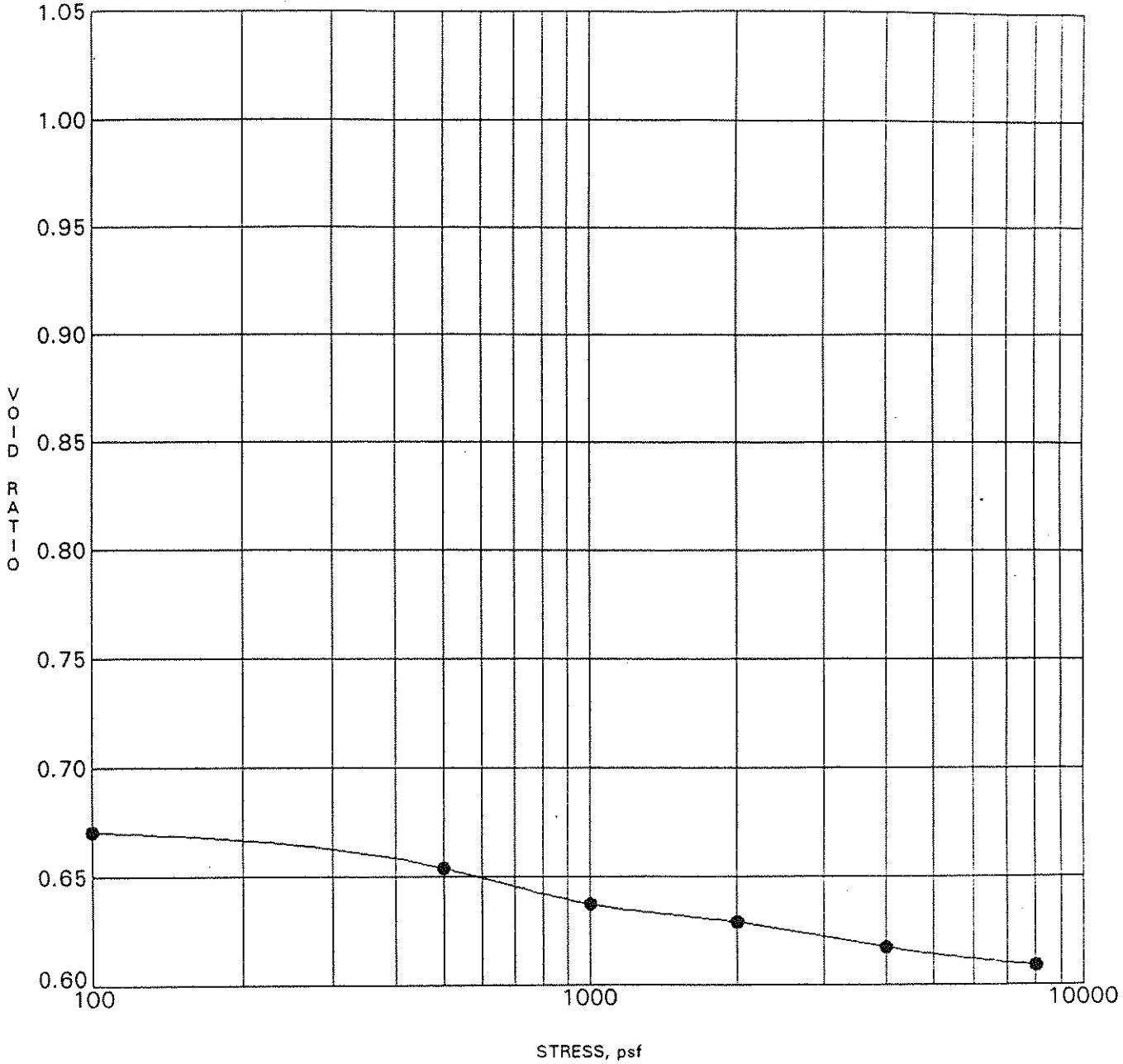
Specimen Identification	Classification	DD	MC%
● DH-3-#2 3.0		104	9

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



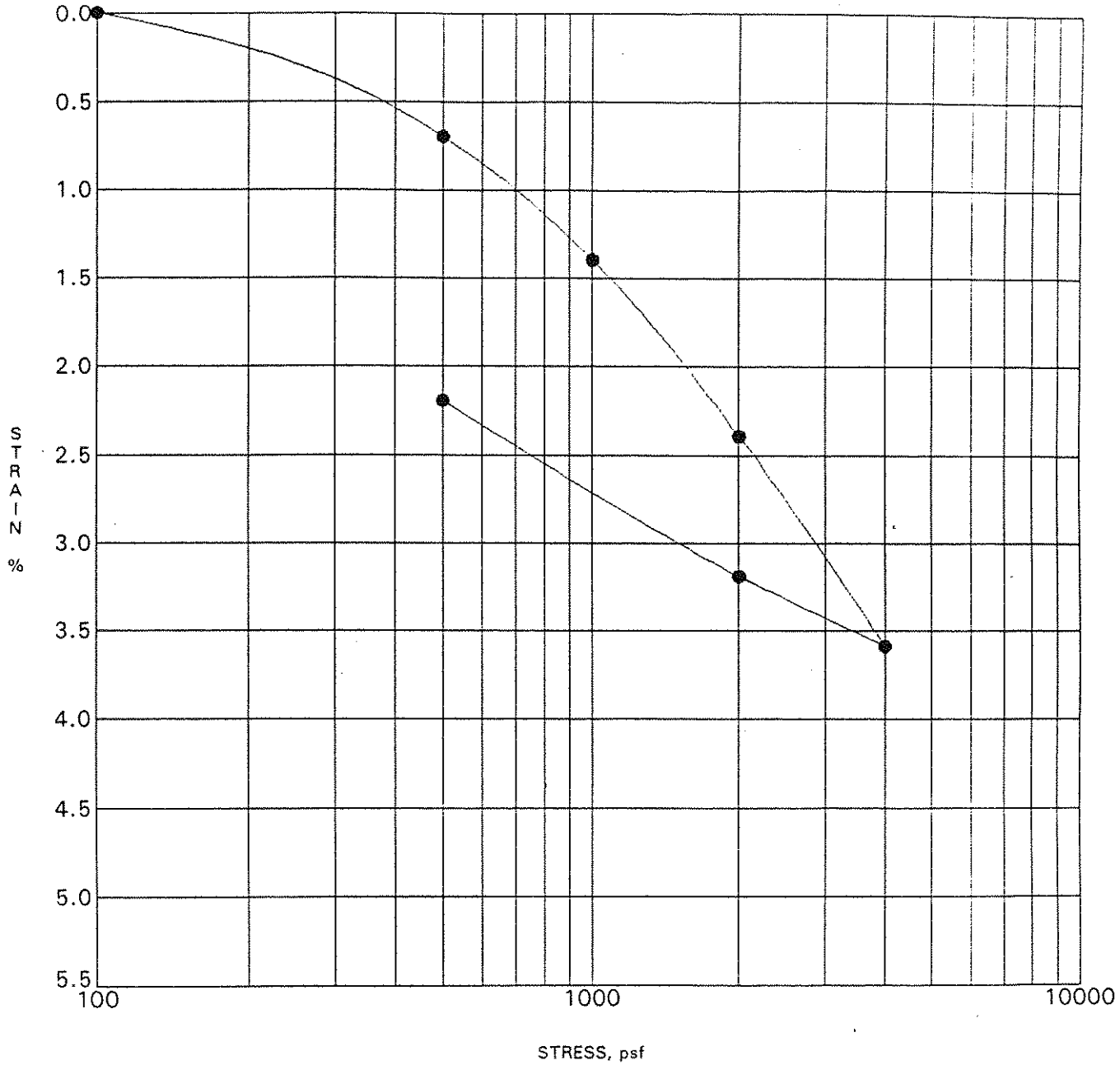
Specimen Identification	Classification	DD	MC%
● DH-3-#2 3.0		104	9

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



Saturated at 1000 psf

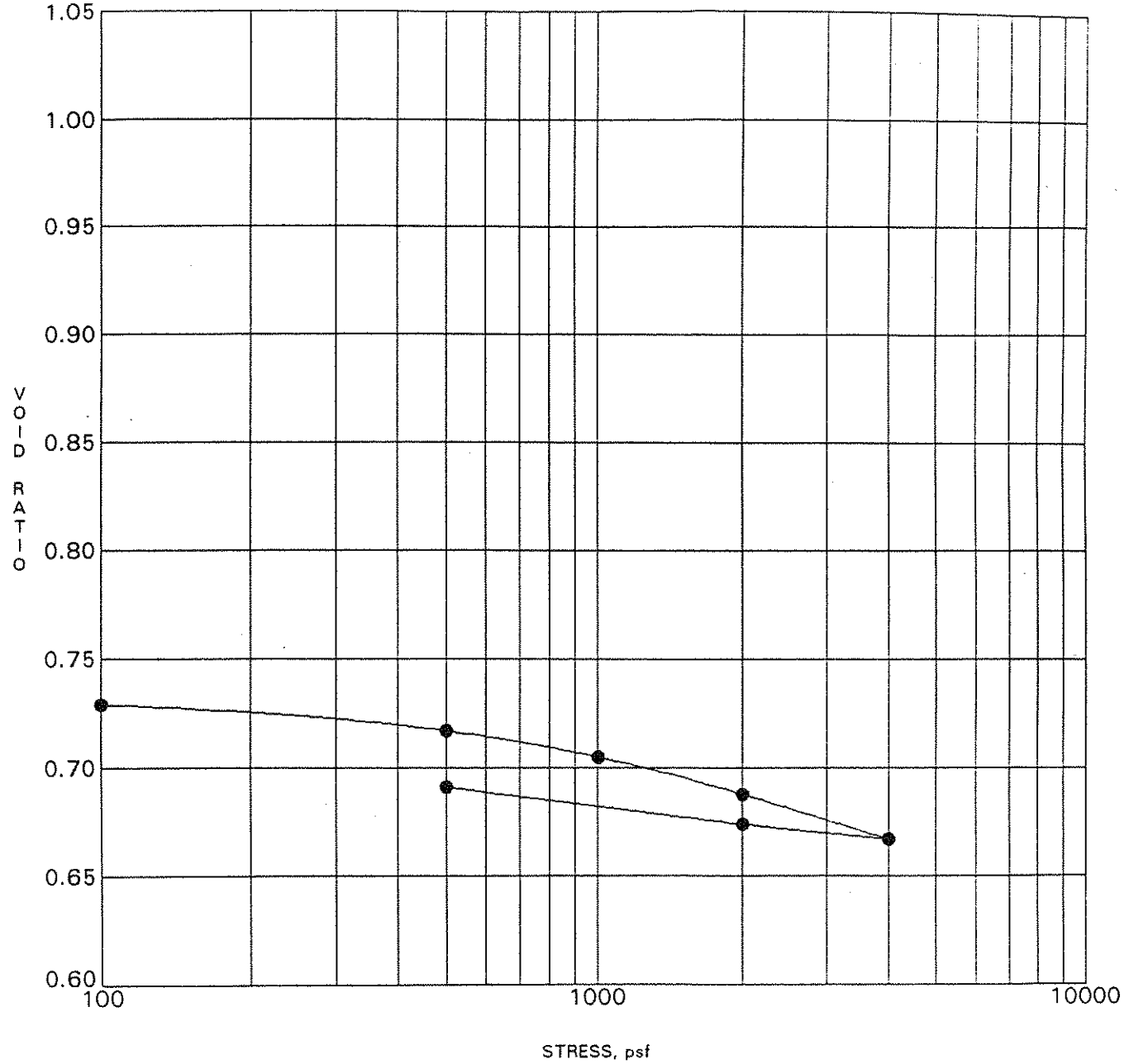
Specimen Identification		Classification	DD	MC%
● DH-3 10.0		LEAN CLAY with SAND CL	97	24

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



Saturated at 1000 psf

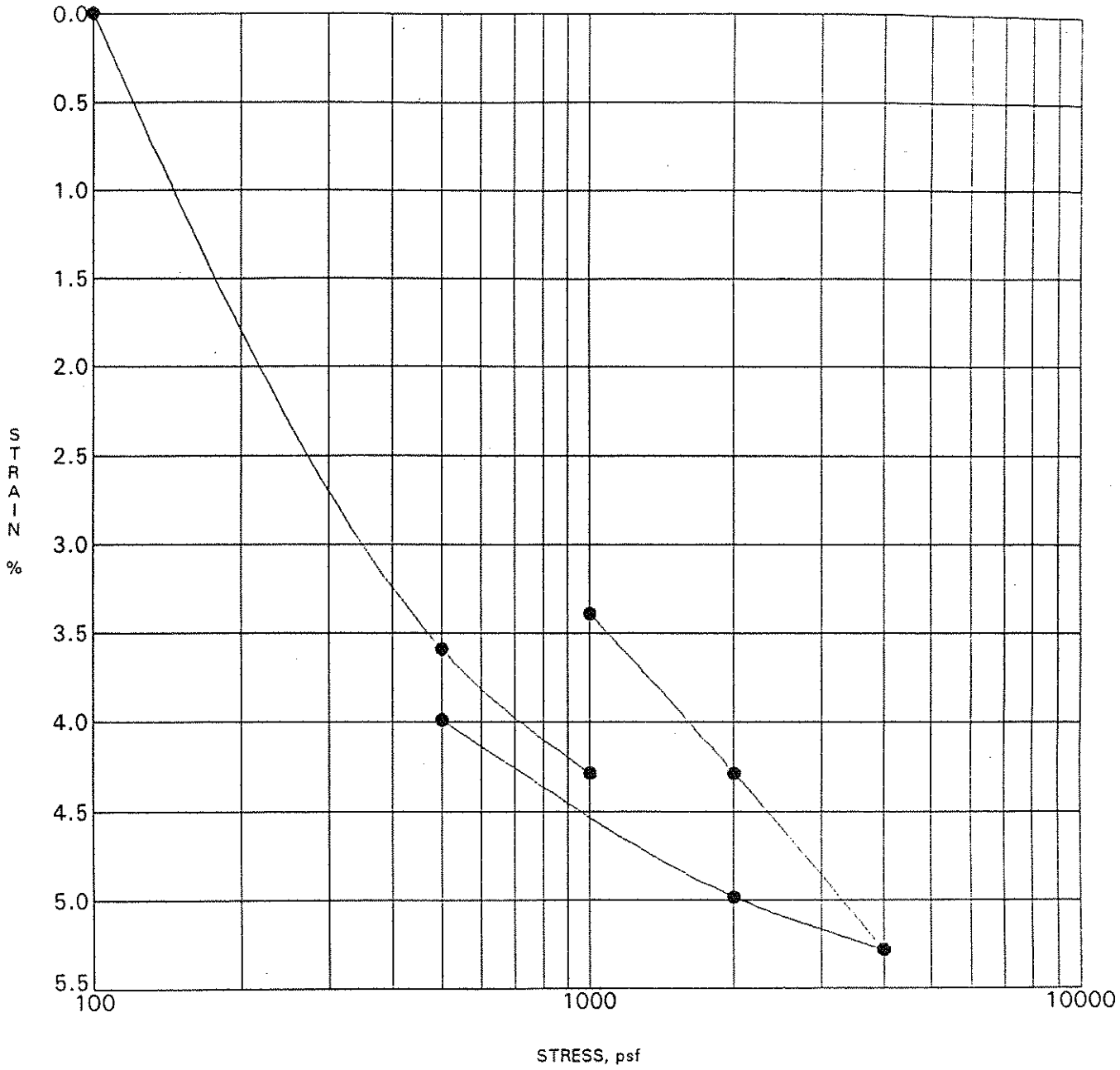
	Specimen Identification		Classification	DD	MC%
●	DH-3	10.0	LEAN CLAY with SAND CL	97	24

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



Saturated at 1000 psf

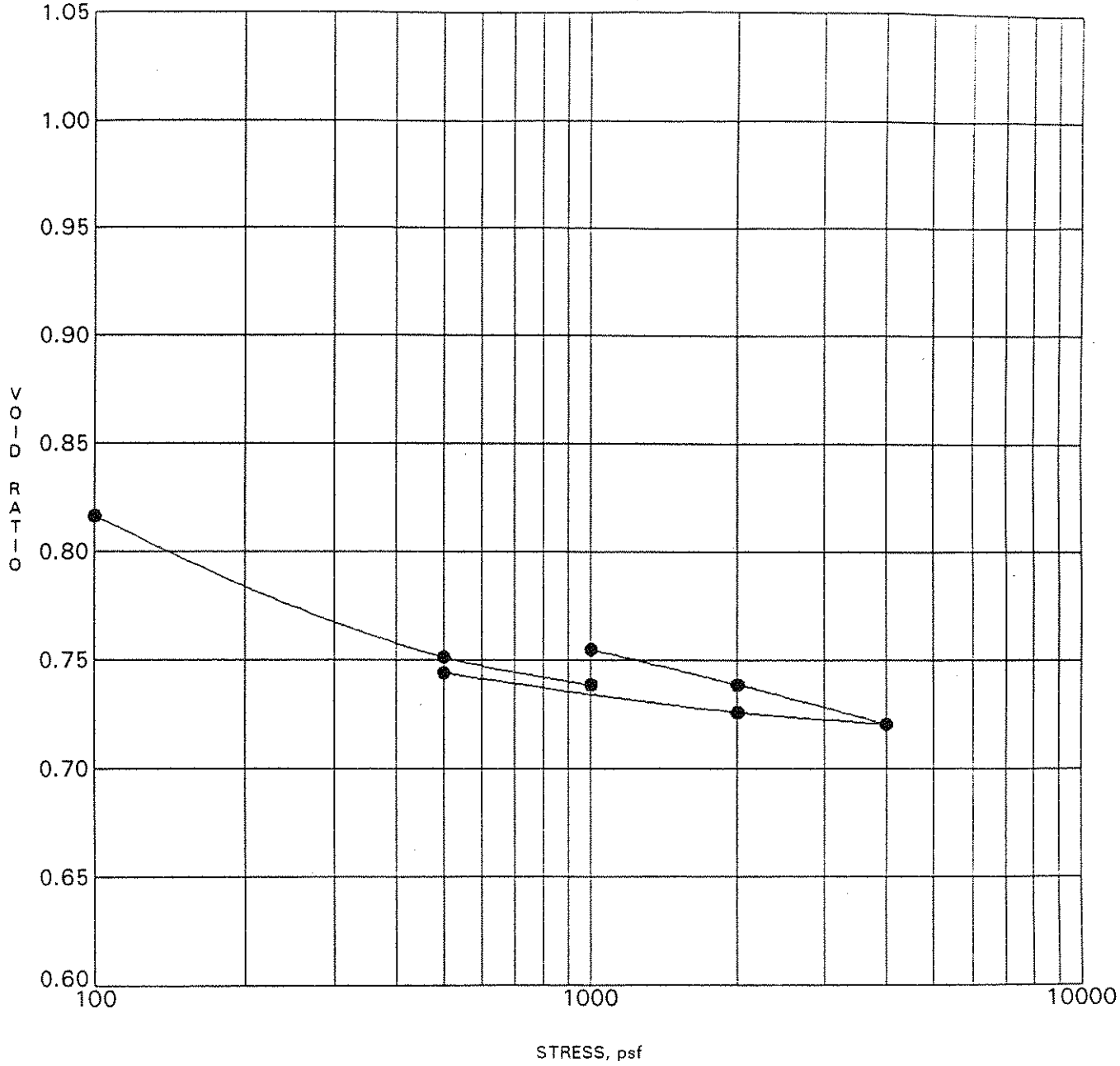
Specimen Identification		Classification	DD	MC%
●	DH-7 4.0	LEAN CLAY CL	93	28

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana



Saturated at 1000 psf

Specimen Identification		Classification	DD	MC%
● DH-7 4.0		LEAN CLAY CL	93	28

PROJECT BRICK BREEDEN FIELDHOUSE
RENOVATIONS - BRICK BREEDEN FIELDHOUSE

JOB NO. 26965060
DATE 1/30/97

CONSOLIDATION TEST

Terracon
Billings, Montana

APPENDIX C

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS	: Split Spoon - 1⅜" I.D., 2" O.D., unless otherwise noted	PS	: Piston Sample
ST	: Thin-Walled Tube - 2" O.D., Unless otherwise noted	WS	: Wash Sample
PA	: Power Auger	FT	: Fish Tail Bit
HA	: Hand Auger	RB	: Rock Bit
DB	: Diamond Bit - 4", N, B	BS	: Bulk Sample
AS	: Auger Sample	PM	: Pressuremeter
HS	: Hollow Stem Auger	DC	: Dutch Cone
		WB	: Wash Bore

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon, except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL	: Water Level	WS	: While Sampling
WCI	: Wet Cave In	WD	: While Drilling
DCI	: Dry Cave In	BCR	: Before Casing Removal
AB	: After Boring	ACR	: After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of ground water levels is not possible with only short term observations.

DESCRIPTIVE SOIL CLASSIFICATION:

Soil Classification is based on the Unified Soil Classification System and ASTM Designations D-2487 and D-2488. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays, if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse grained soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

CONSISTENCY OF FINE-GRAINED SOILS:

Unconfined Compressive Strength, Qu, psf	Consistency
< 500	Very Soft
500 - 1,000	Soft
1,001 - 2,000	Medium
2,001 - 4,000	Stiff
4,001 - 8,000	Very Stiff
8,001 -16,000	Hard
> -16,000	Very Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS:

N-Blows/ft.	Relative Density
0-3	Very Loose
4-9	Loose
10-29	Medium Dense
30-49	Dense
50-80	Very Dense
80 +	Extremely Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) (of Components Also Present in Sample)	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component Of Sample	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) (of Components Also Present in Sample)	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

Terracon

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel[F, G, H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[E]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G, H, I]
			Fines classify as CL or CH	SC	Clayey sand[G, H, I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K, L, M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K, L, M]
		organic	Liquid limit — oven dried / Liquid limit — not dried < 0.75	OL	Organic clay[K, L, M, N] / Organic silt[K, L, M, O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K, L, M]
			PI plots below "A" line	MH	Elastic silt[K, L, M]
		organic	Liquid limit — oven dried / Liquid limit — not dried < 0.75	OH	Organic clay[K, L, M, P] / Organic silt[K, L, M, Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel", whichever is predominant.

[L] If soil contains ≥ 30% plus. No. 200 predominantly sand, add "sandy" to group name.

