ENTRY FORM

DVASE
2020 Excellence in Structural Engineering Awards Program

PROJECT CATEGORY (check one):

Buildings under $5M		Buildings Over $100M	
Buildings $5M - $15M		Other Structures Under $1M	
Buildings $15M - $40M		Other Structures Over $1M	
Buildings $40M - $100M	x	Single Family Home	

Approximate construction cost of facility submitted:	$98M
Name of Project:	University of Rhode Island Fascitelli Center for Advanced Engineering
Location of Project:	South Kingstown, RI
Date construction was completed (M/Y):	October 2019
Structural Design Firm:	Ballinger
Affiliation:	**All entries must be submitted by DVASE member firms or members.**
Architect:	Ballinger
General Contractor:	Dimeo Construction Company

Company Logo (insert .jpg in box below)

B A L L I N G E R

Important Notes:

- Please .pdf your completed entry form and email to bsagusti@barrhorstman.com.
- Please also email separately 2-3 of the best .jpg images of your project, for the slide presentation at the annual dinner and for the DVASE website. Include a brief (approx. 4 sentences) summary of the project for the DVASE Awards Presentation with this separate email.

- Provide a concise project description in the following box (one page maximum). Include the significant aspects of the project and their relationship to the judging criteria.

The University of Rhode Island Fascitelli Center for Advanced Engineering represents the ambitious mission of College of Engineering Dean Raymond Wright to create a "transformational building that fosters a vibrant and innovative environment by attracting the best faculty, students, and industry partners."

Constructed on the former site of five demolished engineering buildings on the University's main South Kingstown campus, the new Engineering Building serves as a "bridge" between the Liberal Arts programs at campus south and the Basic Sciences at campus north.

The Trusses

To create a literal bridge, the central bar of the building is supported by (3)-260' long x 55' (four-story) tall architecturally exposed steel trusses, each with 160' center spans plus cantilevers at each end. This layout allows for a column-free commons area and unobstructed pass-through from campus south to north. The trusses are spaced 41' on center with 8' cantilevered corridors on both exterior walls, and support four stories of laboratory program and mechanical penthouse. As a teaching application of "engineering in sight", the major truss members are comprised of W14 diagonals and W36 top and bottom chords, which also serve as floor girders. Unfactored diagonal loads range from 2200 kips in tension in the most highly loaded diagonals, 1600 k in the compression diagonals, and 900 k - 1500 k tension and compression in the top and bottom chords.

As the trusses are the dominant architectural expression for the building, they are coated with intumescent paint as fireproofing to retain the visual shape of the wide flanges. Ballinger designed and documented each custom connection intersection as the truss diagonals passed through the floor levels. As most connections are exposed to view, all were designed as welded and ground down to AESS standards after completion. Bolts were used only as erection aids for fit-up. Since cost was a major concern, rather than simply specifying a CJP weld at all connections, each member and weld was sized to support only the load required. The use of PJP welds greatly reduced field and material costs in the compression members, as well as the time associated with removal and infill of backing bars and access holes. An on-site mock-up of the central "node", where 8 members intersect, was provided to confirm feasibility of the welds selected and to approve aesthetics of the final ground-down and painted condition.

Because the truss dimensions far exceeded transportation limits, Ballinger provided a sequence of erection on the contract documents and worked closely with Berlin Steel to determine splice points. Because the full 160' center span, or the full height, could not be erected at one time, 15 temporary columns were provided in Ballinger's design, each with their own foundation to temporarily support the building during erection. Once all welds were made and inspections passed, the temporary columns were removed in the sequence defined by Ballinger. After all temporary columns were removed, the concrete slabs on deck were placed to a level surface elevation (the weight of additional concrete having been accounted for in the truss design), such that the deflection of the main span of the truss did not produce undue deflections in the center of the lab bar.

Ballinger also produced truss deflection diagrams as part of the contract documents, for the use of exterior wall manufacturer and mechanical, electrical, and plumbing subcontractors in understanding the tolerances and movements that their respective systems would need to accommodate.

