SME STEEL CONTRACTORS

DETAILING MANUAL

1st Edition Rev 0 07/19/2022

CONSTRUCTING FOR THE FUTURE

The information presented in this manual has been prepared in accordance with recognized engineering principles and is for general information only. While it is believed to be accurate, this manual is meant to be a guide. Each project has its own unique aspects, specifications, and general conditions which must be considered.

Caution must be exercised when relying upon specifications and codes developed by governing bodies and incorporated by reference herein since such material may be modified or amended from time to time subsequent to the release of this edition.

FOREWORD

SME Steel Contractors, Inc., founded in 1992, is one of the largest fabricators/erectors of structural steel in the United States with fabrication facilities in Utah, Idaho, Nevada, and Arizona. Driven to be different from all others, we demand of ourselves a single-minded focus to deliver an exceptional performance that spans from inception to completion.

SME Steel Contractors, Inc. is a subsidiary of SME Industries, Inc. which includes a group of related companies to deliver full Division 5 products and services. Continuous efforts to improve processes, procedures, research and development, new products and services, and new market penetrations, make SME Steel Contractors a strong partner.

SME Steel Contractors' objective is to make our structural steel partnership the subcontractor of choice, by being the leader in structural steel related products, services, value engineering, target value design, collaboration, cooperation, leadership, and overall project success. Critical to our success includes attention to details, specifications, code development, research, education, technical assistance, quality certification, standardization, and market development. SME Steel Contractors has a long tradition of service to the structural steel industry providing timely and valuable solutions.

To accomplish our objectives, SME Steel Contractors publishes detailing manuals, project management manuals, quality control manuals, safety manuals, production manuals, equipment manuals, design guides, and product specifications which are reviewed and updated. Additionally, governing body publications are made available from organization such as AISC, AWS, and ANSI.

INTRODUCTION

This manual has been prepared by SME Steel Contractors, Inc. (SME) to assist detailing contractors in the preparation of shop and erection drawings for SME projects. Please note that the contents of this manual are proprietary and confidential to SME and the set forth "means and methods" used by SME in performing its work for owners, general contractors, and others. This manual and its contents should therefore be used solely for the purpose of preparing detail drawings at the request of SME. This manual is protected by copyright and other intellectual property laws and principles and may not be used, copied, or distributed to third parties, in whole or in part.

Please note that SME expects recipients of this manual to prepare shop and erection drawings in accordance with this manual and its contents. Failure to follow this manual's directions and specifications may result in claims or damages for which SME will hold detailing contractors liable.

This manual replaces and supersedes all previous detailing manuals prepared and distributed by SME. It has been updated and incorporates the latest AISC fabrication and erection requirements as well as requirements unique to SME for transmitting and processing of shop and field requirements.

In the event recipients of this manual have questions regarding the manual or its contents, including this introduction, please contact Brett Stapel at 801.280.0711.

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SECTION 1 ADMINISTRATIVE REQUIREMENTS

1.1 Prequalification Procedure

a. SME will not enter into any detailing contract with a detailer unless that detailer has been prequalified.

b. Any detailing firm that has not done work with SME shall submit a completed "Detailer's Prequalification Statement" which will be provided to each firm on an individual basis. Any exceptions or clarifications to SME's Detailing Manual or contract, taken by the detailer, should be submitted with the completed Prequalification Statement.

c. Be advised that detailing firms that employ off-shore detailers MUST have a full-time, fully-staffed office within the continental U.S. or Canada. SME will not contract with firms that broker or sublet services to independent detailers.

d. Upon review of the completed Statement, SME may ask the detailer for follow-up information and/or visit the detailer's office.

e. SME will either approve or disapprove the detailer.

1.2 Maintaining Qualification Status

a. Approved detailers will be included on SME's list of prequalified detailers, which is referred to by SME's Estimating and Sales departments as well as Project Managers.

b. SME's Detailing Manager and Senior Project Manager(s) will monitor the performance, quality, and adherence to SME standards of all contract detailers and will disapprove any detailer that does not maintain the requirements put forth in this manual.

c. As a certified structural steel fabricator, SME is audited annually by AISC. A major element of the audit addresses detailing procedures, standards, and quality assurance. Refer to section 21 of this Manual – Supplemental Guidelines for Quality Assurance – for requirements pertaining to subcontract detailing.

1.3 Bidding Instructions

1. Prior to submitting any bid for steel detailing work to SME, detailer must take into account items below:
    a. SME Detailing Manual and agree to meet all of the requirements contained in each section.
    b. All safety and added framing for stability is expected to be included in your bid.
    c. Bid must also include participation in BIM coordination which includes providing weekly models as well as attending coordination meetings up to two (2) hours per week.

2. Inquire about and obtain all pertinent contract documents, including but not limited to the items listed below:
    a. Structural and architectural drawings
    b. Project specifications
    c. Addenda and/or amendments
    d. General and special conditions
    e. Any other related documents that could affect the accuracy of your bid

3. The detailer shall bid to SME's scope of work; a copy of SME's scope letter will be provided with each bid request. Bid shall adhere to the project Request for Proposal (RFP). Any deviation from RFP shall be clearly communicated and accepted by SME prior to bid.
4. Inquire about the project schedule, any value engineering being considered by SME, and the approximate number of sequences being considered for the project.
5. In addition to any specific items required by SME's Estimating department, your bid must include the items listed below:
    a. List of all contract documents used in the preparation of the bid
    b. List of exclusions, if different from SME's scope of work
    c. List of detailing rates including straight time, overtime, and double time to be used for change orders, if different from what was listed in the detailer's prequalification statement
    d. Any breakout pricing as required for the bid

1.4 Bidding Instructions Continued

1. Breakdown of bid price in dollars and bid schedule in working days for items listed below:
    - **a.** Advance Material Lists (AMLs) complete for SME's use
    - **b.** Anchor rod and embed shop and field drawings complete for approval
    - **c.** Structural shop and field drawings complete for approval
    - **d.** Anchor rod and embed shop and field drawings complete for construction
    - **e.** Structural shop and field drawings complete for construction
    - **f.** Field Connection (FC) and Field Bolt (FB) drawings complete for construction

Note: Scrubbing time typically should not exceed 5 working days. Scrubbing time should not be used for checking.

2. "Complete" means 100% detailed and checked, including all part drawings. Durations for the Advance Material Lists and approval drawings shall be in working days from the Notice to Proceed. Durations for construction shall be in working days after return from approval.
3. SME will normally provide sequencing information within five (5) working days from Notice to Proceed and will normally schedule a kickoff meeting to be held within ten (10) working days from Notice to Proceed. Detailer shall allow for this when preparing and submitting their bid schedules.
4. By submitting a bid to SME, detailer is acknowledging that the bid is in conformance with the requirements of SME's detailing contract and latest detailing manual. SME doesn't recognize NISD standards or recommendations that are contrary to its detailing contract or manual. Any detailer requested changes must be addressed in advance of submitting this bid.

1.5 Detailing Contract

- **a.** In most cases, SME will issue a Letter of Intent and/or Notice to Proceed prior to the issuance of a detailing contract, with the understanding that detailer agrees with SME's detailing contract and manual and will sign the same upon receipt.
- **b.** Upon award of a project to detailer, the detailer will be expected to sign a detailing contract per the agreed to example provided in the application for detailing. Submitting a bid to SME is acknowledgment that detailer has read and understands the detailing contract and is willing to sign SME's detailing contract without modification, unless otherwise agreed to in advance.

1.6 Project Setup

a. The information required for setting up a project will be communicated to detailer either through a kickoff meeting or through written correspondence.

b. For most projects, SME will hold a kickoff meeting at SME's office to discuss project setup issues and particulars of a project. Unless specifically told otherwise during the bidding stage, detailer's quote must include at least one trip to SME's office in West Jordan, Utah, to attend the kickoff meeting; in some instances several meetings could be required.

c. Kickoff meetings will typically include representatives from: SME:

Project Management

Estimating and Sales

Purchasing

Shop(s)

Field

QA/QC

Detailer: Project Manager / Group Leader

Other: Outside parties such as deck, joist, or other suppliers when appropriate

d. Issues communicated in kickoff meeting (or in written correspondence if there is no meeting) include:

1. Scope of Work:

Members of SME's team, including detailer, are expected to quickly become familiar with the scope of work included in SME's contract with its client. SME's Estimating and Sales teams will walk through SME's scope of work (AS SOLD) and answer any pertinent questions.

2. Project Sequencing:

a. SME's preconstruction and erection managers will establish and define the sequence of erection for each project. Sequencing and crane plan drawings will be prepared and distributed at or before kickoff meeting.

b. Detailer is expected to prioritize all phases of the detailing work in accordance with SME's sequence of erection.

c. Numbering systems and the means and methods of noting and identifying sequences on shop and field drawings.

1.7 Project Schedule

a. The overall schedule for SME's scope of work will typically be already set when SME is awarded the project. At the kickoff meeting, or through written correspondence, SME's Project Manager will present this overall schedule and discuss the specifics of how it is going to be accomplished.

b. Based on the sequence of erection that has been set and based on communications with SME's Project Manager, detailer is expected to confirm a detailed schedule that includes, at a minimum, the following:

1. Advance Material List (AML) – complete for SME's use with an established model
2. Shop and field erection drawings – complete for approval – BY SEQUENCE
3. Shop (including parts drawings) and field erection drawings, including all files listed in section 11
4. Submit for fabrication – complete for fabrication and construction by sequence

c. Detailer's schedule should conform to the overall parameters set when the project was bid. Once it is submitted and approved by SME, it will become part of the detailing contract documents.

1.8 Technical Requirements

a. Technical requirements include SME's requirements as stated in all sections of the Detailing Manual and any additional project-specific requirements.

b. SME's Project Manager will identify and instruct detailer of any project-specific requirements at the kickoff meeting or through written correspondence.

c. SME MAY prepare "Setup" drawings that will show both generic and project-specific connections and welds. These set-up drawings will be presented for review and discussion at the kickoff meeting and, if necessary, submitted to the Engineer of Record for formal review and approval.

d. Detailer will incorporate the detailed information on the setup drawings into the shop and field drawings as instructed by SME's Project Manager at the kickoff meeting or through written correspondence.

e. Detailer shall log and maintain a complete set of specifications during the detailing and checking process. Specifications shall be continually reviewed to ensure the incorporation of specification requirements into the shop drawings.

1.9 Project Procedures

a. The following project procedures need to be strictly followed by detailer. Exceptions and deviations must be discussed with and approved by SME's Project Manager at the start of the project.

b. Communications:

1. SME shall designate, in writing, the person(s) who shall be SME's authorized representative(s). No other person(s) shall be authorized to provide detailer with instructions, orders, and/or directions unless authorized by SME's Project Manager.
2. Detailer shall designate, in writing, the person(s) who shall be detailer's authorized representative(s). Except in an emergency, the authorized representative(s) shall be the only person(s) to whom SME shall give instructions/orders.
3. SME's authorized representative for all administrative issues will be SME's designated Project Manager.
4. SME's authorized representative for all technical issues will be either SME's designated Project Manager or Detailing Manager.
5. All communications will be through SME's authorized representative(s).
6. On occasion, SME will arrange for direct communications between detailer and the project's general contractor, architect, structural engineer, or other subcontractors.
7. SME's Project Manager must make such authorization for direct communication, in writing.
8. Whether communicating with SME or other parties, detailer must promptly confirm, in writing, all verbal communications. SME will not be responsible for any verbal communications that have not been confirmed in writing to SME and the other party.
9. All SME-related questions (i.e., erection aids, shop clarifications, sequencing, AMLs, etc. shall be addressed to SME by email.

1.10 Requests for Information (RFIs)

a. RFIs are to be used to resolve missing or conflicting information in the contract documents. Before submitting each RFI, detailer shall make every effort to research ALL available contract drawings and documents in order to avoid inconveniencing the engineer or architect.

b. The following procedures shall be used in the processing and handling of RFIs:

1. RFIs shall be submitted by detailer, in writing, on an acceptable form and provide sample to Project Manager for approval. If requested, SME can provide RFI form for detailer use.
2. All RFIs shall be sequentially numbered and dated. If the requested information is required by a certain date in order to maintain detailer's schedule, such date shall be noted on the RFI and should allow for a reasonable amount of time for response.
3. SME will respond to the RFI by returning the form to detailer with the pertinent response information.
4. In those instances where detailer has verbally discussed a question with either SME or another party and received an answer, both the question and the answer shall be written on the RFI form and sent to SME for confirmation and distribution. The RFI should be noted with a comment stating that it is a confirmation of a verbal communication.
5. Limit each RFI to one question or issue only!

c. SME may, at times, be at the mercy of its client as to a timely response. Outstanding RFIs are not necessarily an excuse for delay in detailer's submittal schedule. If an RFI has not been answered in time for a scheduled submittal, detailer shall proceed as follows whenever practical:

1. Area(s) in question should be clouded on the drawing(s) and noted with the outstanding RFI No. with wording such that the person reviewing the drawings can furnish the proper response.
2. Upon receipt of the response, and after incorporating it on the drawings, the clouds and notes shall be removed. Drawings need not be re-submitted for approval unless so instructed by the approver.
3. If the above procedure is not practical due to the quantity or complexity of the RFIs and a submittal is going to be delayed, SME must be notified immediately, in writing, with a detailed explanation of the reason for delay.

1.11 RFI Logs

a. For each of SME's projects, detailer must maintain an RFI Log that contains the appropriate information.

b. RFI Logs shall always be current and available for SME's use, whenever requested.

1.12 Shop and Field Drawing Logs

a. Detailer shall maintain shop and field drawing logs for each of SME's projects. The form must contain the appropriate information.

b. Drawing logs shall always be current, listing all drawings, including "void", "on hold", and "not used" drawings and available for SME's use if requested.

1.13 Design Drawings, Specifications, and Document Logs

a. Detailer shall maintain a design drawing, specification, and document log for each of SME's projects. The form must contain the appropriate information. Logs shall always be current and available for verification with SME if requested.

b. SME may, at its option, create and furnish detailer with a design document log, listing the original "issued for construction" set of documents.

1.14 Payment, Changes, Claims, and Delays

a. Detailer will refer to project-specific detailing subcontract.

1.15 Change Orders

a. Detailer shall submit change order requests and claims in sufficient detail as to enable the proper evaluation by SME and/or SME's client. This needs to include a sufficient level of detail to prove a change has occurred. There are several options detailer can use including overlays that show the change, color coded markups with a legend, etc. Provide Project Manager a sample change order example to be approved at the start of the project.

b. Detailer shall also track all costs and retain all records, including time sheets and revised drawingsassociated with any change in order to substantiate detailer's request in case of dispute.

1.16 Project Closeout

a. Upon completion of detailer's work, detailer must submit the following items before SME can process detailer's application for final payment:

1. Affidavit that all work is complete
2. Copy of detailer's final, updated drawing log
3. All As-Built drawings completed
4. Any other data required by SME's contract documents including the As-Built model in its native format

SECTION 2 NUMBERING SYSTEMS

2.1 Numbering System Checklist

- ☐ SME Project Management has provided you with 10-digit project number.
- ☐ All correspondence with SME will include the assigned project number. This includes letters of transmittal, shop and field drawings, and email communication.
- ☐ All documents and correspondence with SME will include the assigned project number. This includes letters of transmittal, shop and field drawings and email communication.
- ☐ SME Project Management has provided you with clear direction on sequencing.
- ☐ You understand all phases of detailing including Advanced Material List (AML). Shop and field drawings will be identified by the preassigned sequence numbers.
- ☐ You have a clear understanding of shop and field drawing numbering system requirements.
- ☐ Shop details to be placed on 11x17 drawing border with Bill of Material in upper right hand corner incrementally increased in size to accommodate larger details.
- ☐ Field drawings, anchor bolt (AB) plans, erection sheets, and field connection (FC) details placed on 24x36 drawing border.
- ☐ All shipping marks are identified by the correct alpha prefixes provided, followed by sheet number.
- ☐ You have a clear understanding of multi-member assemblies and their requirements.
- ☐ Parts labeled with correct prefix and placed on horizontal 8.5x11 border.
- ☐ Understand once part is issued for fabrication, it cannot be revised for any reason.
- ☐ Unlike shop drawings, void part drawings are not to be sent to SME.
- ☐ Preassigned standard parts (SP) have been used and correctly prefixed with SP instead of typical alpha prefix.
- ☐ Field drawings have been identified with correct alphabetical prefix.
- ☐ Drawing revision for approval shows the correct alphabetic revision and description.
- ☐ Drawing revision for fabrication or construction shows the correct alphabetic revision and description.

2.2 Project Numbers

a. A 10-digit project number will be assigned by SME to each project. Unless instructed otherwise, this number will be unique to, and remain constant throughout, the duration of the project.

b. Example job numbers: 01-2157-00, 01-2853-00

c. All drawings, transmittals, and other documents generated by the detailer shall be identified in the appropriate place with the assigned project number.

d. All communication through email shall include the project number in the subject line.

2.3 Sequence Numbers

a. Each project will be divided into sequences. SME's Project Manager and Field Superintendent will divide each project into sequential and erectable areas. This will be provided at the kickoff meeting prior to detailing by Project Management. Note: **NO SEQUENCE CAN EXCEED 500 TONS.**

b. All phases of work (AML, shop drawings, fabrication, shipping, and erection) will be identified and tracked by the preassigned sequence numbers.

c. NOTE: The start, direction, and completion of each structural project is determined by jobsite accessibility, structure footprint, crane size and path, existing structures, and/or obstacles, etc.

d. Sequence "0" is reserved for items that require advance delivery to the project site such as FOB items, anchor bolts, embeds, templates, etc.

2.4 Shop Detail Drawing Numbering System

Sequence	0:	Drawing	numbers	–	1	thru	999	**
Sequence	1:	Drawing	numbers	–	1001	thru	1999	
Sequence	2:	Drawing	numbers	–	2001	thru	2999	
Sequence	3:	Drawing	numbers	–	3001	thru	3999	
Sequence	4:	Drawing	numbers	–	4001	thru	4999	
Sequence	5:	Drawing	numbers	–	5001	thru	5999	
Sequence	6:	Drawing	numbers	–	6001	thru	6999	
Sequence	7:	Drawing	numbers	–	7001	thru	7999	
Sequence	8:	Drawing	numbers	–	8001	thru	8999	
Sequence	9:	Drawing	numbers	–	9001	thru	9999	
Sequence	10:	Drawing	numbers	–	10001	thru	10999	
Sequence	11:	Drawing	numbers	–	11001	thru	11999	
Sequence	12:	Drawing	numbers	–	12001	thru	12999	

Typical thru all sequences the project requires.

With this numbering system, the sequence is immediately identified when looking at either the drawing or the piece mark written on any given member.

****Should be used only for advance delivery items such as FOB embeds, anchor bolts, and templates.**

There are two allowed sizes for shop drawings:

11” x 17” (preferred) incrementally increased in size to accommodate larger details

or 24” x 36” for larger assemblies

There is only one size allowed for field drawings:

24” x 36” for all erection placement plans and details

2.5 Shop Detail Shipping Mark Prefixes

All members receiving shipping marks will be identified by the Alpha prefixes shown below followed by the sheet number.

AR = Anchor Rod

ARF = Anchor Rod Frame

B = Beam

BB = Box Beam (built out of plate)

BMM = Beam Multi-Member (beam with shop attached cantilevers)

C = Column

CMM = Column Multi-Member (column with shop attached cantilevers)

CB = Box Column (built out of plate)

F = Frame (multi-member shipping assemblies)

FBP = Field Bent Plate (field installed bent plate)

H = Handrail

HB = Horizontal Brace

M = Miscellaneous (bollards and all other shapes other than angle and plate)

MA = Miscellaneous Angle (loose angle, lintels, deck bearing etc.)

ME = Miscellaneous Embed (plate, angle, channel etc.)

MP = Miscellaneous Plate (Loose shear tabs, etc.)

PG = Plate Girder

RF = Roof Frame (drop or bolt-in frames for roof drains, etc.)

S = Stairs

ST = Setting Template for anchor rod placement

T = Truss (multi-member shipping assembly)

TM = Temporary Member for stability (to be removed after erection complete)

VB = Vertical Brace

WWF = Welded Wide Flange (beam or column fabricated from plate)

2.6 Sub Members for Multi-Member Assemblies Prefixes

Every multi-member assembly will consist of one main member that will carry the shipping mark throughout the fabrication and erection process. The member will be identified by one of the shipping mark prefixes in section 2.4. All other members in the assembly will be considered sub members. These members will be identified with the suffixes shown below.

Each sub member mark will start with the sheet number of the main frame followed by an alphanumeric sequence.
Example: If you had a frame with a shipping mark of F1025, your sub members would be marked 1025A, 1025B, 1025C, etc.
If you use all of the alphabet, then you can start at the beginning and double up the prefix.
Example: 1025AA, 1025AB, 1025AC, etc.

The suffixes shown below can be used.
A, B, C, D, F, G, H, J, K, L, M, N, R, S, T, U, V, W, X, Y, Z

At no time will the letters E, I, O, P, or Q be used.

2.7 Shop Part Drawing Numbering System

a. Part drawings shall be 8 ½" x 11" and have an alphanumeric identity consisting of a lowercase prefix shown in table below followed by a number running consecutively from 1 to 99999. Example: a1, p1, bp1, bc1, wt1, etc.

b. SME has preassigned standard parts that will be prefixed with SP instead of typical alpha prefix. See Section 18 of this manual for a list of these drawing assignments.
Note: Detailer shall not modify or add to any of the drawings on this list.

c. Part drawings and marks are unique to the project, but not unique to any specific sequence. Do not duplicate identical parts within a project.
Note: Once issued as Rev. "0" For Fabrication, part drawings may NOT be revised for any reason. Re-draw and assign a new drawing number. Void part drawings are not to be sent to SME.

All sub material marks will be identified by the alpha prefixes shown below followed by a number.

Angle: **a**
Plate: **p**
Bent Plate: **bp (used for perimeter and opening closure)**
Bent Connection Plate: **bc (used as a connection plate)**
Round Plate: **p**
Square Bar: **sb**
Flat Bar: **f**
Round Bar: **rb**
Deck: **dk**
Grating: **gr**
Grating Tread: **gt**
Shear Stud: **ss**
Threaded Stud: **tws**
W Tee: **wt**
Channel: **c**
Turnbuckle: **tb**
Pipe: **hss**
Rebar: **reb**
S Shape: **s**
HSS/TS: **hss**
Miscellaneous: **m**
Wide Flange: **w**
S Tee: **st**
Clevis: **cl**
Cold Formed Channel: **cfc**
Cold Formed Z: **cfz**

2.8 Field Drawing Numbering System

All field drawings have an alphanumeric identity. The alphabetical prefix shall be one of the following:

- **AB for anchor bolt placement plans** (AB1 , AB2, AB3, etc.)
- **EM for embed placement plans** (EM1 , EM2, EM3, etc.)
- **E for erection drawings,** follow numbering system shown below

  Sequence number plus two digits (example for sequence 1: E100, E101, E102, E103, etc. Sequence 11: E1100, E1101, E1102, E1103, etc.
- **FC for special field welding and bolting details** (FC1 , FC2, FC3, etc.)
- **FB for field bolt placement drawings** (replace erection drawing prefix with FB)

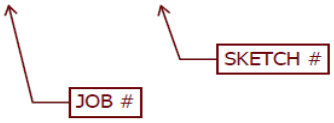
  Example: E100 will become FB100
- **BP for bent plate placement drawings** (replace erection drawing prefix with BP)

  Example: E100 will become BP100 (don't provide unless directed to by Project Management)

2.9 Sketch Numbering System

a. A sketch that is part of an RFI will be labeled with the RFI number as the prefix and the sketch number as the suffix. For example: RFI 001 has a sketch attached. It will be named RFI_001_SK:1 If multiple sketches are part of the RFI, each one will get its own unique label: RFI_001_SK:1, RFI_001_SK:2, RFI_001_SK:3, etc.

b. Sketches sent to SME for direction from shop, field, or project management will be labeled with the job number as the prefix and a number as the suffix. For example: 01-2892-00_SK:1, 01-2892-00_SK:2, 01-2892-00_SK:3, etc.



c. Detailer will keep a signout log for these sketches and never re-use the numbers.