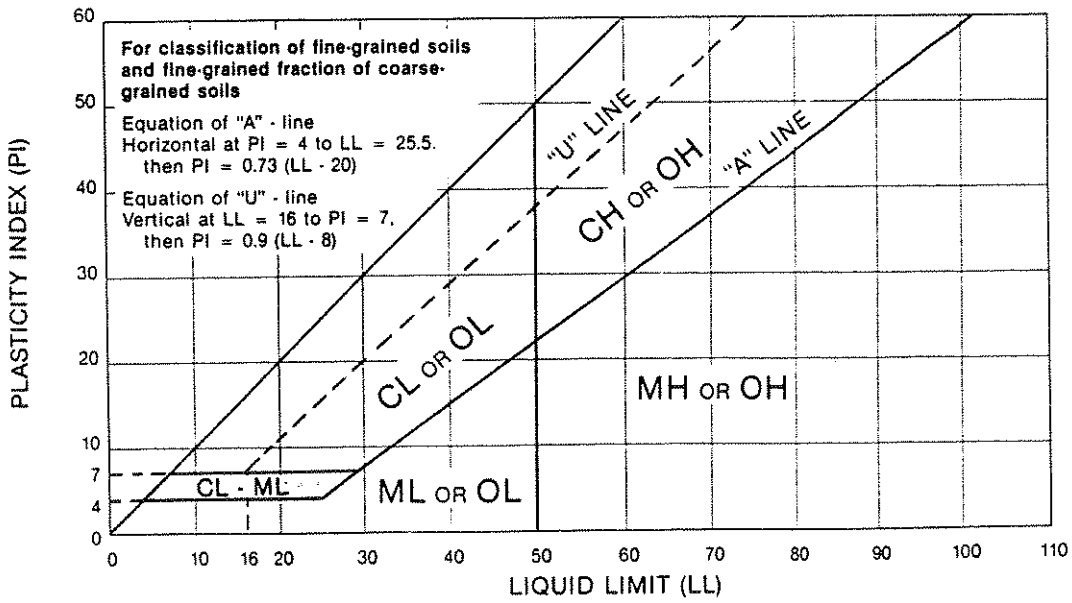
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

ROCK CLASSIFICATION
(Based on ASTM C-294)

Sedimentary Rocks

Sedimentary rocks are stratified materials laid down by water or wind. The sediments may be composed of particles of pre-existing rocks derived by mechanical weathering, evaporation or by chemical or organic origin. The sediments are usually indurated by cementation or compaction.

Chert — Very fine-grained siliceous rock composed of micro-crystalline or crypto-crystalline quartz, chalcedony or opal. Chert is various colored, porous to dense, hard and has a conchoidal to splintery fracture.

Claystone — Fine-grained rock composed of or derived by erosion of silts and clays or any rock containing clay. Soft massive; gray, black, brown, reddish or green and may contain carbonate minerals.

Conglomerate — Rock consisting of a considerable amount of rounded gravel, sand and cobbles with or without interstitial or cementing material. The cementing or interstitial material may be quartz, opal, calcite, dolomite, clay, iron oxides or other materials.

Dolomite — A fine-grained carbonate rock consisting of the mineral dolomite [$CaMg(CO_3)_2$]. May contain noncarbonate impurities such as quartz, chert, clay minerals, organic matter, gypsum and sulfides. Reacts with hydrochloric acid (HCL).

Limestone — A fine-grained carbonate rock consisting of the mineral calcite ($CaCo_3$). May contain noncarbonate impurities such as quartz, chert, clay minerals, organic matter, gypsum and sulfides. Reacts with hydrochloric acid (HCL).

Sandstone — Rock consisting of particles of sand with or without interstitial and cementing materials. The cementing or interstitial material may be quartz, opal, calcite, dolomite, clay, iron oxides or other material.

Shale — Fine-grained rock composed of, or derived by erosion of silts and clays or any rock containing clay. Shale is hard, platy, or fissile may be gray, black, reddish or green and may contain some carbonate minerals (calcareous shale).

Siltstone — Fine grained rock composed of, or derived by erosion of silts or rock containing silt. Siltstones consist predominantly of silt sized particles (0.0625 to 0.002 mm in diameter) and are intermediate rocks between claystones and sandstones, may be gray, black, brown, reddish or green and may contain carbonate minerals.

LABORATORY TESTS
SIGNIFICANCE AND PURPOSE

TEST	SIGNIFICANCE	PURPOSE
California Bearing Ratio	Used to evaluate the potential strength of subgrade soil, subbase, and base course material, including recycled materials for use in road and airfield pavements.	Pavement Thickness Design
Consolidation	Used to develop an estimate of both the rate and amount of both differential and total settlement of a structure.	Foundation Design
Direct Shear	Used to determine the consolidated drained shear strength of soil or rock.	Bearing Capacity, Foundation Design & Slope Stability
Dry Density	Used to determine the in-place density of natural, inorganic, fine-grained soils.	Index Property Soil Behavior
Expansion	Used to measure the expansive potential of fine-grained soil and to provide a basis for swell potential classification.	Foundation & Slab Design
Gradation	Used for the quantitative determination of the distribution of particle sizes in soil.	Soil Classification
Liquid & Plastic Limit, Plasticity Index	Used as an integral part of engineering classification systems to characterize the fine-grained fraction of soils, and to specify the fine-grained fraction of construction materials.	Soil Classification
Permeability	Used to determine the capacity of soil or rock to conduct a liquid or gas.	Groundwater Flow Analysis
pH	Used to determine the degree of acidity or alkalinity of a soil.	Corrosion Potential
Resistivity	Used to indicate the relative ability of a soil medium to carry electrical currents.	Corrosion Potential
R-Value	Used to evaluate the potential strength of subgrade soil, subbase, and base course material, including recycled materials for use in road and airfield pavements.	Pavement Thickness Design
Soluble Sulphate	Used to determine the quantitative amount of soluble sulfates within a soil mass.	Corrosion Potential
Unconfined Compression	To obtain the approximate compressive strength of soils that possess sufficient cohesion to permit testing in the unconfined state.	Bearing Capacity Analysis for Foundations
Water Content	Used to determine the quantitative amount of water in a soil mass.	Index Property Soil Behavior

Terracon

REPORT TERMINOLOGY
(Based on ASTM D653)

Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Finished Grade	The final grade created as a part of the project.
Footing	A portion of the foundation of a structure that transmits loads directly to the soil.
Foundation	The lower part of a structure that transmits the loads to the soil or bedrock.
Frost Depth	The depth of which the ground becomes frozen during the winter season.
Grade Beam	A foundation element or wall, typically constructed of reinforced concrete, used to span between other foundation elements such as drilled piers.
Groundwater	Subsurface water found in the zone of saturation of soils, or within fractures in bedrock.
Heave	Upward movement.
Lithologic	The characteristics which describe the composition and texture of soil and rock by observation.
Native Grade	The naturally occuring ground surface.
Native Soil	Naturally occurring on-site soil, sometimes referred to as natural soil.
Optimum Moisture Content	The water content at which a soil can be compacted to a maximum dry unit weight by a given compactive effort.
Perched Water	Groundwater, usually of limited area maintained above a normal water elevation by the presence of an intervening relatively impervious continuing stratum.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Skin Friction (Side Shear)	The frictional resistance developed between soil and an element of structure such as a drilled pier or shaft.
Soil (earth)	Sediments or other unconsolidated accumulations of solid particles produced by the physical and chemical disintegration of rocks, and which may or may not contain organic matter.
Strain	The change in length per unit of length in a given direction.
Stress	The force per unit area acting within a soil mass.
Strip	To remove from present location.
Subbase	A layer of specified material in a pavement system between the subgrade and base course.
Subgrade	The soil prepared and compacted to support a structure, slab or pavement system.

Terracon

THE BRICK BREEDEN FIELDHOUSE
ADDITION AND RENOVATION
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA

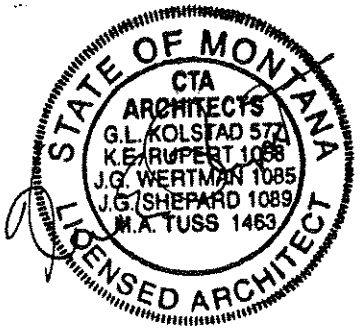
MSUFH

ELECTRONIC SEALS & SIGNATURES ON DRAWINGS

Most sections of these Contract Documents were reproduced electronically directly from the CADD files to the printer. Originals were not produced that could be wet signed.

The following individuals in responsible charge of their disciplines have completed their review and have authorized their seal and signature to be electronically affixed to the drawings.

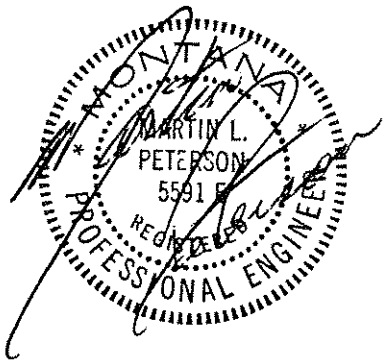
Wet signed sets of reproductions will be provided to jurisdictions requiring them for their records.



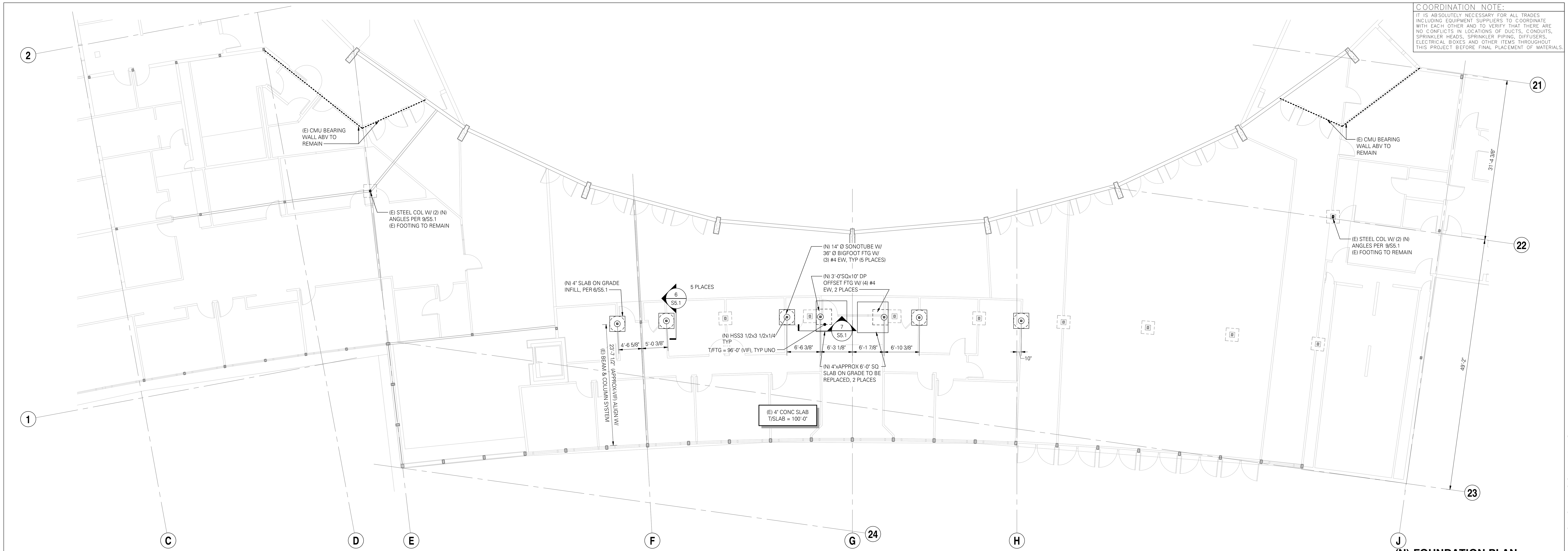
Keith Rupert
Architecture

Steve Bjordahl
Structural

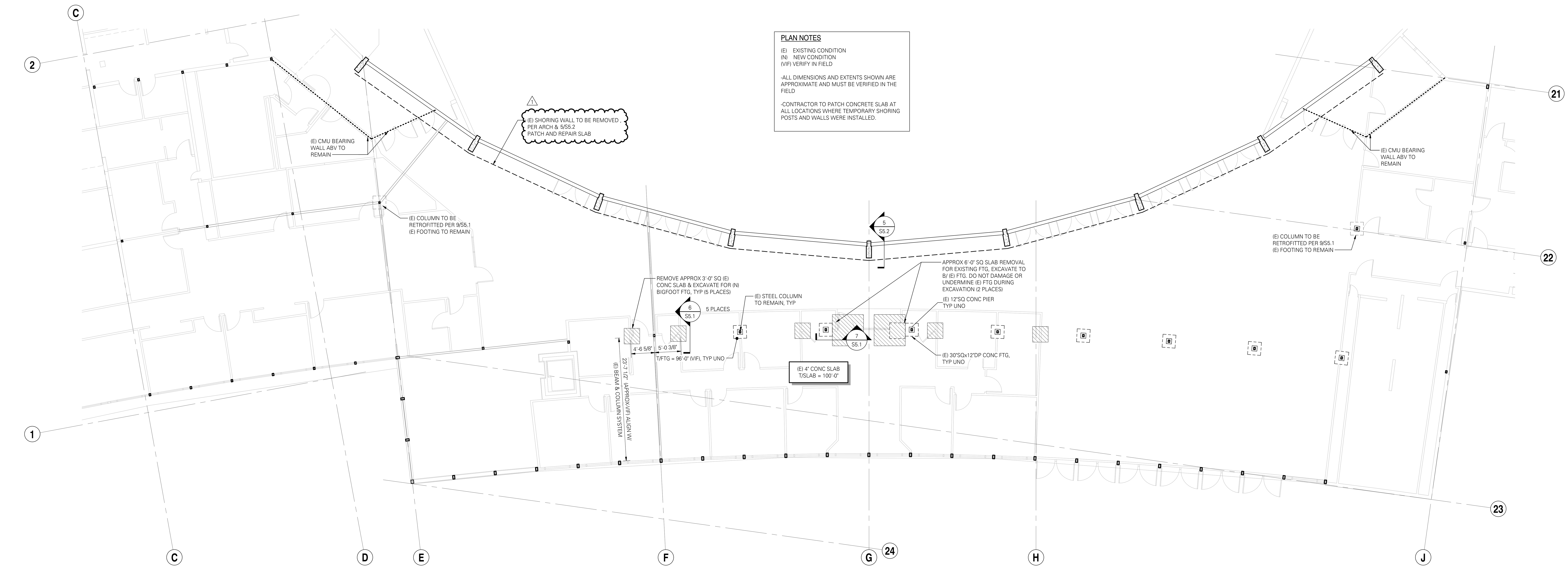
Jerry Baker
Mechanical



Martin Peterson
Electrical



(N) FOUNDATION PLAN
SCALE: 1/8" = 1'-0"



(E) FOUNDATION PLAN
SCALE: 1/8" = 1'-0"

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse
West Entrance Roof Retrofit

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI engineers
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718
P (406) 556-8600 www.dci-engineers.com
CIVIL STRUCTURAL

DRAWN BY: JNH
REVIEWED BY: JML

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
1	ADD #1	11/17/20

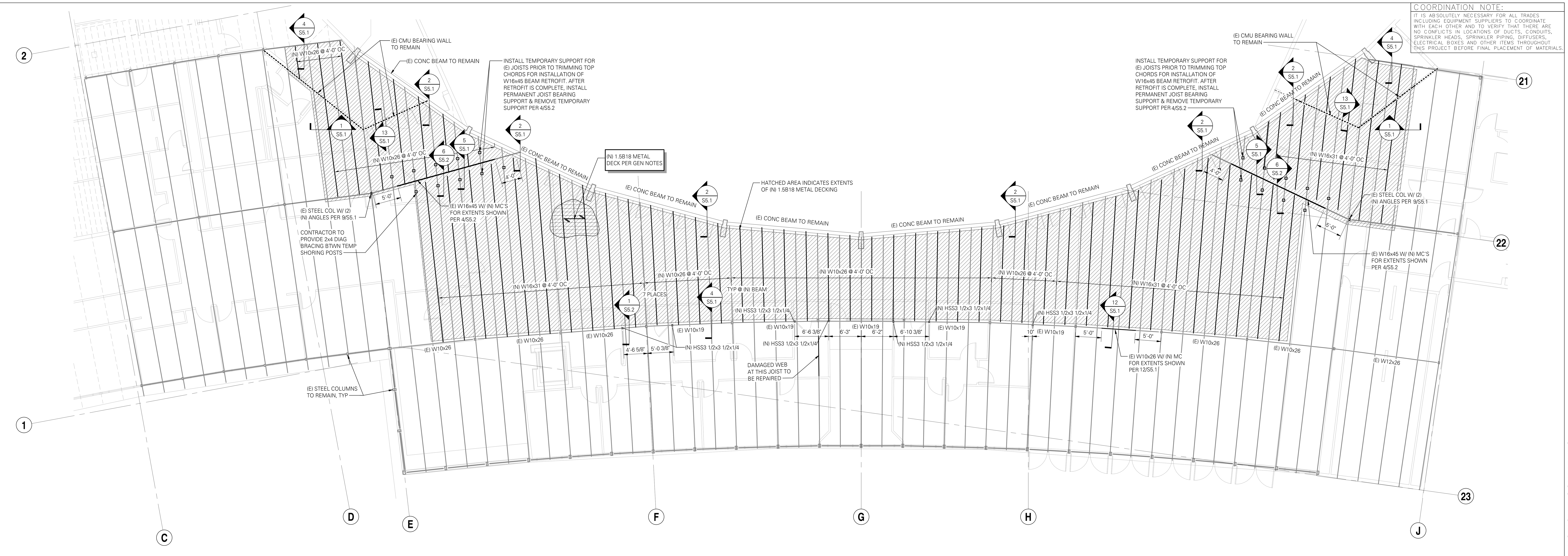
PPA# 19-0172

20151-0060

SHEET TITLE
STRUCTURAL - (E) & (N) FOUNDATION PLANS

SHEET
S1.1

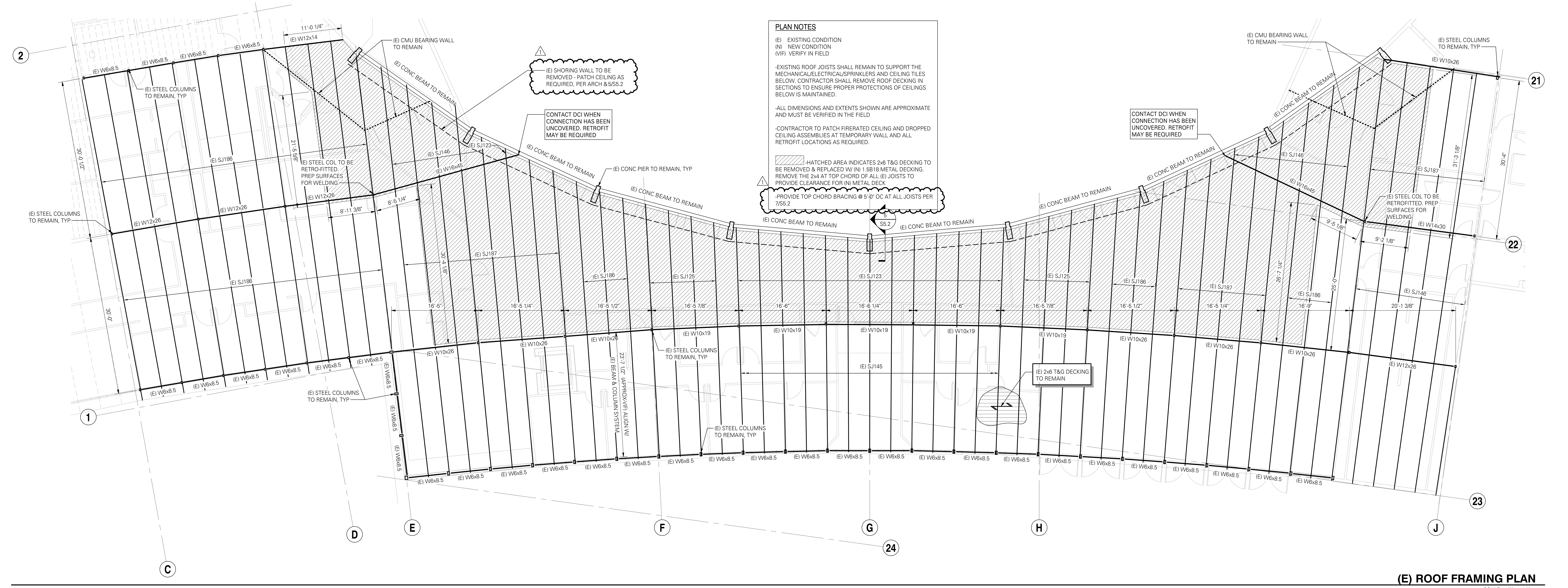
DATE
11/17/20



(N) ROOF FRAMING PLAN

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

COORDINATION NOTE:
IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



PLAN NOTES

(E) EXISTING CONDITION
(N) NEW CONDITION
(VIF) VERIFY IN FIELD

-EXISTING ROOF JOISTS SHALL REMAIN TO SUPPORT THE MECHANICAL/ELECTRICAL/SPRINKLERS AND CEILING TILES BELOW. CONTRACTOR SHALL REMOVE ROOF DECKING IN SECTIONS TO ENSURE PROPER PROTECTIONS OF CEILINGS BELOW IS MAINTAINED.

-ALL DIMENSIONS AND EXTENTS SHOWN ARE APPROXIMATE AND MUST BE VERIFIED IN THE FIELD

-CONTRACTOR TO PATCH FIRERATED CEILING AND DROPPED CEILING ASSEMBLIES AT TEMPORARY WALL AND ALL RETROFIT LOCATIONS AS REQUIRED.