Truss Supports

To accommodate thermal expansion and contraction, the trusses bear on six ConServ disc bearings, custom designed to the design load at each location. The slide bearing assemblies range from 24"-40" square and 8"-12" height. Since grade varies by one full story from the west to east ends of the truss, a concrete-encased steel portal frame supports the slide bearing assemblies, designed to resist the lateral force imparted by the slide bearing assembly prior to it slipping into service at the design load.

Construction Administration and Inspections

2654 unique steel fabrication piece drawings were produced for the project. Berlin Steel and Ballinger held weekly team meetings to review truss member splice points, connection detailing, and coordination items. Several member piece drawings were three pages long in order to capture the detailing at each unique condition along the truss member lengths.

Given the quantity of CJP and PJP welds required at the truss connections, the substantial amount of shop fabrication in Berlin's Quebec shop, and the critical nature of each connection node, a detailed inspection plan was developed to ensure the quality and soundness of each weld. Upon the return of each sequence of erection drawings, Ballinger also provided a color-coded set of plans and details to indicate which connections required shop vs. field UT, MT, and visual inspections. The inspector used these to cross check their plans to provide a complete inspection report for each sequence.

Temporary Column Removal

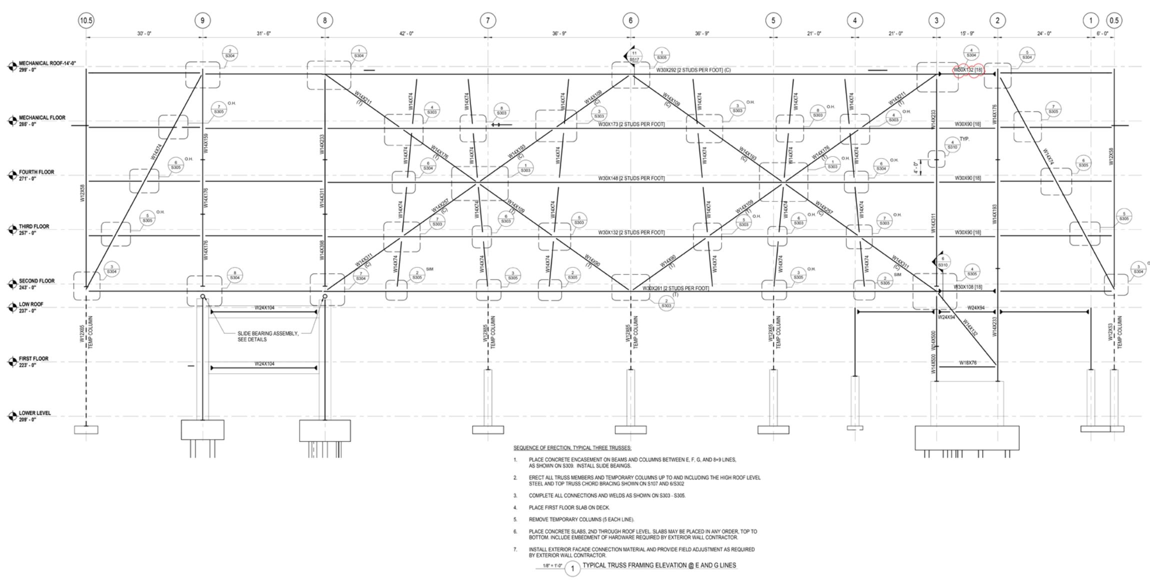
Prior to the removal of the temporary columns, Ballinger and Berlin met on site to review the sequencing and logistics of the removal operation. Ballinger provided both the sequence of removal and the anticipated deflection of the truss after each removal. The work was scheduled for a Saturday so that no workers would be on the upper levels out of an abundance of caution.