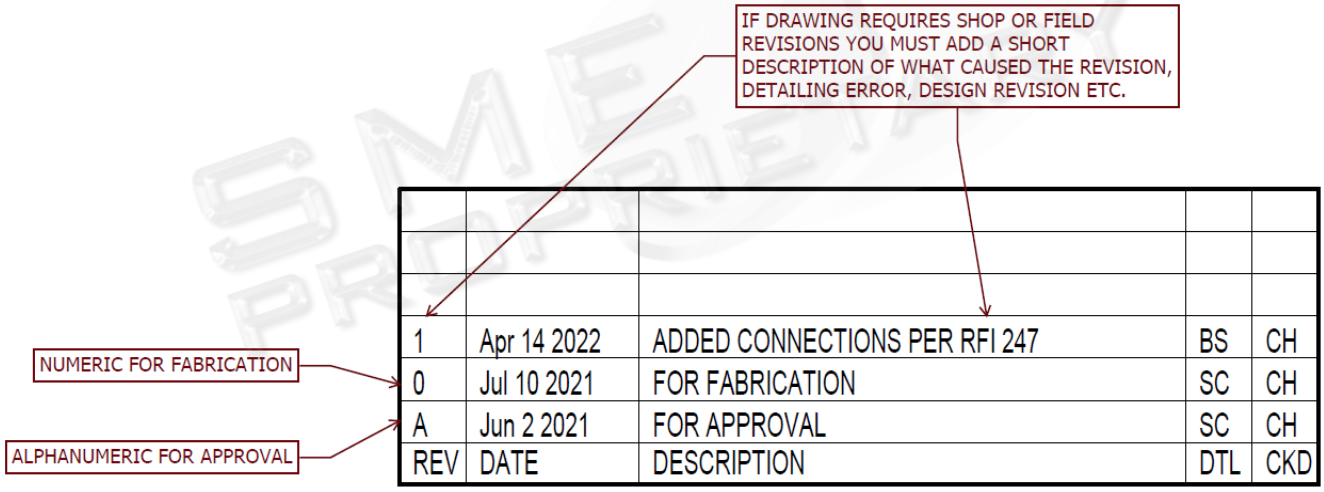
2.10 Drawing Revisions For Approval

Shop and field drawings being sent for approval shall carry an alphabetic revision notation. The first time the document is submitted for approval, it will be revision “A”. If upon return from approval it is marked as revise and re-submit, the document revision level will be increased to the the next letter in the alphabet “B”, “C”, etc.

Note: Revision levels to be uppercase.

2.11 Drawing Revisions For Fabrication and Construction

Shop and field drawings being sent for fabrication shall carry a numeric revision notation. The first time the document is submitted for approval, it will be revision “0”, Subsequent revisions will be increased to the the next number “1”, “2”, etc.



REV	DATE	DESCRIPTION	DTL	CKD
1	Apr 14 2022	ADDED CONNECTIONS PER RFI 247	BS	CH
0	Jul 10 2021	FOR FABRICATION	SC	CH
A	Jun 2 2021	FOR APPROVAL	SC	CH

SECTION 3 FABRICATION PHASE CODES

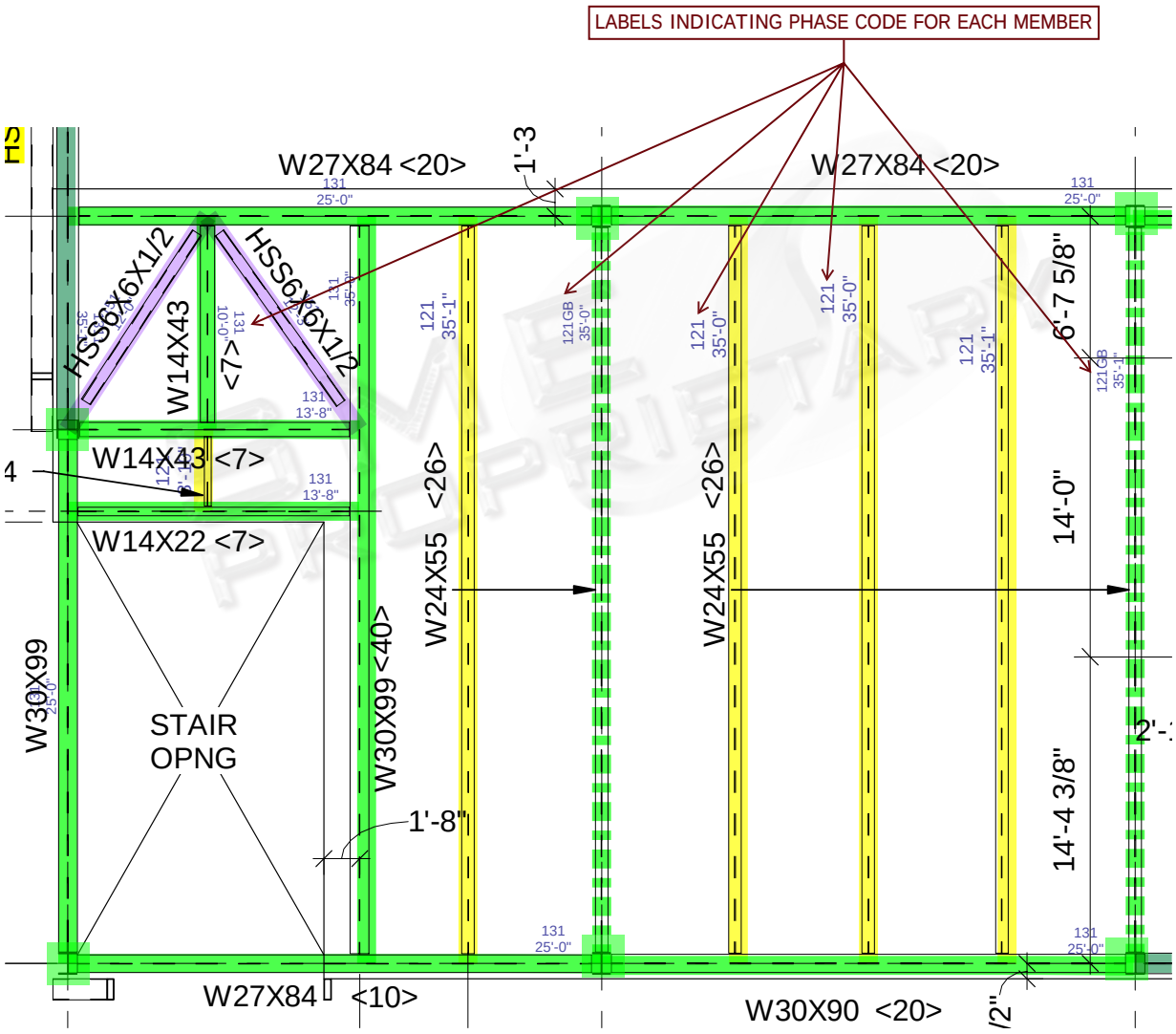
3.1 Fabrication Phase Code Checklist

- ☐ SME Project Management has provided you with Bluebeam document with project specific phase codes.
- ☐ Bluebeam document with phase codes weren't supplied. Detailer has confirmed with Project Management document isn't available and given direction to proceed with phase codes per table.
- ☐ SME Project Management has provided Estimating 5311 report for your specific project.
- ☐ Correct phase code has been identified in Bill of Material.
- ☐ Phase code is included in the kiss file in the correct location.
- ☐ You have a clear understanding of phase codes per table if Bluebeam document wasn't provided.

3.2 Phase Code Overview

a. A Phase Code is a 3 to 6 digit number that detailer will assign to each shipping mark that will be released for fabrication.

b. The phase code will be assigned by SME's Estimating department and will be provided to the detailers in PDF format with each member having a label as shown in the example below. This phase code is required to be in the Bill of Material and exported in the kiss file or other acceptable electronic transfer for import into SME's database.



3.3 Phase Code 5311 Report Example

Information below is an example of the Estimating 5311 report that contains all of the labor categories for your specific job. You will receive a copy of this report as well as access to the Bluebeam drawings with locations where each category is located.

JOB NAME: SME ASSIGNED PROJECT NAM
JOB #: 10 DIGIT SME JOB NUMBER

SME STEEL CONTRACTORS

Date:6/16/2022Time:10:50 AM

CRANE PIECES, UNO

LABOR BREAKDOWN

QC Included

CATEGORY	DESCRIPTION	PCS	WT	UNIT WT	HRS	1.000	ADJUSTMENT	UNIT MH	MH/TON
111	MOMENT FRAME BEAMS	3	1.93	0.64	9.79	9.79		3.26	5.08
1111	MOMENT FRAME BEAMS HEAVY	4	9.52	2.38	19.62	19.62		4.91	2.06
121	FILL BEAMS	814	524.78	0.64	1,980.99	1,980.99		2.43	3.77
1211	HEAVY FILL BEAMS	3	5.84	1.95	24.71	24.71		8.24	4.23
121SM	SHORT FILL BEAMS	6	0.53	0.09	10.55	10.55		1.76	19.85
131	GIRDER BEAMS	1,255	953.39	0.76	8,382.84	8,382.84		6.68	8.79
1311	HEAVY GIRDER BEAMS	73	142.40	1.95	1,128.91	1,128.91		15.46	7.93
141	CANTILEVER BEAMS	59	13.80	0.23	201.19	201.19		3.41	14.58
1411	HEAVY CANTILEVER BEAMS	57	19.34	0.34	393.37	393.37		6.90	20.34
151	HSS BEAMS	285	72.94	0.26	1,391.57	1,391.57		4.88	19.08
151EL	HSS ELEVATOR SEPERATOR BEAMS	24	3.12	0.13	45.17	45.17		1.88	14.50
171	FILL CHANNEL BEAMS	27	1.35	0.05	20.84	20.84		0.77	15.45
181	BRACE FRAME BEAM	60	69.44	1.16	1,436.22	836.22	-600.00	13.94	12.04
1811	HEAVY BRACE FRAME BEAM	30	77.71	2.59	363.06	963.06	600.00	32.10	12.39
221,222	GRAVITY COLUMNS	332	452.82	1.36	7,933.18	7,933.18		23.90	17.52
241, 242	HSS COLUMN	45	20.29	0.45	420.81	420.81		9.35	20.74
241EL, 242EL	HSS ELEVATOR GUIDERAIL SUPPORT COLUMN	196	46.15	0.24	259.61	259.61		1.32	5.63
252	HSS POST	164	15.15	0.09	740.85	740.85		4.52	48.90
281, 282	BRACE FRAME COLUMNS	60	247.53	4.13	2,508.56	2,508.56		41.81	10.13
705, 705AB, 705C	EMBED	196	9.11	0.05	340.58	340.58		1.74	37.38
731	KICKER (OVER 10'-0")	161	3.52	0.02	70.81	70.81		0.44	20.10
761	ROOF FRAMES	5	0.20	0.04	12.45	12.45		2.49	62.09
761CA	CANOPY FRAMES	2	1.60	0.80	15.57	15.57		7.79	9.76
771G	LOOSE PLATE GIRTS	126	25.26	0.20	123.25	123.25		0.98	4.88
772AB, 772C, 772PW	LOOSE SHEAR PLATE	500	0.95	0.00	150.20	150.20		0.30	158.02
		0	0.00	0.00	0.00	0.00		0.00	0.00
	ANCHOR ROD ASSEMBLY	0	0.00	0.00	0.00	0.00		0.00	0.00
		0	0.00	0.00	0.00	0.00		0.00	0.00
	Clean & Paint	0	0.00	0.00	31.85	31.85		0.00	0.00
	Bent Plate	0	0.00	0.00	41.13	41.13		0.00	0.00
	Safety Cable Connections	0	0.00	0.00	805.70	805.70		0.00	0.00
		0	0.00	0.00	0.00	0.00		0.00	0.00
	AESS	0	0.00	0.00	0.00	0.00		0.00	0.00
	STAGE & LOAD	0	0.00	0.00	0.00	0.00		0.00	0.00
DO NOT DELETE	MISC FAB (J-ALLEN)	0	0.00	0.00	0.00	0.00		0.00	0.00
DO NOT DELETE	MISC FAB (DOG BONES)	0	0.00	0.00	0.00	0.00		0.00	0.00
DO NOT DELETE	MISC FAB (30% FEMA WELDING)	0	0.00	0.00	0.00	0.00		0.00	0.00
SUB-TOTALS		4,487	2,718.66	0.61	28,863.38	28,863.38	0.00	6.43	10.62
BOLTS		0	0.00						
GRAND TOTALS		4,487	2,718.66						

3.4 Example Bill of Material with Phase Code

Detailer will have column in Bill of Material labeled PC. This is where the phase code is required to be shown.

PC INDICATES PHASE CODE

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
B1074	ONE	BEAM					655	1	2-40	131
B1074	1	W18x35	18-3 1/2		A992		640			
p306	1	PL 1/2x5	10 1/16		A572-50		6			
p307	1	PL 1/2x5	1-1 1/16		A572-50		9			
		FIELD BOLTS								
	8	TC 7/8 Dia A325X	2 1/4	+1HD WASH						

PHASE CODE PER ESTIMATING DEPARTMENT

3.5 Example Kiss file with Phase Code

Detailer will have column in Bill of Material labeled PC. This is where the phase code is required to be shown.

PHASE CODE IN KISS FILE

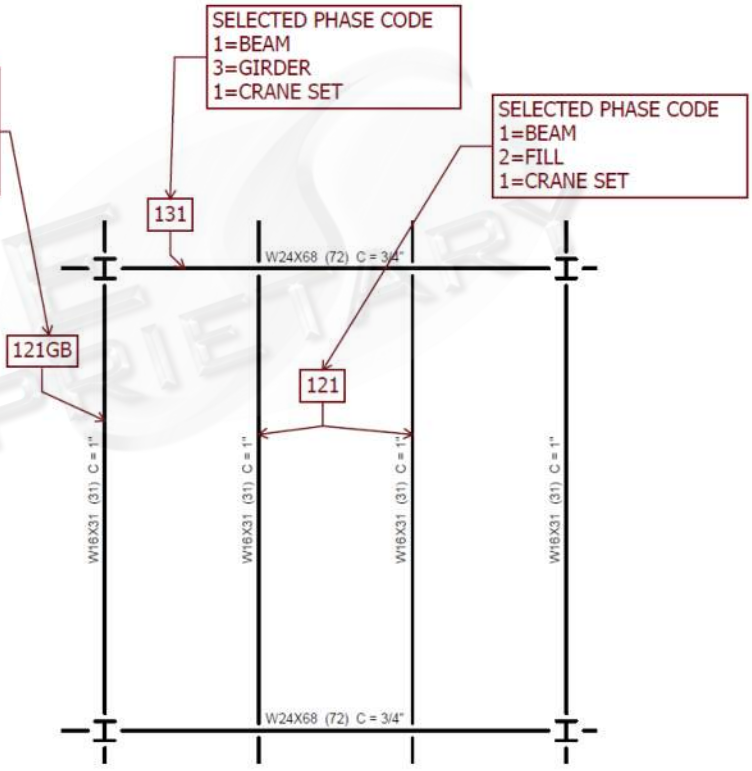
```
KISS,1.1
H,2671_SME Example,2671_SME Example,,06/16/22,11:42,F,Estimate
*
D,1074,B,B1074,B1074,1,W,18x35,A992,5574.92,,,,131
W,1074,B,BEAM,06/16/22,SDS8.113
M,B1074,1,BEAM,,,13,
S,1,1
A,2-40
D,1074,B,B1074,p306,1,PL,1/2x5,A572-50,255.59,,,,
D,1074,B,B1074,p307,1,PL,1/2x5,A572-50,331.79,,,,
D,1074,B,B1074,,8,HS,7/8x2-1/4,A325X ,57.15,,Field:TC:+1HD WASH,,
```

3.6 Phase Code When One Isn't Provided

a. If a member is missing a predetermined phase code from the Estimating set, the detailer will choose one based on phase code legends per member type and assign to each shipping mark that will be released for fabrication. The same rule will apply to future revisions. The estimators will not be providing these.

b. Per the legend, the detailer will be selecting a 3-digit code that correctly describes the member. **(SEE EXAMPLE LEGEND BELOW.)**

EXAMPLE LEGEND



PARTIAL FRAMING PLAN

3.7 Estimating Phase Code Legends

ESTIMATING PHASE CODES

1 BEAM

MOMENT	1	CRANE	1	
FILL	2			
GIRDER	3			
CANT	4	HAND	2	
TUBE	5			
C-BEAMS	7	F.O.B.	5	
BRACE FRM	8			

SM	SMALL <6'
L	LONG >55'
EL	ELEVATOR
SW	SCREENWALL
1	HEAVY >99 PLF

2 COLUMN

MOMENT	1	LOWER	1	
WF	2			
WF-POST	3			
TUBE	4	UPPER	2	
TS-POST	5			
PIPE	6			
BRACE FRM	8	F.O.B.	5	

EL	ELEVATOR
SW	SCREENWALL
CX	CRUCIFORM
SL	SLOPED

3 BRACE

WF	1	CRANE	1	
CHANNEL	2			
ANGLE	3			
TEE	4	HAND	2	
TUBE	5			
PIPE	6			
		F.O.B.	5	

H	HORIZONTAL
V	VERTICAL

4 TRUSS

WF	1	CRANE	1	
CHANNEL	2			
ANGLE	3			
TEE	4	HAND	2	
TUBE	5			
PIPE	6			
		F.O.B.	5	

TC	TOP CHORD
BC	BOT CHORD
VW	VERT WEB
DW	DIA WEB

5 PLATE FAB

BOX COL	1	LOWER	1	
		UPPER	2	
PL COL	2	F.O.B.	5	
PL GIRD	3	CRANE	1	
		HAND	2	
BOX BM	4	F.O.B.	5	

1	HEAVY
L	LONG

6 Misc

WF	1	CRANE	1	
CHANNEL	2			
ANGLE	3	HAND	2	
TEE	4			
TUBE	5			
PIPE	6	F.O.B.	5	

7 SECONDARY

EDGE ANG	1	CRANE	1	
EDGE PL	2			
KICKERS	3			
HANGERS	4	HAND	2	
ROOF FRM	5			
FRAMES	6			
LOOSE PL	7			
AB TEMPL	8	F.O.B.	5	
RODS	9			
EMBEDS	0			

7772= LOOSE CLIP ANGLES

8 BOLTS

FIELD	DIA.
TC BOLT	≤3/8" Ø
1	3
PLAIN	1/2" Ø
2	4
LIW	5/8" Ø
3	5
EXPANSN	3/4" Ø
4	6
FIELD DBA	7/8" Ø
5	7
FIELD STUD	1" Ø
6	8
F.O.B.	1-1/8"Ø
BOLTS	9
7	≥1-1/4" Ø
STUDS	0
8	
ANCHOR	9
EXPANSN	0

9 USER DEFINE

1	CRANE-1	A	USER DEFINED
2	HAND-2	B	USER DEFINED
3	F.O.B.-5	C	USER DEFINED

Freight On Board (FOB)

We build and ship it. Others unload and install it

SECTION 4 ADVANCE MATERIAL LISTS

4.1 Advance Material Checklist

- ☐ Used correct material specification.
- ☐ Noted all CVN requirements in reports as well as included in kiss file.
- ☐ Rolled members identified and rolling sketch provided with AML.
- ☐ Material identified in report and kiss file as AESS.
- ☐ Assigned all material in scope page and line numbers.
- ☐ Included SME shop identification as required.
- ☐ Provided plate AML as directed by Project Management. Used correct grade and identified any CVN requirements.
- ☐ Provided angle AML as directed by Project Management. Note: all angle to be A572-50
- ☐ Have an understanding of revised AML and the procedure.
- ☐ Provided a base tonnage report by sequence without connections.
- ☐ All plate identified as grade 36 in design documents to be taken off as A572-50.
- ☐ All angle identified as grade 36 in design documents to be taken off as A572-50.
- ☐ All HSS identified as grade A500-B in design documents to be taken off as A500-C.
- ☐ All channel identified as grade A36 in design documents to be taken off as A572-50.
- ☐ Beam to column taken off point to point minus 1/2 depth or flange width based on orientation.
- ☐ At braced frame, beams that have a portion of beam replaced with full height gusset: deduct this section from overall beam length (review with project management).

4.2 Advance Material List Overview

Unless otherwise agreed upon in writing by SME, detailing contract price will include the preparation and checking of an AML per the instructions provided in this manual. Detailer will provide a complete AML for all rolled shapes including C shapes, structural tubing (square, rectangular, and round), angle, M shapes, MC shapes, pipe, plate, S shapes, ST shapes cut from S shapes, W shapes, and WT shape cut from W shapes. Projects could have special material that will be discussed at kickoff meeting and detailer will be given written direction on how to proceed.

Note: Detailer to spec A572-50 for all plate and angle material unless project specifications requires a different grade of material. Review with Project Management as required.

SME realizes the majority of plate and angle other than base plates and built-up members won't be available for AML with the initial release. Detailer will be required to provide an updated AML after a significant amount of detailing has been completed. This will be defined at the kickoff meeting and detailer will be given instruction from the Project Manager.

4.3 AML Key Items

a. Detailer should pay particular attention to five items that can have a negative financial and/or schedule impact if not correctly included in the AML:

1. Correct material specification
2. CVN testing requirements (this needs to be reflected in remarks section of download)
3. Non-existing member sizes
4. Members to be rolled (provide sketch with AML)
5. AESS requirements

b. Proper material specs and testing requirements should be fully understood and correctly identified. Incorrect or unavailable member sizes that appear on design documents should be identified during the AML process and brought to the attention of SME Steel for clarification.

c. When possible, identify members that will be fabricated and finished per AESS specifications. It will allow us to identify and reject any material with flaws or defects that will not meet AESS specifications for that project. AESS requirements to be identified by Project Management in the kickoff meeting.

d. By noting those members that will require rolling, it will allow SME to order that material specific to rolling and schedule requirements.

e. Beam to column taken off point to point minus 1/2 Depth or 1/2 Flange width depending on orientation.

f. Complete AML withing 10 calendar days after given notice to proceed.

4.4 Page and Line Numbers

Each member requiring an AML number will be assigned a page and line number to identify it. Due to different software capabilities, you have two (2) options for page and line numbers.

Option #1

If your software allows infinite line numbers, you can have the page number match the sequence number and use as many lines as required for each sequence.

Example: Sequence 1 numbering system would be 1-1, 1-2 ,1-3, etc.

Sequence 10 numbering system would be 10-1, 10-2, 10-3, etc.

Option #2

If your software limits the number of lines per page, you will start with page 1 and use the maximum number of lines. Then go to page 2 and use the maximum number of lines, continuing to the next page as required.

Example: for line limitation of 50, you would use 1-1 through 1-50, then go to page 2. Not every line of each page is expected to be used due to how the material is grouped.

Example AML REPORT

Advance Bill of Material Report ABM File: 2335 AML REV 0 Rev: 0 Page 2

Sequence 1

Steel Grade A913-65

Member Route `SHOP' ..... WJ

Ln	Qty	Material	Length	Total Weight	Steel Grade	Seq	Remarks
1	1	W33x354	42- 4	14986	A913-65	1	CVN
2	1	W33x354	42- 0	14868	A913-65	1	CVN
3							
4	4	W33x318	52- 0	66144	A913-65	1	CVN
5	4	W33x318	46- 6	59148	A913-65	1	CVN
6							
7	1	W33x263	46- 6	12230	A913-65	1	CVN
8							
9	2	W33x241	46- 6	22414	A913-65	1	

Sub Totals; Material Count: 13 Weight: 189790 Surface Area: 6723

REGARDLESS OF MATERIAL TYPE, PLATE WIDE FLANGE ETC, CVN MUST BE INCLUDED IN THE REPORT AS WELL AS DIGITAL DOWNLOAD KISS FILE ETC.

4.5 Shop Identification and Sorting

SME has two shops: West Jordan and Pocatello. Each shop has a unique routing code: WJ for West Jordan and POC for Pocatello. Unless directed otherwise, all raw material will be ordered and shipped to the West Jordan facility. If directed to route material to Pocatello, detailer will include the correct shop code with the AML that splits the page and line numbers can be used for sorting. The shop code will be shown in each shop drawing Bill of Material and be included in the digital files for import into the purchasing software.