-HATCHED AREA INDICATES 2x6 T&G DECKING TO BE REMOVED & REPLACED W/ (N) 1.5B18 METAL DECKING. REMOVE THE 2x4 AT TOP CHORD OF ALL (E) JOISTS TO PROVIDE CLEARANCE FOR (N) METAL DECK

-PROVIDE TOP CHORD BRACING @ 5'-0" OC AT ALL JOISTS PER 7/S5.2

(E) ROOF FRAMING PLAN

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

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse
West Entrance Roof Retrofit

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI engineers
CIVIL | STRUCTURAL
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718
P (406) 556-8600
www.dci-engineers.com

DRAWN BY: JNH
REVIEWED BY: JML

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
1	ADD #1	11/17/20

PPA# 19-0172

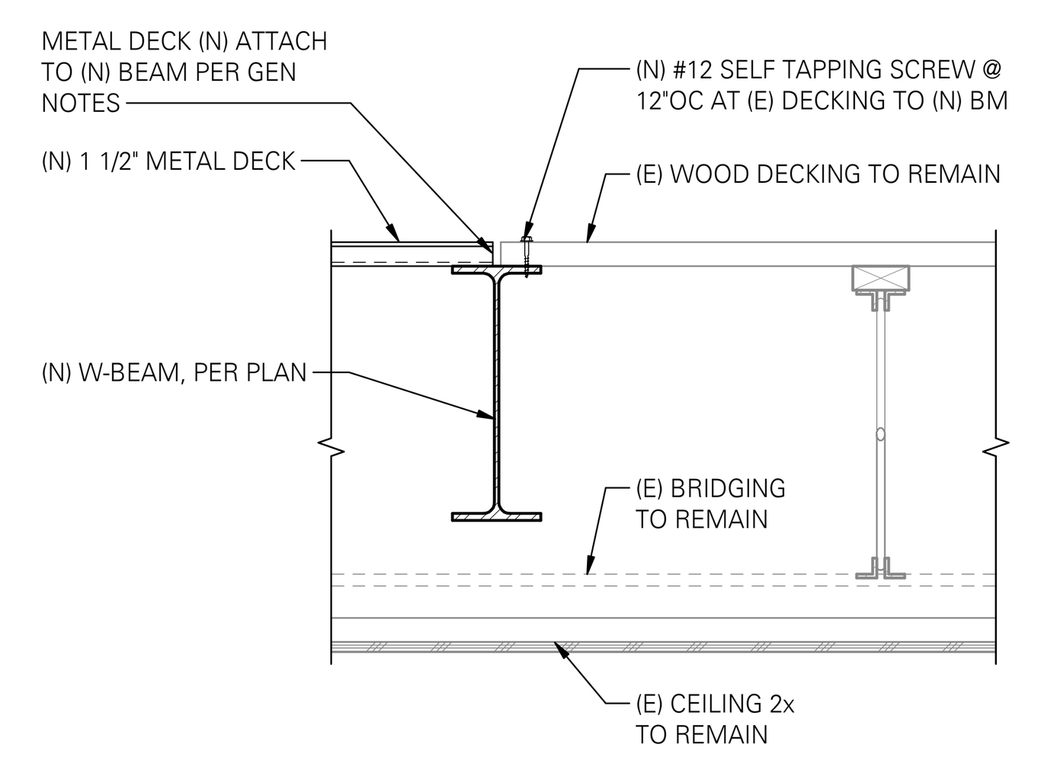
20151-0060

SHEET TITLE
STRUCTURAL - (E) & (N) ROOF FRAMING PLANS

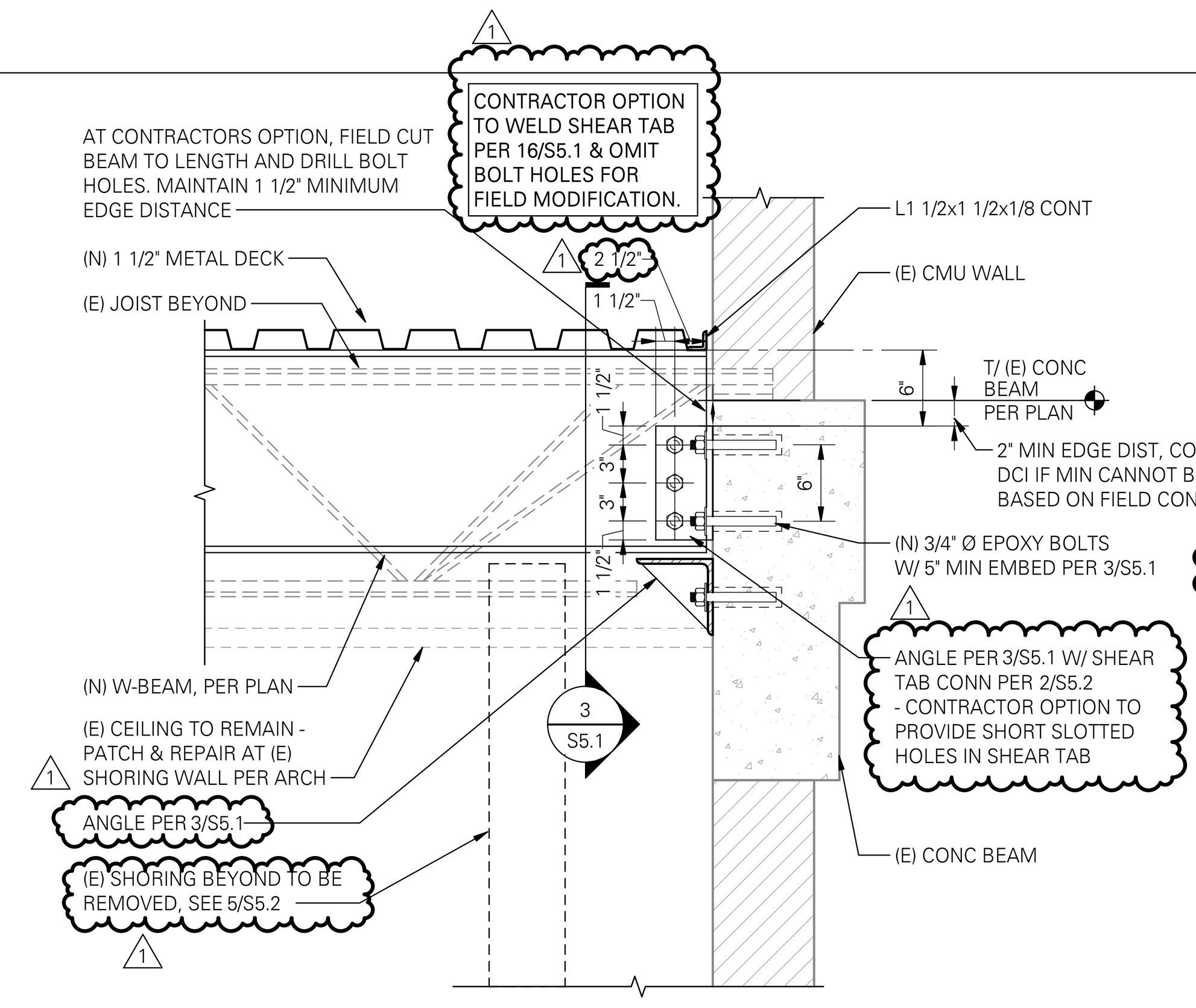
SHEET
S2.1

DATE
11/17/20

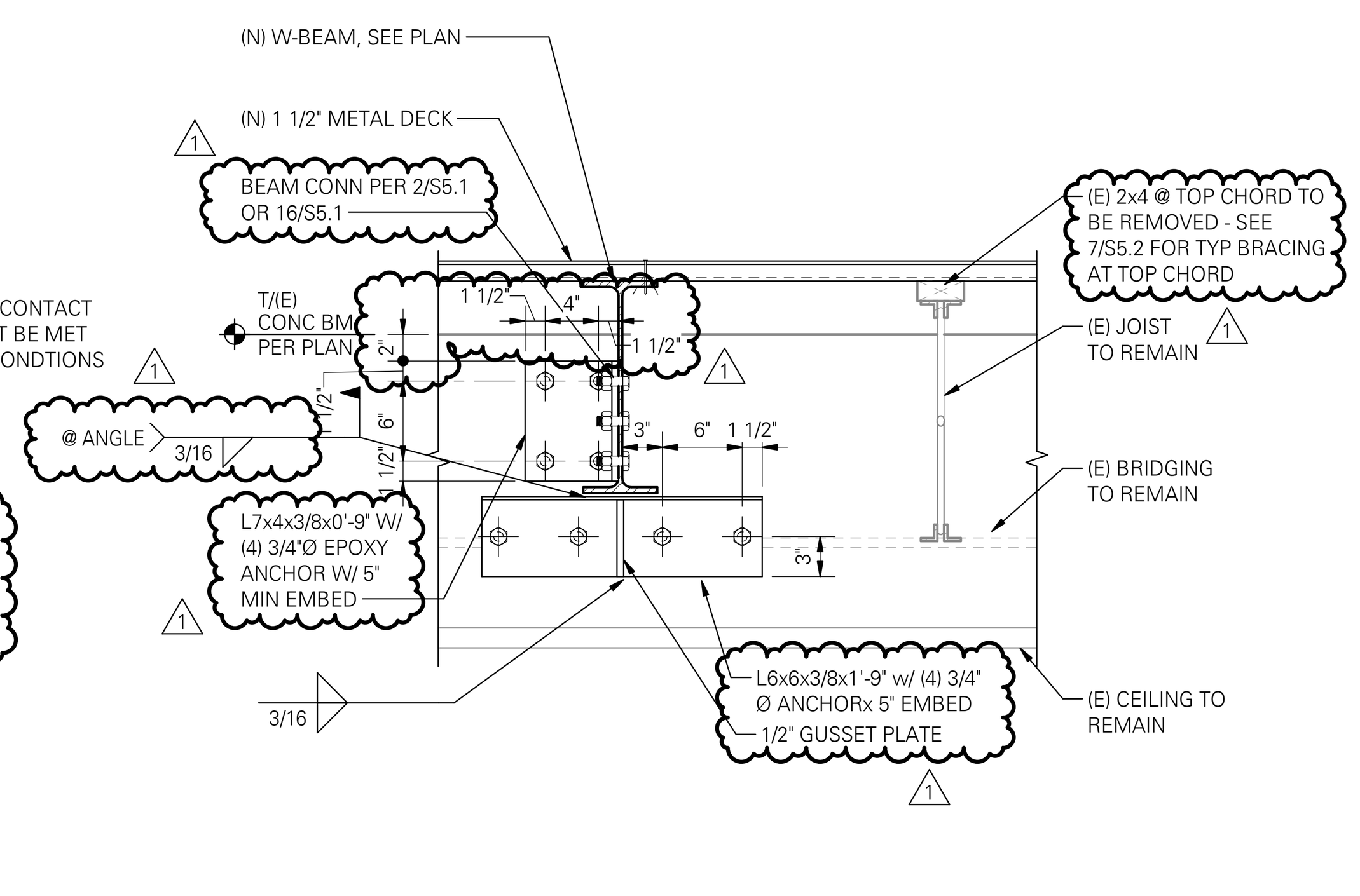
COORDINATION NOTE:
IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



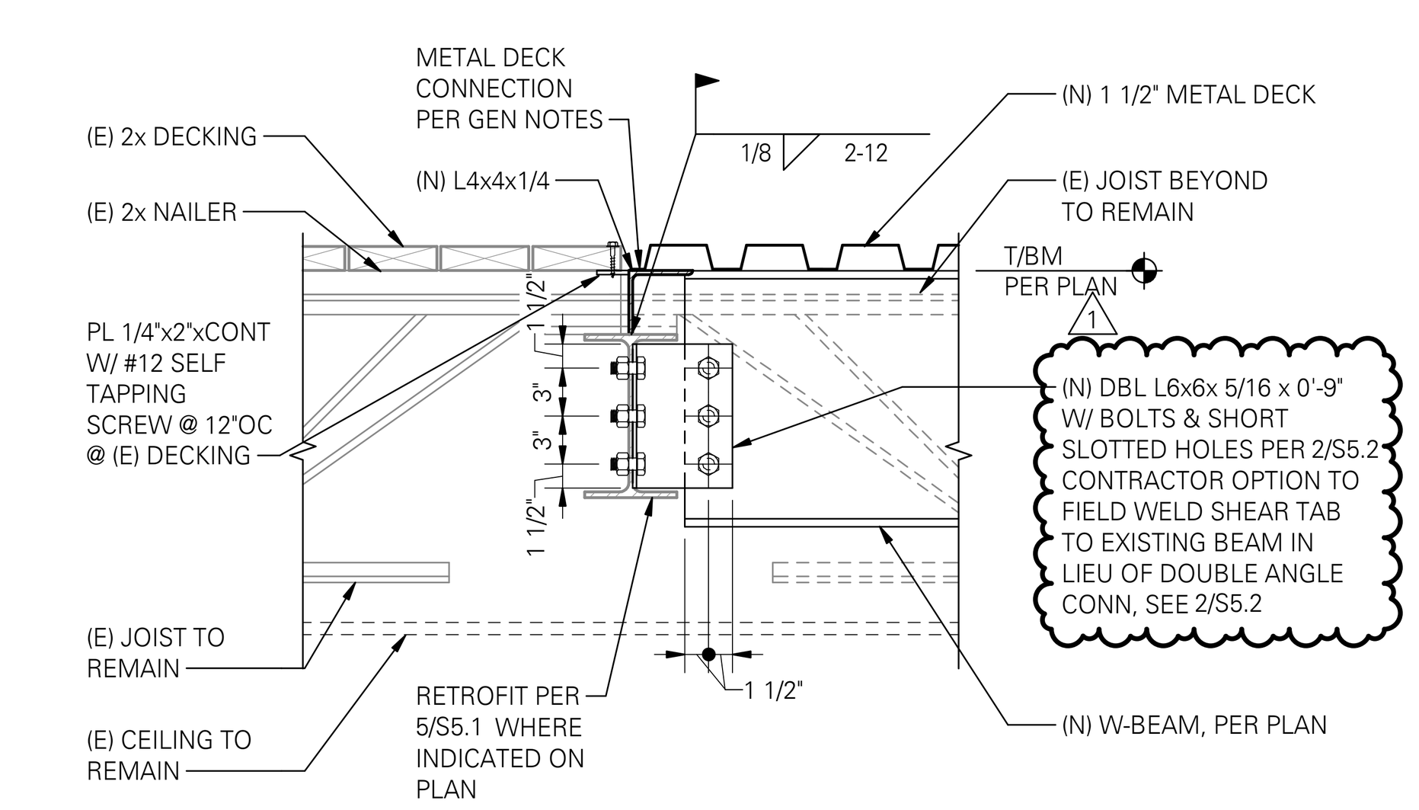
1 **TRANSITION AT ROOF EDGE**
SCALE: 1" = 1'-0"



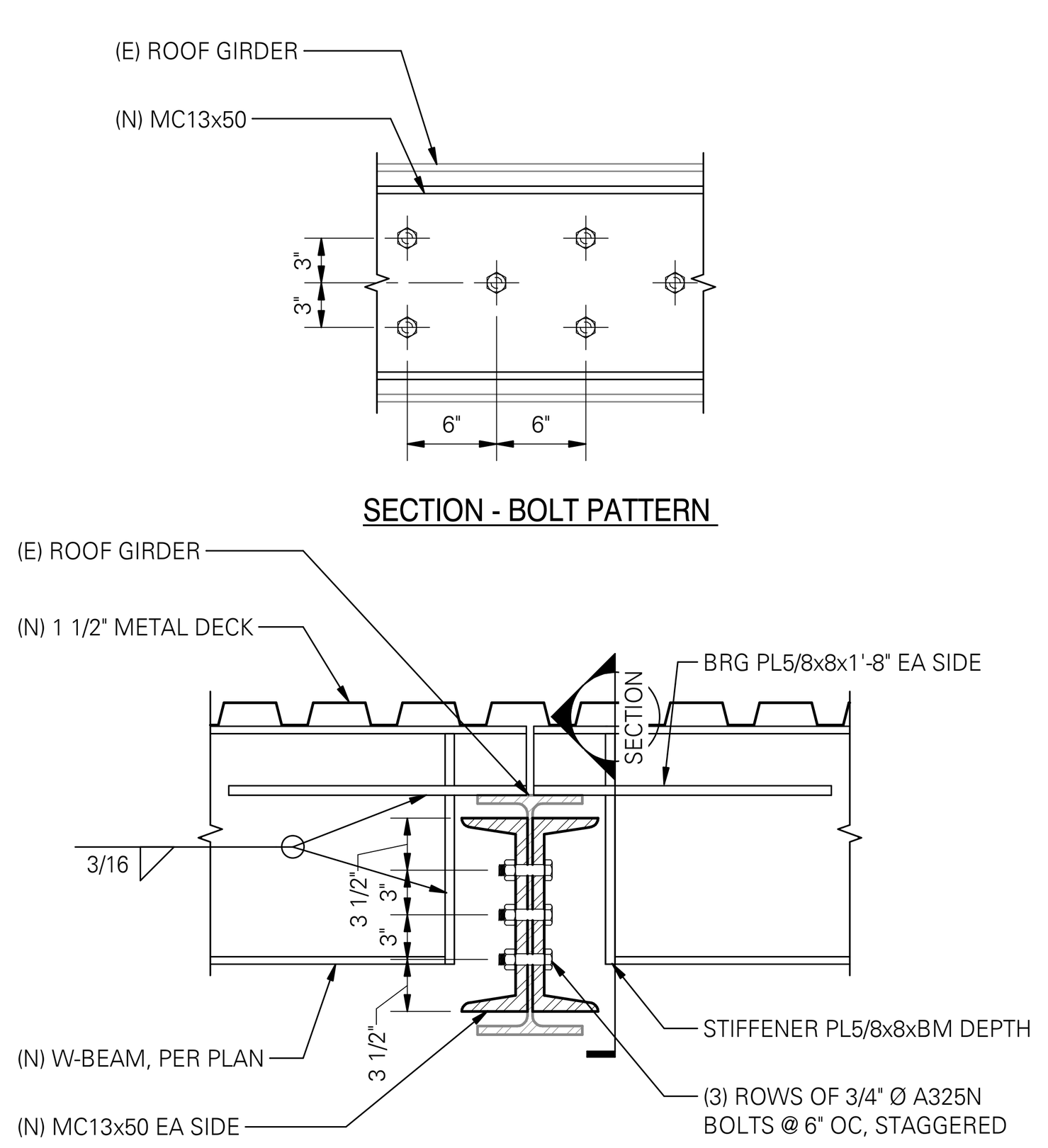
2 **(N) W-BEAM AT (E) CONCRETE BEAM**
SCALE: 1" = 1'-0"



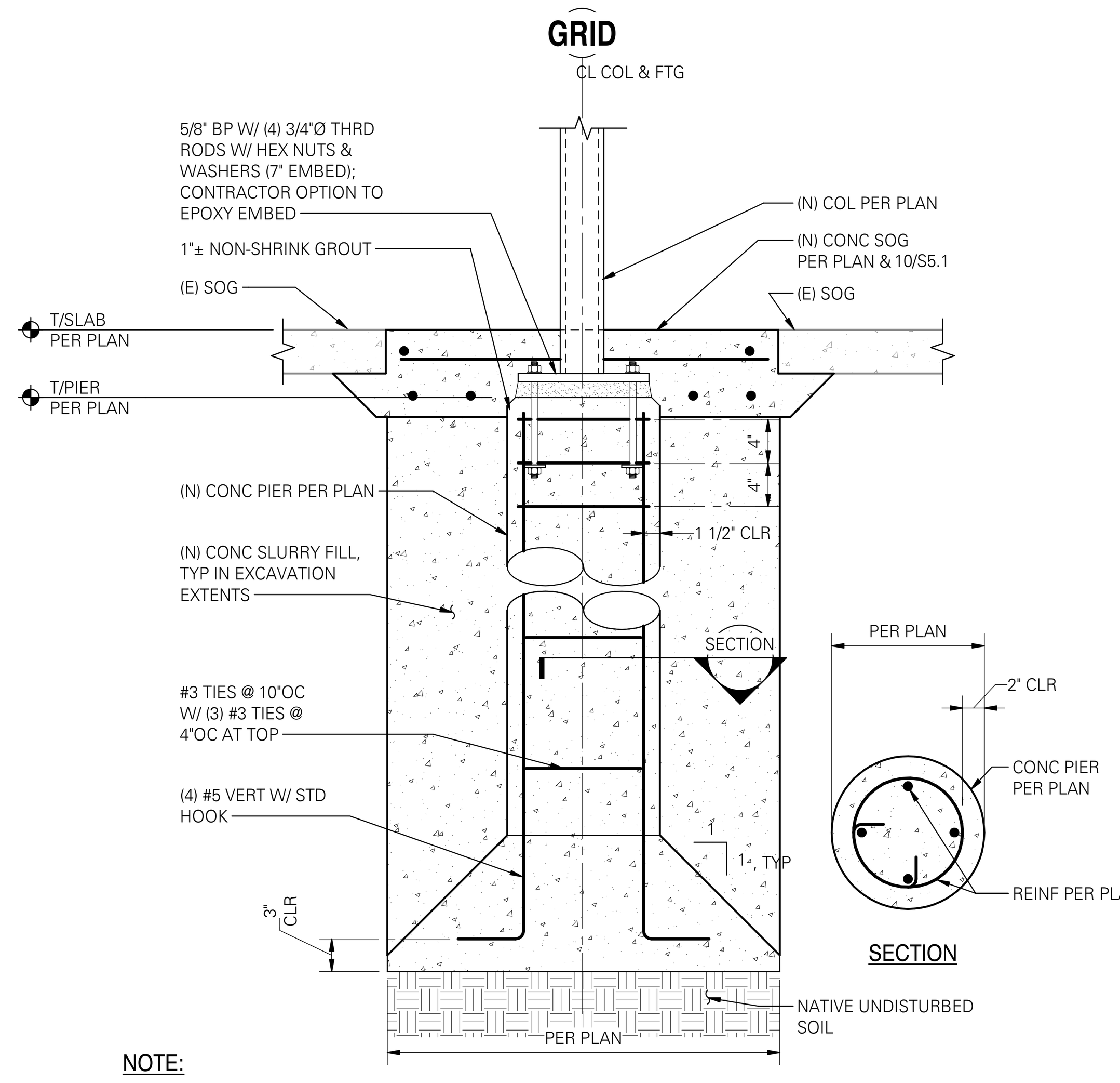
3 **(N) W-BEAM & (E) JOIST AT (E) CONCRETE BEAM**
SCALE: 1" = 1'-0"



4 **(N) W-BEAM AT (E) W-BEAM**
SCALE: 1" = 1'-0"

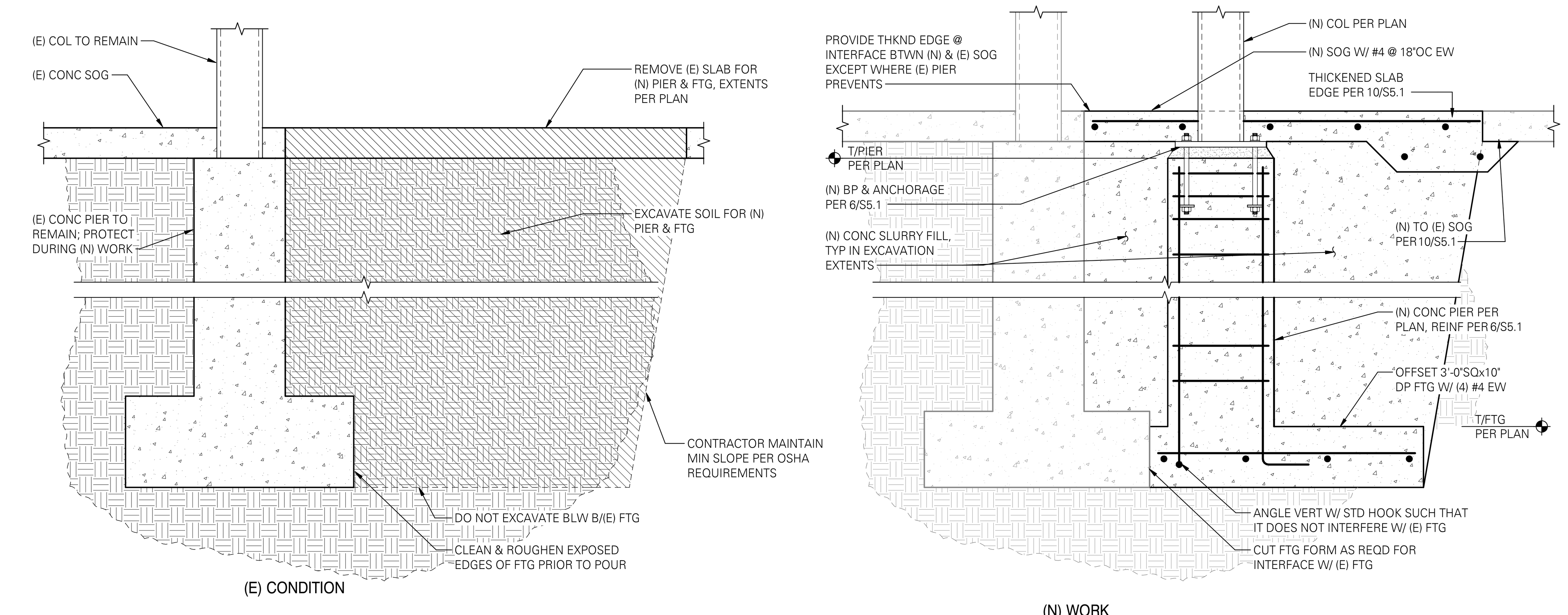


5 **(E) GIRDER RETRO-FIT**
SCALE: 1" = 1'-0"