While removing the fifth column in the sequence, the truss it supported dropped suddenly, and loud screeching of the structure above was observed. The contractors halted the column removal and consulted the engineer for further direction. On the following Monday, Ballinger's engineer flew directly to the job site from vacation to assess the condition. We discovered that the issue was a 50 ton rebar delivery placed directly over the column being removed. The rebar was set upon wood railroad ties spanning across the top of the composite shear studs on the tops of the beams, causing the reported "screeching" as the structure deflected more than anticipated. After accompanying the inspector to reinspect the connections affected by this area, the engineer provided the "all clear" for continued removal of the columns. The engineer stood below the building with the steel worker while he torched through the remaining columns as a sign of confidence and the solidarity of our roles in assuring the safe delivery of the project.

The official ribbon cutting for the building was held in October 2019 to great excitement within the state of Rhode Island. Architectural reviews and building occupant feedback have been extremely positive, and the research programs within the building are well underway.

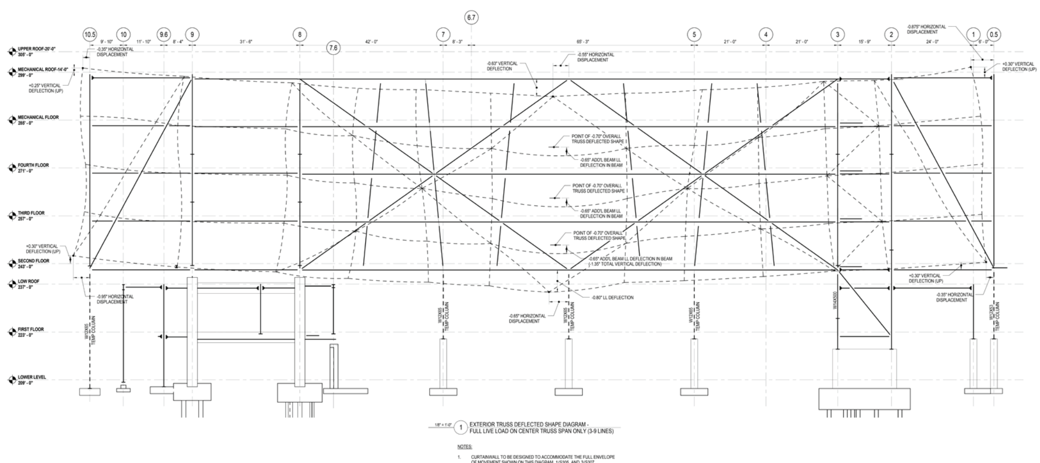
- The following 5 pages (maximum) can be used to portray your project to the awards committee through photos, renderings, sketches, plans, etc…