4.6 When to AML Plate

Include plate on the AML when any of the following is true:

1. When plate is greater than 3/4” thick and greater
2. When plate grade of material is anything other than A572-50
3. When plate part is longer than 20’-0”
4. Large quantity of any size plate (notify Project Manager for requirements)
5. Any plate requiring Charpy V-notch testing
6. At the direction of SME Project Manager

4.7 When to AML Angle

Include angle on the AML when any of the following is true:

01. When there are large quantities of single size (established at kickoff meeting)
02. When any leg of the angle is greater than 6”
03. When the leg thickness is greater than 1/2”
04. Large quantity of any size angle (notify Project Manager for requirements)
05. At the direction of SME Project Manager

4.8 AML Revisions Overview

Detailer will be held responsible for the accuracy and completeness of the AML and for promptly revising the AML whenever required, due to design changes. During detailing and approval process, SME stresses the promptness of issuing these revisions. Prompt, meaning within five (5) working days of receipt of any document or information that created the change. Should five (5) working days not be enough, due to the magnitude or quantity of changes received at one time, detailer must immediately notify SME in writing, explaining the reasons for any delay, and agree to an extended time frame.

4.9 Guideline for When Revisions SHOULD Be AML'd

01. Added quantities to an existing AML page and line number
02. New members
03. Existing members 100 lb/ft and up that have been lengthened by more than 4"
04. Deleted AML page and Line numbers

4.10 Guideline for When Revisions SHOULD NOT Be AML'd

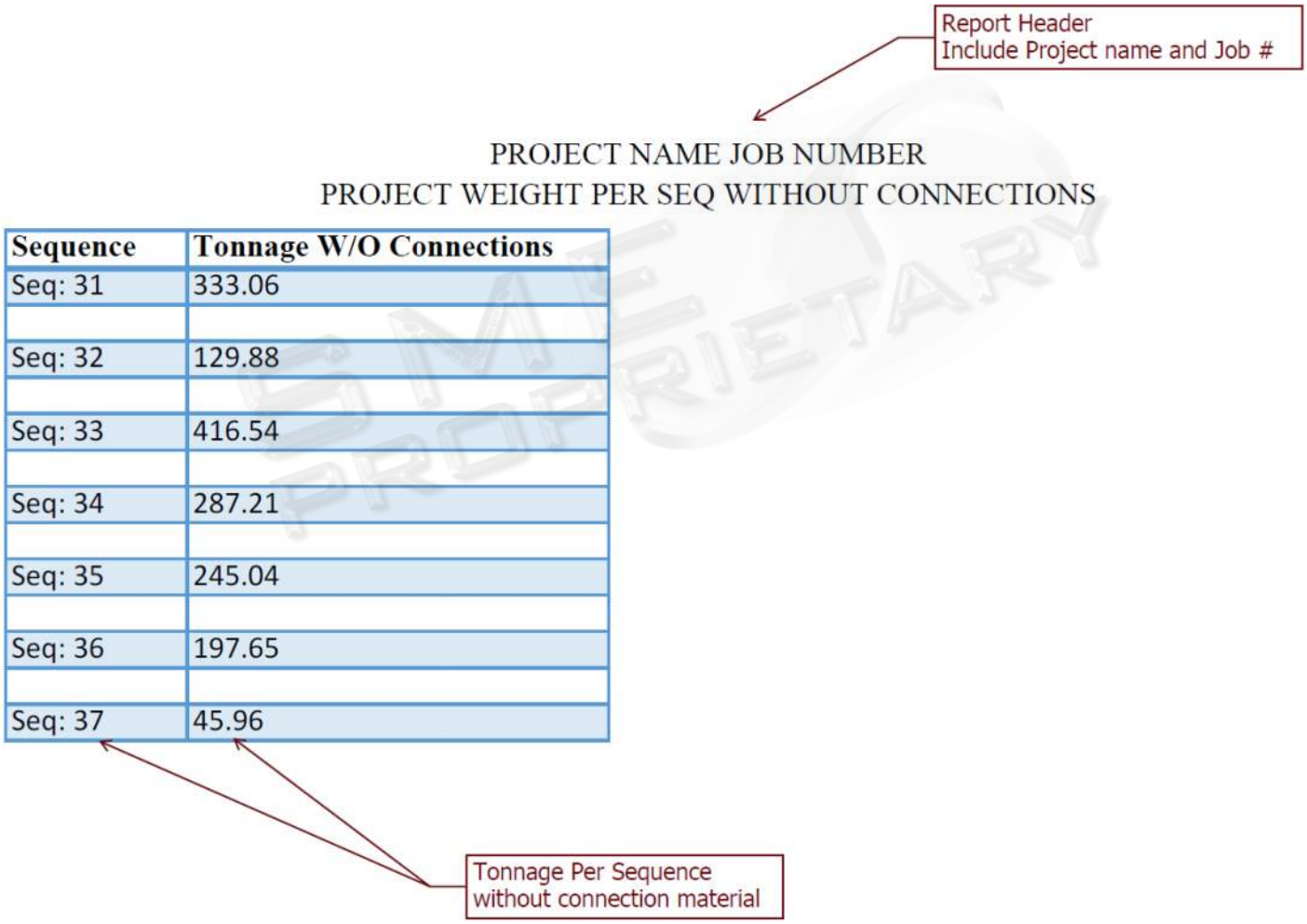
01. Do "**NOT**" issue a revised or new AML for any drawing after it has been issued for fabrication.

4.11 Project Manager Review Prior to Formal Issuance

a. Detailer shall submit all revised AMLs to SME Project Manager for review prior to formal issuance to Document Control and Purchasing. It will be the Project Manager's responsibility to identify and delete any unnecessary revisions.

4.12 ABM Base Tonnage Report at Formal Issuance

a. Detailer shall submit ABM tonnage report in Excel format listing each sequence and tonnage per sequence without any connection material (see example below).



4.13 Table of Material Descriptions

MATERIAL DESCRIPTION	TYPE	MATERIAL GRADES	WT PER
Channels - American Standard	C	A36	LF
Channels - American Standard	C	A572-50	LF
Channels - American Standard	C	A588	LF
Structural Tubing - Square, Rectangular & Round	HSS	A500-B, A500-B	LF
Structural Tubing - Square, Rectangular & Round	HSS	A1085	LF
Angles	L	A36	LF
Angles	L	A572-50	LF
Angles	L	A588	LF
M Shapes	M	A36	LF
M Shapes	M	A572-50	LF
M Shapes	M	A572-42	LF
M Shapes	M	A572-45	LF
M Shapes	M	A572-55	LF
M Shapes	M	A572-65	LF
M Shapes	M	A588	LF
Channels - Miscellaneous	MC	A36	LF
Channels - Miscellaneous	MC	A572-50	LF
Channels - Miscellaneous	MC	A588	LF
Pipe	PI	A106	LF
Pipe	PI	A500-B	LF
Pipe	PI	A53-A	LF
Pipe	PI	A53-B	LF
Pipe	PI	API5LL	LF
Pipe	PI	Type 316	LF
Plate	PL	A36	LF
Plate	PL	A572-42	LF
Plate	PL	A572-45	LF
Plate	PL	A572-50	LF
Plate	PL	A588	LF
Plate	PL	A709-50	LF
Plate	PL	AR	LF
Plate	PL	S304	LF
Plate	PL	S316	LF
S Shapes	S	A36	LF
S Shapes	S	A572-50	LF
S Shapes	S	A588	LF
Structural Tees - Cut from S Shapes	ST	A36	LF
Structural Tees - Cut from S Shapes	ST	A572-50	LF
Structural Tees - Cut from S Shapes	ST	A588	LF
W Shapes	W	A36	LF
W Shapes	W	A572-50	LF
W Shapes	W	A572-65	LF
W Shapes	W	A588	LF
W Shapes	W	A992	LF
Structural Tees - Cut from W Shapes	WT	A36	LF
Structural Tees - Cut from W Shapes	WT	A572-50	LF
Structural Tees - Cut from W Shapes	WT	A572-65	LF
Structural Tees - Cut from W Shapes	WT	A588	LF
Structural Tees - Cut from W Shapes	WT	A992	LF
			LF
			LF
			LF
			LF
			LF

SECTION 5 DRAWING TITLE BLOCK

5.1 Drawing Title Block Checklist

- ☐ Title block includes project name, locations, and SME 10-digit job number.
- ☐ Confirmed title block nor anywhere else on the drawing includes contractor, architect, or engineer names.
- ☐ Confirmed title block nor anywhere else on the drawing includes detailer firm name.
- ☐ Confirmed title block includes detailer and checker initials.
- ☐ All clean prep and paint is identified correctly.
- ☐ Typical hole diameter for your current project is identified.
- ☐ Typical shop notes have been provided as well as any additional notes your project requires.

5.2 General Requirements

a. Title block shall contain and be limited to sufficient information to convey the content of the drawings, the project name, and the project location.

b. SME specifically does **NOT** want any of the following information either in the **TITLE BLOCK** or elsewhere on the drawings:

- Contractor name
- Architect or Engineer name
- Detailer firm name

5.3 Detailer and Checker Initials

a. Title blocks will include the detailer and checker initials and dates on which their work was completed. The Initials and date of completion can be listed in the sheet's revision chart as the drawings are released for approval, fabrication, or revised fabrication.

5.4 Clean Prep and Paint Boxes

a. Do not leave either box blank.

b. No matter the finish, CLEAN or PREP box must be filled in with an SSPC number (example: SSP3-SP3). If there is no primer or paint, then fill in with SSPC-SP2 or per project specifications - whichever is more stringent.

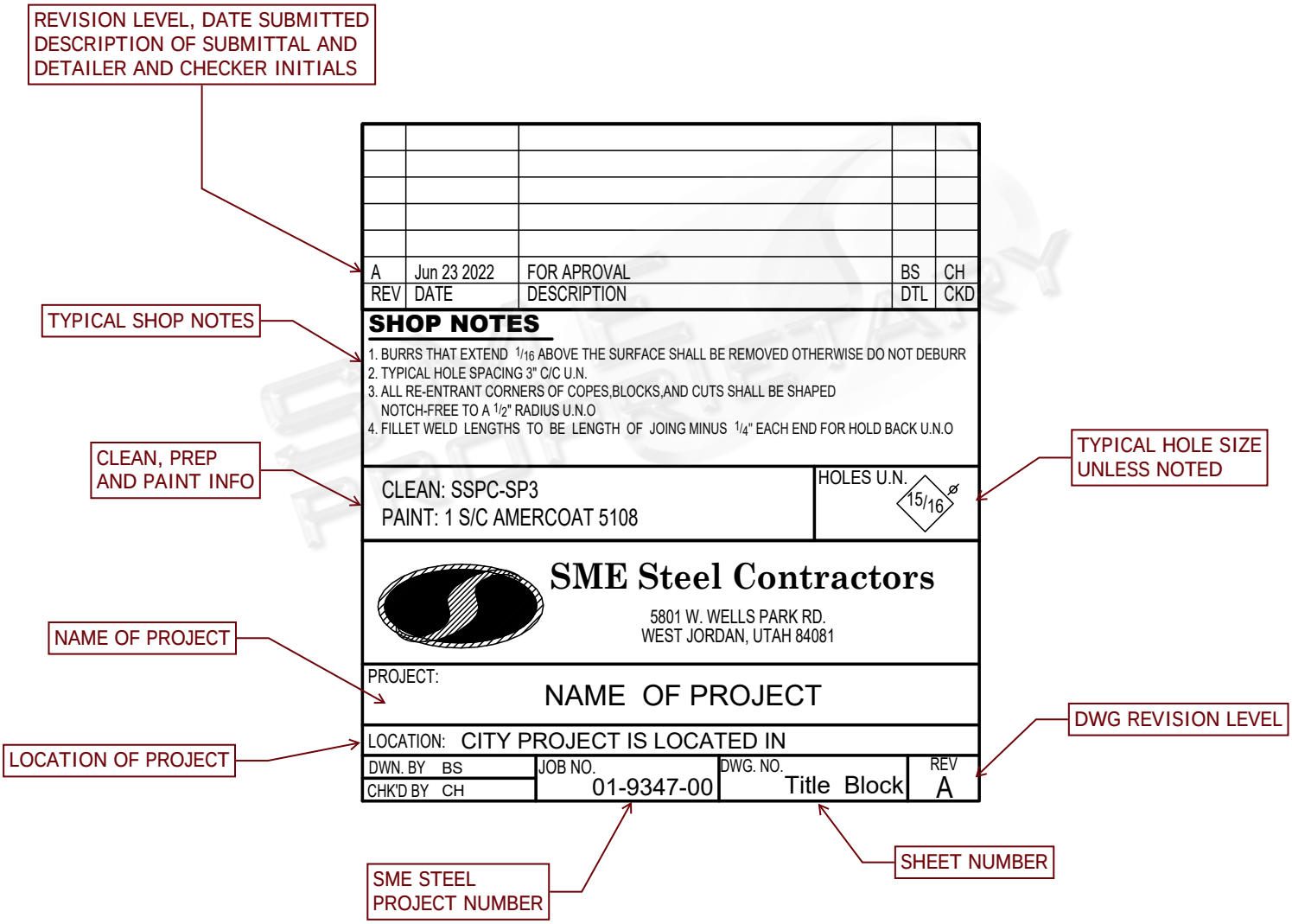
c. Paint box shall be filled in with the following information:

1. Specific paint product (example: Sherwin Williams Procryl B66-310)
2. Color. If there is NO primer or finish paint, then fill in "NONE".
3. If the member galvanizes, then fill in "HOT DIP GALVANIZED".
4. If multiple coats are required, identify each product that is shop applied.

5.5 Typical Hole Diameter

Provide the general (or typical) hole size in the “Holes” box. Exceptions are to be specifically noted on the drawing.

5.6 Title Block Example



SME STEEL CONTRACTORS

SECTION 6 SHOP DETAIL DRAWINGS

SECTION 6 SHOP DETAIL DRAWINGS

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6.1 Shop Detail Drawing Checklist

- ☐ One detail or shipping assembly per sheet.
- ☐ Drawing size sufficient to clearly show work to be performed by the Shop.
- ☐ No opposite-hand or as-noted details.
- ☐ If multiple sheets for one detail are required, you used the correct naming with Bill of Material on first sheet.
- ☐ Lifting weight has been provided on the drawing as well as in the Bill of Material.
- ☐ All connection plates have bearing surface indicator.
- ☐ All parts have been dimensioned as required and located dimensionally.
- ☐ Provided reference to all erection sheets where shipping mark appears.
- ☐ If submitting a drawing for revised fabrication, you have provided reference to what caused the change: RFI, etc.
- ☐ Confirmed Bill of Material contains all necessary information for drawing and kiss file export.
- ☐ Multi-member assemblies have the correct naming of shipping marks, sub members, and sheets.
- ☐ Grid locations are located directly below the mark number.
- ☐ Columns have directional mark indicating direction: North, South, East, West, etc.
- ☐ Bent plate detailed at max length of 10-0 with field installed section provided with beam and back lapped for shipping.
- ☐ Slip critical connections have been identified as required. Example: SSPC-6 blast for Class B faying surface.
- ☐ Beams with camber have camber requirement shown on the drawing and in the remarks column of Bill of Material.
- ☐ FOB Items have the correct drawing numbers: 1 through 999.
- ☐ Provided assembly drawings for anchor rods and templates if instructed by Project Management.
- ☐ Fully understand the requirements for truss drawings and sub-members whether being assembled in the Shop or Field.
- ☐ Identified all members that are AESS and the requirements.
- ☐ Made note of any special dimensional tolerances.

6.2 General Criteria for Shop Detail Drawing Preparation

a. Only one detail (unique shipping unit assembly) will be drawn on a given shop drawing. If more than one such unit exists in a given sequence, the quantity of all identical assemblies must be included in the same detail.

b. The drawing size will be sufficient to clearly show the work to be performed by the shop. The scale size of various elements of the drawing will be large enough to avoid the need for clarification by shop personnel.

c. Opposite-hand details are not permitted
As-Noted details are not permitted
Only one (1) piece mark per shop drawing
Bill of Material is required on the first sheet of each shop detail drawing

6.3 Acceptable Sizes of Shop Detail Drawings

a. Whenever possible, shop detail drawings shall be prepared based on the use of 11” x 17” for drawing size prints.

b. More complicated or extensive members such as brace frame columns, frames, and trusses should be prepared based on the use of 24” x 36” for plotting. Once again, one shipping piece mark per shop detail drawing.

c. If more than one drawing is needed to adequately draw one shipping unit, such as a long truss, sequential drawings shall be used for the necessary subsequent sheets. Example: 3 Sheets - 1320, 1320-1, and 1320-2 are required to draw one truss. The shipping mark (T1320) and Bill of Material must appear on the first drawing ~ 1320. Subsequent drawings, 1320-1, and 1320-2, called “Work With” drawings will be referenced by note on drawing 1320.

6.4 Sample Drawings for Review

Upon request, prior to the first formal approval submittal, detailer shall submit samples of the first column and beam detail drawings for SME’s review.

6.5 Detailing Practices

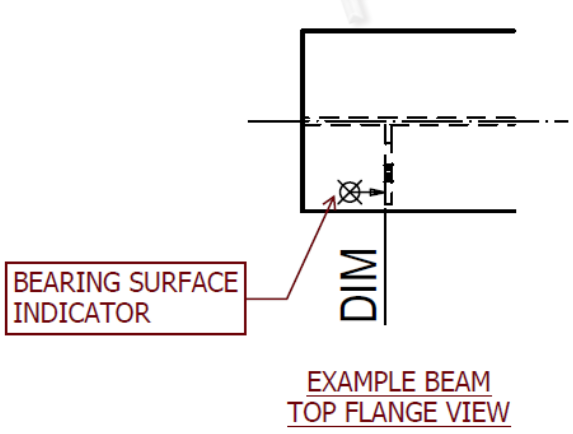
AISC standard detailing practices are to be used, except as modified by instructions in this manual. SME will not recognize NISD standards or recommendations that are contrary to SME's detailing contract or this detailing manual.

6.6 Lifting Weight

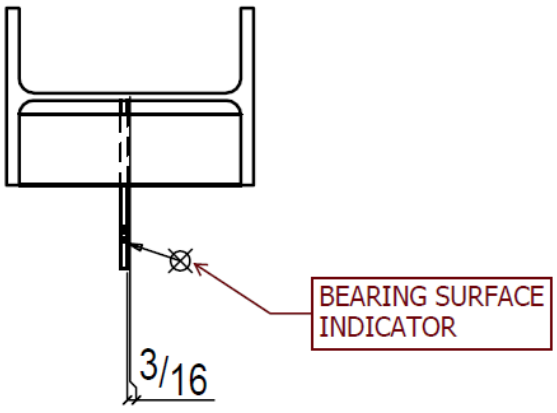
All shipping units require the lifting weight to be displayed on the shop detail drawing in the Bill of Material.

6.7 Connection Plate Bearing Surface Indicator

When parts, such as vertical connection (shear) plates, are shown on a main member such as a beam or column, place an "X" mark on the side of each such plate to indicate to which surface the supported member (usually a beam) will attach.



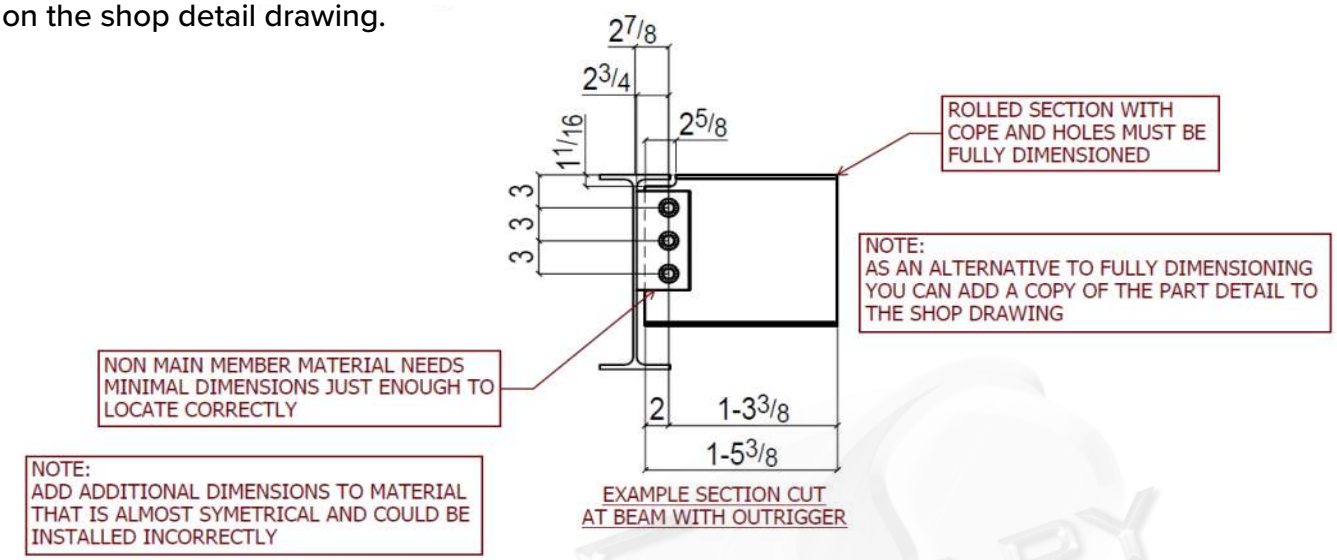
EXAMPLE BEAM TOP FLANGE VIEW



EXAMPLE COLUMN SECTION CUT

6.8 Dimensioning Parts

Typically, a part that has been “detailed” on a part drawing need only be dimensionally located on the shop detail drawing which it is shown. However, parts that are made from bent plate or from “main member” type material do have to be fully re-detailed on the shop detail drawing.



6.9 Erection Drawing Reference

Provide references to the E sheet(s) on all shop detail drawings for locating all pieces detailed on that drawing.

6.10 Revision Reference

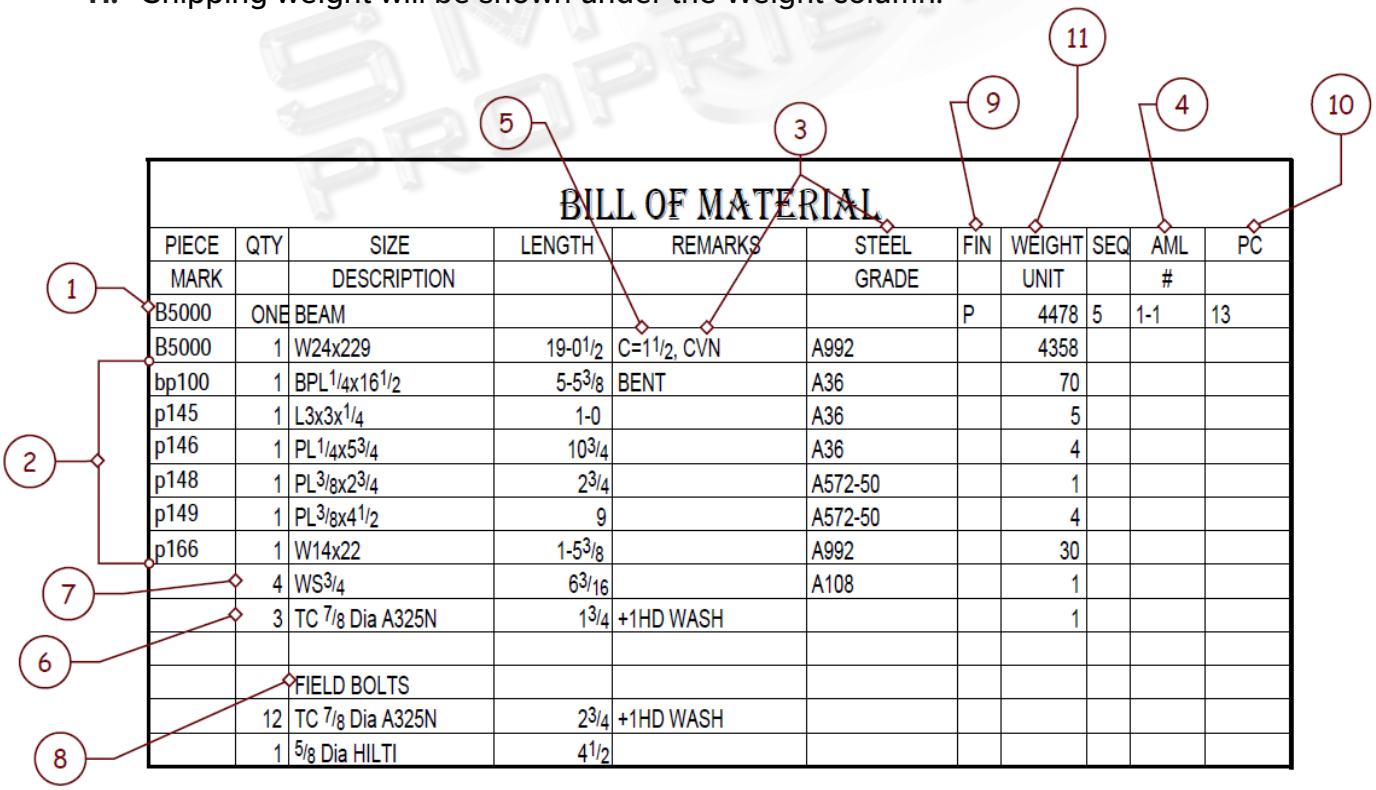
When practical and whenever possible, if a shop detail drawing is created or revised as part of a change in scope [such as a change order (CO), RFI response, etc.], provide a reference to such documents on the shop detail drawing, within or near the title block.