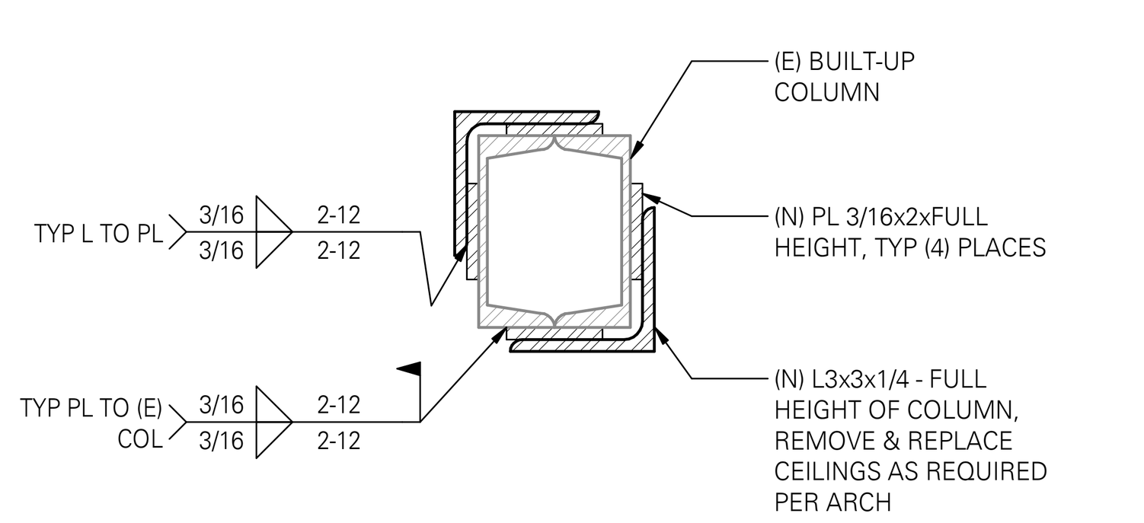


NOTE:
FORM FOOTING USING "BIGFOOT" FOOTING FORMS OR APPROVED EQUAL. CONTRACTOR OPTION TO INSTALL PER 7/S5.1

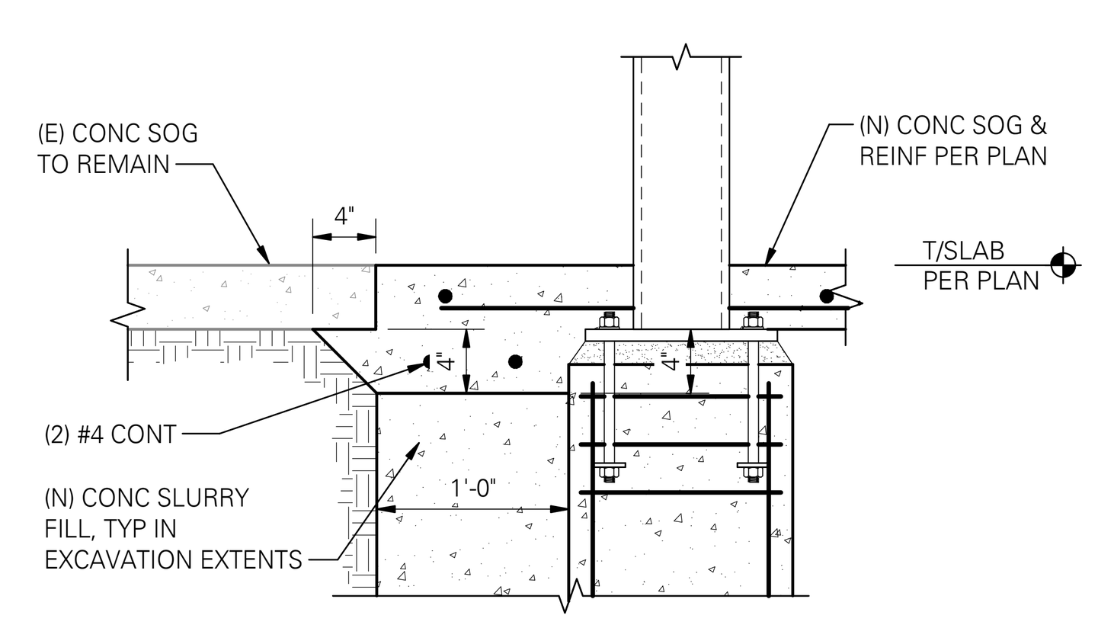
6 **NEW CONCRETE PIER AT NEW COLUMNS**
SCALE: 1" = 1'-0"



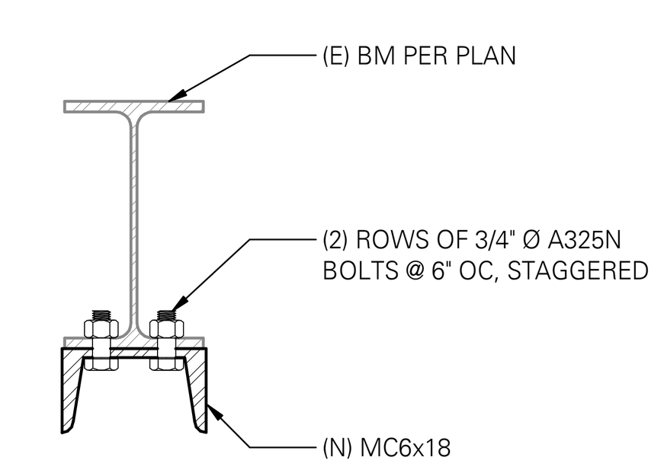
7 **(N) CONC PIER AT (E) FTG**
SCALE: 1" = 1'-0"



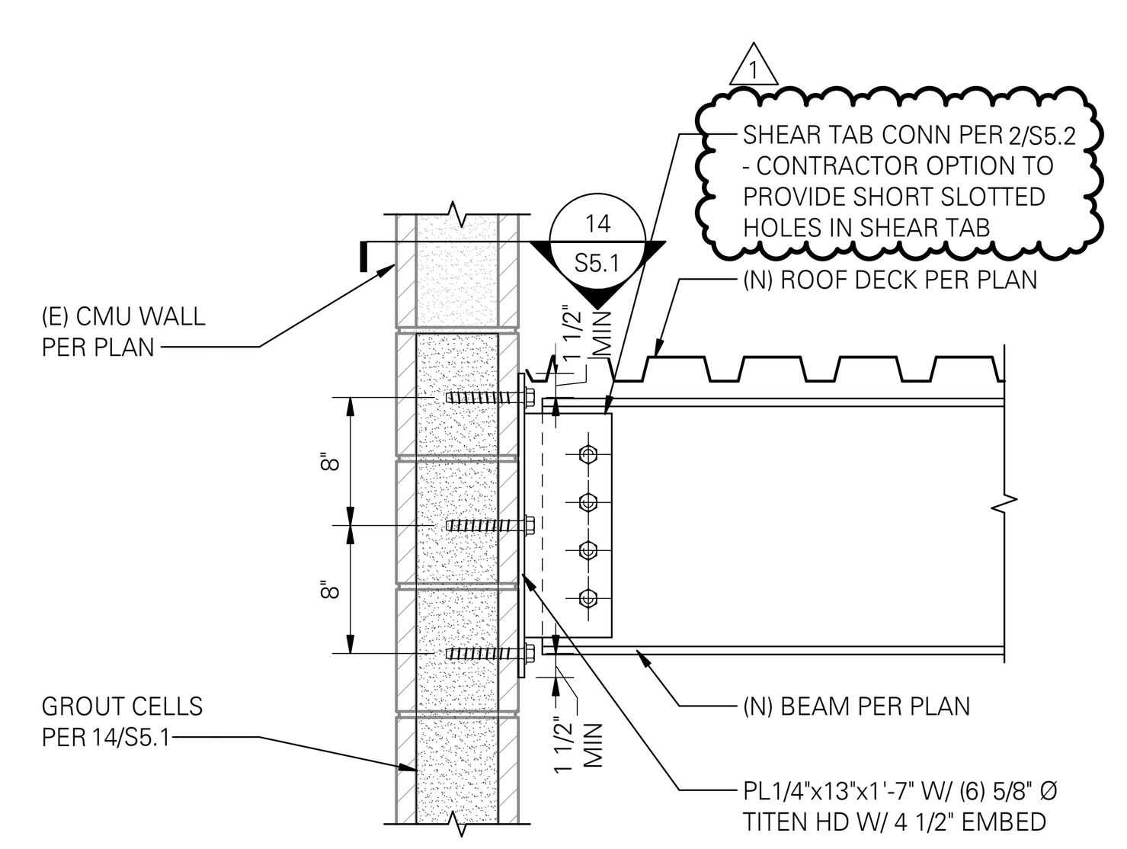
9 **STEEL COLUMN RETROFIT**
NTS



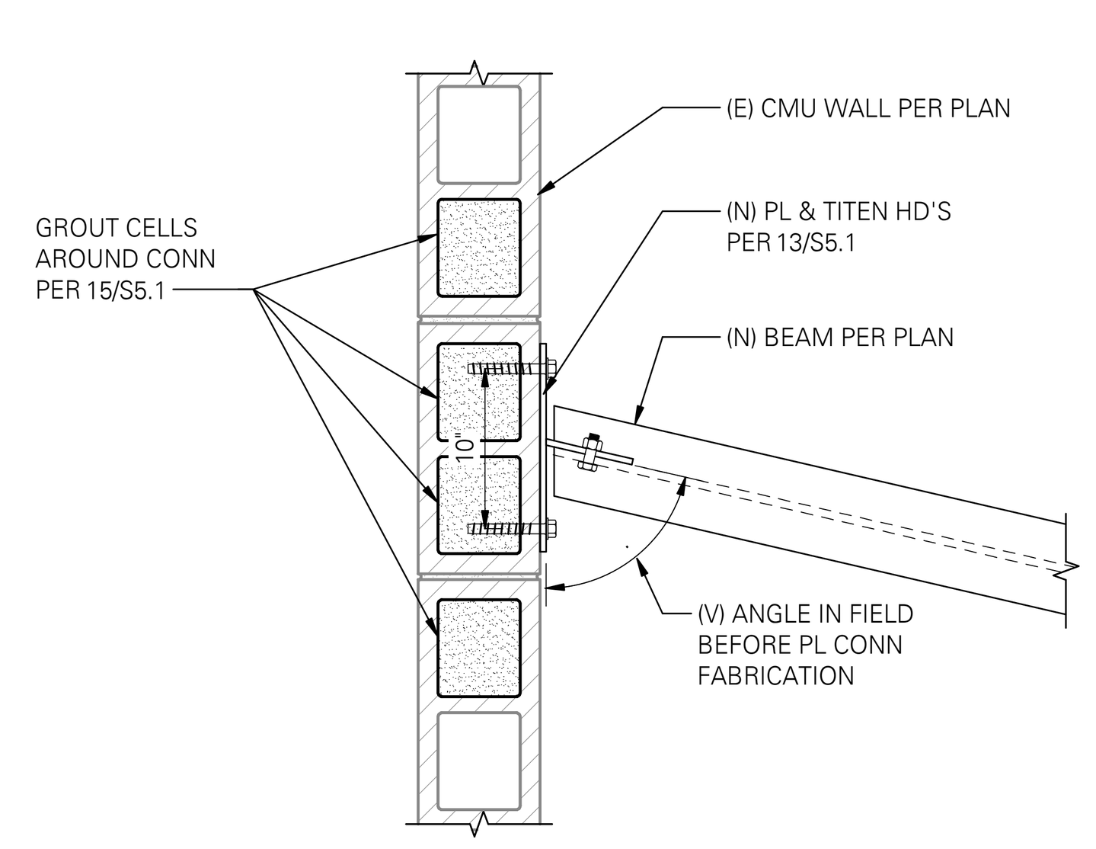
10 **NEW TO EXISTING CONCRETE SLAB ON GRADE**
SCALE: 1" = 1'-0"



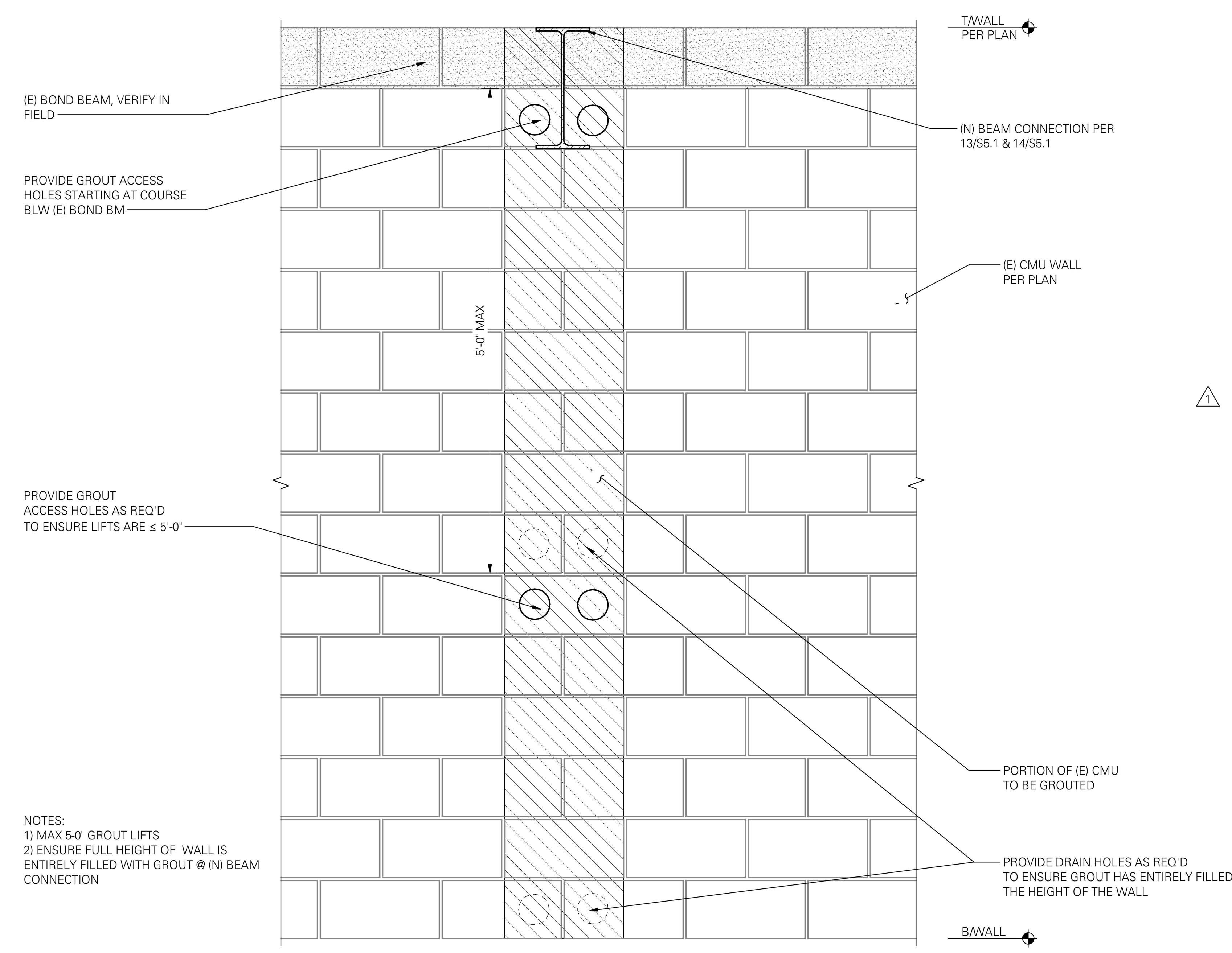
12 **(E) BEAM RETROFIT**
SCALE: 1 1/2" = 1'-0"



13 **SECTION - (N) W-BEAM TO (E) CMU WALL**
SCALE: 1" = 1'-0"

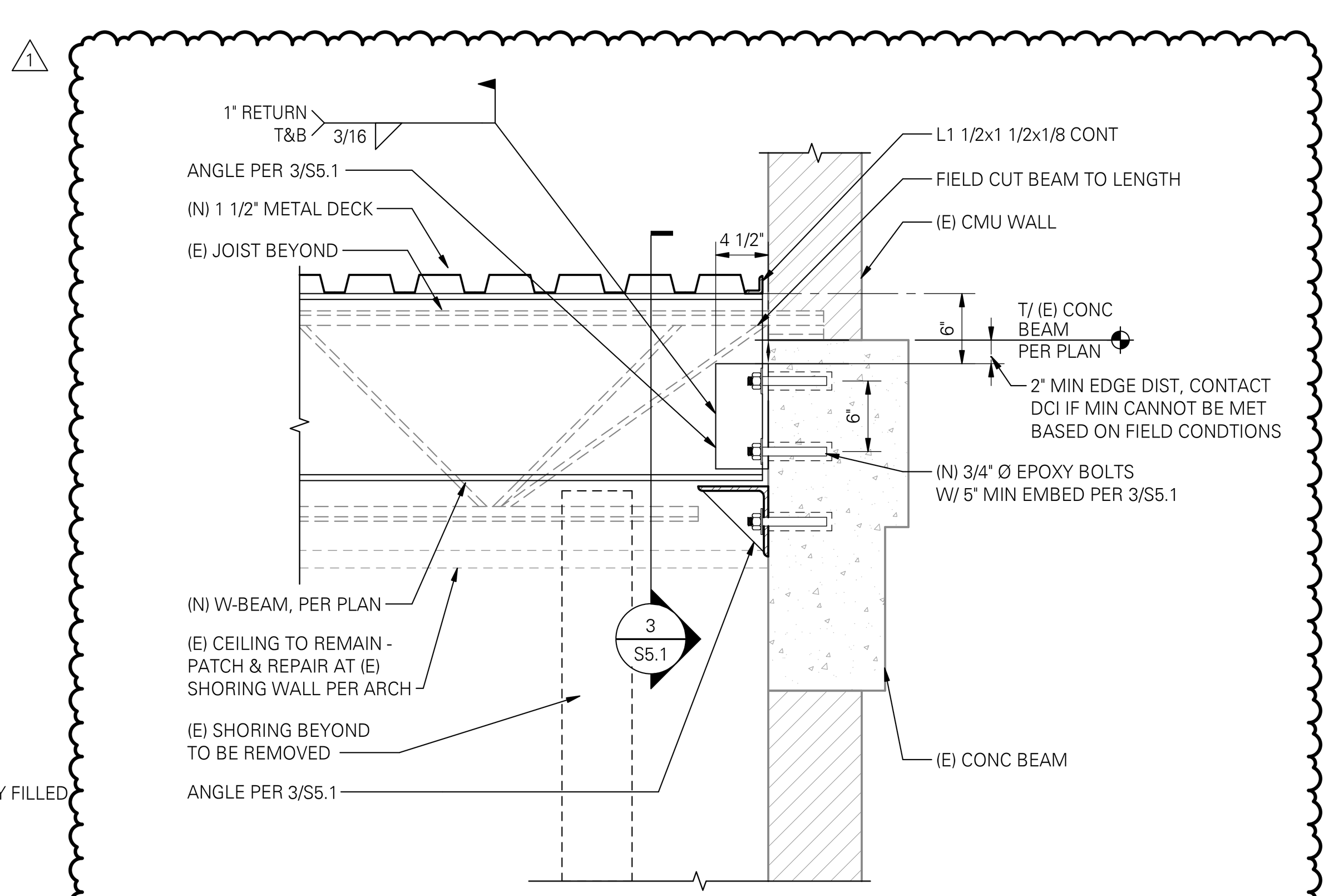


14 **PLAN - (N) W-BEAM TO (E) CMU WALL**
SCALE: 1" = 1'-0"



NOTES:
1) MAX 5'-0" GROUT LIFTS
2) ENSURE FULL HEIGHT OF WALL IS ENTIRELY FILLED WITH GROUT @ (N) BEAM CONNECTION

15 **(N) GROUT IN (E) MASONRY WALL @ (N) BEAM CONNECTION**
SCALE: 1" = 1'-0"



16 **(N) W-BEAM AT (E) CONCRETE BEAM - WELD OPTION**
SCALE: 1" = 1'-0"

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse
West Entrance Roof Retrofit

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI engineers
CIVIL / STRUCTURAL
1060 Fowler Ave. Suite 202
Bozeman, Montana 59718
P (406) 556-8600 www.dci-engineers.com

DRAWN BY: JNH
REVIEWED BY: JML

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
1	ADD #1	11/17/20

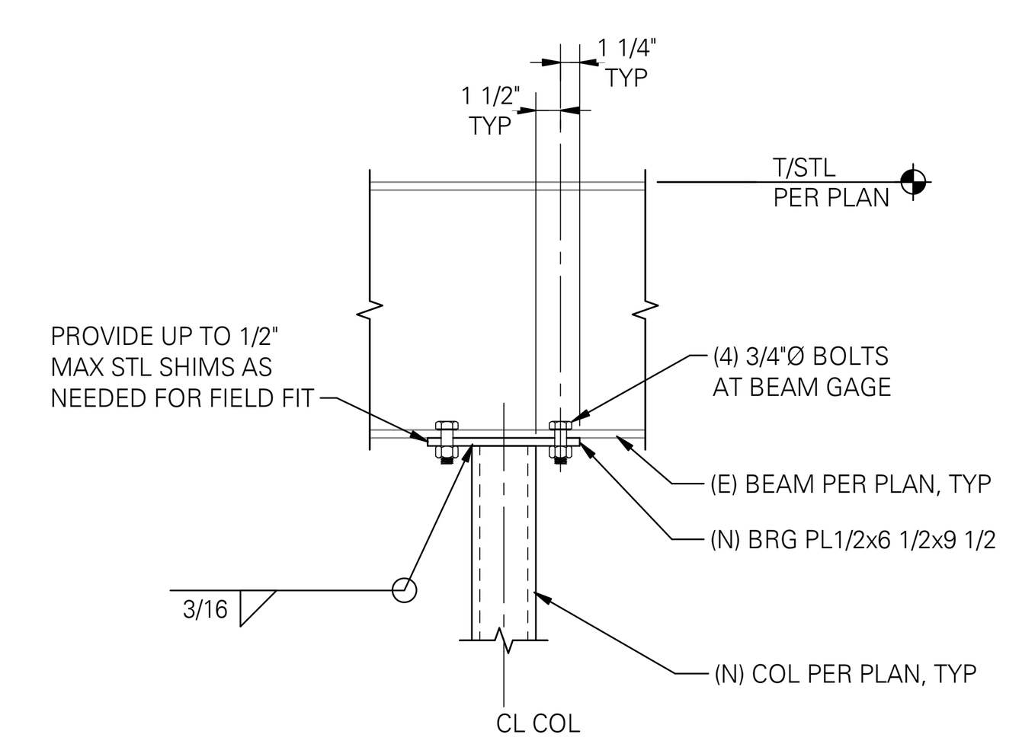
PPA# 19-0172

20151-0060

SHEET TITLE
STRUCTURAL - FRAMING DETAILS

SHEET
S5.1

DATE
11/17/20



1 (E) BEAM TO (N) HSS COLUMN CONNECTION

SCALE: 1" = 1'-0" (05050M)

BOLTED SINGLE SHEAR PLATE CONNECTION - SCHEDULE "A"									
3/4"Ø - A325-N		SINGLE ROW		BEAM Fy=50KSI - CONNECTION PLATE Fy=36KSI					
BEAM SIZE	"N" BOLTS REQUIRED (1)	MIN SHEAR PLATE OR WT STEM THICKNESS	MIN HSS COLUMN WALL THICKNESS(10)	WELD SIZE t(7)	MAX SINGLE COPE DEPTH (9)	MAX DOUBLE COPE DEPTH (9)	CONNECTION CAPACITY - ASD (3) (KIPS)		
							UNCOPED	COPED	
								SINGLE	DOUBLE
W10	2	3/8"	1/4"	3/16"	2 1/2"	1 1/4"	13.2	11.0	11.0
W12	3	3/8"	1/4"	3/16"	2"	1 1/4"	25.6	18.3	18.3
W14	3	3/8"	1/4"	1/4"	2 1/2"	1 1/2"	27.8	EQUAL TO UNCOPED CAPACITY	23.9
W16	4	3/8"	1/4"	1/4"	2 1/2"	1 1/2"	42.4		36.6

BOLTED SINGLE ROW SHEAR PLATE CONNECTION NOTES:

1. PROVIDE EITHER STANDARD OR HORIZONTAL SHORT SLOTTED HOLES AS PERMITTED BY AISC J3.2 IN THE BEAM WEB AND/OR THE SHEAR PLATE.