Rendering

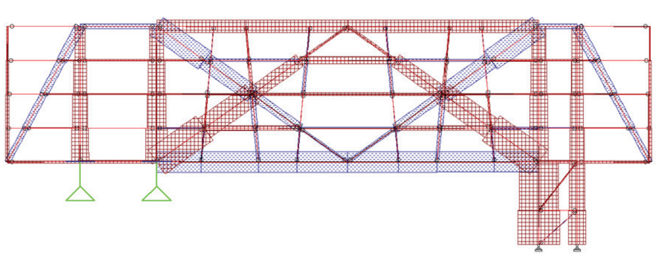


Truss Framing Elevation from Contract Documents

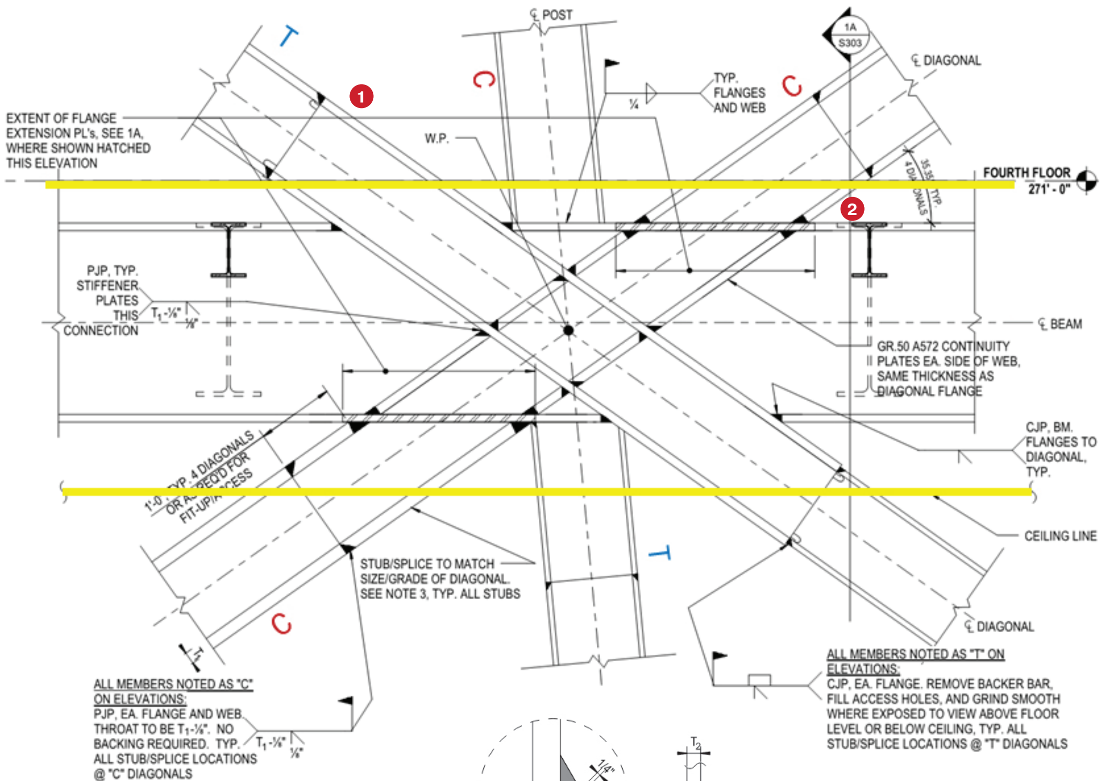
Construction Progress Photo

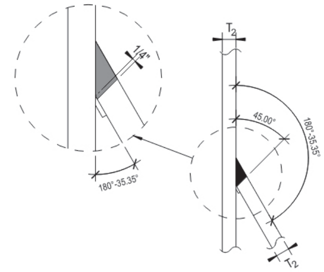


Truss Deflection Diagram from Contract Documents



Analysis Model Axial Load Diagram





3" = 1'-0"
A
PREQUALIFIED CJP T-JOINT
FIGURE 3.6-AWS D1.1-2015

1

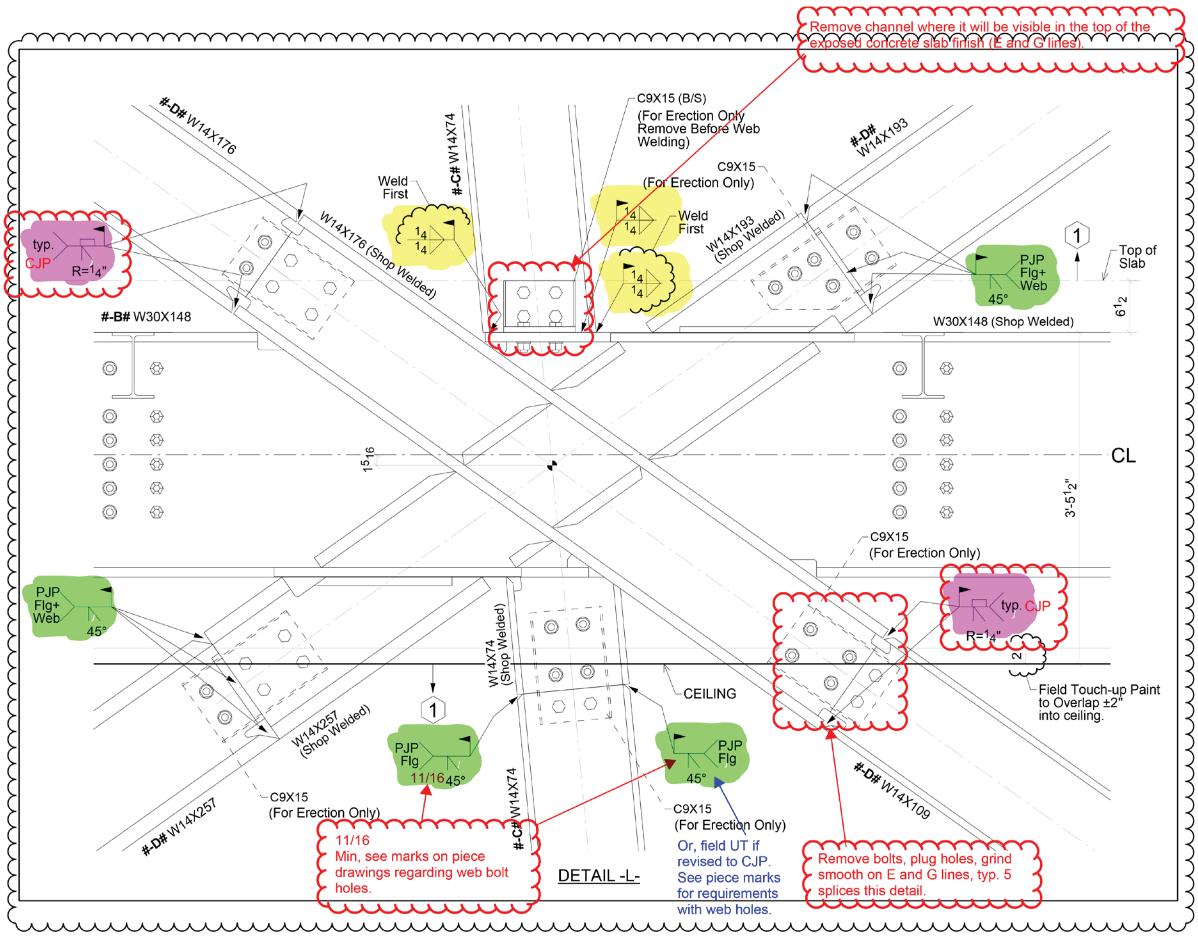