6.11 Bill of Material Example

Bill of Material Legend

1. The principal, main member piece is to be listed first, followed by all other secondary components or “parts”.

2. Parts should then be listed in alphanumerical order, if at all possible.
3. ASTM material specification and grade will be be identified in the Steel Grade column. It is imperative that the material specification and CVN requirement listed in the Bill of Material matches what was AML'd. CVN will be noted in the remarks column.
4. Enter the preassigned AML page and line number in the AML column to the right for each piece of material that is identified in the AML.
5. When a main member is to be cambered, place the camber requirement In the Remarks column of the Bill of Material. Camber or tolerances when necessary must also be identified in the kiss file under remarks.
6. List all shop bolts (bolts that are shop assembled with the shipping unit) by quantity, diameter, grade, and length immediately under the sub material. Nuts and washers need to be listed. No part number is to be assigned to shop bolts. Temporary shop bolts for shipping shall be A325. No A307 bolts at all on SME projects. Shop bolts must be identified in the kiss file.
7. List all manufactured items that are shop attached or assembled with the shipping unit (such as shear studs, deformed bar anchors, slide bearing plates, etc.) immediately under the parts and/or shop bolts. No part number is to be assigned.
8. Field bolts shall be listed separately, near the bottom of the Bill of Material. Field bolts should only be listed on shop drawings for supported members. No part number is to be assigned to field bolts. Field bolts must be identified in the kiss file.
9. If material requires paint or primer, it will be shown under the Finish column and must be identified in the kiss file under the finish category as NP (no paint), P (paint), or G (galvanized).
10. Fabrication phase code will be shown under the phase code column.
11. Shipping weight will be shown under the Weight column.



BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
B5000	ONE	BEAM				P	4478	5	1-1	13
B5000	1	W24x229	19-01 1/2	C=11 1/2, CVN	A992		4358			
bp100	1	BPL 1/4x16 1/2	5-5 3/8	BENT	A36		70			
p145	1	L3x3x 1/4	1-0		A36		5			
p146	1	PL 1/4x5 3/4	10 3/4		A36		4			
p148	1	PL 3/8x2 3/4	2 3/4		A572-50		1			
p149	1	PL 3/8x4 1/2	9		A572-50		4			
p166	1	W14x22	1-5 3/8		A992		30			
	4	WS 3/4	6 3/16		A108		1			
	3	TC 7/8 Dia A325N	1 3/4	+1HD WASH			1			
		FIELD BOLTS								
	12	TC 7/8 Dia A325N	2 3/4	+1HD WASH						
	1	5/8 Dia HILTI	4 1/2							

6.12 Multi-Member Assembly Bill of Material Example

Bill of Material Legend

1. The first line will contain the shipping mark and description (example: column, truss, frame, etc.). The second line will contain the material and description of the main member of the multi-member assembly.
2. Next line items will contain sub members of the multi-member assembly. List all parts in numerical order.

Note: For all other Bill of Material requirements, work with pages 6-7.

1

2

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
F9000	ONE	FRAME					4721	9		25
F9000	1	HSS6x6x1/2	26-01/2		A500C		915			
9000A	1	HSS6x6x1/2	26-01/2		A500C		915			
9000B	1	HSS6x6x1/2	26-011/16		A500C		916			
9000D	1	HSS6x6x1/2	26-011/16		A500C		916			
9000F	1	HSS14x6x1/2	2-2		A500C		135			
9000G	1	HSS14x6x1/2	2-2		A500C		135			
9000H	1	HSS14x6x1/2	2-5		A500C		151			
9000J	1	HSS12x6x1/2	2-2		A500C		121			
9000K	1	HSS12x6x1/2	2-5		A500C		135			
9000M	1	HSS12x6x1/2	2-2		A500C		121			
p233	4	PL5/16x3	5		A572-50		1			
p238	4	PL5/16x3	5		A572-50		1			
p265	4	PL3/4x47/8	47/8		A572-50		5			
p281	2	PL3/8x3	71/2		A572-50		2			
p320	16	PL3/8x41/2	9		A572-50		4			
p348	2	PL1/2x14	1-6		A572-50		35			
p385	2	PL1/2x16	1-8		A572-50		45			
		FIELD BOLTS								
	8	7/8 Dia A325N	21/2							
	48	TC 3/4 Dia A325N	2	+1HD WASH						

6.13 General Criteria for Column Shop Detail Drawing Preparation

a. Columns shall be oriented on the drawing with the base plate at the bottom of the drawing (if detailed vertically) or the left side of the drawing (if detailed horizontally).

b. Running dimensions shall originate from the top of the base plate, locating all holes, parts, etc. For upper-tier columns, the running dimension shall originate from the furthest left end of the members main material.

c. Running dimensions shall be given for each column face that has holes or parts located on it.

d. Opposite-hand and as-noted details are not permitted.

e. Sloped columns shall be drawn either vertically or horizontally on the drawing. Do not draw on a slope! Working dimensions should be given as if it were in the vertical or horizontal position.

f. Note the beam size at all column connections.

g. Provide steel elevations at the bottom of base plate, top of steel elevation at each beam framing into column, and top of column.

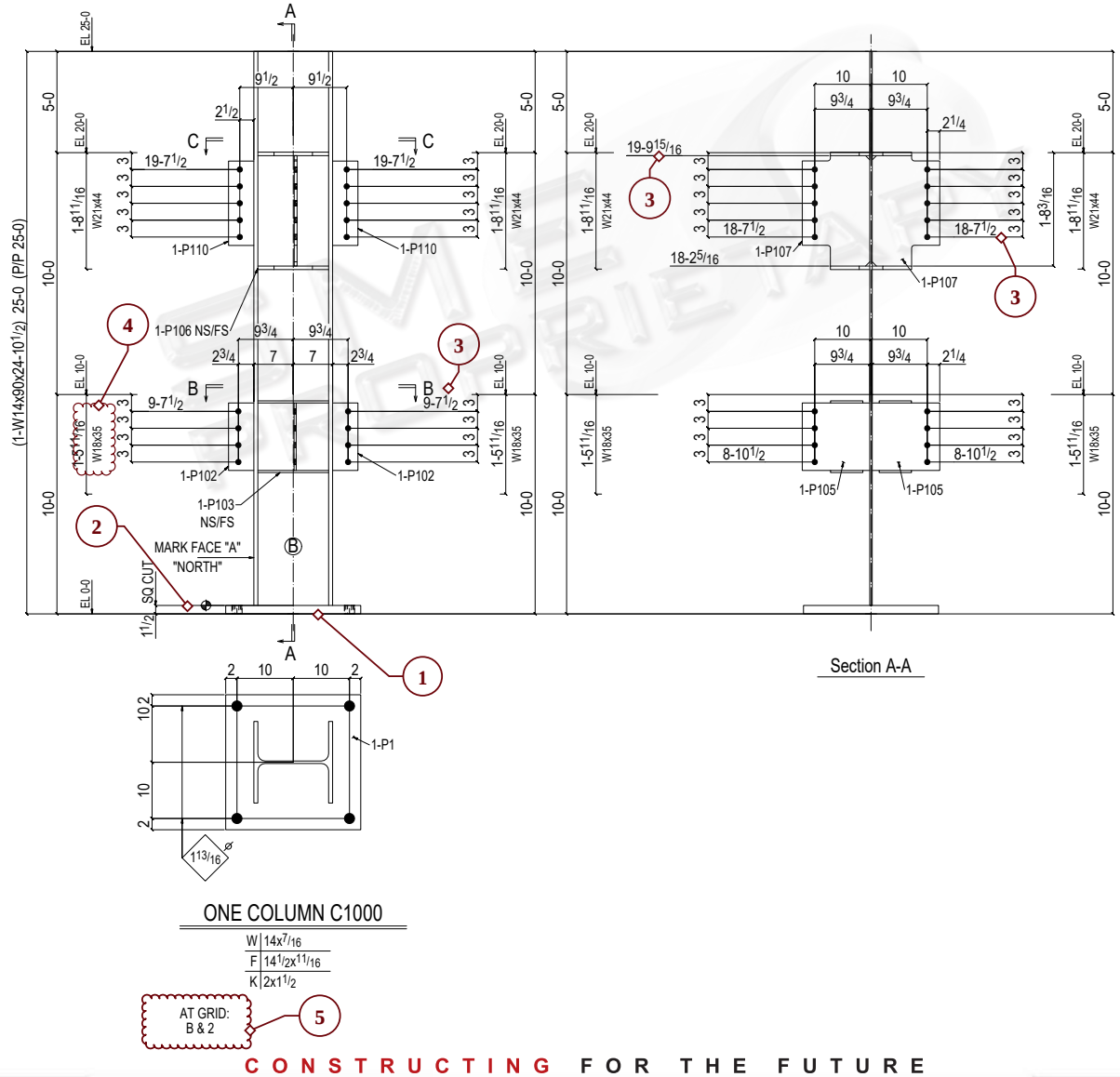
h. Grid location reference(s) shall be noted directly below the description/mark number on each column detail.

i. Add directional mark to column flange face A indicating direction: North, South, East, and West.

6.14 Column Example

Legend

1. Columns shall be oriented on the drawing with the base plate at the bottom of the drawing (if detailed vertically) or the left side of the drawing (if detailed horizontally).
2. Running dimensions shall originate from the top of the base plate, locating all holes and parts. For upper-tier columns, the running dimension shall originate from the furthest left end of the member's main material.
3. Running dimensions shall be given for each column face that has holes or parts located on it.
4. Note the beam size at all column connections.
5. Grid location reference(s) shall be noted directly below the description/mark number on each column detail.



6.15 General Criteria for Beam Shop Detail Drawing Preparation

a. Opposite-hand and as-noted details are not permitted.

b. All beam end preparation work shall be completely detailed on the shop detail drawings where they apply.

c. Camber shall be shown by notation and dimension both on the detail and by comment in the Bill of Material.

d. Sloped/broken back beams: Draw all sloped beams and one leg of a broken-back beam in a flat position on the drawing. Working dimensions should be given in the flat horizontal position.

e. Bent Plate: Whenever possible, all bent plate (slab edge form) should be detailed with and shop welded to the beams. See section 16 for detailed instructions on how to detail bent plate edge forms.

f. Running dimensions shall originate from the left end of the main member (not to the face of clip angle, end plate or any "part" extending beyond the left end of the main member), locating all holes and connections along beam.

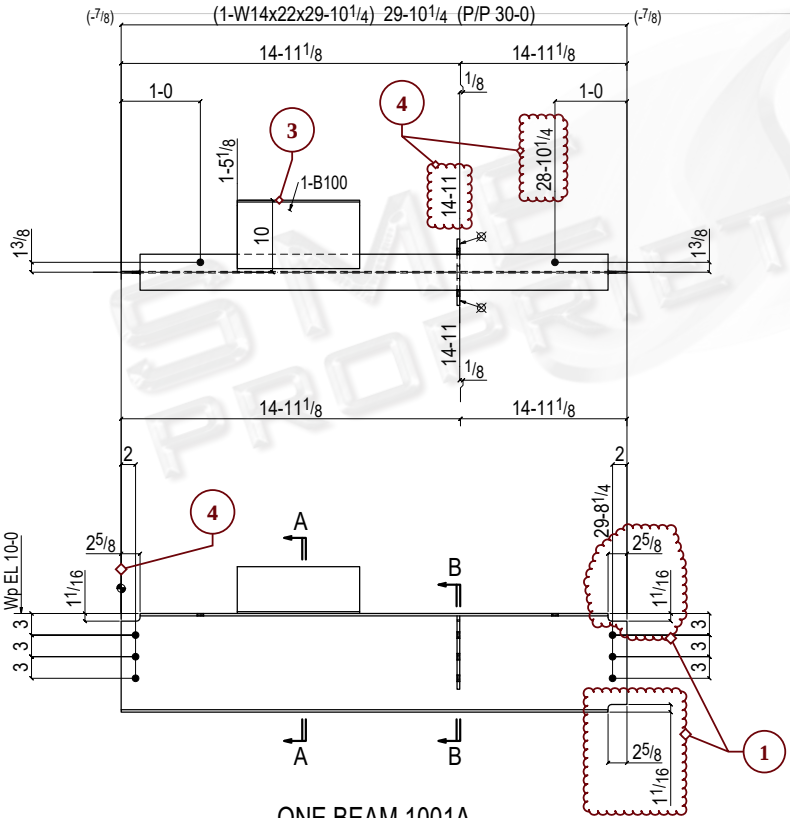
g. Grid location reference(s) shall be noted directly below the description/mark number on each beam detail.

h. Detailer to review project requirements for slip critical connections and identify any faying surfaces that have additional requirements to meet slip coefficient. Example: Class B would require faying surface to be prepped to SSPC-6.

6.16 Beam Example

Legend

1. All beam end preparation work shall be completely detailed on the shop detail drawings where they apply.
2. Camber shall be shown by notation and dimension both on the detail and by comment in the Bill of Material.
3. Bent Plate: Whenever possible, all bent plate (slab edge form) should be detailed with and shop welded to the beams. Note: Bent plate to be detailed in 10-0 lengths maximum beam detail.
4. Running dimensions shall originate from the left end of the main member locating all holes and connections along beam.
5. Grid location reference(s) shall be noted directly below the description/mark number on each beam detail.



ONE BEAM 1001A

W 13 11/16 x 1/4 p149
F 5x 5/16
K 1 1/16 x 13/16

AT GRID: A & 1

SHOP NOTE: CAMBER 3/4 UP

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
B1001	ONE	BEAM					728	1		131
B1001	1	W14x22	29-10 1/4	C=3/4	A992		652			
B100	1	BPL 1/4 x 15 1/2	5-0	BENT	A572-50		66			
	2	PL 3/8 x 4 1/2	10 3/16		A572-50		5			
		FIELD BOLTS								
	6	7/8 Dia F1852N	2							

6.17 General Criteria for FOB Shop Detail Drawing Preparation

a. Early delivery items (FOB anchor rods, embeds, etc.) should not be detailed with the sequence(s) where they are located. They are to be detailed for the project as a whole, using drawing numbers 1 thru 999 as described in section 2.

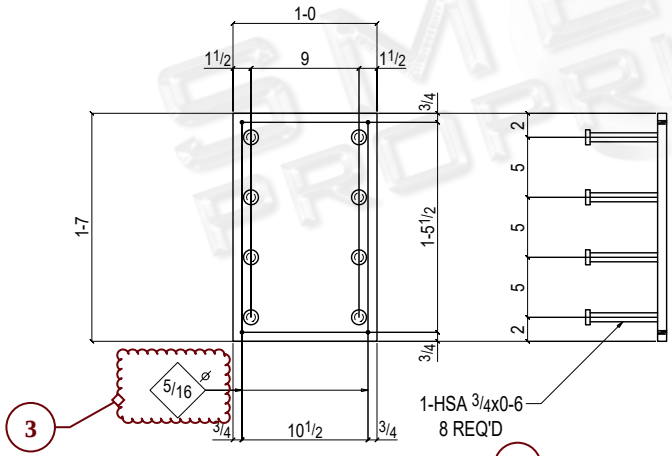
b. Indicate on each shop detail drawing the field drawings that the pieces detailed can be located: either AB, EM, or E sheets.

c. All embedded angles, channels, plates, etc. should be detailed with at least two (2) 5/16" diameter nailer holes. Detailer should confirm with the Project Manager prior to completing shop details for specific instructions on each project.

JOB NO:	SEQUENCE:	RELEASE:
SHOP ROUTING:		

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
ME43	ONE	PLATE					55	0		70
ME43	1	PL 3/8 x12	1-7		A572-50		48			
	8	WS 3/4	6		A108		1			



ONE PLATE ME43

NEAR GRIDS:
G.5 /1

Legend

1. **Shipping Marks 1 thru 999**
2. **Indicate where ship mark is located.**
3. **Nailer Holes**

2

Total weight : 55

ERECTION DRAWING REF:
EM1

REV	DATE	DESCRIPTION		
0	Oct 12 2020	FOR FABRICATION	BS	CH
A	Aug 28 2020	FOR APPROVAL	BS	CH

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A 1/2" RADIUS U.N.O
4. BENT PLATE WITH NOTE BACKLAP INDICATES PLATE TO BE TACKWELDED TO ADJACENT BENT PLATE FOR FIELD INSTALLATION

CLEAN: SSPC-SP2
PAINT: NONE

HOLES U.N. 15/16 ø

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT:

LOCATION:

DWN. BY BS	JOB NO.	DWG. NO. 43	REV 0
CHKD BY CH			

6.18 Truss Detailing Scope

a. This procedure is to be utilized by all companies that detail trusses for SME Steel Contractors. Truss fabrication and assembly is a critical element in structural steel and procedures need to be followed in order to be efficient and cost effective.

b. Each project is unique and, as such, it is imperative that time shall be spent in the kickoff meeting to discuss at a minimum: splice locations (shop and field), crane location in the field, crane limitations, weld prep orientation, shipping requirements and limitations, minimizing field assembly and welding as much as possible (value engineering of shop vs. field assembly), lifting lug requirements and locations, and any value engineering ideas and details that were incorporated by SME Sales and Estimating teams.

6.19 Shop Assembled Truss Procedure

a. Trusses shall have an assembly drawing(s) that shall show:

- Overall truss dimensions
- All work point to work dimensions including all chords, verticals, and horizontals (work points need to originate from a point on the material, not out in space)
- Cross square dimensions on all assembly drawing hole locations
- Running dimensions to all work points (from ends of material)
- Camber diagram if required (if not required, state: camber not required)
- Truss piece mark number: T1000, T1001, etc.
- Splice locations for both Shop and Field
- Weld prep details for both Shop and Field
- Painting and surface prep requirements
- Bill of Material that lists all members and parts required for fabrication
- Work With drawing note (work this drawing with 1001B, 4501B, etc.)
- Welding and bolting details for lacing members
- Erection target marks
- All shims shall be detailed with the truss and shop tacked to the shipping piece (multiple shim thicknesses are required)
- Any other noted specifications or details from the design documents

6.20 Truss Sub Assembly Drawings

Note: Sub assembly drawings required for all chords, vertical, and horizontal members

- The Overall chord and lacing member dimensions
- All work point dimensions (all work points shall originate from a point on the material)
- Hole locations
- Running dimensions to all holes, work points, parts, lift lugs, etc. (from ends of material)
- Sub assembly mark number: A1001, A4501, etc. (NOTE: These are not to be part drawings. They require a separate fabrication process and therefore need their own sub-assembly mark.)
- Splice locations for both Shop and Field
- Weld prep details for both Shop and Field
- Painting and surface prep requirements
- Work With drawing note (work this drawing with 1001B, 4501B, etc.)
- Welding and bolting details
- Erection target marks
- All shims shall be detailed and shop tacked (multiple shim thicknesses are required)
- Any other noted specifications or details

6.21 Weld Preps Shop Fabrication

- All weld preps for shop fabrication shall face up and out on wide flange sections
- Weld preps shall be per SME Shop and Field standards unless noted by SME. Work with section 12 for weld access hole requirements by code.

6.22 Field Assembled Truss Procedure

Trusses shall have an overall assembly drawing that will show:

- Overall complete truss dimensions including all sections of truss
- All work point to work dimensions including all verticals and horizontals and chords (work points to be measurable in the Field)
- Cross square dimensions on all assembly drawings
- Hole locations
- Running dimensions to all work points (work points to be measurable in the Field)
- Camber diagram if required (if not required, note: Camber not required)
- Truss piece mark number: T1000, T5000, etc.
- Splice locations for both Shop and Field
- Weld prep details for the Field
- Painting and surface prep requirements
- Bill of Material that lists all members and parts required for fabrication
- Work With drawing note (work this drawing with 2001B, 5501B, etc.)
- Welding and bolting details
- Erection target marks
- Any other noted specifications or details from the design documents
- Erection aids/lifting lugs as directed by SME Project Manager

6.23 Truss Knocked Down Field Assembled Truss Procedure

Note: Trusses (knocked down) shall have an assembly drawing for all chords, vertical, and horizontal members that will show:

- Overall complete truss dimensions including all sections of the truss
- All work point dimensions (work points to be measurable in the Field)
- Hole locations
- Running dimensions to all holes, work points, parts, lifting lugs, etc.
- Shipping mark number: T1000, T5000, etc.
- Splice locations for both Shop and Field
- Weld prep details for Field welds
- Painting and surface prep requirements
- Work With drawing note (work this drawing with 2003A, 5503A, etc.)
- Welding and bolting details
- Erection target marks
- Any other specifications or details from the design documents

ADDITIONAL COMMENTS:

NOTE: All weld preps for field fabrication/assembly in the Field shall face up and out on WF sections. Weld preps shall per SME Field standards unless noted by SME.

- Field truss assembly, unless noted otherwise, shall have the truss laying flat with the lifting lugs away from the crane (tipping the truss towards the crane).
- On occasion, the truss will be Field assembled vertically in stanchions: weld preps will remain in the same UP and OUT positions but will be on the different parts of the WF sections (flanges and webs).

SECTION 7 SHOP PART DETAIL DRAWINGS

- ☐ All sub-material attached to main members has been detailed and placed on 8.5x11 horizontal sheets.
- ☐ All information required to fabricate each part has been provided.
- ☐ Special material requirements have been noted where required. Example: CVN requirements.
- ☐ Part drawings don't include a Bill of Material.
- ☐ Quantities are not included on part drawing.
- ☐ All parts are detailed using the correct prefix per SME numbering system.
- ☐ Part drawing consists of a single piece of material; no assemblies are allowed.
- ☐ Understand once part drawing has been submitted for fabrication, it can't be revised or used again.
- ☐ Provided information regarding any special tolerances.

7.2 Part Drawing Overview and Requirements

a. All “detail” material (each separate piece of structural plate and/or shape to be shop attached to the main member) shall be drawn individually on 8 1/2” x 11” part drawings. Whether or not a detail part is one-of-a-kind or repeats throughout the project, it will be detailed on a part drawing. (The exception to this is bent parts. See section 7.3.)

b. Detailed parts are **NOT** unique to an individual sequence but common to the entire project. Therefore, the detailer need only draw a part that repeats once with the first sequence where it appears.

c. Part drawings include but are not limited to: shear tabs, connection plates, connection angles, stiffener and doubler plates, continuity plates, bracing gusset plates, base plates, and cap plates as well as any structural shape that is used as a secondary piece on a main member.

d. Part drawings shall show all information required to fabricate the part. There are no Bills of Material on a part drawing. The complete material description shall be printed below the drawing of the part.

e. The part mark is the drawing number. Work with section 2 for correct part prefixes. Examples: A100, C152, HSS259, P505, etc.

f. Quantities are not to be shown or indicated on part drawings.

g. Assemblies or weldments composed of two or more pieces are **NOT** to be detailed on a part drawing. Each component part shall be detailed separately, on its own part drawing. The assembly or weldment shall be shown on the shop detail drawings.

h. Part drawings are to be submitted with the first shop detail drawing where they occur. Since parts are common to the entire project: once a part has been submitted for fabrication, it need not be submitted again.

7.3 Bent Parts for Fabrication

a. All bent plate material shall be drawn individually on 8 1/2" x 11" part drawings. Whether or not a detail part is one-of-a-kind or repeats throughout the project, it will be detailed on a "bp" for all non-connection bent material such as pour stops, or a "bc" drawing that designates a bent plate used for a connection such as skewed beam or elevator guide rail connection bent plate.

b. Bent part drawings shall show all information required to fabricate the part. There are no Bills of Material on a part drawing. The complete material description shall be printed below the drawing of the part.

c. The bent part mark is the drawing number. All bent part drawings are prefixed with lowercase letters "bp" followed by the number. Examples: bp124, bp257, etc.

d. Quantities are not to be shown or indicated on the bent part drawings.