2. WHERE SHORT-SLOTTED HOLES ARE USED, PROVIDE HARDENED WASHERS PER AISC J3.2.

3. CAPACITIES BASED ON AISC 13TH EDITION WITH ASTM A325-N BOLTS.

4. HORIZONTAL DISTANCE FROM SUPPORT FACE TO CENTERLINE OF BOLT GROUP SHALL BE AS SHOWN IN THE DETAILS, BUT SHALL NOT EXCEED 3 1/2" IN THE AS-BUILT CONDITION. SUPPORT FACE FOR TEE IS THE INSIDE FACE OF FLANGE.

5. VERTICAL EDGE DISTANCE FROM BOLT CENTERLINE TO EDGE OF STEEL SHALL BE 1 1/2" TYPICALLY, EXCEPT THAT 1 1/4" IS PERMITTED PER AISC TABLE J3.4 FOR 3/4" DIAMETER BOLTS WITHOUT ANY REDUCTION IN THE TABULATED CAPACITIES.

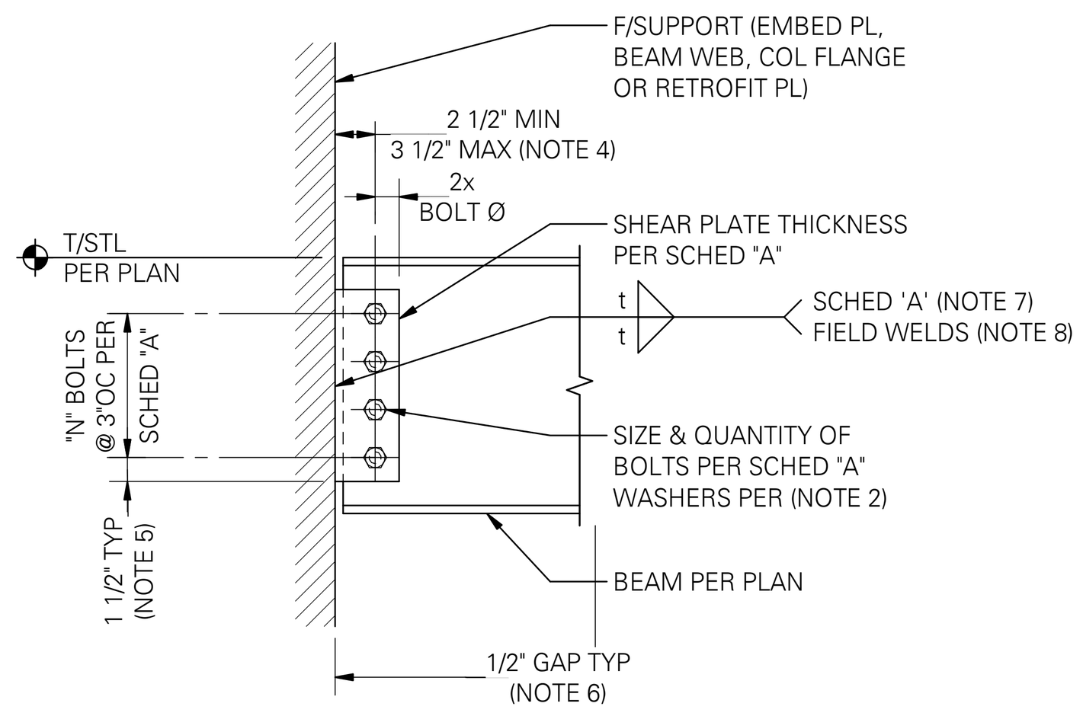
6. GAP BETWEEN BEAM END AND SUPPORT FACE SHALL BE 1/2" EXCEPT FOR "WT" CONNECTORS USED WITH HSS COLUMNS. WHERE "WT" ARE USED AS SHEAR TAB ELEMENTS, THE GAP BETWEEN FACE OF COLUMN AND END OF BEAM SHALL NOT EXCEED THE LESSER OF 1 1/2" OR THE "k" DISTANCE OF THE "WT" PLUS 1/4".

7. WELD SIZES SHALL BE THE LARGER OF THE SIZE (t), TABULATED IN SCHEDULE "A" OR MINIMUM SHOWN IN TABLE 1.

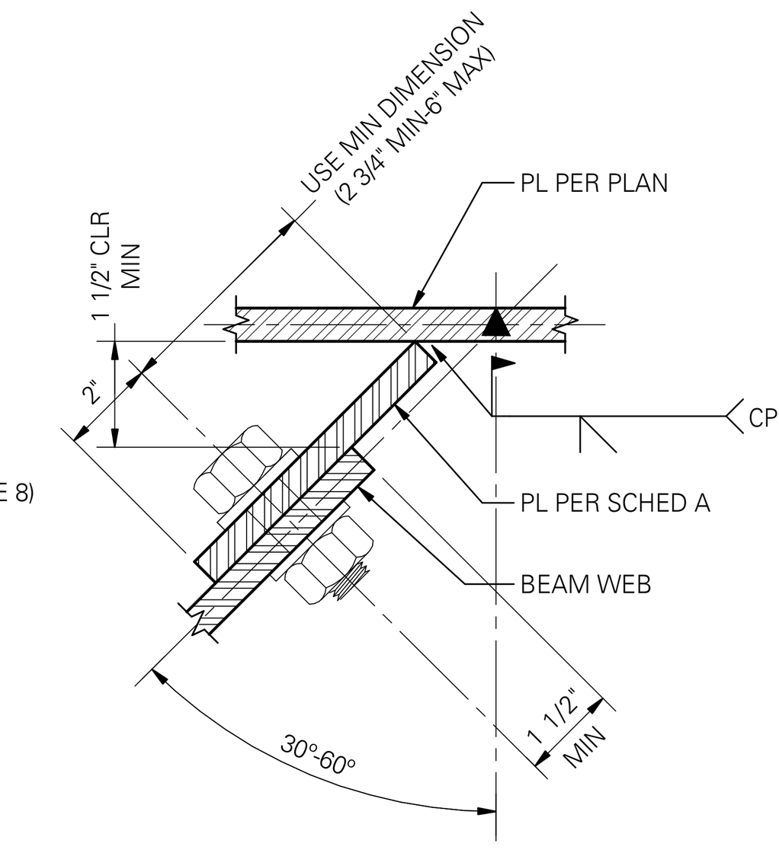
8. FIELD FILLET WELDS SHALL BE SIZED TO BE AT LEAST 1/8" LARGER THAN THE WELD SIZE SHOWN IN SCHEDULE "A", UNLESS PROPER FIT-UP IS VERIFIED BY A SPECIAL INSPECTOR PRIOR TO WELDING.

9. COPE DEPTHS (SINGLE AND DOUBLE) SHALL NOT EXCEED THE LESSER OF THOSE SHOWN IN SCHEDULE "A", NOR AS ALLOWED BY BOLT HOLE SPACING AND MINIMUM EDGE DISTANCE REQUIREMENTS. SINGLE COPE LENGTH SHALL NOT EXCEED 6 1/2". DOUBLE COPE LENGTHS SHALL NOT EXCEED THAT REQUIRED TO ACCOMMODATE GIRDER FLANGE + 1/2" MAX GAP BETWEEN FLANGES.

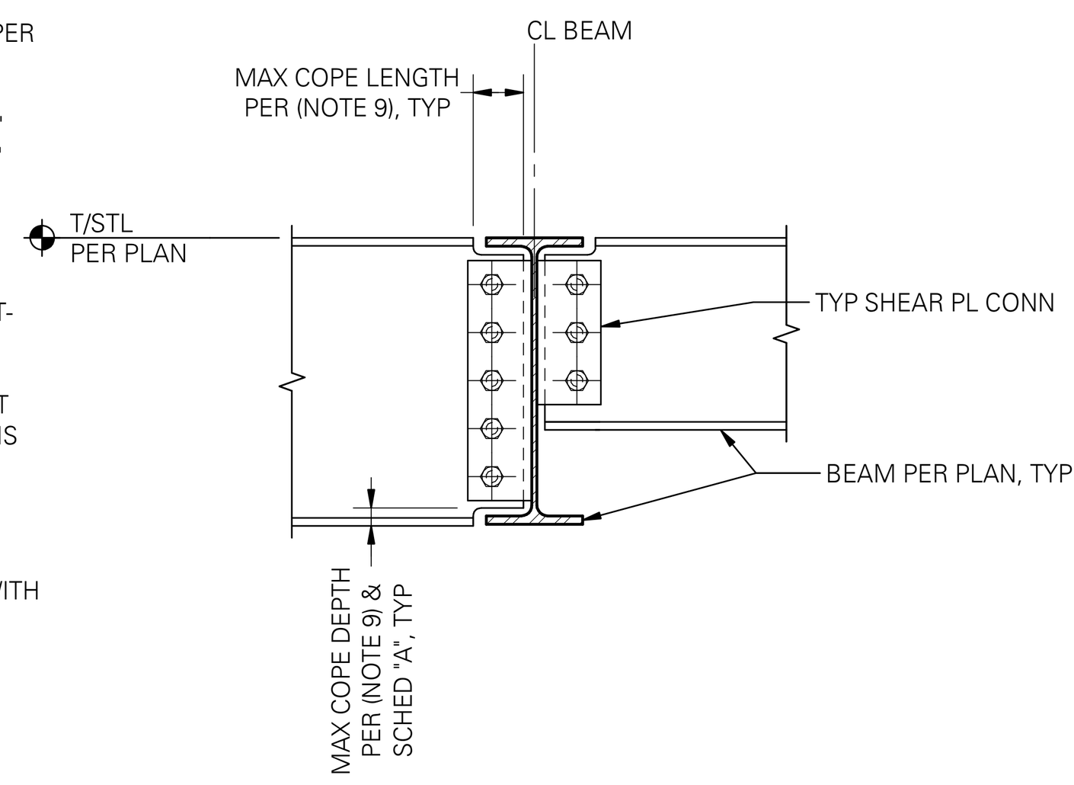
10. UNCOPED CAPACITIES OF WT CONNECTIONS ARE VALID WITH MINIMUM NOMINAL HSS COLUMN WALL TABULATED THICKNESS. THE EFFECTIVE THROAT OF FLARE BEVEL GROOVE WELDS IS BASED ON OUTSIDE RADIUS OF HSS, AND IS TAKEN AS 5/8 TIMES THE HSS WALL THICKNESS BASED ON AWS D1.1, TABLE 2.1. WHEN 3/4" A325-N BOLTS ARE USED, A 3/16" HSS COLUMN WALL THICKNESS IS PERMITTED WITH A 20% REDUCTION OF THE WT CONNECTION CAPACITY.



TYPICAL SHEAR PLATE CONNECTION



SKEWED BOLTED BEAM



BEAM TO BEAM CONNECTION

SHEAR PLATE INFORMATION PER TYPICAL SHEAR PLATE CONNECTION.

TABLE 1 MINIMUM WELD SIZE TABLE	
PLATE OR FLANGE THICKNESS (T) *	MINIMUM FILLET SIZE
T < 1/2"	3/16"
1/2" < T ≤ 3/4"	1/4"
3/4" < T	5/16"

* MINIMUM WELD SIZE TO BE BASED ON THICKNESS OF THE THICKER PART.

2 SINGLE SHEAR PLATE (SINGLE ROW) CONNECTIONS

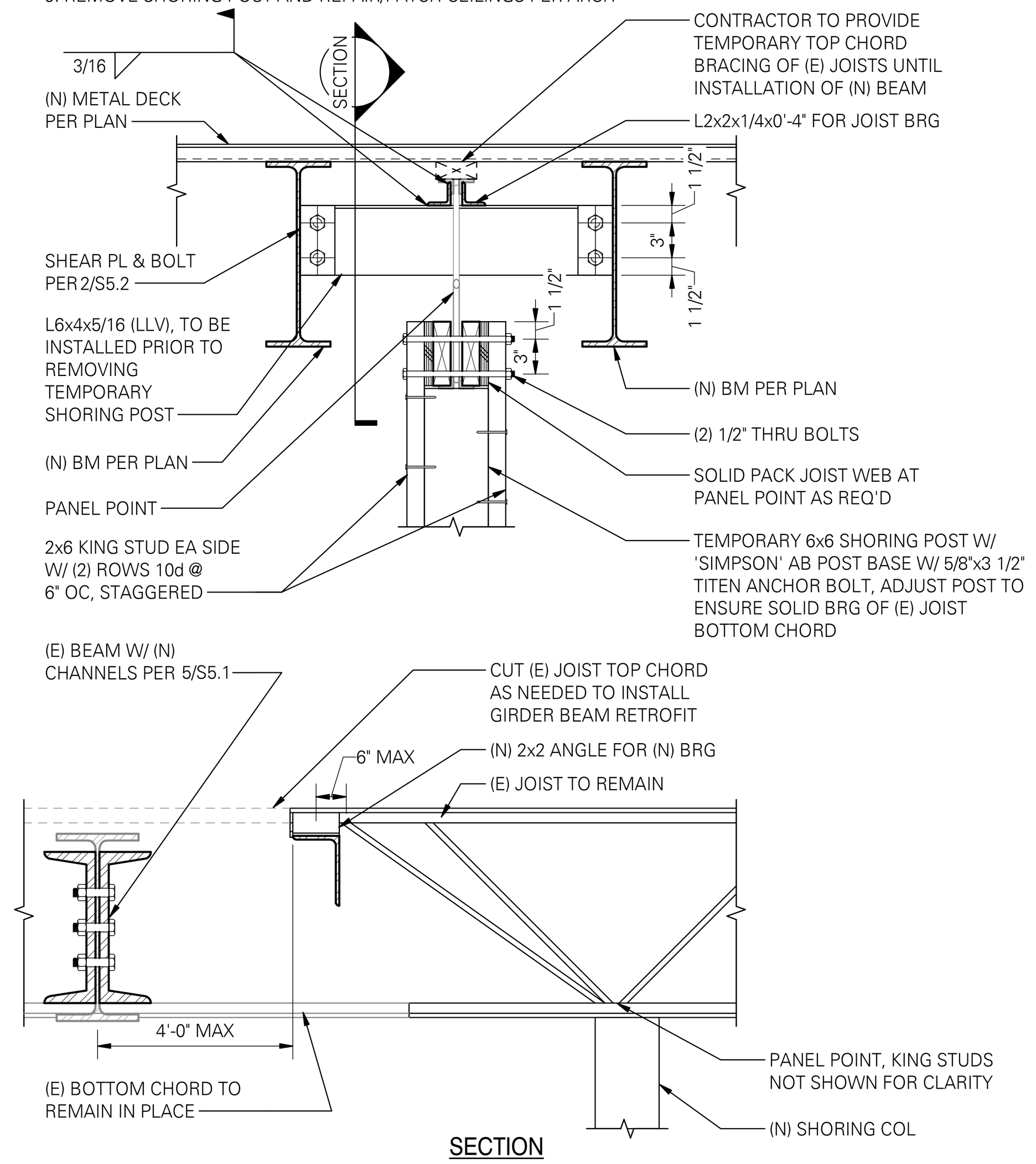
SCALE: 1" = 1'-0" (05201M)

COORDINATION NOTE:

IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

TEMPORARY SHORING SEQUENCING:

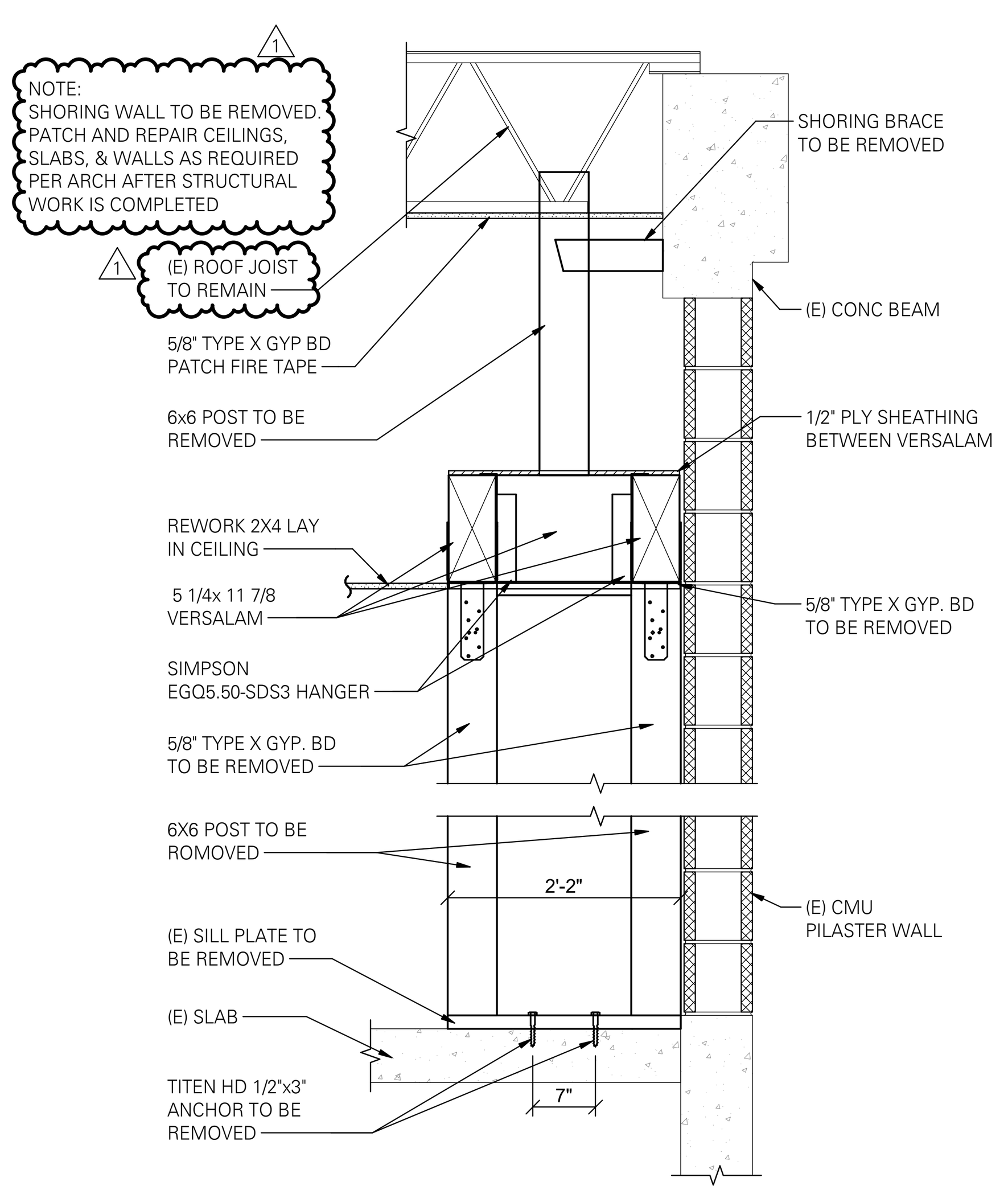
1. INSTALL (N) 6x6 SHORING POST & KING STUDS @ EA (E) JOIST WHERE BEAM RETROFIT IS REQUIRED, EA SIDE OF BEAM, SEE PLAN
2. INSTALL TEMP, TOP CHORD BRACING
3. REMOVE TOP CHORD TO INSTALL NEW CHANNEL RETROFIT, SEE PLAN FOR EXTENTS
4. INSTALL BEAM RETROFIT PER 5/S5.1
5. INSTALL (N) BEAMS EACH SIDE OF (E) JOIST PER PLAN
6. INSTALL (N) L6x4 SUPPORT ANGLE AT (E) JOIST
7. REMOVE 2x4 @ TOP CHORD FOR METAL DECK CLEARANCE, TYP @ (N) METAL DECK
8. INSTALL (N) METAL DECK
9. REMOVE SHORING POST AND REPAIR/PATCH CEILINGS PER ARCH



SECTION

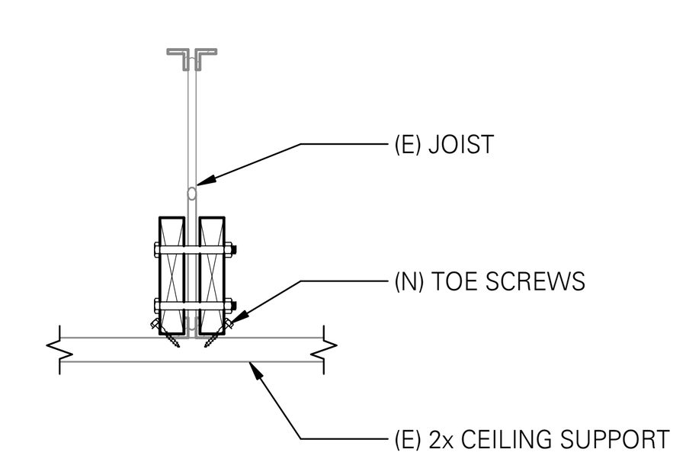
4 TEMPORARY SHORING OF (E) JOISTS @ (E) BEAM RETROFIT - 2 LOCATIONS

SCALE: 1" = 1'-0"