Tension member continuous through joint—CJP weld adjacent lengths together as required for load—but only as required for load

2

Maintain load path for compression members—PJP welds adequate for bearing

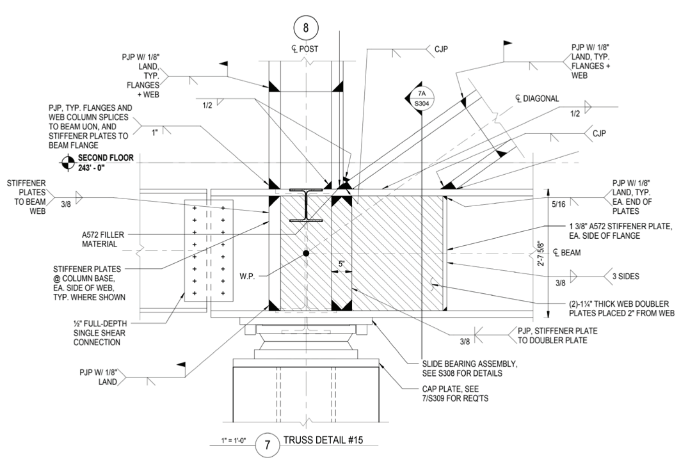
Node
Connection
Detail

On Site
Node
Mock-Up

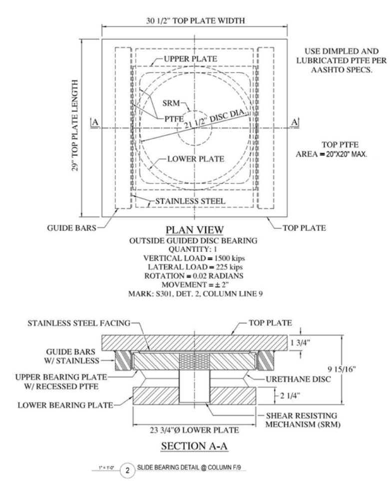


Field MT
Field UT
Field Visual (Fillets)
Shop MT
Shop UT
Shop Visual (Fillet)