7.4 Issuing Parts for Fabrication

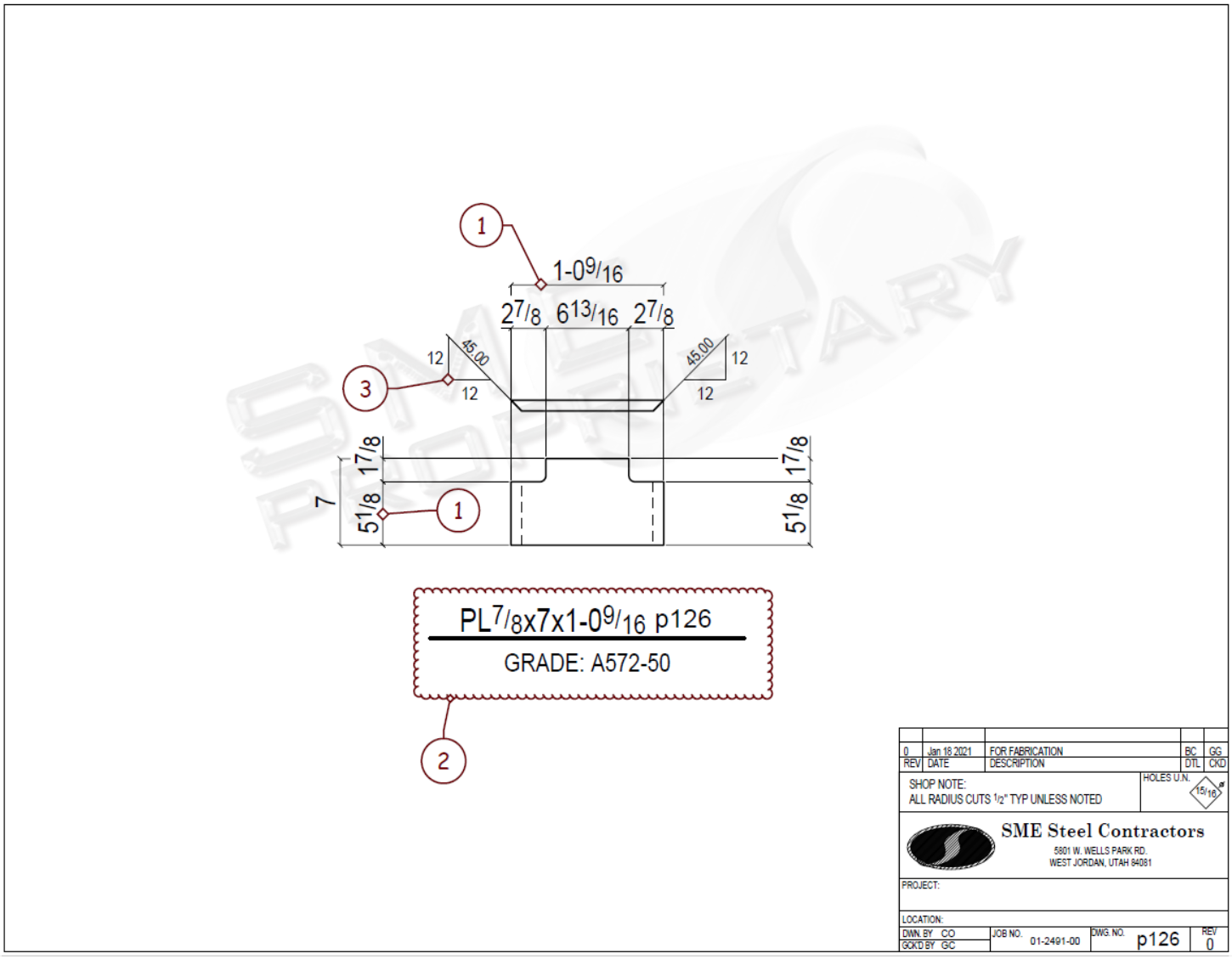
a. When issuing for fabrication, the drawings shall show revision level "0". No higher revision level is allowed for part drawings. If a part requires revision after it has been issued and released for fabrication, a new part drawing and number shall be created. (This may mean the old part drawing and mark number will not be used again.) Part drawings are NEVER revised once issued for Fabrication Rev. 0.
Note: Detailer is not to provide SME with void part sheets.

b. ***Part drawings will always be placed on horizontal 8.5x11 sheet.***

7.5 “p” Part Example

Legend

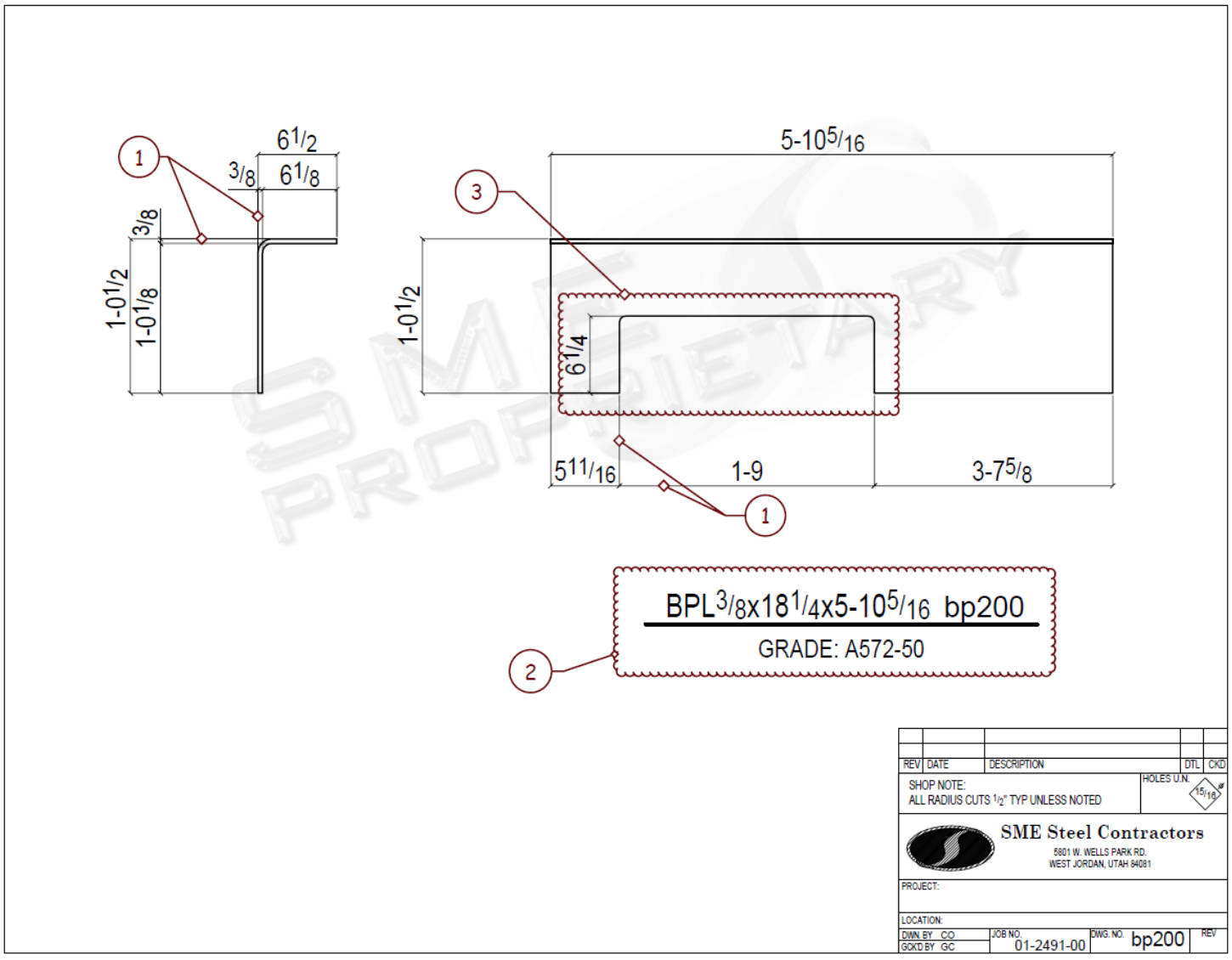
1. Dimensions required to fabricate the part
2. Complete material description printed below the drawing of the part
3. Any other information required to fabricate the part: cuts, preps, etc.



7.6 "bp" Part Example

Legend

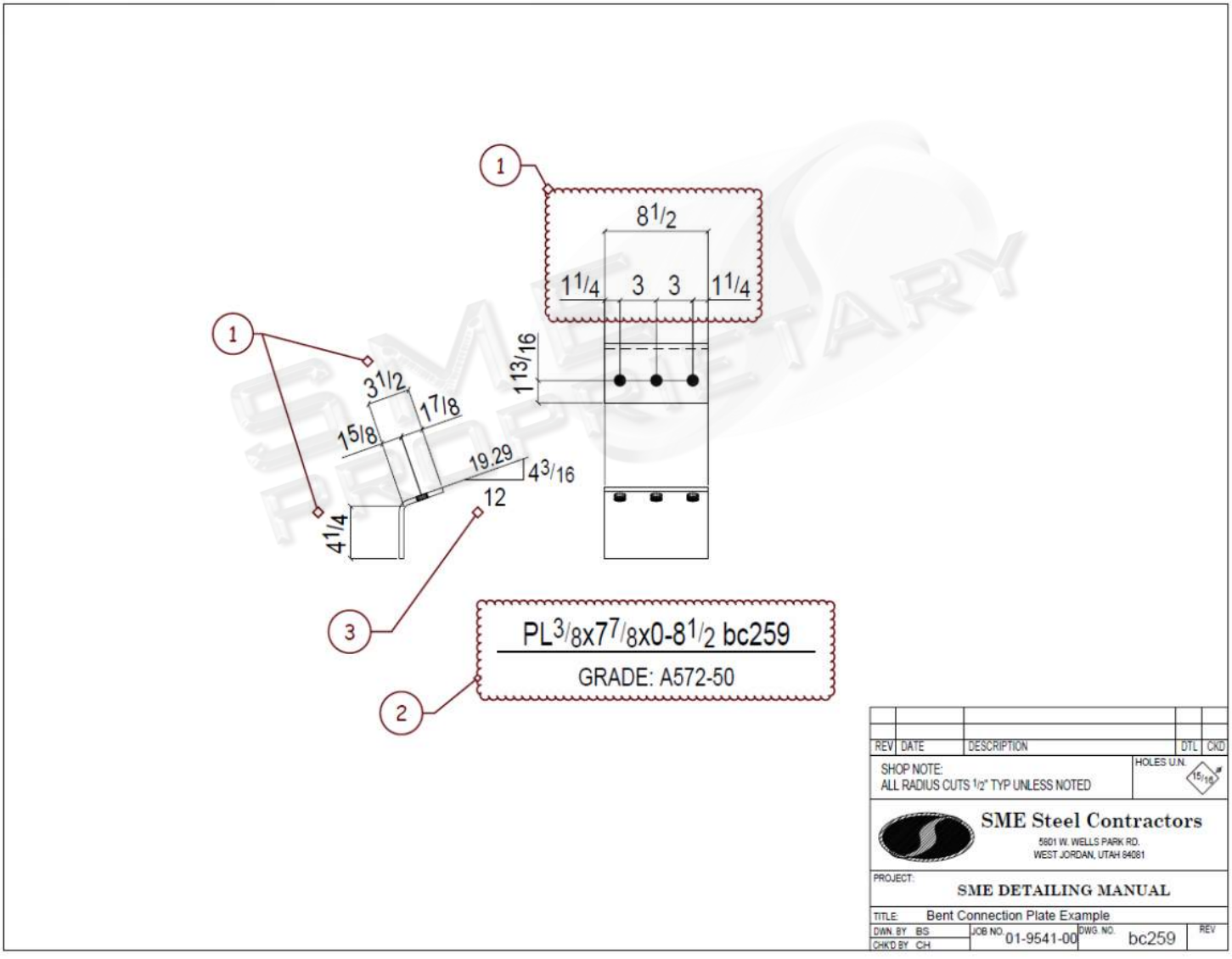
1. Dimensions required to fabricate the part
2. Complete material description printed below the drawing of the part
3. Any other information required to fabricate the part: cuts, preps, etc.



7.7 “bc” Part Example

Legend

1. Dimensions required to fabricate the part
2. Complete material description printed below the drawing of the part
3. Any other information required to fabricate the part: cuts, preps, bevel for bend, etc.



SME STEEL CONTRACTORS

SECTION 8 FIELD DRAWINGS

SECTION 8 FIELD DRAWINGS

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8.1 Field Drawing Checklist

- ☐ Included all information required for anchor rod placement plans
- ☐ Included all information required for anchor rod setting details
- ☐ Identified welding of plate washers when specified by design with the sequence where the column is located
- ☐ Reviewed and followed all SME anchor rod requirements in addition to project requirements
- ☐ Reviewed with SME Project Manager any special requirements and example setting assemblies instead of loose items
- ☐ Identified all shear key locations and provided adequate dimensions for concrete blockout
- ☐ If anchor rod assembly is required, you fully understand the shop drawing requirements
- ☐ Included all information required for embed placement plans
- ☐ Included all embed shop drawing requirements
- ☐ Have reviewed and included all erection drawing requirements
- ☐ Included all necessary field connection information on the FC drawings
- ☐ Identified in plan and elevation all nontypical grades of material; example: a913-65, must be identified
- ☐ Reviewed field bolt drawing requirements and included all necessary information
- ☐ Used the correct field bolt symbols
- ☐ Included point to point field bolt report when submitting field bolt drawings for construction
- ☐ For projects with field installed cantilevers, detailer will add tip heights to erection drawings as required by each specific project. Review with Project Management for final direction.

8.2 Anchor Rod Placement Plans

a. The information required at each column location shall Include:

- Column size and orientation
- Anchor rod and template piece marks
- Elevation to bottom of base plate
- Shear key locations as required
- Dimensions from grid lines to anchor rod centerlines
- Update placement plans to include shipping mark of columns, once assigned

8.3 Anchor Rod Setting Details

a. The information required at each setting detail shall Include:

- Anchor rod description and piece mark
- Anchor rod projection above top of concrete/footing
- Grout thickness
- Shear keys layouts where required by design, with size and depth
- Welding of plate washers to base plate when specified on the design

8.4 Anchor Rod Requirements

Approach to anchor rod details and minimum requirements:

a. Anchor bolts shall be detailed with sequence “0” drawings.

b. Lengths shall be grouped in two-inch increments.

c. Minimum projection above top plate element (base plate or plate washer) shall be two bolt diameters.

d. Thread length equal to full projection above top of concrete/footing, unless design requires something different.

e. Check that footing depth and architectural finish permit detailed lengths of embedment.

f. The full anchor rod assembly shall be detailed with a shipping mark on the detail drawing. In addition, FOB manufactured components, which include the threaded rod, nuts, and standard washers, will be included in the Bill of Material, but do not require sub-marks or any additional details. All plate washers, embedded in concrete or otherwise, shall be given a sub-material mark, be fully detailed and placed on a “p” sheet, and included when drawing is released for fabrication.

g. Anchor rods shall be detailed using phase code “BY”.

h. Anchor rods shall be detailed to the greater of the design and the following minimum requirements: All columns and posts shall have a minimum of four (4) one-inch diameter anchor rods, F1554 Gr. 55 weldable unless instructed otherwise by SME

i. Anchor rod size and spacing must comply with the contract drawings. If not shown on the design drawings in either detail or section, the specified length(s) should be assumed to be the embedded length.

j. Review with SME Project Management at the beginning of each project; over-sizing holes and plate washer requirements for anchor bolts. Unless noted otherwise, all anchor rods will receive two (2) plate washers - one on top and one on the bottom of the base plate!

8.5 Anchor Rod Placement Typical Notes on Sheet

a. The anchor rod plan shall contain the following general notes:

- Dimensions on this plan must be strictly adhered to. Report any error or misunderstanding at once.
- Contractor shall furnish an as-built drawing of all anchor bolts and embeds before erection of steel can begin.
- Check finish base plate elevation after setting of each plate or column.
- All Templates to be removed prior to placing steel.
- Erector to verify actual grout thickness required and adjust shims as necessary.

8.6 Anchor Rod Setting Template Details

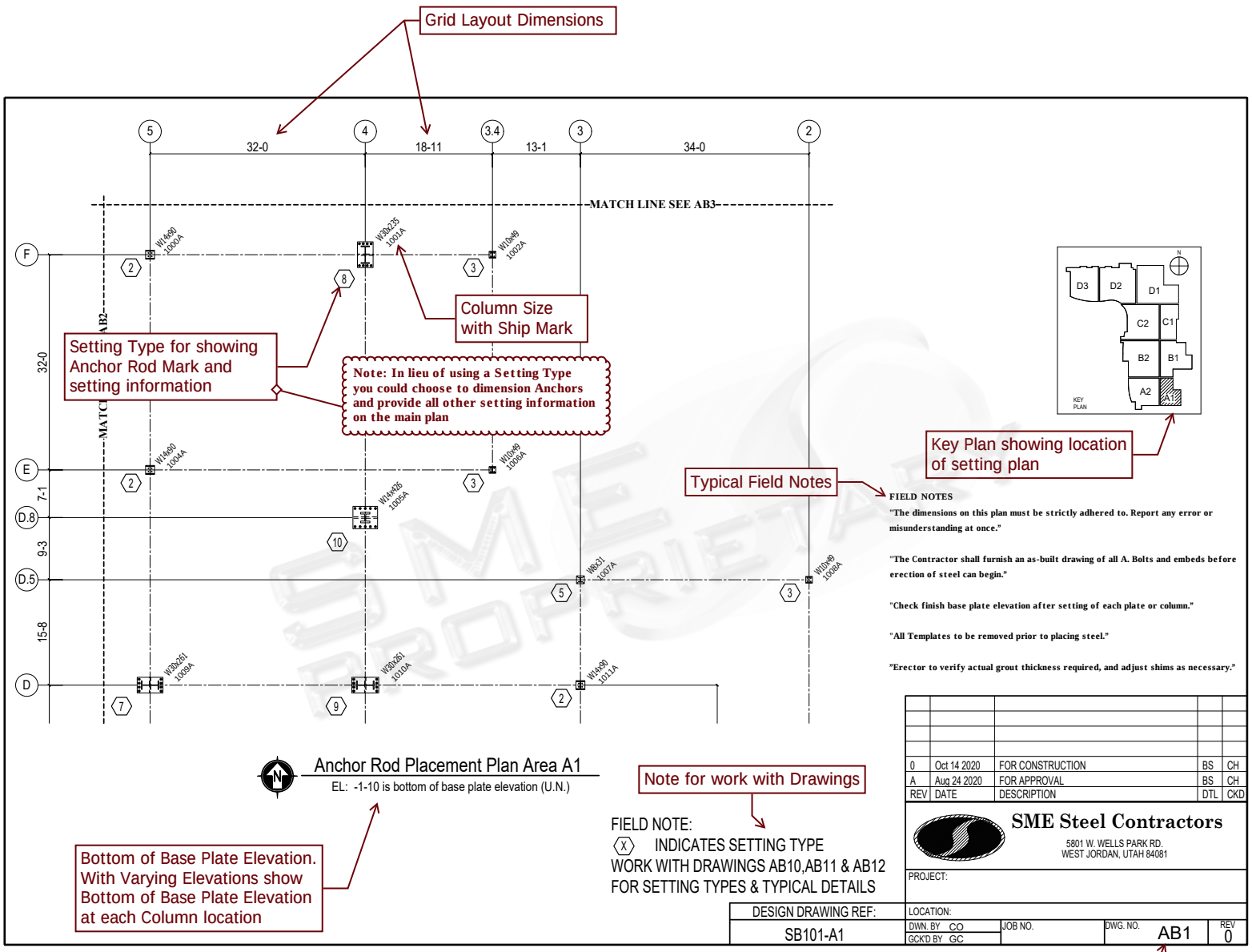
a. Anchor rod setting details and minimum requirements:

- Templates shall be detailed the same width and length as the base plate.
- Template thickness to be 1/8” unless directed otherwise by SME.
- Holes for anchor rods to be 1/16” oversized.
- Quantities: one template for each column location.
- Templates to be scribed with center line.
- Add nailer holes in each corner.

8.7 Grout Holes in Base Plates

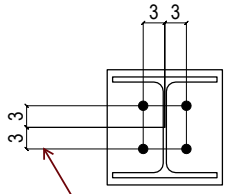
a. Provide grout holes in column base plates only as shown on the contract drawings. If grout holes are not shown, they will not be furnished unless required in writing by SME’s Project Manager.