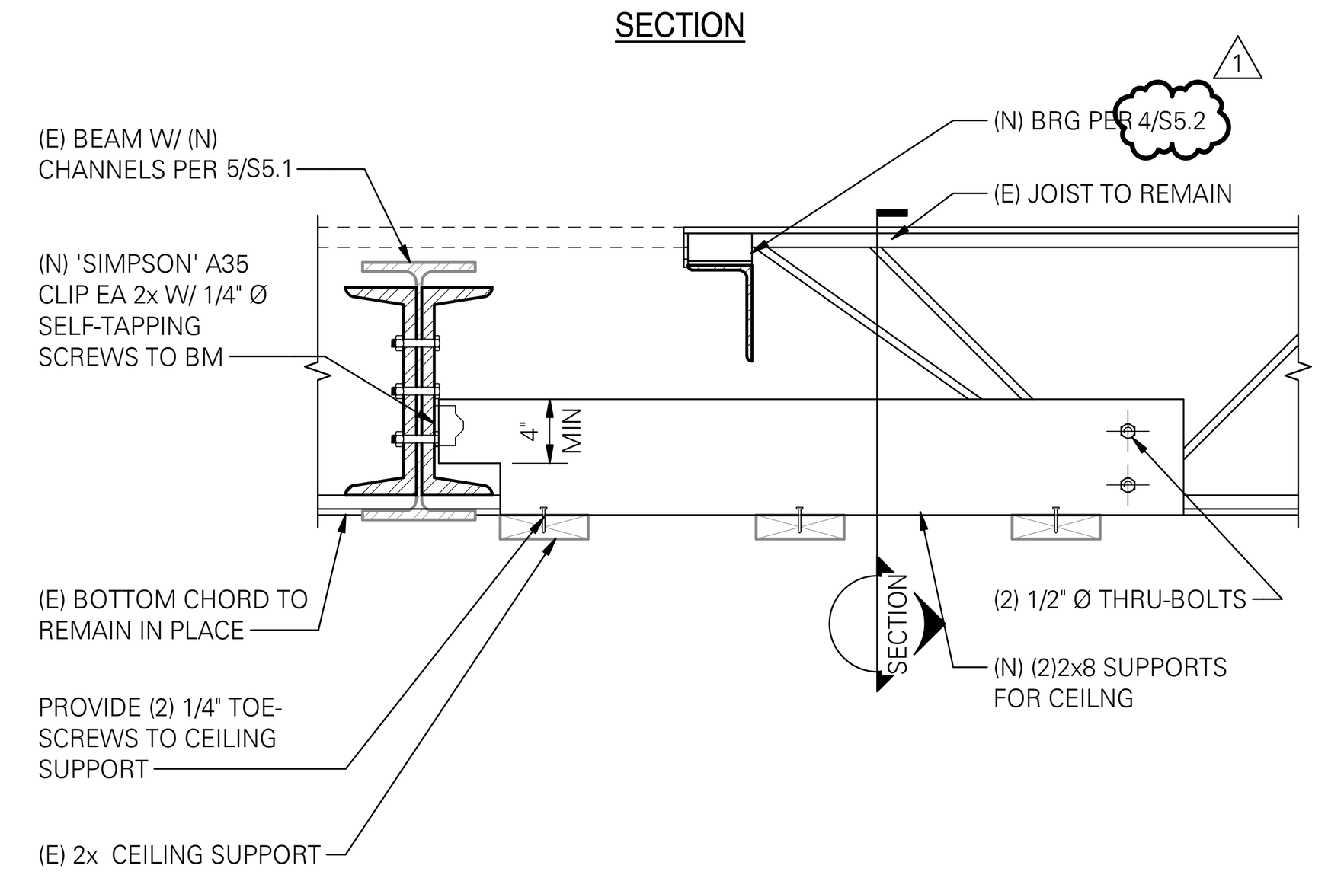


5 (E) SHORING WALL TO BE REMOVED

SCALE: 3/4" = 1'-0"

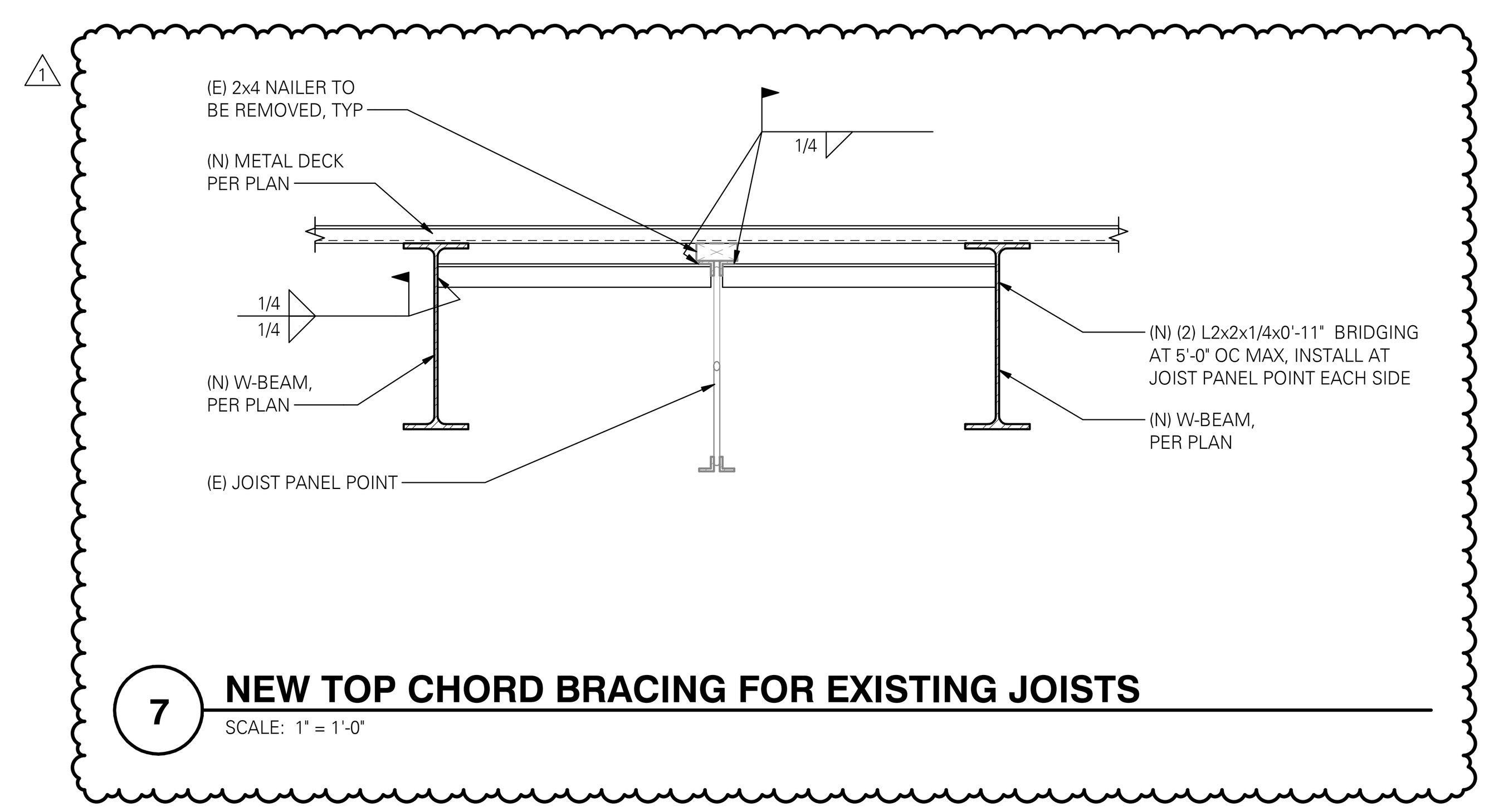


SECTION



6 SUPPORT FOR CEILING AT (N) BEAM RETROFIT

SCALE: 1" = 1'-0"



7 NEW TOP CHORD BRACING FOR EXISTING JOISTS

SCALE: 1" = 1'-0"

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse
West Entrance Roof Retrofit

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI engineers
CIVIL / STRUCTURAL
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718

DRAWN BY: JNH
REVIEWED BY: JML

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
1	ADD #1	11/17/20

PPA# 19-0172

20151-0060

SHEET TITLE
STRUCTURAL - FRAMING DETAILS

SHEET
S5.2

DATE
11/17/20

DEMOLITION PLAN LEGEND

- (dashed box) — INDICATES ITEMS TO BE DEMOLISHED AND/OR REMOVED
- (#) — SELECTIVE DEMOTION NOTE

GENERAL DEMOLITION NOTES:

A. THE REMOVAL/DEMOLITION NOTES LISTED ARE INTENDED TO CONVEY A GENERAL DESCRIPTION OF THE REMOVAL/DEMOLITION WORK THROUGHOUT THE PROJECT. SEE INDIVIDUAL DISCIPLINE SHEETS FOR SPECIFIC DEMOLITION WORK.
B. WHETHER SPECIFICALLY INDICATED OR NOT, ALL ITEMS/MATERIALS/EQUIPMENT REQUIRED TO BE REMOVED OR DEMOLISHED TO COMPLETE THE WORK SHALL BE INCLUDED IN THE BID.
C. ALL REMOVED ITEMS, EXCEPT THOSE NOTED TO BE REUSED OR TO REMAIN AS THE PROPERTY OF THE OWNER SHALL BECOME THE PROPERTY OF THE CONTRACTOR, AND SHALL BE REMOVED FROM THE JOBSITE.
D. REFER TO COVER SHEET FOR GENERAL PROJECT NOTES.
E. REFER TO OTHER PORTIONS OF THE CONTRACT DOCUMENTS FOR ADDITIONAL DEMOLITION REQUIREMENTS. REFER TO A501 FOR EXTENT OF FLOOR REPAIRS. REFER TO A901 FOR EXTENT OF CEILING REPAIRS.
F. PROTECT THE BUILDING INTERIOR AT ALL TIMES, OUTSIDE OF WORK AREAS. PROMPTLY REPAIR DAMAGES CAUSED TO ADJACENT FACILITIES/FINISHES BY DEMOLITION OR CONSTRUCTION WORK AT NO ADDITIONAL COST TO THE OWNER. REPAIR SHALL EXTEND TO THE NEAREST INSIDE OR OUTSIDE CORNER.
G. CONTRACTOR TO VISIT SITE AND VERIFY EXISTING CONDITIONS PRIOR TO BIDDING. CONTRACTOR IS RESPONSIBLE TO COORDINATE THEIR OBSERVATIONS WITH THESE CONTRACT DOCUMENTS. IF INCONSISTENCIES EXIST, THE CONTRACTOR SHALL INFORM THE ARCHITECT BEFORE BIDDING.
H. PROVIDE DUST PROTECTION AS REQUIRED.
I. THE BUILDING AND GROUNDS SHALL BE KEPT CLEAN AND FREE OF REFUSE AT ALL TIMES.
J. DISRUPTIONS AND OUTAGES MUST BE FULLY COORDINATED WITH MSU PM A MINIMUM OF 72-HOURS IN ADVANCE. COORDINATE SCHEDULE OF DEMOLITION WORK WITH MSU TO MINIMIZE DISRUPTION OF OWNER'S OPERATIONS.

(#) DEMOLITION NOTES

1. REMOVE PARTITIONS AT LEAST 2'-0," OR AS REQUIRED TO FACILITATE WORK STRUCTURAL UPGRADE WORK. PROTECT ADJACENT SURFACES FROM DAMAGE.
2. CAREFULLY REMOVE DOORS IN THEIR ENTIRETY (INCLUDING DOORS, HARDWARE, FRAME, ETC.), WITH THE INTENTION OF RE-INSTALLING THE DOORS (IN THEIR ENTIRETY).
3. REMOVE FLOORING FINISH MATERIAL AND SLAB TO INSTALL SONOTUBE FOOTING. SEE STRUCTURAL FOR EXTENT OF WORK.
4. REMOVE CEILING(S) TO ACCOMMODATE WALL REMOVAL FOR STRUCTURAL UPGRADES. SEE A9.1 FOR EXTENT OF WORK FOR CEILING PATCHING/REPLACEMENT.
5. REMOVE EXISTING SHORING WALL, APPROXIMATELY 65'-0" L.F. REFERENCE THE SHORING DRAWINGS. SEE A9.1 FOR EXTENT OF WORK FOR CEILING PATCHING/REPLACEMENT. 1

PLAN LEGEND

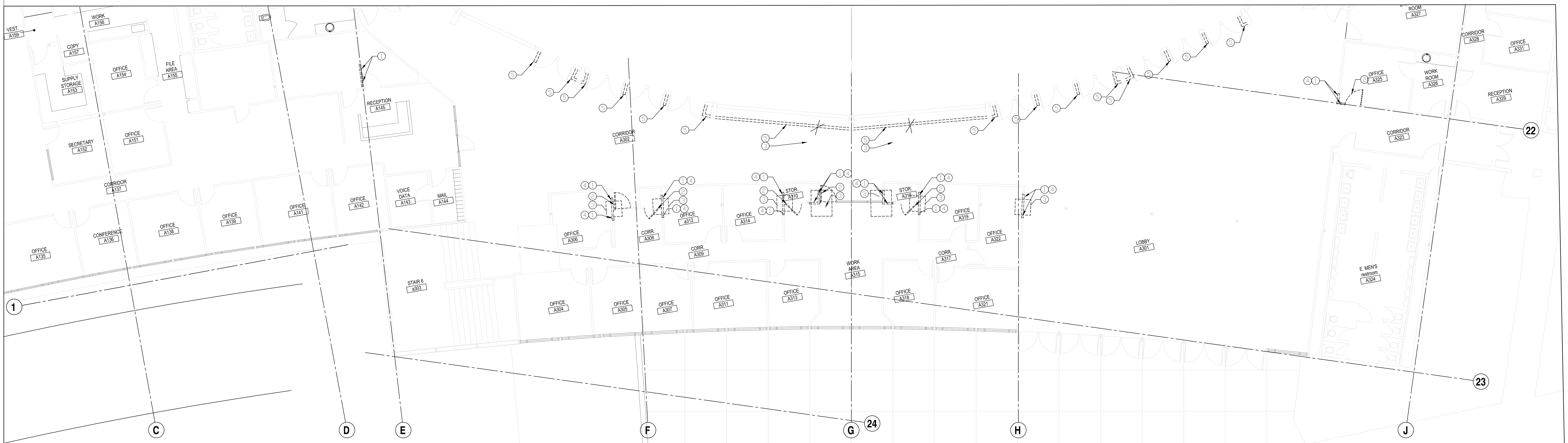
- ROOM — ROOM NAME
- A### — ROOM NUMBER
- (#) — PLAN NOTE
- (hatch) — WALL INFILL

(#) PLAN NOTES

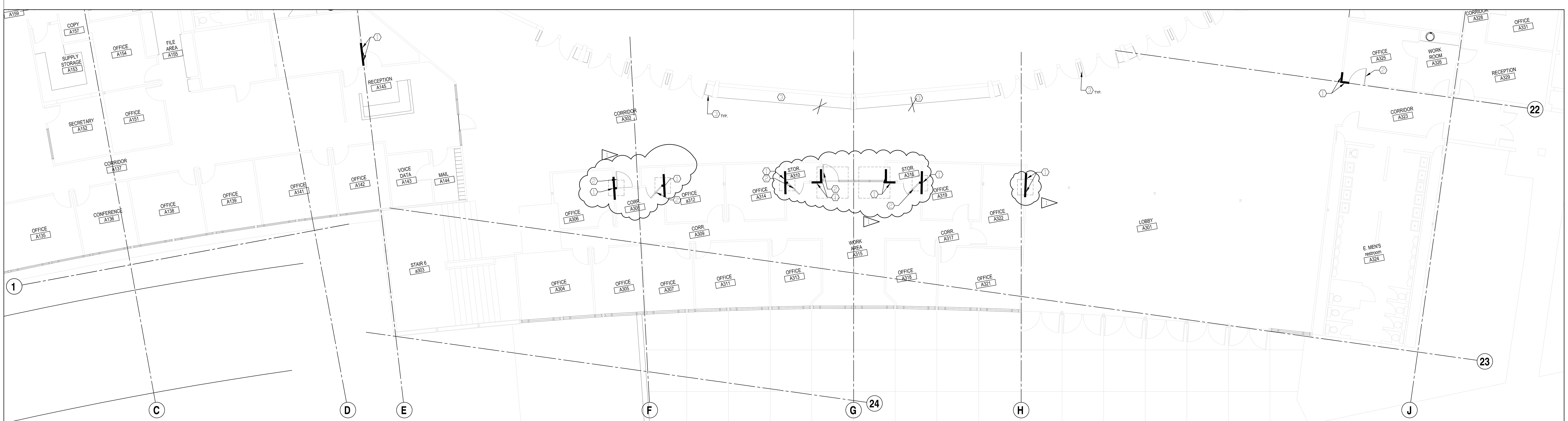
1. INFILL WALL, MATCHING EXISTING CONSTRUCTION (3 5/8" 25 GA. METAL STUDS @ 16" O.C.). PAINT WALL INFILL TO MATCH EXISTING WALL COLOR. SEE A501 FOR PATCHING AND FINISH NOTES. 1
2. RE-INSTALL DOORS IN THEIR ENTIRETY (INCLUDING DOORS, HARDWARE, FRAME, ETC.)
3. PATCH FLOOR WHERE TEMPORARY WALL SHORING IS LOCATED. SEE SHEET A5.1 FOR FINISH. 1

COORDINATION NOTE:

IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



1 A1.0 DEMO FLOOR PLAN
1/8"=1'-0"



2 A1.0 FLOOR PLAN
1/8"=1'-0"

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI ENGINEERS®
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718
P: (406) 556-8600 www.dci-engineers.com
CIVIL / STRUCTURAL

Cushing Terrell®
cushingterrell.com
800.757.9522

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse
West Entrance Roof Retrofit

STATE OF MONTANA
JAMES A BALDWIN
No. 8164
BILLINGS MT
LICENSED ARCHITECT

DRAWN BY: HOLLING
REVIEWED BY: BALDWIN

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
BID	ADD #1	11/17/20

PPA# 19-0172

Project #

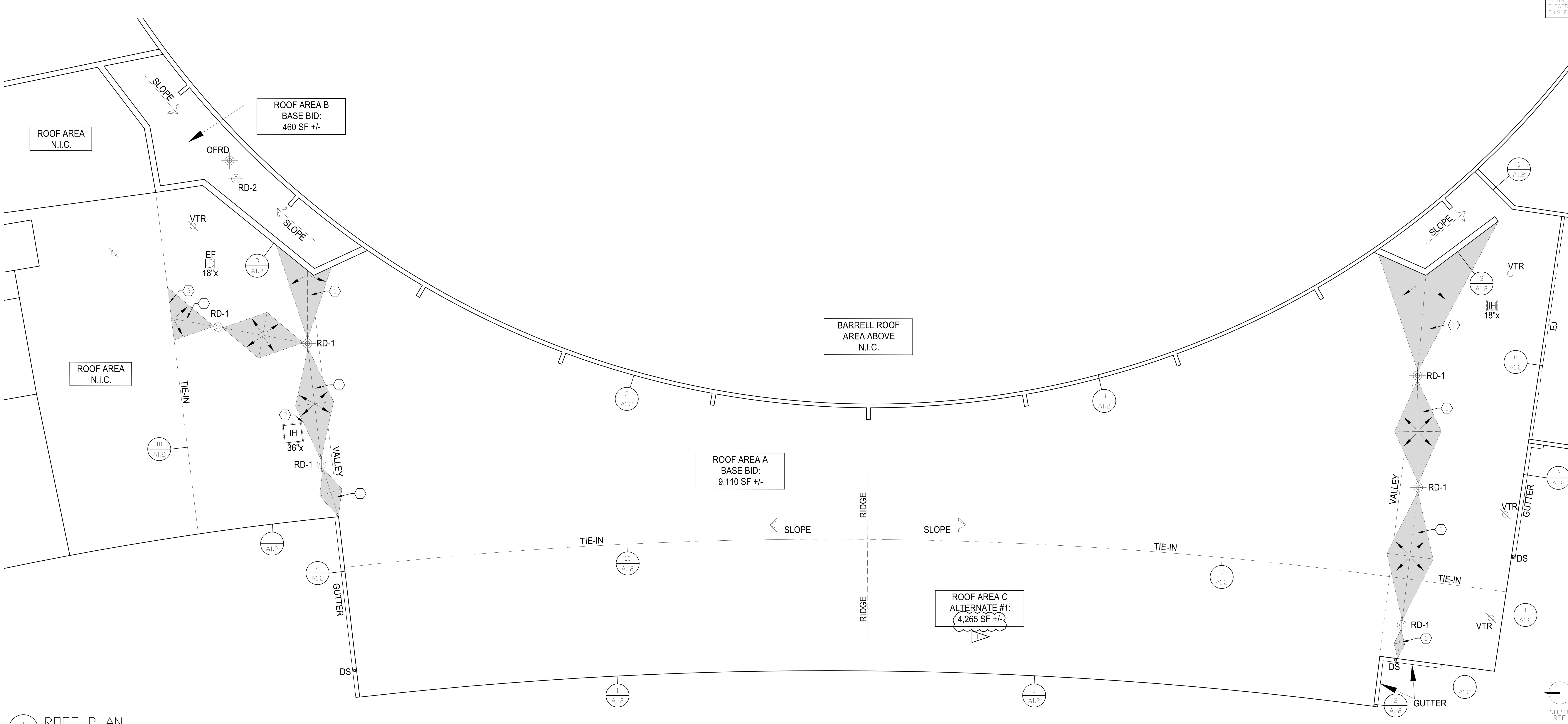
SHEET TITLE
ARCHITECTURAL - FLOOR PLANS

SHEET
A1.0

DATE
11.01.2020

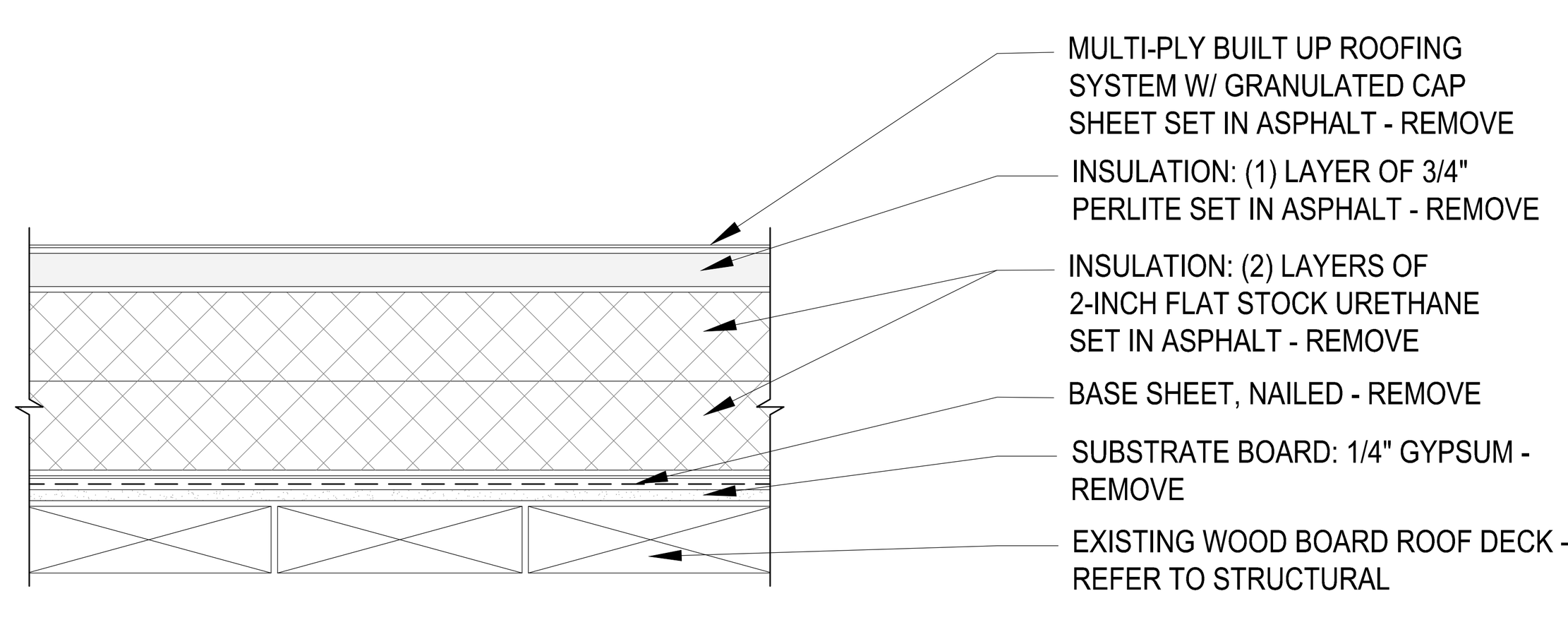
COORDINATION NOTE:

IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



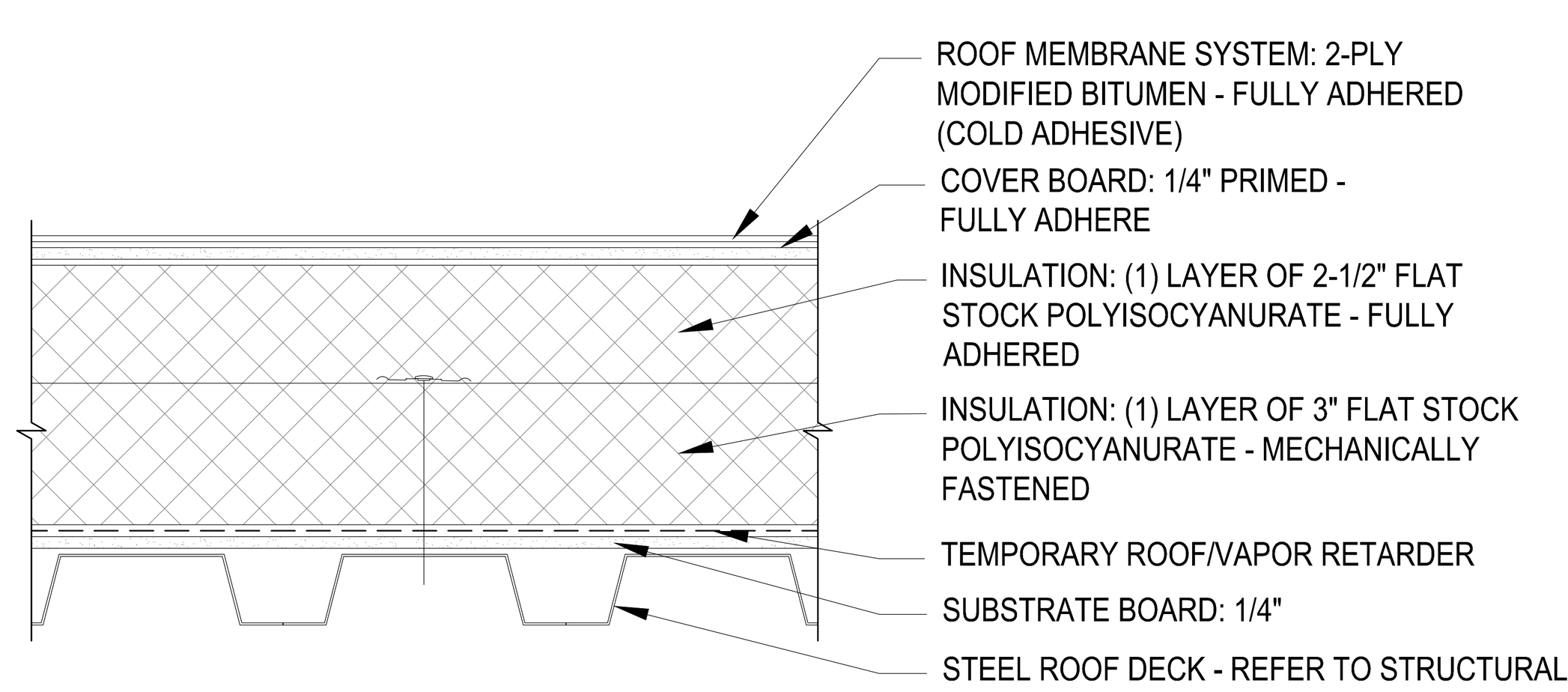
1 A101 ROOF PLAN

1/8"=1'-0"



2 A1.1 EXISTING ROOF CONSTRUCTION - ROOF AREA(S) A, B AND C

3"=1'-0"



3 A1.1 NEW ROOF CONSTRUCTION - ROOF AREA(S) A, B AND C

3"=1'-0"

GENERAL ROOFING NOTES

1. THE FOLLOWING REFERENCES HAVE BEEN USE AS A BASIS FOR DESIGN OF THE ROOFING RELATED WORK OF THE PROJECT AND SHALL BE USED BY THE CONTRACTOR TO DETERMINE REQUIREMENTS FOR FABRICATION AND/OR INSTALLATION WHEN NOT SPECIFICALLY INDICATED IN THE CONTRACT DOCUMENTS.
   A. NATIONAL ROOFING CONTRACTORS ASSOCIATION (NRCA) "ROOFING AND WATER PROOFING MANUAL, FIFTH EDITION".
   B. SHEET METAL AND AIR CONDITIONING NATIONAL CONTRACTORS ASSOCIATION (SMACNA) - "ARCHITECTURAL SHEET METAL MANUAL, FIFTH EDITION".
   C. 2018 INTERNATIONAL BUILDING CODE.
   D. INTERNATIONAL PLUMBING CODE, MOST CURRENT ADOPTED VERSION
   E. AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE) - SEI/ASCE 7-16: "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES" (REVISION OFSEI/ ASCE 7-10).
   F. MATERIAL MANUFACTURERS MOST RECENT PRINTED SPECIFICATIONS AND INSTALLATION DETAILS.
2. PRIOR TO THE START OF WORK THE CONTRACTOR SHALL PROVIDE AND INSTALL PROTECTION OVER, UNDER AND/OR AROUND ALL EXISTING SERVICES LINES, BUILDING COMPONENTS, SIDEWALKS, PAVEMENT AND LANDSCAPING WHICH COULD BE DAMAGED OR SOILED WHILE PERFORMING WORK OF THE CONTRACT.
3. DETAILS IN THE PROJECT DRAWINGS ARE SHOWN AT SPECIFIC LOCATIONS AND ARE INTENDED TO SHOW GENERAL REQUIREMENTS THROUGHOUT:
   A. DETAILS NOTED ARE "TYPICAL" AND IMPLY ALL SIMILAR CONDITIONS TREATED SIMILARLY. MODIFICATIONS TO MADE BY THE CONTRACTOR TO ACCOMMODATE MINOR VARIATIONS WITHOUT ADDITIONAL COST TO THE OWNER.
   B. COMPONENTS NOT INDICATED AS "EXISTING" ON ALL PROJECT DRAWINGS SHALL BE CONSIDERED NEW COMPONENTS TO BE PROVIDED AND INSTALLED BY THE CONTRACTOR.
4. IN NO CASE SHALL OTHER CONSTRUCTION RELATED WORK BE DOWN, OVER, OR CONSTRUCTION RELATED TRAFFIC BE ROUTED OVER COMPLETED ROOF SECTIONS WITHOUT PROTECTION BEING PLACED OVER NEW ROOF MEMBRANE/SHINGLES. PROTECTION SHALL CONSIST OF THE FOLLOWING (BOTTOM TO TOP).
   A. 1-INCH EXPANDED POLYSTYRENE
   B. 10-MIL POLYETHELENE
   C. 1/2" PLYWOOD
   D. WEIGH DOWN ALL PROTECTION MATERIALS TO PREVENT DISPLACEMENT BY WIND.

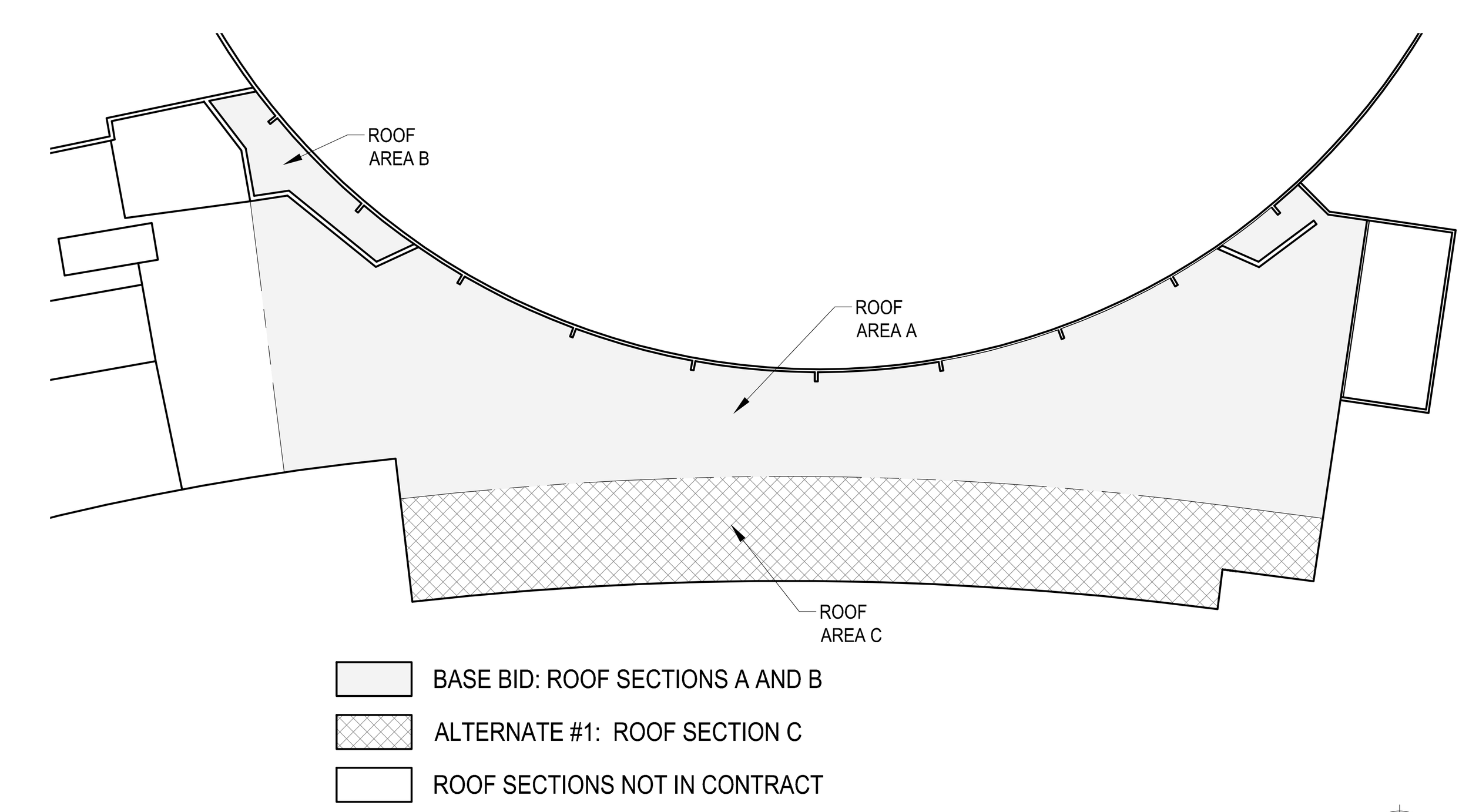
   NOTE: NEW ROOF AREAS THAT HAVE NOT BEEN PROTECTED FROM CONSTRUCTION RELATED TRAFFIC AS SPECIFIED ABOVE SHALL BE REMOVED AND REPLACED AT NO ADDITIONAL COST TO THE OWNER.
5. PROVIDE WALKPADS AROUND ALL ROOF TOP EQUIPMENT.
6. PROVIDE CRICKETS ON THE UP SLOPE SIDE OF ALL ROOF CURBS AS REQUIRED FOR DRAINAGE.
7. FIELD VERIFY ALL DIMENSIONS.

ROOF SYMBOL LEGEND

RD-1	NEW ROOF DRAIN AT EXISTING LOCATION - INSTALL PER DETAIL 7/A1.2
RD-2	EXISTING ROOF DRAIN - REFER TO DETAIL 7/A1.2 FOR SIMILAR
OFRD	EXISTING OVERFLOW ROOF DRAIN - REFER TO DETAIL 7/A1.2 FOR SIMILAR
EF	EXHAUST FAN CURB (ELEC. OR SERVICEABLE) - REFER TO DETAIL 4/A1.2
IH	INTAKE HOOD/VENT (NO ELEC.) - REFER TO DETAIL 4/A1.2
VTR	PLUMBING VENT THROUGH ROOF - FLASH PER DETAIL 5/A1.2
	PARAPET/ROOF TO WALL - REFER TO DETAIL 3/A1.2
	CONCRETE COLUMNS THROUGH ROOF - INSTALL BASEFLASHING PER DETAIL 3/A1.2
	ROOF EDGE - REFER TO DETAIL 1/A1.2
GUTTER	ROOF EDGE W/ GUTTER - REFER TO DETAIL 2/A1.2
DS	LOCATION OF NEW GUTTER DOWNSPOUT - REFER TO DETAIL 6/A1.2
RIDGE	ROOF SLOPE RIDGE LINE
VALLEY	ROOF SLOPE VALLEY LINE
TIE-IN	NEW TO EXISTING ROOF TIE IN - REFER TO DETAIL 10/A1.2
EJ	EXPANSION JOINT AT NEW TO EXISTING ROOF SECTION - INSTALL PER DETAIL 8/A1.2
SLOPE	DIRECTION OF FINISHED ROOF SLOPE FROM SLOPING STRUCTURE
	DIRECTION OF FINISHED ROOF SLOPE FROM TAPERED INSULATION / CRICKETS
	TAPERED INSULATION/CRICKET (light shade)
#	ROOF PLAN NOTE
AREA "_" ### SF	ROOF AREA DESIGNATION TAG: SF IS APPROXIMATE - FIELD VERIFY

ROOF PLAN NOTES:

1. INSTALL 1/2" IN 12" TAPERED POLYISOCYANURATE CRICKET
2. INSTALL CRICKET AS REQUIRED TO CLEAR EDGE OF CURB AS INDICATED
3. INSTALL CRICKET AS REQUIRED TO MATCH HEIGHT AND WIDTH OF CRICKET OF ADJACENT SECTION AT NEW TO EXISTING ROOF TIE IN



KEY PLAN
NO SCALE

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI ENGINEERS
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718
P: (406) 556-8600
www.dci-engineers.com
CIVIL | STRUCTURAL

Cushing Terrell.
cushingterrell.com
800.757.9522

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse

West Entrance Roof Retrofit

STATE OF MONTANA
JAMES A BALDWIN
No. 8164
BILLINGS MT
LICENSED ARCHITECT

DRAWN BY: GAUER
REVIEWED BY: BALDWIN

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
BID	ADD #1	11/17/20

PPA# 19-0172

SHEET TITLE

SHEET
A1.1

DATE
11.01.2020

LEGEND

- CORNER GUARD - SEE SPECIFICATIONS
- FINISH TAG
- FLOOR FINISH TAG
- PAINTED WALLS

ROOM FINISHES

FLOOR FINISHES

C CARPET TILES
E EXISTING
SC SEALED CONCRETE

BASE FINISHES

E EXISTING
CS CONCRETE SLAB ON GRADE

WALL FINISHES

P PAINT

MISC FINISHES

RT RUBBER FLOOR TRANSITION

GENERAL FINISH NOTES

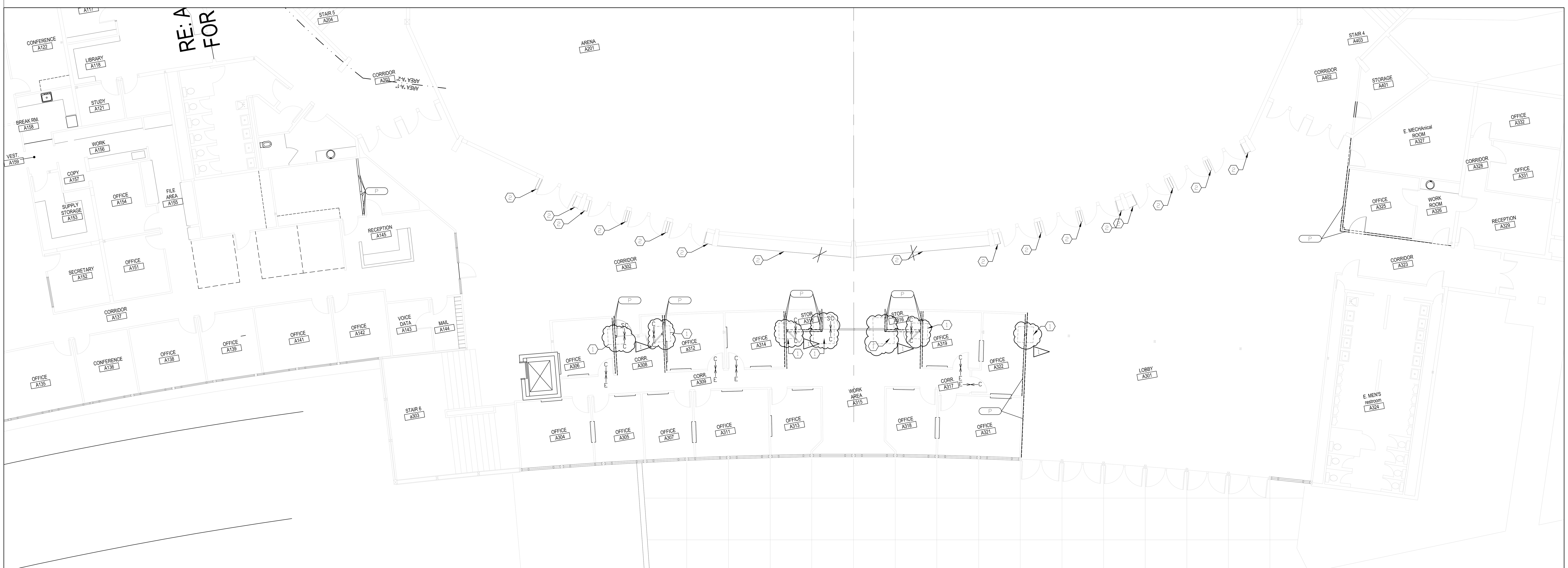
A. PROVIDE RUBBER TRANSITION STRIPS AT ALL CONCRETE AND CARPET TRANSITIONS. TRANSITION TO MATCH EXISTING.
B. ALL TRANSITIONS TO OCCUR DIRECTLY BENEATH DOORS UNLESS OTHERWISE NOTED.
C. ALL PRODUCTS TO BE INSTALLED PER MANUFACTURERS INSTRUCTION USING MANUFACTURERS ADHESIVES, ETC.
D. PATCH ALL AREAS OF REMOVED FINISH.
E. MATCH EXISTING ADJACENT WALL FINISHES AT NEW AND REMODELED WALLS.
F. REPAINT HOLLOW METAL DOORS AND FRAMES TO MATCH EXISTING.

FINISH NOTES

1. AREA OF EXTENT OF FLOOR WORK, MATCH REPLACED FLOORING WITH EXISTING. SEE STRUCTURAL FOR SIZE EXTENT.
2. PATCH FLOOR WITH A DURAFLEX RESINOUS SYSTEM TO MATCH EXISTING CONCRETE FLOOR FINISH AND TOUCH-UP WALL ONCE SHORING IS REMOVED.

COORDINATION NOTE:

IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



1 A5.1 FINISH PLAN
1/8"=1'-0"
N

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

DCI engineers
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718
P: (406) 556-8600
www.dci-engineers.com
CIVIL / STRUCTURAL

Cushing Terrell.
cushingterrell.com
800.757.9522

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse

West Entrance Roof Retrofit

STATE OF MONTANA
JAMES J. BALDWIN
No. 8164
BILLINGS MT
LICENSED ARCHITECT

DRAWN BY: HOLLING
REVIEWED BY: BALDWIN

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
BID	ADD #1	11/17/20

PPA# 19-0172

Project #

SHEET TITLE
ARCHITECTURAL - FINISH PLAN

SHEET
A5.1

DATE
11.01.2020

DEMOLITION PLAN LEGEND

- INDICATES ITEMS TO BE DEMOLISHED AND/OR REMOVED
- (#) SELECTIVE DEMOTION NOTE

GENERAL DEMOLITION NOTES:

A. THE REMOVAL/DEMOLITION NOTES LISTED ARE INTENDED TO CONVEY A GENERAL DESCRIPTION OF THE REMOVAL/DEMOLITION WORK THROUGHOUT THE PROJECT. SEE INDIVIDUAL DISCIPLINE SHEETS FOR SPECIFIC DEMOLITION WORK.
B. WHETHER SPECIFICALLY INDICATED OR NOT, ALL ITEMS/MATERIALS/EQUIPMENT REQUIRED TO BE REMOVED OR DEMOLISHED TO COMPLETE THE WORK SHALL BE INCLUDED IN THE BID.
C. ALL REMOVED ITEMS, EXCEPT THOSE NOTED TO BE REUSED OR TO REMAIN AS THE PROPERTY OF THE OWNER SHALL BECOME THE PROPERTY OF THE CONTRACTOR, AND SHALL BE REMOVED FROM THE JOBSITE.
D. REFER TO COVER SHEET FOR GENERAL PROJECT NOTES.
E. REFER TO OTHER PORTIONS OF THE CONTRACT DOCUMENTS FOR ADDITIONAL DEMOLITION REQUIREMENTS. REFER TO A501 FOR EXTENT OF FLOOR REPAIRS. REFER TO A9.1 FOR EXTENT OF CEILING REPAIRS.
F. PROTECT THE BUILDING INTERIOR AT ALL TIMES, OUTSIDE OF WORK AREAS. PROMPTLY REPAIR DAMAGES CAUSED TO ADJACENT FACILITIES/FINISHES BY DEMOLITION OR CONSTRUCTION WORK AT NO ADDITIONAL COST TO THE OWNER. REPAIR SHALL EXTEND TO THE NEAREST INSIDE OR OUTSIDE CORNER.
G. CONTRACTOR TO VISIT SITE AND VERIFY EXISTING CONDITIONS PRIOR TO BIDDING. CONTRACTOR IS RESPONSIBLE TO COORDINATE THEIR OBSERVATIONS WITH THESE CONTRACT DOCUMENTS. IF INCONSISTENCIES EXIST, THE CONTRACTOR SHALL INFORM THE ARCHITECT BEFORE BIDDING.
H. PROVIDE DUST PROTECTION AS REQUIRED.
I. THE BUILDING AND GROUNDS SHALL BE KEPT CLEAN AND FREE OF REFUSE AT ALL TIMES.
J. DISRUPTIONS AND OUTAGES MUST BE FULLY COORDINATED WITH MSU PM A MINIMUM OF 72-HOURS IN ADVANCE. COORDINATE SCHEDULE OF DEMOLITION WORK WITH MSU TO MINIMIZE DISRUPTION OF OWNER'S OPERATIONS.

(#) DEMOLITION NOTES

1. REMOVE EXISTING UPPER GYP/TILE & LOWER ACT/GRID CEILINGS AS REQUIRED TO FACILITATE WORK FOR STRUCTURAL UPGRADES - BOTH LOWER AND UPPER CEILINGS.