Color Coded Inspection Details

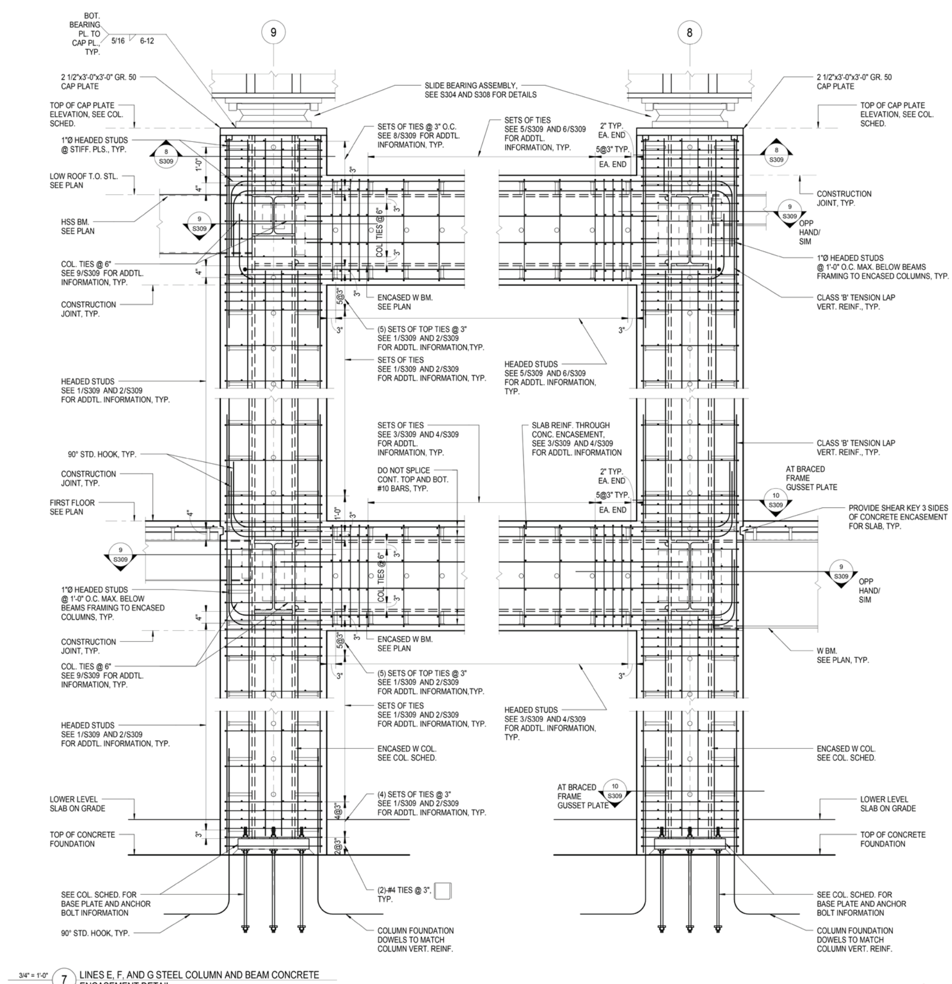


Base of Truss Detail at Slide Bearings



Slide Bearing Detail

Project Near Completion



Base of Truss Portal Frame at Slide Bearings

By signing, signatory agrees to the following and represents that he or she is authorized to sign for the structural design firm of record.

All entries become the property of DVASE and will not be returned. By entering, the entrant grants a royalty-free license to DVASE to use any copyrighted material submitted.

If selected as an award winner, you may be offered the opportunity to present your project at a DVASE breakfast seminar. Would you be willing to present to your colleagues? ☒ ***YES*** ☐ ***NO***

Submitted by:

Print name:	**Signature:**	**Date:**
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