8.8 Anchor Rod Placement Plan Example



8.9 Anchor Rod Setting Detail Examples

ANCHOR ROD	1A (4) 1" DIA			TYP SETTING REF:
TEMPLATE	3A			A
PROJECTION	7"	GROUT	2"	
EMBEDMENT	0'-9"			
ANCHOR PLATE	N/A			



Anchor Rod & Template Marks
Projection, Grout and Embedment

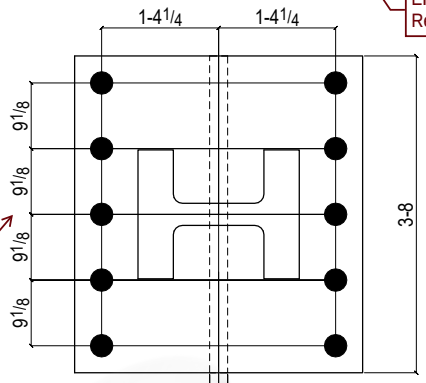
Anchor Rod Dimensions from Grid

Anchor Rod Dimensions from Grid

ANCHOR ROD SETTING TYPE 2

ANCHOR ROD	7A (10) 3" DIA			TYP SETTING REF:
TEMPLATE	8A			B
PROJECTION	1'-3 1/2"	GROUT	2"	
EMBEDMENT	4'-0"			
ANCHOR PLATE	9A			

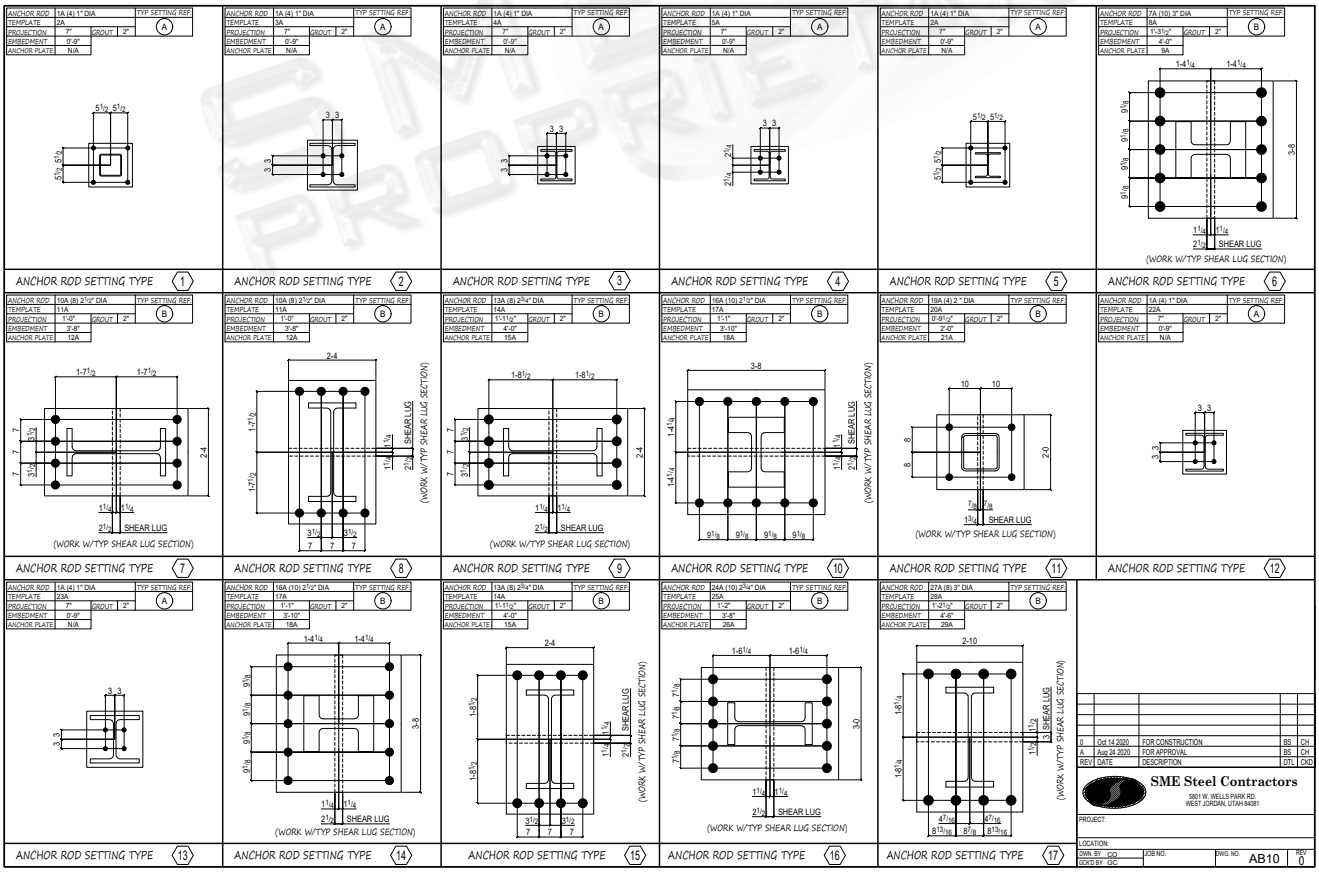
Elevation View Reference



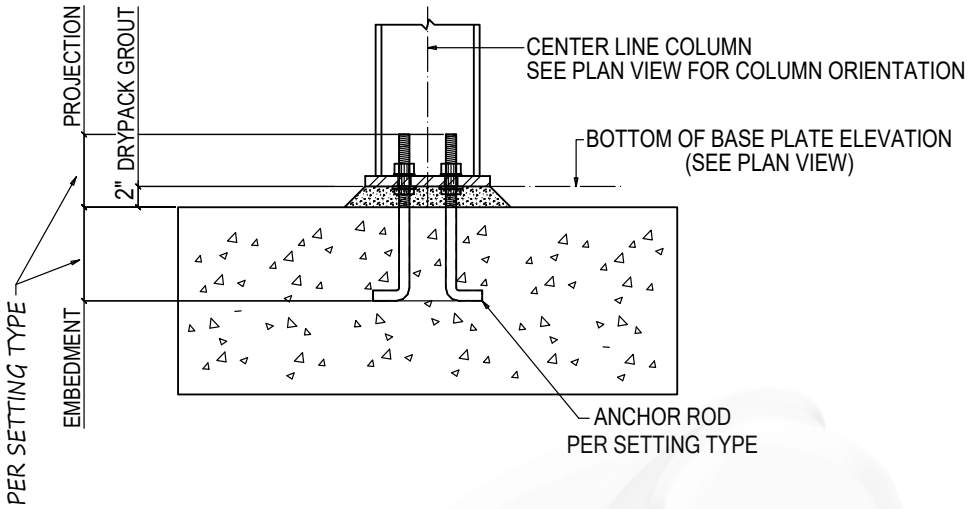
Shear Key Layout Dimensions

1 1/4 1 1/4
2 1/2 SHEAR LUG
(WORK W/TYP SHEAR LUG SECTION)

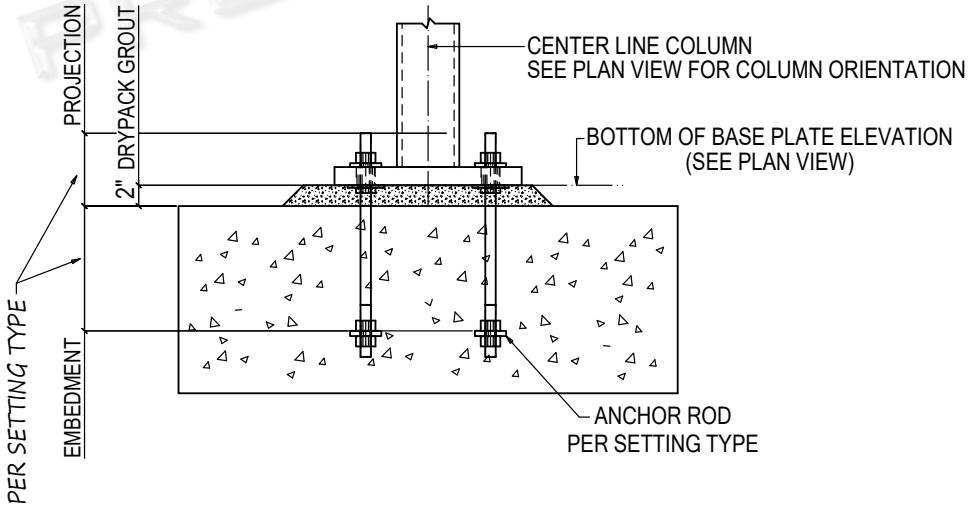
ANCHOR ROD SETTING TYPE 6



8.10 Anchor Rod Setting Elevation View Examples

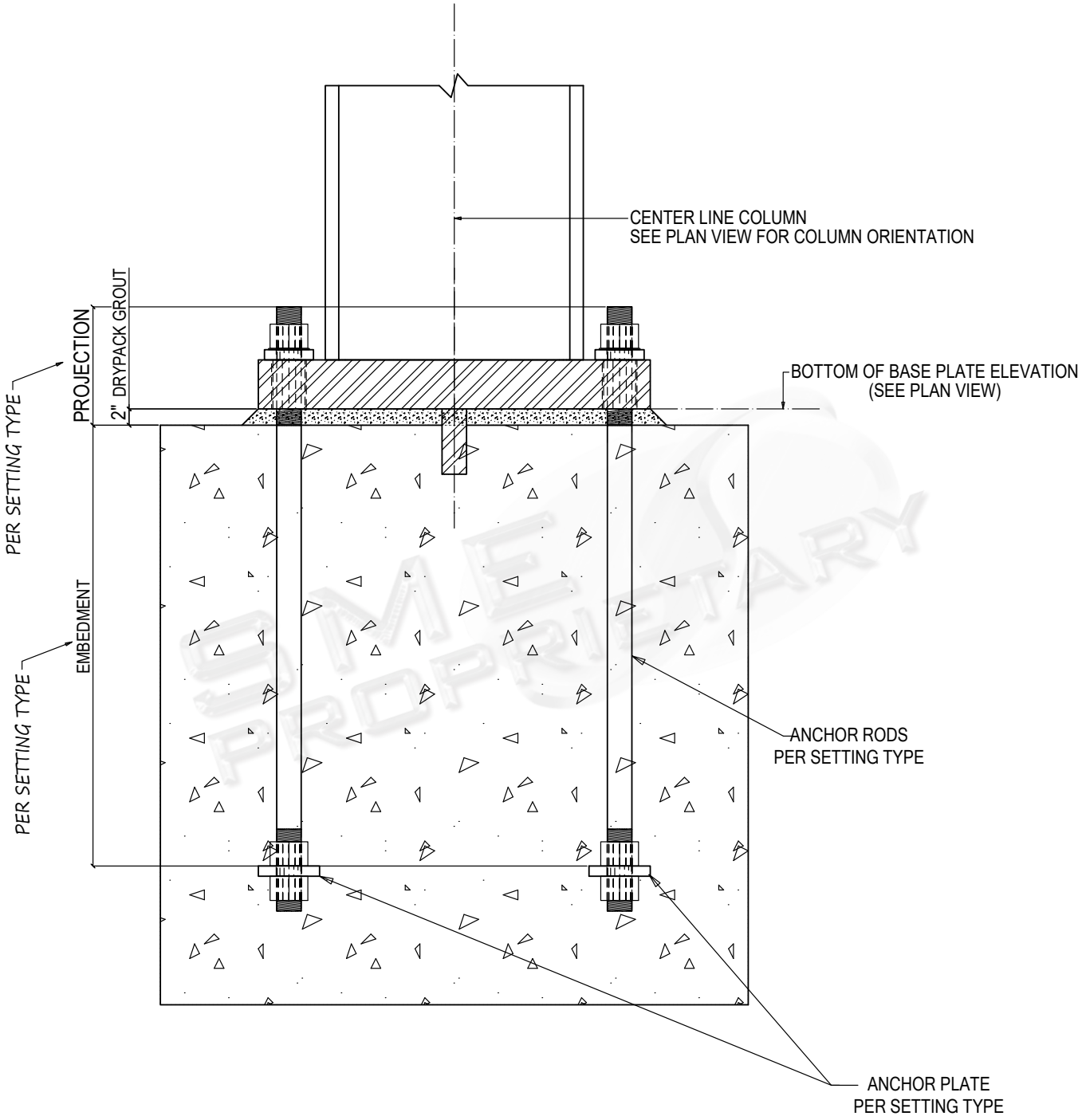


A TYPICAL ANCHOR ROD SETTING DETAIL



C TYPICAL ANCHOR ROD SETTING DETAIL

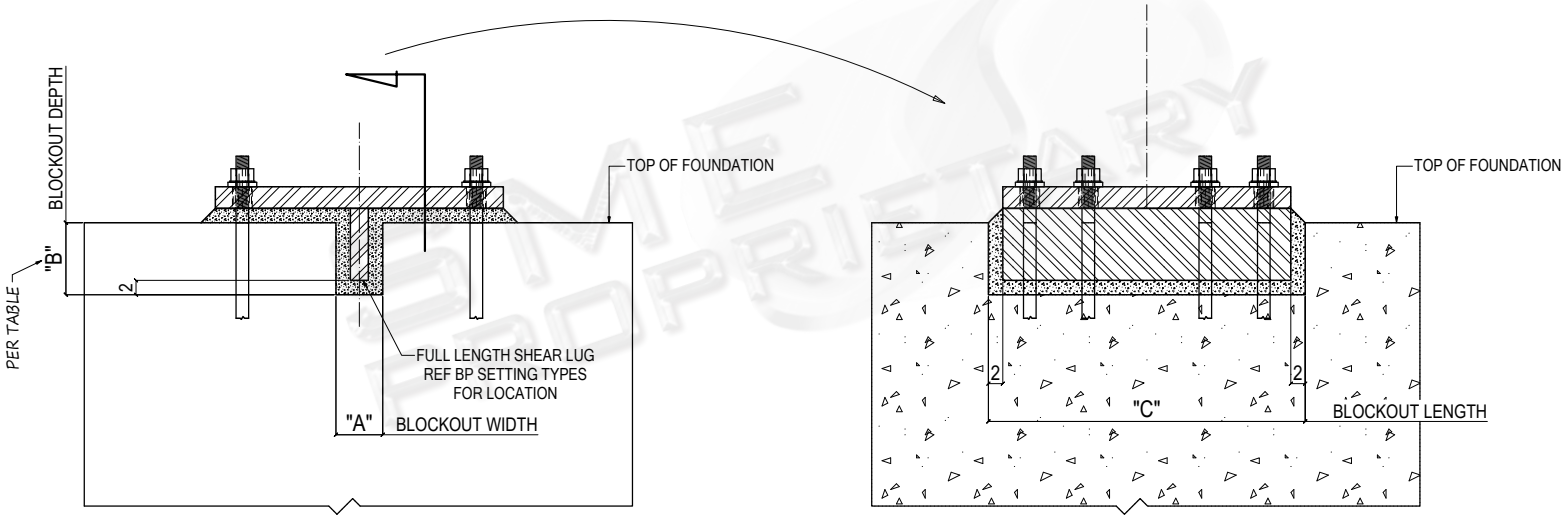
8.11 Anchor Rod Setting Elevation View with Shear Key Example



B TYPICAL ANCHOR ROD SETTING DETAIL

8.12 Anchor Rod Setting Shear Key Dimensioning Example

SETTING TYPE REF	DIM "A"	DIM "B"	DIM "C"
6	6 1/2	7	4-0
7	6 1/2	7 1/2	2-8
8	6 1/2	7 1/2	2-8
9	6 1/2	7 1/2	2-8
10	6 1/2	7	4-0

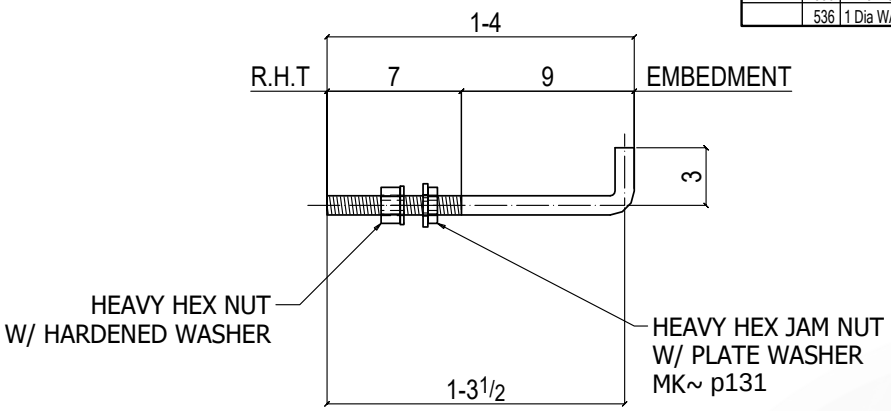


TYPICAL SHEAR LUG SECTION
(BLOCKOUT FOR SHEAR KEYS IN FOUNDATION)

8.13 Anchor Rod Examples

BILL OF MATERIAL

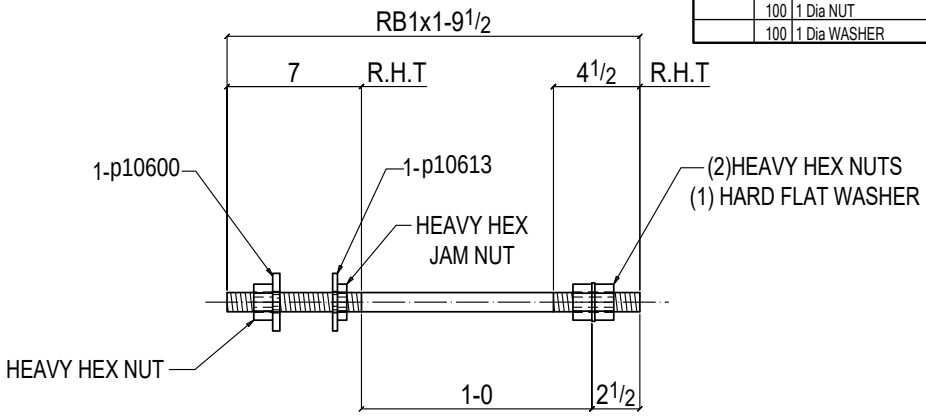
PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
AR1	536	ANCHOR ROD					4	0		BY
AR1	536	RB1	1-6 3/16		F1554-Gr.36		4			
p131	536	PL 1/4x2 1/4	2 1/4		A572-50		0			
	536	1 Dia NUT		HHNT	A563					
	536	1 Dia NUT		JMNT	A563					
	536	1 Dia WASHER		HD	F436					



536 ANCHOR RODS AR1

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
AR4	100	ANCHOR ROD					6	0		BY
AR4	100	RB1	1-9 1/2		F1554-Gr.55		5			
p10600	100	PL 3/8x3	3		A572-50		1			
p10613	100	PL 1/4x3	3		A572-50		1			
	300	1 Dia NUT		HHNT	A563					
	100	1 Dia NUT		JMNT	A563					
	100	1 Dia WASHER		HD	F436					



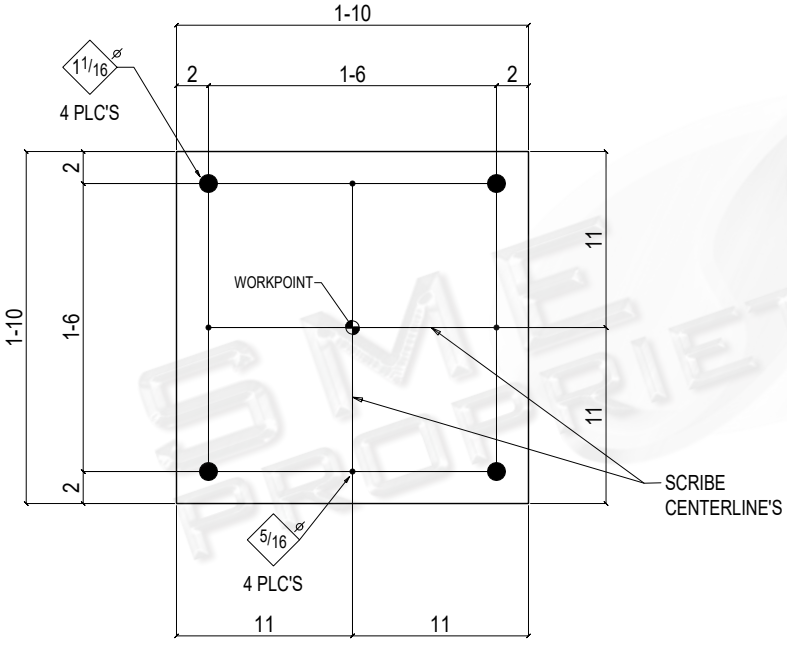
100 ANCHOR RODS AR4

8.14 Anchor Rod Setting Template Example

JOB NO:	SEQUENCE:	RELEASE:
SHOP ROUTING:		

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
ST52	6	TEMPLATE					17	0		78
ST52	6	PL 1/8x22	1-10		A572-50		17			



6 TEMPLATES ST52

Total weight : 103

ERECTION DRAWING REF:
AB2

REV	DATE	DESCRIPTION	DTL	CKD

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A ½" RADIUS U.N.O
4. BENT PLATE WITH NOTE BACKLAP INDICATES PLATE TO BE TACKWELDED TO ADJACENT BENT PLATE FOR FIELD INSTALLATION

CLEAN: SSPC-SP2 PAINT: NONE	HOLES U.N. 15/16 ø

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT:			
LOCATION:			
DWN. BY BS CHK'D BY CH	JOB NO.	DWG. NO. 52	REV

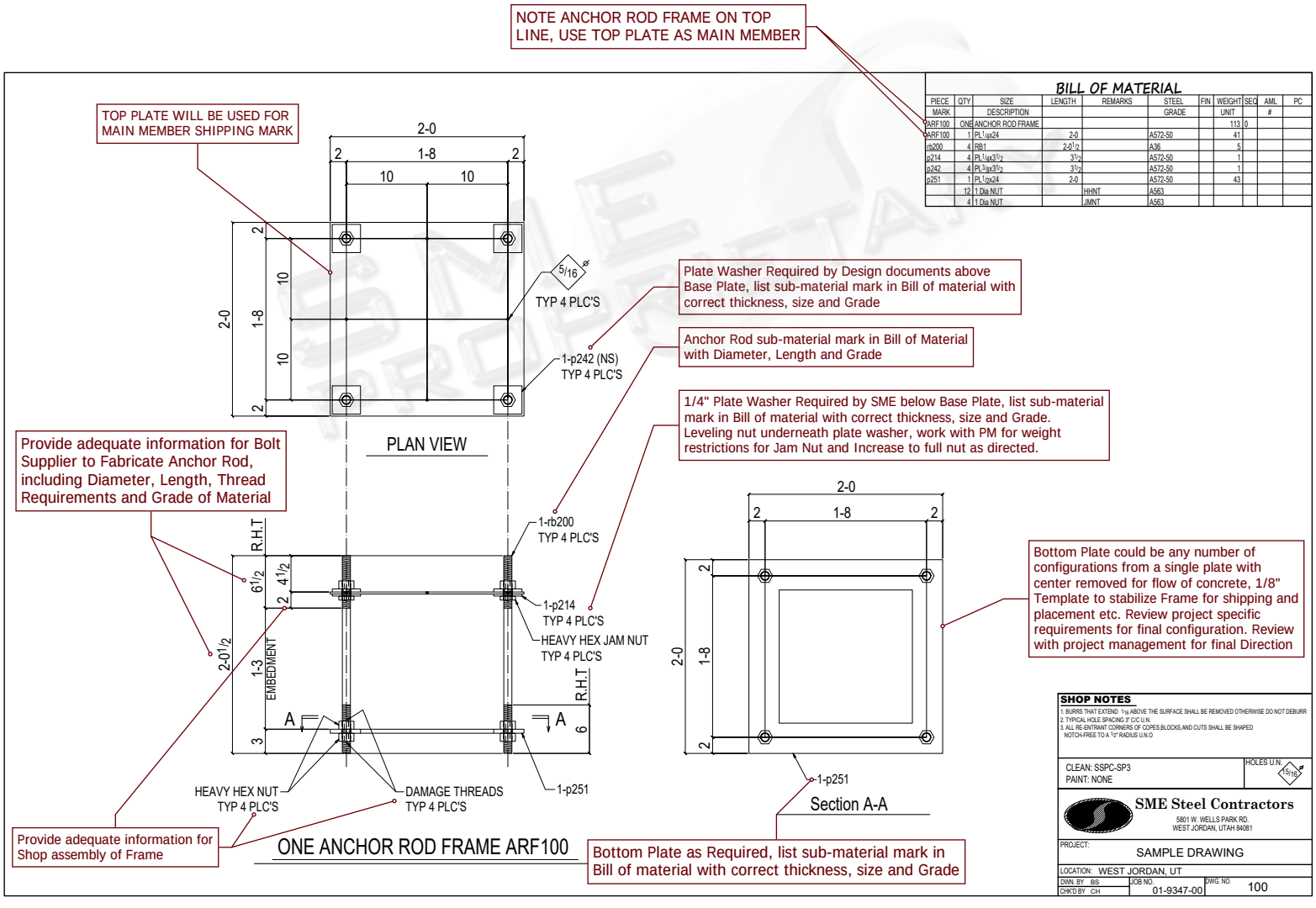
8.15 Anchor Rod Assembly Overview and Example

Overview:

The Project you're working on may or may not require anchor rod assembly drawings. Review with Project Management at turnover meeting to detailer and confirm if this is a job requirement. If required, instead of detailing anchor rods, templates and any other uplift plates, etc, you will detail as a frame for field placement. All typical shop drawing requirements will apply.

Detailer Note:

You're expected to meet all requirements shown below in the sample drawing. Based on job specific frame configurations, you might have additional requirements. Once you've been given final direction from Project Management and completed your first anchor rod placement frame, send an advance copy prior to submitting for approval to SME for internal review.