PLAN LEGEND

- ROOM — ROOM NAME
- A### — ROOM NUMBER
- (#) — PLAN NOTE
- WALL INFILL

REFLECTED CEILING LEGEND

- ACT — CEILING MATERIAL
- HT — CEILING HEIGHT
- # — ADDITIONAL NOTES

2X4 ACOUSTICAL LAY-IN CEILING

GYPSUM BOARD CEILING

DEMO'D CEILING 1

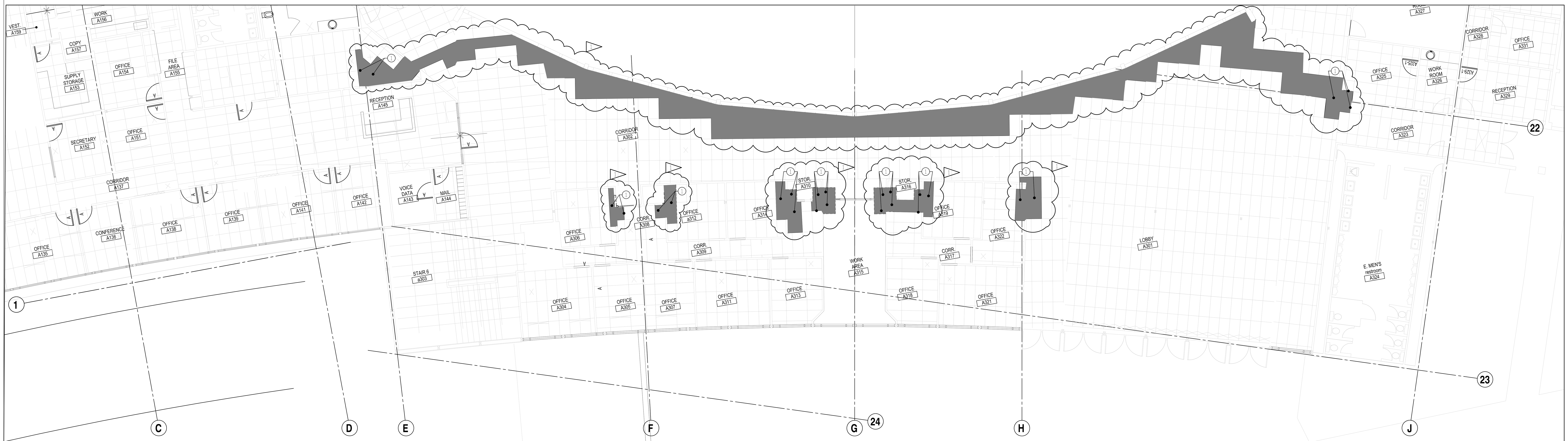
CEILING MATERIAL
ACT 2X4 ACOUSTICAL LAY-IN PANEL TO MATCH EXISTING
EXST EXISTING TO REMAIN
GYP GYPSUM BOARD - TAPE, TEXTURE, & PAINT TO MATCH EXISTING

(#) PLAN NOTES

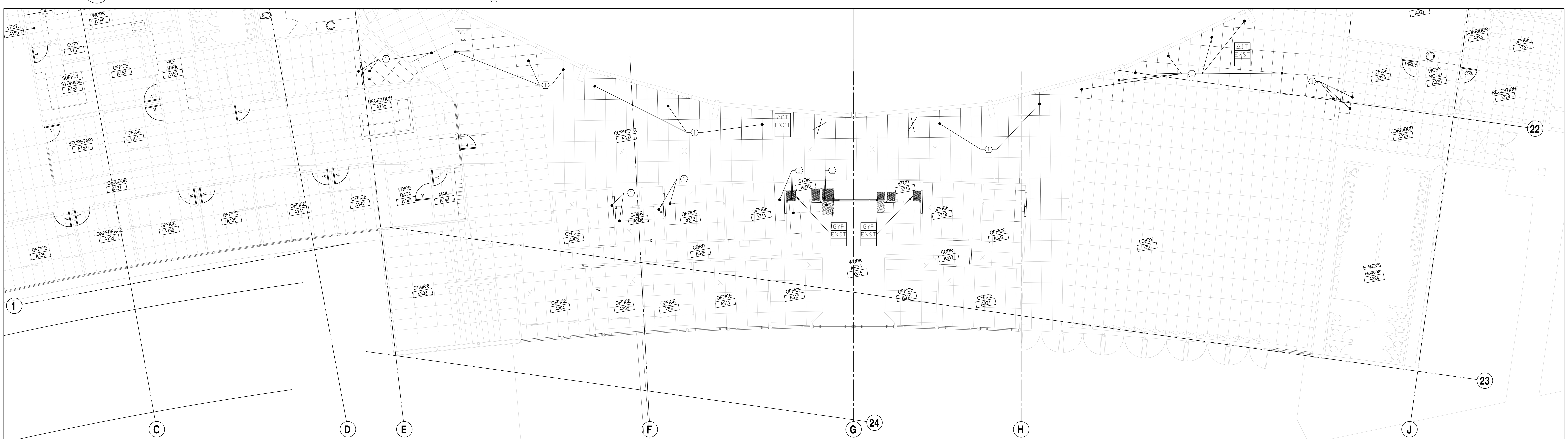
1. REPLACE/REPAIR DEMO'D LOWER AND UPPER CEILINGS. MATERIAL COLOR AND PAINT TO MATCH EXISTING.

COORDINATION NOTE:

IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INCLUDING EQUIPMENT SUPPLIERS TO COORDINATE WITH EACH OTHER AND TO VERIFY THAT THERE ARE NO CONFLICTS IN LOCATIONS OF DUCTS, CONDUITS, SPRINKLER HEADS, SPRINKLER PIPING, DIFFUSERS, ELECTRICAL BOXES AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.



1 DEMO REFLECTED CEILING PLAN
A9.1
1/8"=1'-0"
N



2 REFLECTED CEILING PLAN
A9.1
1/8"=1'-0"
N

100% CONSTRUCTION DOCUMENTS

Brick Breeden Fieldhouse

West Entrance Roof Retrofit

MONTANA STATE UNIVERSITY

MSU-CPDC
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA
PHONE: 406.994.5413
FAX: 406.994.5665

Cushing Terrell®
cushingterrell.com
800.757.9522

DCI engineers®
1060 Fowler Ave, Suite 202
Bozeman, Montana 59718
P: (406) 556-8600 www.dci-engineers.com
CIVIL / STRUCTURAL

STATE OF MONTANA
JAMES J. BALDWIN
No. 8164
BILLINGS MT
LICENSED ARCHITECT

DRAWN BY: HOLLING
REVIEWED BY: BALDWIN

REV.	DESCRIPTION	DATE
##	DESCRIPTION	DD/MM
SD	SCHEMATIC DESIGN	04/10/20
CD	95% REVIEW	07/28/20
CD	100% CD	11/01/20
BID	ADD #1	11/17/20

PPA# 19-0172

Project #

SHEET TITLE
ARCHITECTURAL - REFLECTED CEILING PLANS

SHEET
A9.1

DATE
11.01.2020

FOR
REFERENCE
ONLY

06.29.17 11:09 PM | L:\MSU\MSU_ROOFINV\BIMCAD\Struct\MSU_Roofinv_s001.dwg

STRUCTURAL GENERAL NOTES

THE INTENT OF THIS SHORING INSTALLATION PLAN IS TO PROVIDE TEMPORARY SHORING FOR A PERIOD OF APPROXIMATELY ONE YEAR AND TO ALLOW EXITING THE WEST END OF THE ARENA THROUGH EXISTING DOORS.

A. GOVERNING CODES

1) NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, ANSI/AWC NDS-2018.
2) TIMBER CONSTRUCTION MANUAL, AITC 6TH EDITION.
3)

B. DESIGN LOADS AND CRITERIA

1) GRAVITY LOADS:
   a) ROOF LOADS:
      1. ROOF DEAD LOAD: 20 psf
      2. ROOF SNOW LOAD: 225 psf

C. MATERIALS SECTION:

1) STRUCTURAL STEEL:
   a) ANGLE SHAPES: ASTM A36, Fy = 36 ksi
2) BOLTS: ASTM A307 GRADE A; WOOD OR WOOD TO STEEL CONNECTIONS OR ERECTION ONLY
3) ADHESIVE ANCHORS:
   a) CONCRETE: ASTM A193 GRADE B7 THREADED ROD W/ CHISEL POINT & INJECTABLE ADHESIVE SUCH AS (HILTI HIT-RE 500 V3) ICC-ES REPORT ESR-3814 OR APPROVED EQUAL
4) SCREW ANCHORS:
   a) CONCRETE: ASTM B633, CLASS SC1, TYPE III SUCH AS (SIMPSON STRONG-TIE TITEN HD) ICC-ES REPORT ESR-2713 OR APPROVED EQUAL
5) VERSA-LAM: ICC-ES REPORT ESR-1040
   Fb = 3100 psi, Fv = 285 psi
   Fc = 3000 psi, E = 2.0E6 psi
6) DIMENSION LUMBER:GRADED BY WESTERN WOOD PRODUCTS ASSOCIATION (WWPA) OR WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
   <=4X NOMINAL: DOUGLAS FIR-LARCH #2 UNO
   <=4X NOMINAL: DOUGLAS FIR-LARCH #2 PLATES AND BLOCKING
   >4X NOMINAL: DOUGLAS FIR-LARCH #1 OR HEM-FIR SS, UNO
7) WOOD SHEATHING / PANELS: APA - THE ENGINEERED WOOD ASSOCIATION (APA) RATED "STRUCTURAL I" OR "SHEATHING" AS DESIGNATED BELOW SUITED FOR SPAN & USE
   WALL SHEATHING:
   a) PLYWOOD 15/32" NOMINAL PANEL THICKNESS - 32/16 SHEATHING EXTERIOR, SHEATHING
8) TIMBERS: GRADED BY NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA) AS THEY PERTAIN TO STRUCTURAL TIMBER DOUGLAS FIR-LARCH #1

D. WOOD FRAMING

1) ENGINEERED WOOD PRODUCTS SHOWN ON THE DRAWINGS ARE THE PRODUCTS OF TRUS JOIST - BOISE CASCADE AND ARE DESIGNATED BY THE MANUFACTURER'S STANDARD PRODUCT NUMBERS. THE INTENT OF THE DESIGN IS FOR THESE ITEMS TO BE ATTACHED TO EACH OTHER AND TO THE SURROUNDING STRUCTURE TO BEHAVE AS A SYSTEM. WHETHER SHOWN OR NOT, PROVIDE ACCESSORY ITEMS (BLOCKS, CLIPS, STIFFENERS, STRAPS, ETC) DESIGNED BY THE MANUFACTURER, FOR A COMPLETE SYSTEM. FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION AND USE.
   a) ENGINEERED WOOD PRODUCT SUBSTITUTIONS SHALL REQUIRE WRITTEN APPROVAL FROM THE ENGINEER AND SHALL BE IDENTICAL IN DEPTH AND SPACING WHILE MEETING OR EXCEEDING MOMENT, SHEAR AND STIFFNESS PROPERTIES FOR THE MEMBERS SPECIFIED. FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION AND USE.
2) FRAMING CONNECTORS, ANCHORS, AND HANGERS SHOWN ON THE DRAWINGS ARE THE PRODUCTS OF SIMPSON STRONG-TIE COMPANY, PLEASANTON, CALIFORNIA AND ARE DESIGNATED BY THE MANUFACTURER'S STANDARD PRODUCT NUMBERS. FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION AND USE. PRODUCTS WITH EQUIVALENT CAPACITY AND QUALITY MAY BE SUBSTITUTED AFTER A SUBMITTAL HAS BEEN PROVIDED BY THE GENERAL CONTRACTOR AND FINAL APPROVAL BY STRUCTURAL ENGINEER. NOTE: "USP" LUMBER CONNECTORS ARE PRIOR APPROVED FOR DIRECT SUBSTITUTION OF SIMPSON PRODUCTS USING THE "USP" REFERENCE NUMBER INDEX. WHERE DIRECT SUBSTITUTION IS NOT AVAILABLE IN THE INDEX, PROVIDE A SUBSTITUTION SUBMITTAL FOR PROPOSED PRODUCT SUBSTITUTION.
3) SAWN LUMBER:
   a) SAWN LUMBER SHALL BE NEW OR RECYCLED STABLED WOOD WITH MAXIMUM MOISTURE CONTENT OF 19%.
   b) STRUCTURAL MEMBERS NOT SPECIFICALLY DETAILED FOR PENETRATIONS SHALL NOT BE CUT FOR MECHANICAL PIPES, DUCTS ETC UNLESS APPROVED BY THE ENGINEER.
   c) ALL LAG SCREWS SHALL HAVE LEAD HOLES DRILLED THE SAME DIAMETER FOR THE SHANK AND 50% OF THE SHANK DIAMETER FOR THE THREADED PORTION. LUBRICATE THREADS BEFORE INSTALLATION.
   d) NAILING REQUIREMENTS NOT SPECIFIED ON THE CONSTRUCTION DOCUMENTS SHALL BE IN ACCORDANCE WITH IBC FASTENING SCHEDULE, TABLE 2304.9.1.
4) WOOD SHEATHING:
   a) INSTALL PLYWOOD PANELS WITH FACE GRAIN PERPENDICULAR TO SUPPORTS.
   b) INSTALL WALL STRUCTURAL PANELS WITH FACE GRAIN EITHER PARALLEL TO OR PERPENDICULAR TO SUPPORTS. IN HORIZONTAL INSTALLATIONS, STAGGER ALL END JOINTS A MINIMUM OF ONE STUD SPACE AND IN VERTICAL INSTALLATIONS, STAGGER ALL END JOINTS A MINIMUM OF THE TYPICAL STUD SPACING, UNLESS NOTED OTHERWISE ON CONSTRUCTION DOCUMENTS. FASTEN PANELS TO SUPPORTING FRAMING AND BLOCKING AS INDICATED ON CONSTRUCTION DOCUMENTS.
5) TIMBER FRAME CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF TIMBER FRAME ENGINEERING COUNCIL (TFEC) "CODE OF STANDARD PRACTICE FOR TIMBER FRAME STRUCTURES" (TFEC 2).
   a) TIMBER SHALL BE NEW OR RECYCLED STABLED TIMBER WITH MAXIMUM MOISTURE CONTENT OF 16%.

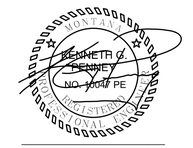
E. MISCELLANEOUS

1) ALL WOOD FRAMING BELOW 2X4 LAY IN CEILING TO BE WRAPPED TO CREATE A WALL SEGMENT BETWEEN PAIRS OF DOORS OR BETWEEN POSTS AS SHOWN. WRAP WITH 5/8" TYPE X GYP BOARD, TAPE AND FINISH TO LEVEL 4 OR GREATER FOR A PAINTED SURFACE. PAINT A MINIMUM OF ONE COAT PRIMER TWO COAT FINISH PER MSU'S COLOR SELECTION. OPENINGS IN ADHERED ACOUSTICAL TILE CEILING (12X12) SHALL BE REPAIRED BY INSTALLING A LAYER OF 5/8" TYPE X GYP BOARD, EDGES MUDDED AND SEAMS FIRE TAPPED.
2) IF ELECTRICAL CONDUIT, JUNCTION BOXES OR OTHER ITEMS ARE IN THE WAY OF THE SHORING DEPICTED, RELOCATE AS REQUIRED.

CTA®
www.ctagroup.com
800.757.9522

MSU FIELD HOUSE WEST ENTRY SHORING

MONTANA STATE UNIVERSITY
BOZEMAN, MT

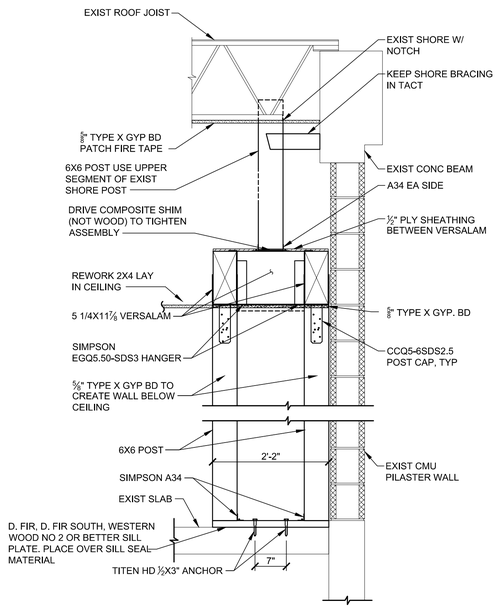


CONSTRUCTION DOCUMENTS

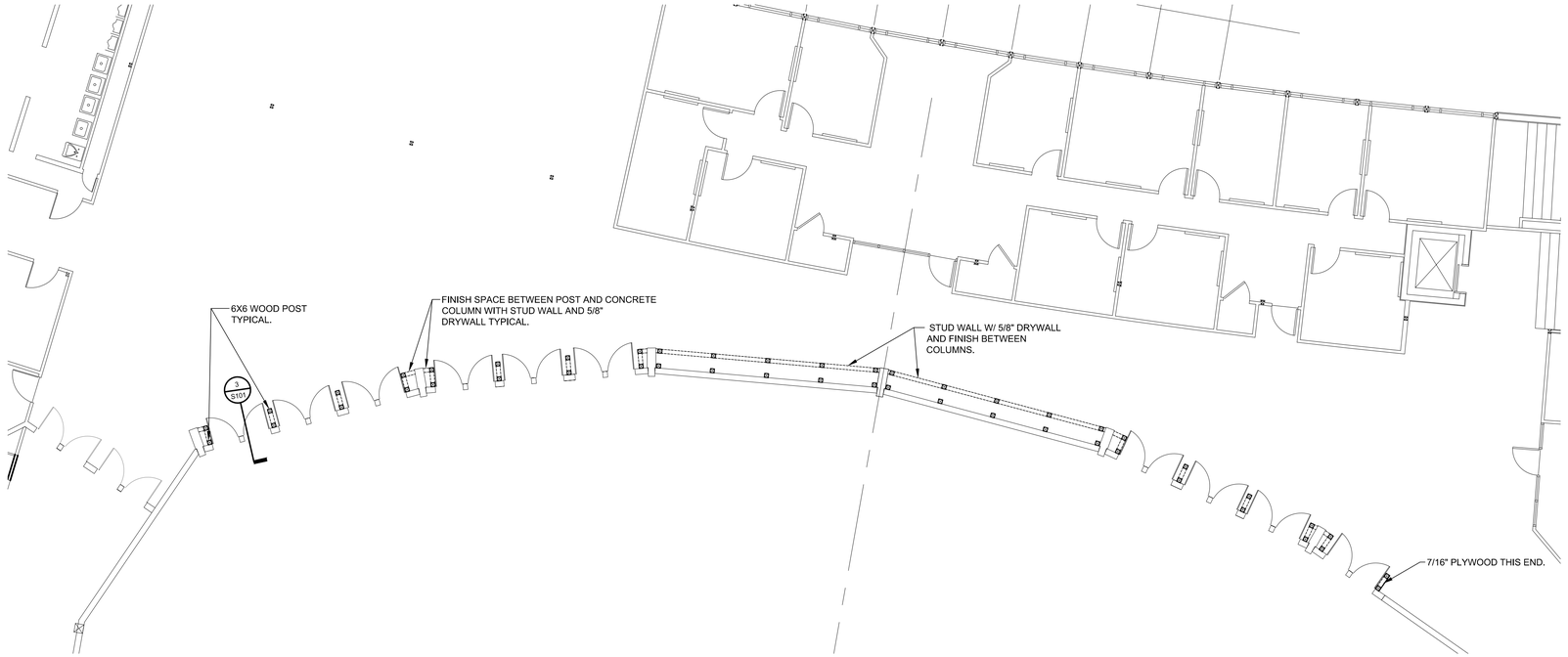
03.20.2019
DRAWN BY | GLEASON
CHECKED BY | PENNEY
REVISIONS
-

STRUCTURAL
GENERAL
NOTES

S001

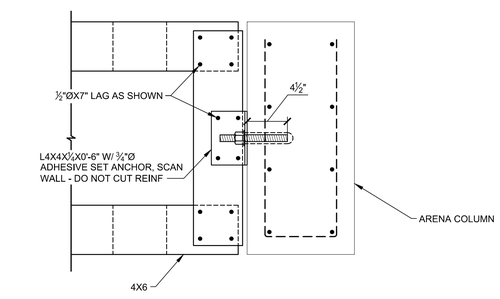


3 S101 — 3/4"=1'-0"

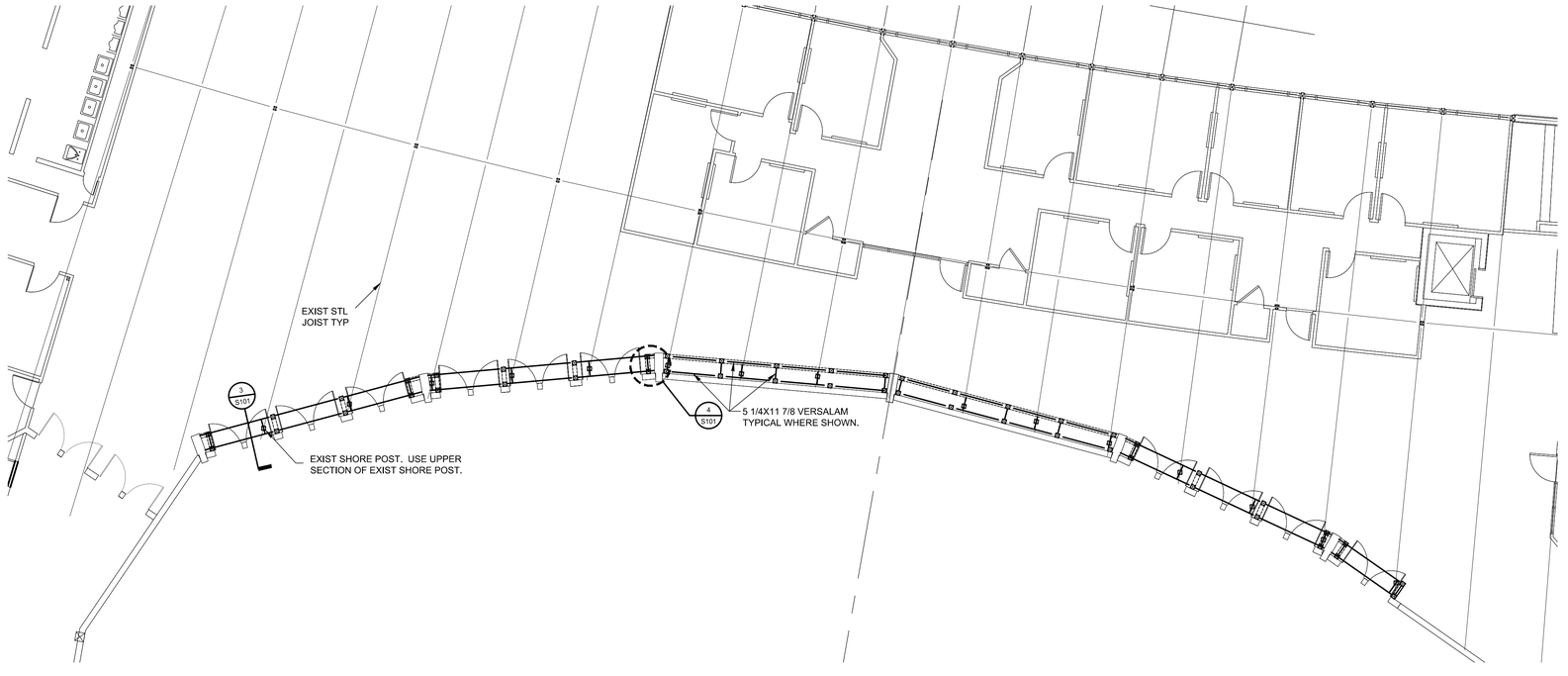


1 S101 — PARTIAL MAIN LEVEL FRAMING PLAN — 1/8"=1'-0"

NORTH REF.



4 S101 — TYPICAL SHORING FRAME END ATTACHMENT — 1 1/2"=1'-0"



2 S101 — PARTIAL ROOF FRAMING PLAN — 1/8"=1'-0"

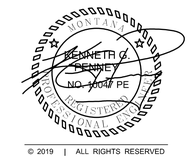
NORTH REF.

FOR REFERENCE ONLY

CTA
www.ctagroup.com
800.757.9522

MSU FIELD HOUSE WEST ENTRY SHORING

MONTANA STATE UNIVERSITY
BOZEMAN, MT



CONSTRUCTION DOCUMENTS

03.20.2019
DRAWN BY | GLEASON
CHECKED BY | PENNEY
REVISIONS
-

PLANS
SHEETS
DETAILS

S101