8.16 Embeds

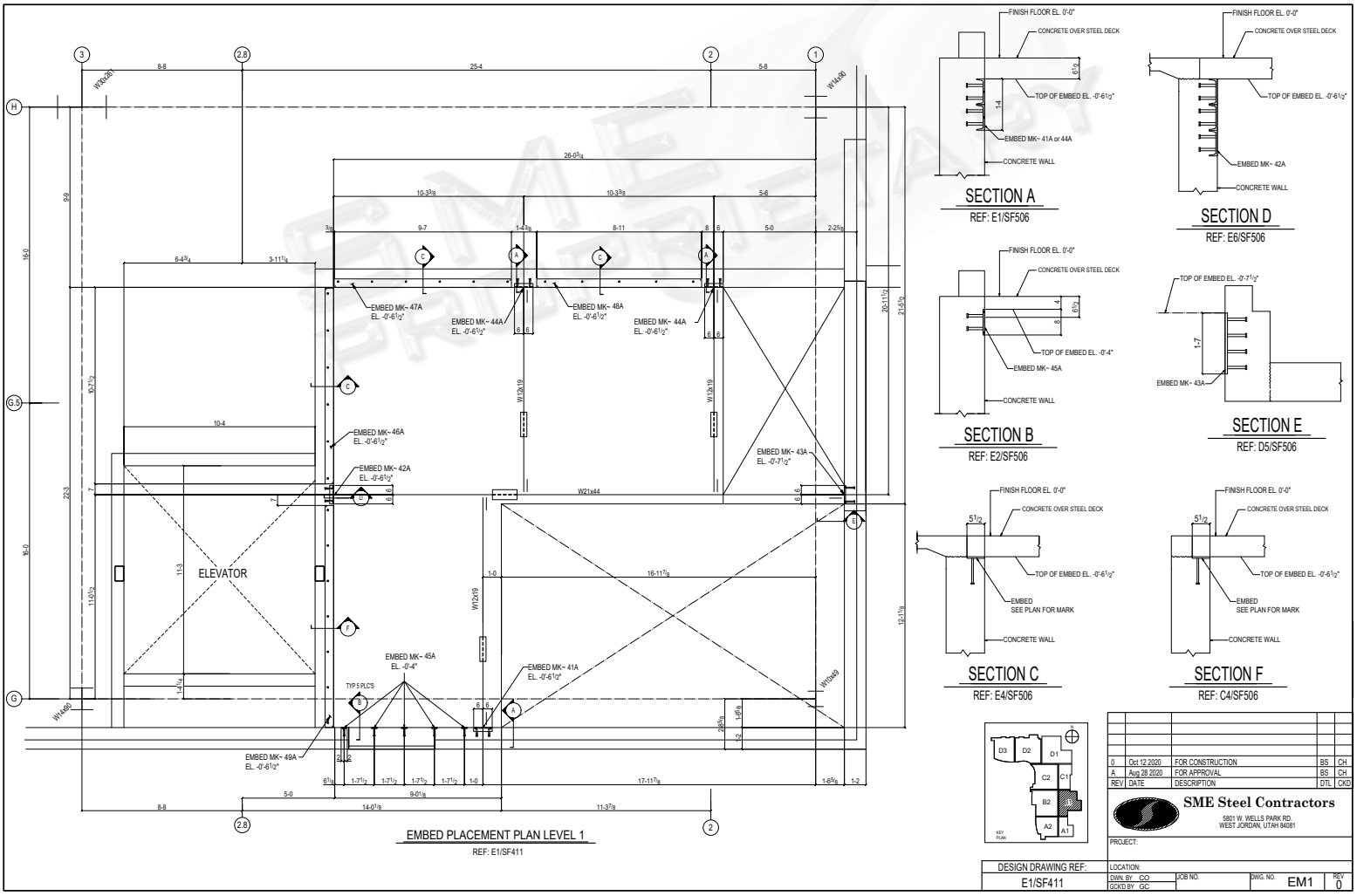
a. Embeds shall be detailed with sequence “0” drawings.

b. EM drawings showing wall elevations and locations are required for embed plates and wall pockets and all FOB items.

c. Details of embed plates shall include 3/16” diameter nail holes at each corner using 3/4” to one inch edge distance. For embeds weighing over 100 pounds, consult SME for any special requirements.

d. Drawings shall show the embedded item only. Any field attached fittings, such as shear plates, shall be detailed with the sequence they occur. Layout dimensions and field welding information shall be included. Separate shipping marks shall be assigned and shown on the erection drawing.

8.17 Embed Placement Plan Example

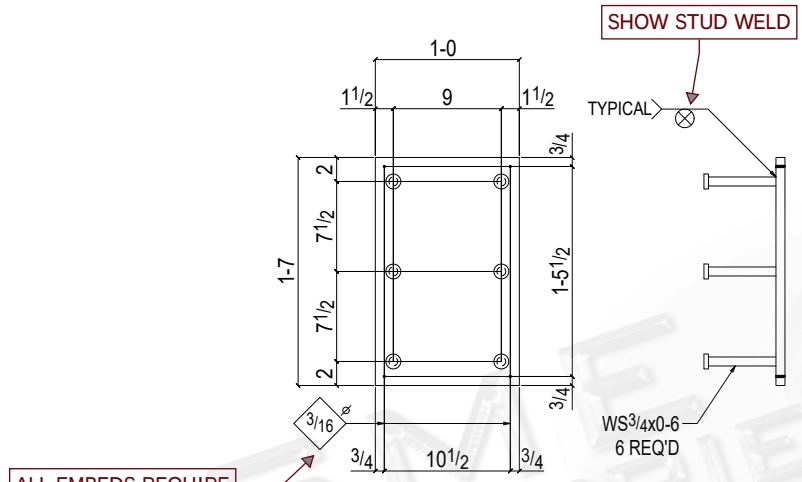


8.18 Embed Example

JOB NO:	SEQUENCE:	RELEASE:

BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
ME43	ONE	PLATE					53	0		70
ME43	1	PL 3/4x12	1-7		A572-50		48			
	6	WS 3/4	6		A108		1			



ONE PLATE ME43

BS

NEAR GRIDS:
G/4

Total weight : 53

ERECTION DRAWING REF:
EM1

REV	DATE	DESCRIPTION	DTL	CKD
0	Jun 25 2022	FOR FABRICATION	BS	CH
A	May 25 2022	FOR APPROVAL	BS	CH

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A ½" RADIUS U.N.O
4. BENT PLATE WITH NOTE BACKLAP INDICATES PLATE TO BE TACKWELDED TO ADJACENT BENT PLATE FOR FIELD INSTALLATION

CLEAN: SSPC-SP2
PAINT: 1 S/C AMERCOAT 5108

HOLES U.N. 15/16 ø

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT: **SAMPLE EMBED**

LOCATION: WEST JORDAN, UT 84081

DWN. BY BS	JOB NO 01-0000-00	DWG. NO. 43	REV 0
CHKD BY CH			

8.19 Erection Drawing Requirements

a. Each erection (E) drawing shall contain the following information:

- Overall and bay dimensions at top, right, and left sides
- Design drawing reference
- Arrow showing project North
- Dimensions locating each piece
- Erection marks (as prominent as possible)
- Member size (as inconspicuous as possible)
- Elevation to top of steel with plus and minus dimensions for elevated or depressed members
- Shear lug locations shown in plan; typical diagram not allowed
- Beam camber by dimension under the member size (i.e., c=3/4)
- Asterisk suffix (*) to member size to identify A913-65 members (e.g., W14 x 730*)
- Section breaks and identification as shown on sequencing plans. Special erection information per SME Project Management instruction.
- Stair, elevator, and any other openings identified with “X” lines and an “OPEN” note at each location. For stairs and elevator openings, identify the stair and elevator (e.g., Stair 1, Elevator 12, etc.)
- Sections and call outs to identify and show special details and elevations
- Drawings with a floor split on two (2) or more sheets shall have a key plan with area shown on each sheet identified. Match lines shall be clearly designated.
- Any temporary framing members required for stability will be noted as “TEMP” by the use of the prefix “T” for the shipping mark (e.g., T1525, T2568, etc.). Consult SME for temporary steel that remains as a permanent part of structure.
- Areas with floor slabs thicker than 7 1/2” that require special handrail posts shall be identified on the plans. Consult SME for marking system.
- Show inside dimensions for all floor openings. This includes elevators, stairs, and any other floor penetrations.

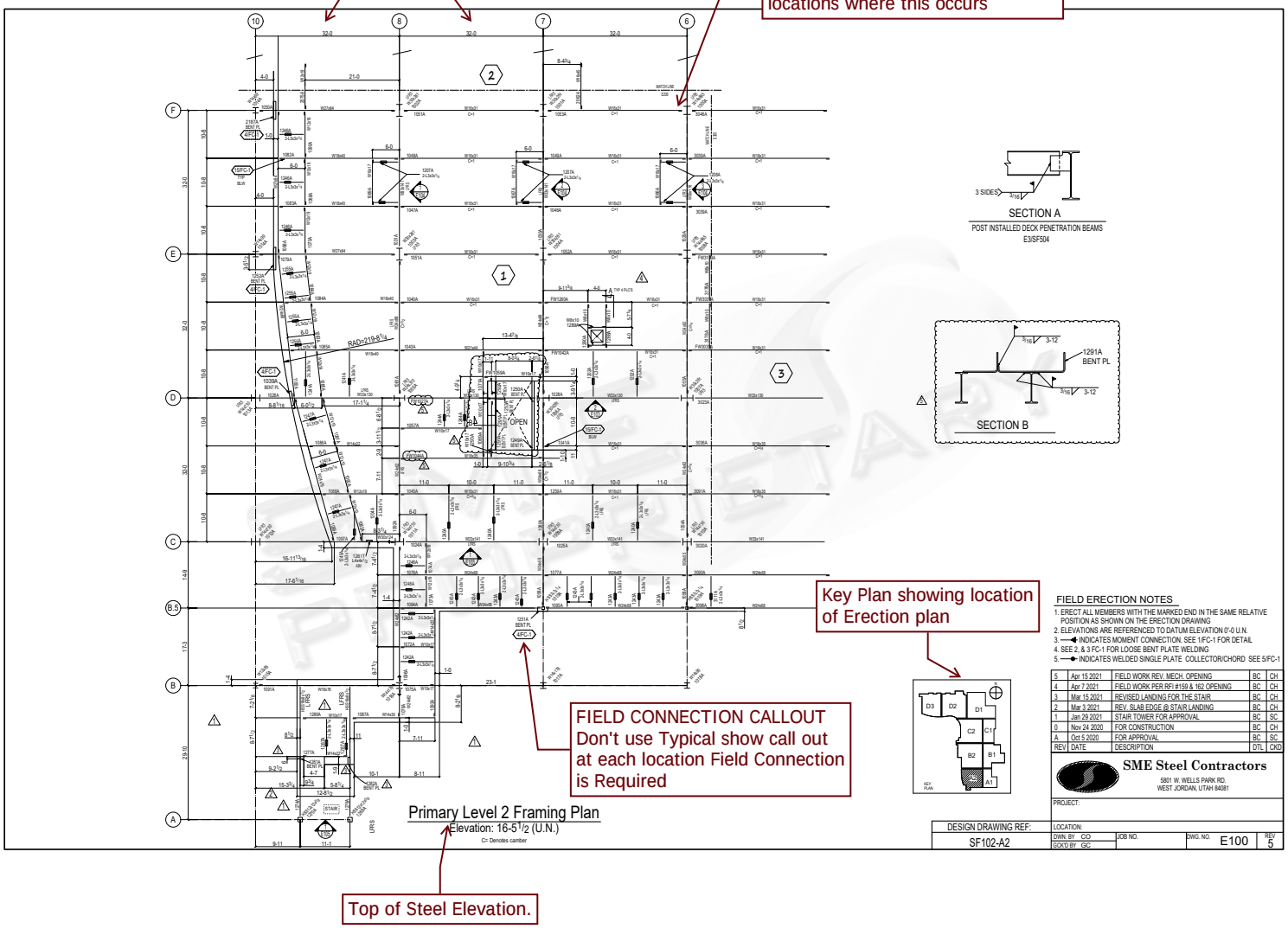
8.20 Erection Drawing Requirements - Continued

a. Each erection (E) drawing shall contain the following information:

- Wherever bracing, intermediate framing, or unusual configurations (for example stepped or sloping columns, etc.) occur in a building, an elevation view shall be provided. The following information is required for elevation views:
  1. Section cut on plan view
  2. Member size and piece mark on both plan and elevation (Include marks for loose gusset and connection pieces on the elevation view.)
  3. Dimensions and elevations

- Intermediate floors, mezzanines, and elevator machine framing shall be shown within the tier of the supporting columns. Attempt to show this framing on the floor erection drawing. If a separate drawing is required, draw dashed line around area and provide erection sheet information for partial plan view.
- Ends of beams with welded connections shall be indicated on the plan view by symbols and section cuts referencing “FC” field connection information.
- Penetration locations, special shop fittings, detailing setup dimensions, or other information of no use to the erector shall not appear on erection (E) drawings.
- Submit a sample check print of the erection (E) drawings for SME review.
- Cloud all missing information whenever the erection drawing is submitted to SME.
- Shear lugs are typically located away from the crane. However, shear lugs for all perimeter members and all column web plates at perimeter columns shall be located on the outside of the structure except where impossible due to interference. Coordinate this with SME.
- Consult with SME for critical shear lug orientations. Cross lugging is only permitted where required for erection clearance. Always check for adequate erection clearance when locating shear lugs or member connections. Common problems include closely spaced beams, stiffeners in the supporting member, skewed members, and other shop attachments such as curtain wall connections. Contact SME if clearance is not adequate to install the member.

8.21 Erection Drawing Example



8.22 Field Connection (FC) Drawings

a. Field Connection (FC) drawings are to be prepared at the beginning of the project as required to provide instruction for field assembly and welding. Include details of all field welded connections and other non-standard field connections per SME instructions. All non-standard field connections are to be cross-referenced on the erection (E) drawings and the FC drawings.

b. Include information for special weld requirements such as preheat, backing bar removal, run-off tab removal per the specific project requirements, and SME instructions.

c. Any connection utilizing temporary erection bolts or provided with open “pin-out” holes shall be shown on the FC drawings. Note such holes and bolts: “For erection purpose only”

d. Show temporary connections on the FC drawings and clearly show any connections that may remain or must be removed. If they must be removed, show whether they may be cut off close to the member or if they must be ground smooth.

e. Use current AWS weld symbols.

f. The FC drawings are to be submitted for approval in accordance with the detailing schedule.

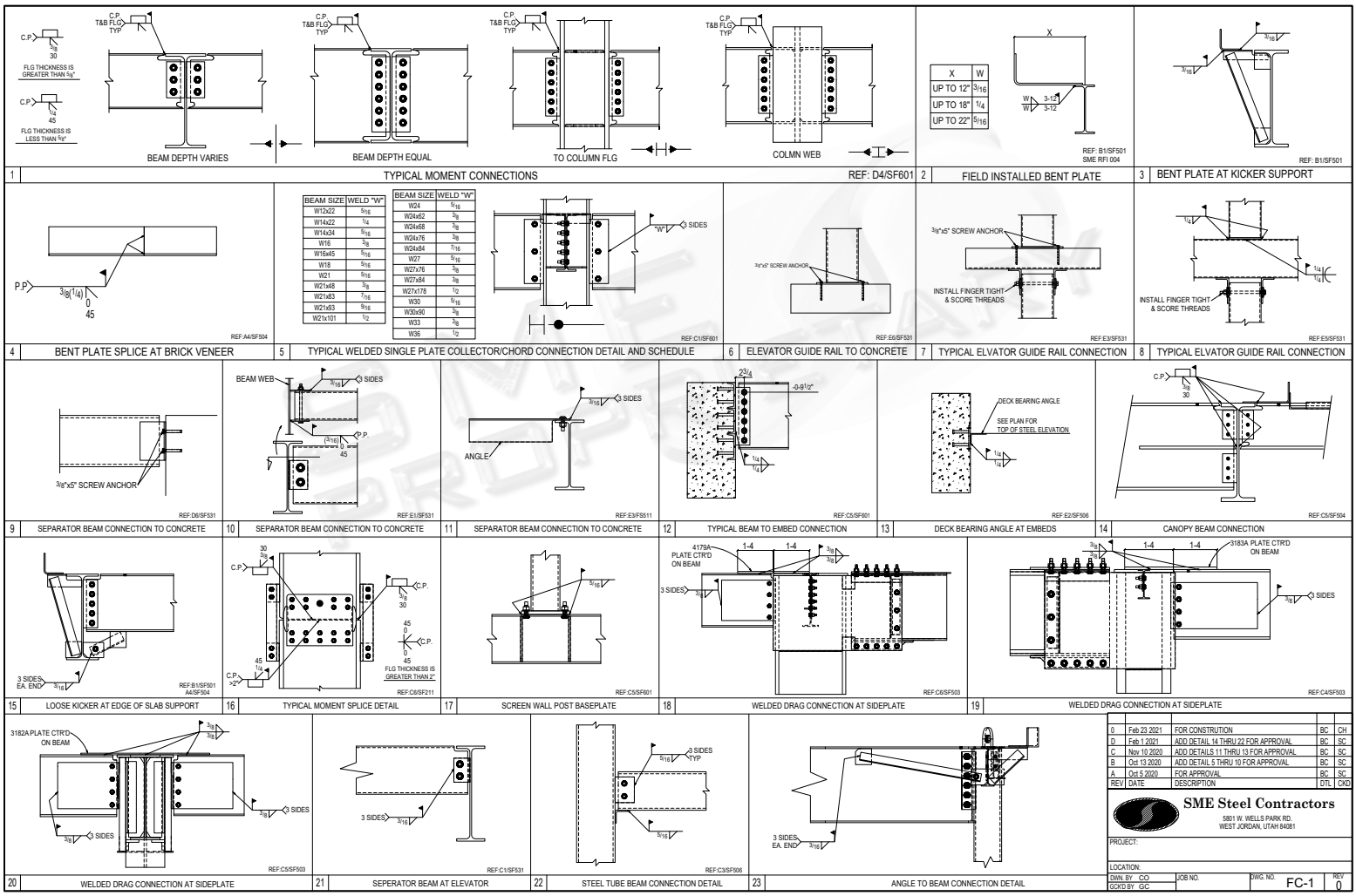
g. Each detail shown on the FC drawings should have the following references shown:

1. Erection drawing reference (where the detail occurs)
2. Design detail reference
3. SME RFI number reference, if design detail has been modified by an RFI

h. At **A913-65 to A913-65 column splices,** FC detail to be separate from standard column splice using E80XX wire. Note to be added at upper tier column and each location clearly identified on all plan and elevation views.

8.23 Field Connection Drawing Example

Note: The FC Drawing shown is just an example. Details will change for each project. Review in kickoff meeting as required.



8.24 Field Bolt (FB) Drawings

a. Each FB drawing shall contain the following information:

- FB drawings are developed by running a copy of the completed erection (E) drawing, changing the prefix from “E” to “FB”, and adding quantities in summary tables by level.

- Adequate information is to be placed on the drawing to inform the field crew of the following:

  Grade: A325, A490, etc.

  Type: X (threads excluded), N (bearing), SC (slip critical)

  Diameter, quantity, and length of bolt to use in each connection and installation requirements.

  Identify using a symbol for all SNUG TIGHT BOLT locations.

- Bolt symbols signifying diameter and length are to follow the SME standard. The top half of the symbol shall contain the quantity in each connection and the bottom half shall contain the bolt length.

- Bolts for column and post splices shall be shown on the FB drawing with the connected piece (typically the floor above). Bolts are to be shown on the detail drawing and billed with the connected member.

- FB drawings are generally not submitted for approval.

- FB drawings are to be submitted to SME in accordance with the detailing schedule and are needed as early as possible to allow ample time for purchasing, receiving, and lot-testing (if required) of field bolts.

- When submitting FB drawings, include a point to point bolt report.

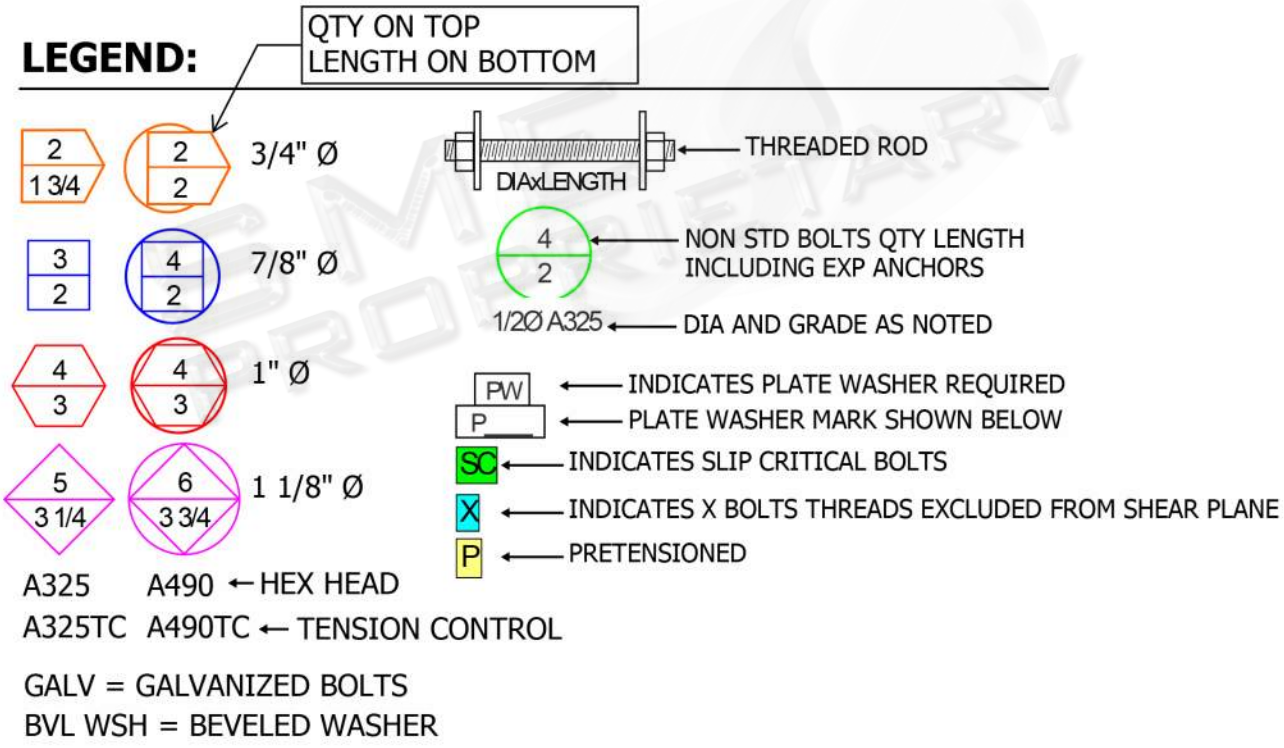
8.25 Field Bolt Standard Notes and Symbols

NOTE:

SME field preference is to snap all TC Bolts. Review job specific requirements during handover meeting from Project Management to detailer and confirm: all bolts to be pretensioned.

FIELD NOTES:

1. THIS DRAWING IS FOR FIELD BOLTS ONLY
2. SEE ERECTION DRAWINGS FOR ALL OTHER INFORMATION
3. PRETENSION ALL BOLTS UNLESS NOTED OTHERWISE
4. BOLTS TYPICAL EACH END U.N.O
5. ALL BOLTS WILL BE TENSION CONTROL UNLESS NOTED
6. ⬡ NEXT TO BOLT SYMBOL INDICATES HEX HEAD BOLT

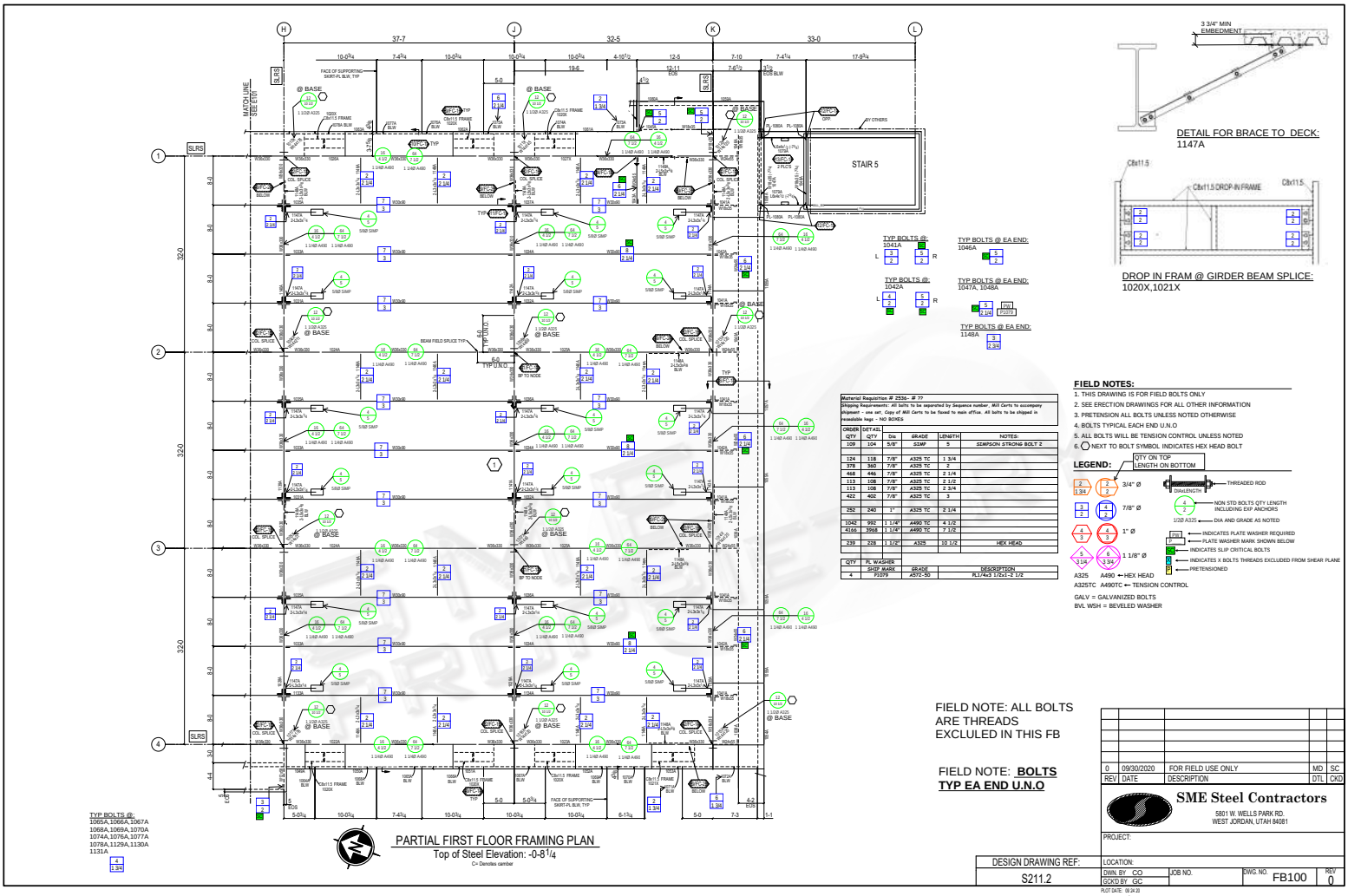


Identify bolts that aren't N (bearing). Example: X (threads excluded) or SC (slip critical)

Identify any special installation methods: snug, pretensioned, turn of the nut, DTI, etc.

Note: No A307 Bolts are allowed on any project per SME standards.

8.26 Field Bolt Drawing Example



SECTION 9 MATERIAL DESIGNATIONS ABBREVIATIONS AND SYMBOLS

9.1 Material Designations Abbreviations and Symbols Checklist

- ☐ Followed standard material designations on shop drawings
- ☐ All plate and angle grade A572-50
- ☐ Reviewed all standard and commonly used abbreviations; applied to shop and field drawings

9.2 Standard Material Designations

The following material designations, types, and material grades are to be used for identifying and listing in the Bill of Materials. (It is important to note that the type (see samples) must be written as listed for use and recognition by SME's data importing software.)

Material Description	Type	Grades	Sample Designation
Channels - American Std.	C	A572-50, A588	C8x11.5
Structural Tube: Square, Rectangular & Round	HSS	A500-B, A500-C, A1085	HSS6x4x.250 HSS8x8x.3125
Angle	L	A572-50, A588	L4x3 1/2x5/16, L4x4x3/8
M Shapes	M	A572-50, -42,-45,-55 & -65,A588	M10x8
Channels - Miscellaneous	MC	A572-50, A588	MC12X10.6
Pipe	PI	A106, A500-B, A53-A, A53-B, API5LL, TYPE316	PI 8STD/SCH40,SCH80 PI 8XS, PI 8XXS
Plate	P L	A36, A572-42-45, & -50, A588, A709-50, AR, S304, S316	PL3/8x6X1-3
S Shapes	S	A36, A572-50, A588	S12x50
Structural Tees (From S)	ST	A36, A572-50, A588	ST9x35
W Shapes	W	A36, A572-50, & -65, A588, A992	W14x22, W24X55
Structural Tees (From W)	WT	A36, A572-50, & -65, A588, A992	WT4x5, WT12x34

Material Description	Type Designation
Checkered Plate	CP
Flat Bar	FB
Flat Washer	FW
High Strength Bolt	HS
Machine Bolt	MB
Nut	NUT
Round Bar Stock	RB
Rebar	REB
Square Bar Stock	SQ
Wedge Anchor	HILTI, REDHEAD OR EPOXY
Welded Stud Anchor	WS
Threaded Stud	TWS (WITH THREADED IN REMARKS)
AR Plate	AR
Bent Plate	PL (WITH BENT NOTED IN REMARKS)
Miscellaneous	MI

9.3 Standard Abbreviations

Abbreviations	Meaning
AR	Anchor Rod
A.N.	As Noted
BE	Both Ends
B1E	Bevel One Edge
BC1E	Bevel Cut One End
FS	Far Side
GA	Gauge
GOL	Gauge Outstanding Leg
HFW	Hardened Flat Washer
HBW	Hardened Beveled Washer
LLBB	Long Legs Back to Back
LLH	Long Leg Horizontal
LLV	Long Leg Vertical
MAX	Maximum
MC1E	Miter Cut One End
MIN	Minimum
NS	Near Side
N&FS	Near and Far Side
NTS	Not To Scale
P1E	Prepare One End
SC1E	Square Cut One End
SLBB	Short Legs Back to Back
T1E	Thread One End
U.N.O	Unless Noted Otherwise

9.4 Commonly Used Abbreviations

Abbreviations	Meaning
CL	Center Line
CTR'D	Centered
DC	Demand Critical
ID	Inside Dimension
P/P	Point to Point
PZ	Protected Zone
R or RAD	Radius
RD	Running Dimension
SC	Slip Critical
T&B	Top and Bottom
TC	Tension Control
TYP	Typical
WP	Work Point
BG	Back Gouge
CJP	Complete Joint Penetration
CP	Complete Penetration
DCW	Demand Critical Weld
PJP	Partial Joint Penetration
PP	Partial Penetration

9.5 Standard Symbols Commentary

a. Detailer's are to use symbols that are standard to the design, detailing, and fabrication industries. This refers to symbols such as hole size, revision level, section or detail reference, round square, etc.

b. 3D modeling and detailing defaults utilized by SDS2 and TEKLA programs are generally acceptable.

c. If necessary on erection plans, a legend of symbols and definitions should be provided.

SECTION 10 SUBMITTING FOR APPROVAL

10.1 Submitting for Approval Checklist

- ☐ Correct drawing numbering used per detailing manual section 2
- ☐ All drawings have title block filled out accurately and include correct revision level
- ☐ Letter of transmittal contains all necessary information
- ☐ Folders labeled correctly with corresponding files
- ☐ Uploaded to ftp site provided by SME
- ☐ Notified all individuals required via email that transmittal has been posted for processing

10.2 Submittal Requirements for Approval

a. Detailer will prepare shop and field drawings with the correct numbering system detailed in Section 2.

b. Shop drawings will include phase codes and Advance Bill of Material identification per sections 3 and 4 of this manual.

c. Field drawings will have all FC call outs to indicate all field welding requirements or any other special field conditions that requires more detail for clarity.

d. Shop and field drawings will have the title block filled out accurately per section 5, including the correct alpha symbol for revision level (e.g., A, B, C, etc.)

e. Kiss and XML files for import

f. Erection drawings will have any item requiring input from approvers clouded with question if allowed by general contractor. Check with SME Project Management. if not allowed, detailer will need to generate an RFI.

10.3 Letter of Transmittal

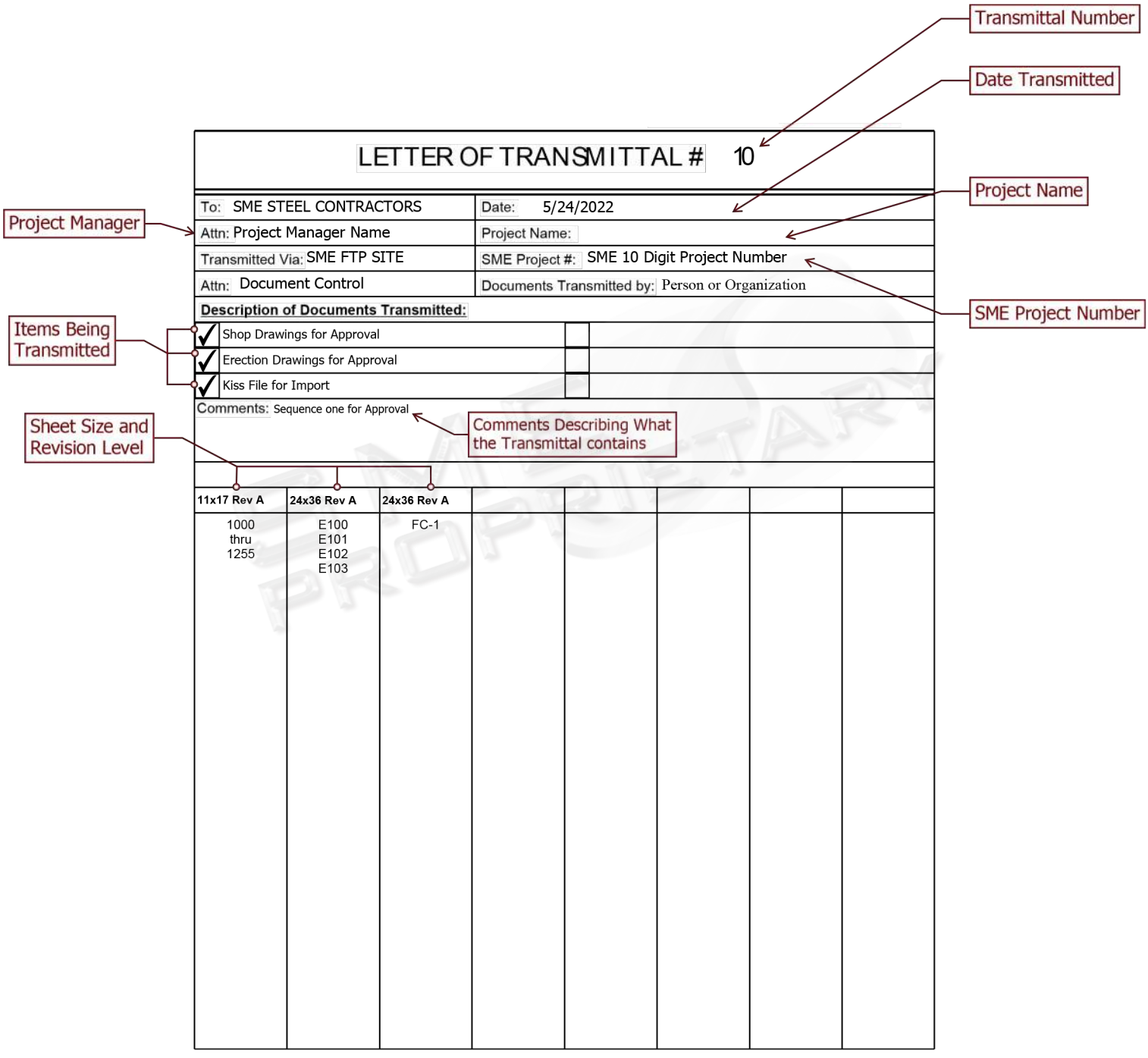
a. Drawing transmittal letters shall list the drawings being transmitted, drawing size, the latest revision of each, and the reason they are being transmitted (preliminary for approval, final for construction, etc.).

b. Drawing numbers shall be listed and grouped by sequence and in increasing numerical order.

c. Unless authorized otherwise by SME's Project Manager, drawing submittals to SME for approval must be complete by sequence.

10.4 Transmittal Example

Note: This is an example transmittal showing the required information to be included. Other layouts are acceptable as long as they include all requirements.



LETTER OF TRANSMITTAL # 10

To: SME STEEL CONTRACTORS	Date: 5/24/2022
Attn: Project Manager Name	Project Name:
Transmitted Via: SME FTP SITE	SME Project #: SME 10 Digit Project Number
Attn: Document Control	Documents Transmitted by: Person or Organization

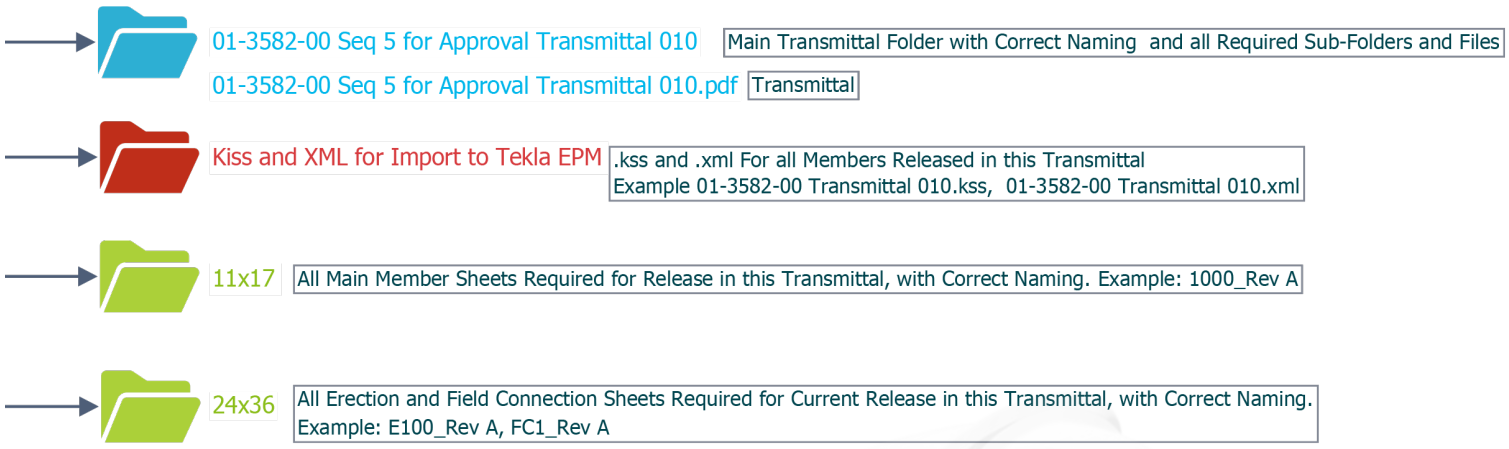
Description of Documents Transmitted:

- ☑ Shop Drawings for Approval ☐
- ☑ Erection Drawings for Approval ☐
- ☑ Kiss File for Import ☐

Comments: Sequence one for Approval

11x17 Rev A	24x36 Rev A	24x36 Rev A					
1000 thru 1255	E100 E101 E102 E103	FC-1					

10.5 Transmittal Folders and Sub-folders for Approval Submittals



10.6 Procedure to Transmit Files Electronically

a. Detailer will upload transmittal folder to ftp site to which detailer has been given access by SME.

b. Once files have been uploaded, detailer will email copy of transmittal to the Project Manager as well as all of the Individuals provided to detailer when project is turned over during handover meeting.

SECTION 11 SUBMITTING FOR FABRICATION

11.1 Submitting for Fabrication Checklist

- ☐ Correct drawing numbering used per detailing manual section 2.
- ☐ Shop drawings include correct phase codes.
- ☐ Field drawings identify all field conditions that require additional information with FC detail.
- ☐ Drawings have title block filled out accurately and include correct revision level.
- ☐ Kiss and XML files included for import.
- ☐ All part drawings required for fabrication included in transmittal.
- ☐ CNC provided in correct format for all main members as well as all sub-material.
- ☐ Letter of transmittal contains all necessary information.
- ☐ All folders labeled correctly with corresponding files.
- ☐ Notified all required individuals via email that transmittal has been posted for processing.
- ☐ If transmittal includes VOID drawings, they are identified and have void watermark within sheet.
- ☐ Sheet names include revision level (Example: 1001_Rev 0).

11.2 Submittal Requirements for Fabrication

a. Detailer will prepare shop and field drawings with the correct numbering system detailed in section 2.

b. Shop drawings will include phase codes and Advance Bill of Material identification per sections 3 and 4 of this manual.

c. Field drawings will have all FC call outs to indicate all field welding requirements or any other special field conditions that requires more detail for clarity.

d. Shop and field drawings will have title block filled out accurately per section 5 Including the correct numerical symbol for revision level (e.g., 0, 1, 2, etc.)

e. Kiss and XML files for import

f. Erection drawings for construction

g. All part drawings required for fabrication

h. CNC files for all main members and submaterial in .nc1, .dxf, and .xml format

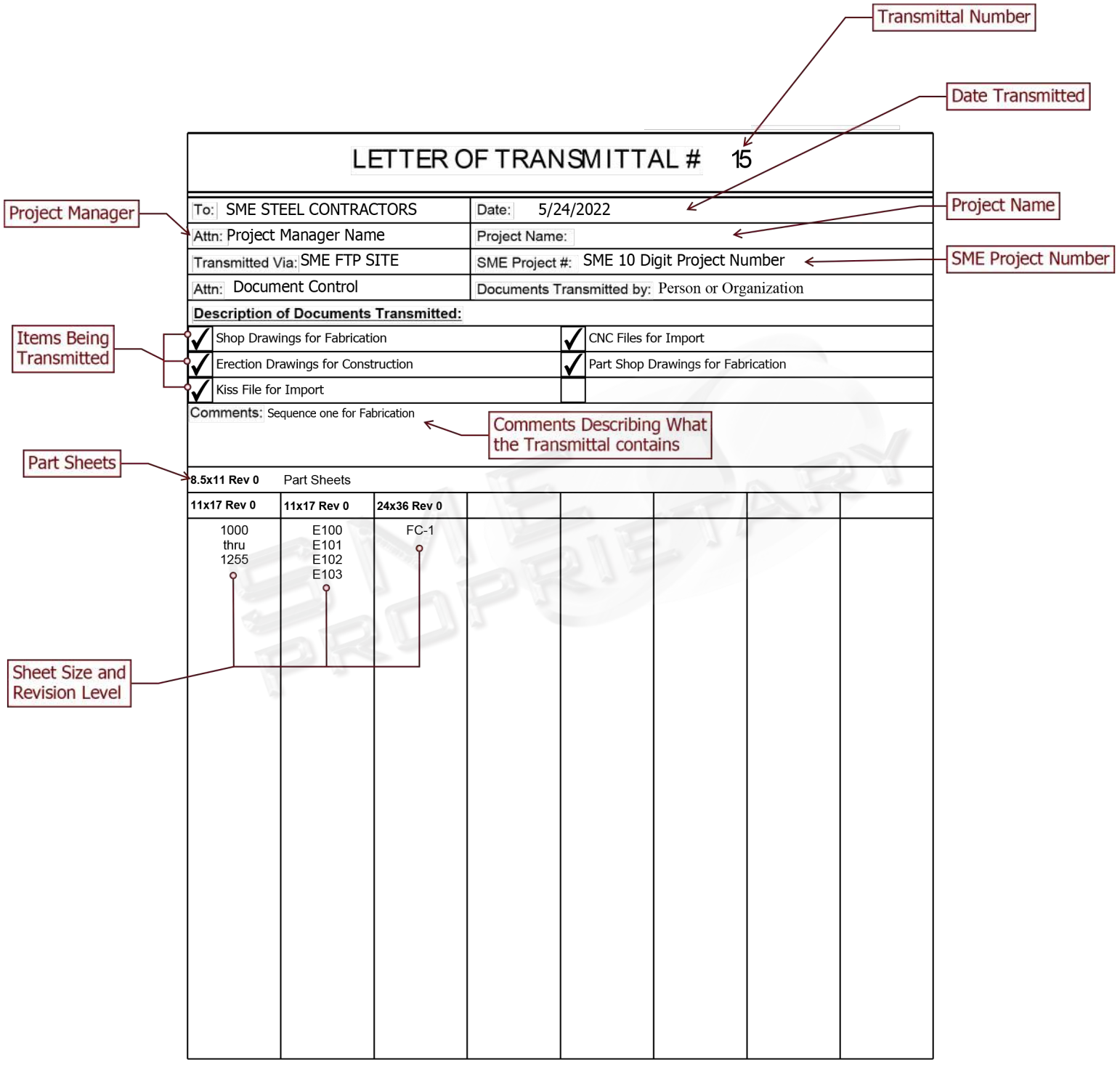
11.3 Letter of Transmittal

a. Drawing transmittal letters shall list the drawings being transmitted, drawing size, the latest revision of each, and the reason they are being transmitted (preliminary for approval, final for construction, etc.).

b. Drawing numbers shall be listed and grouped by sequence and in increasing numerical order. if transmittal is less than 100% completed, note the number of drawings outstanding.

c. Unless authorized otherwise by SME's Project Manager, drawing submittals to SME for construction must be complete by sequence and completely checked.

11.4 Transmittal Example



LETTER OF TRANSMITTAL # 15

To: SME STEEL CONTRACTORS	Date: 5/24/2022
Attn: Project Manager Name	Project Name:
Transmitted Via: SME FTP SITE	SME Project #: SME 10 Digit Project Number
Attn: Document Control	Documents Transmitted by: Person or Organization

Description of Documents Transmitted:

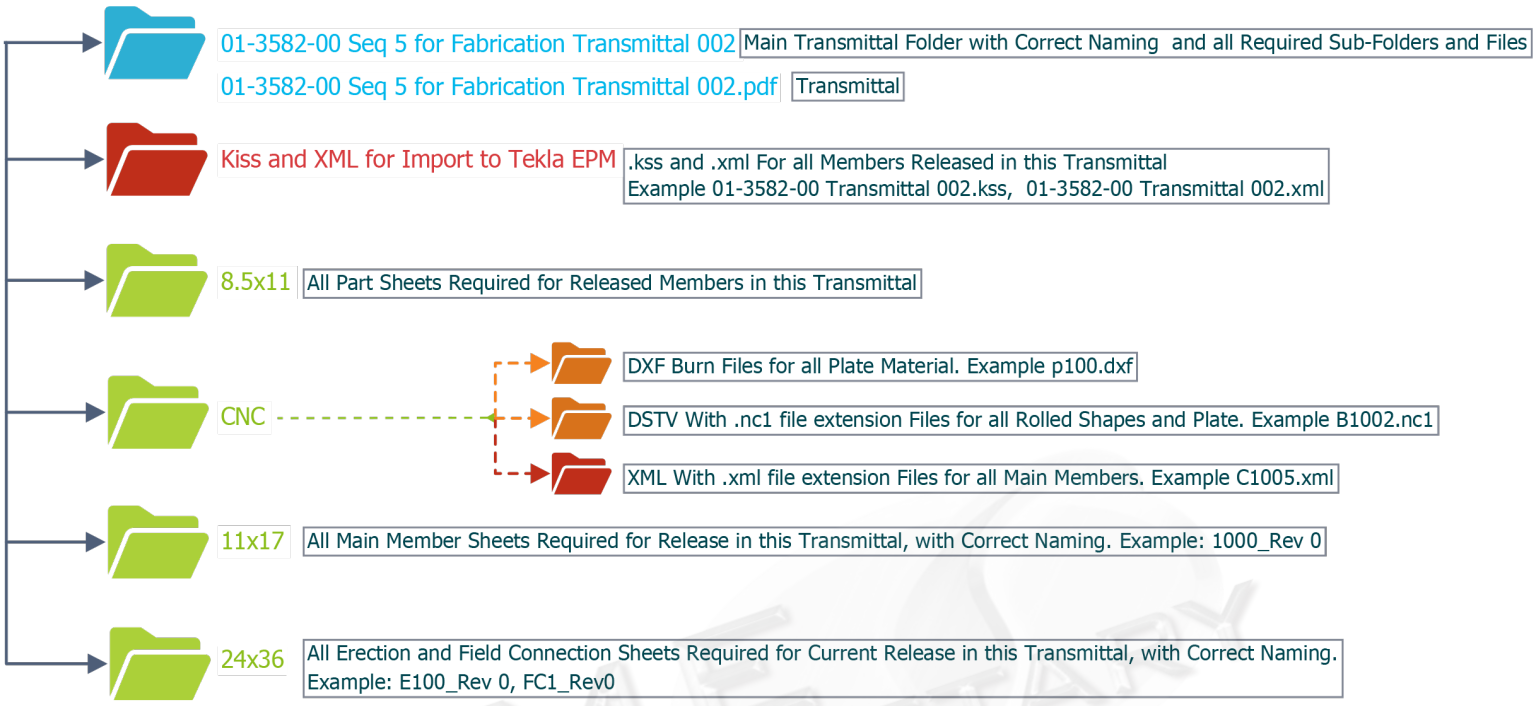
✓ Shop Drawings for Fabrication	✓ CNC Files for Import
✓ Erection Drawings for Construction	✓ Part Shop Drawings for Fabrication
✓ Kiss File for Import	

Comments: Sequence one for Fabrication

8.5x11 Rev 0 Part Sheets

11x17 Rev 0	11x17 Rev 0	24x36 Rev 0					
1000 thru 1255	E100 E101 E102 E103	FC-1					

11.5 Transmittal Folders and Sub-folders for Fabrication



11.6 New Shipping Mark Requirements

If required to revise a member that has previously been released for fabrication due to design revisions, detailing error, etc., and fabrication is complete, detailer must assign member a new shipping mark if any of the following apply:

1. Member changed size
2. Member length increased

(Provide Project Management with exact conditions and they will provide final direction.)

11.7 Revisions to Frames or Multi-Member Assemblies

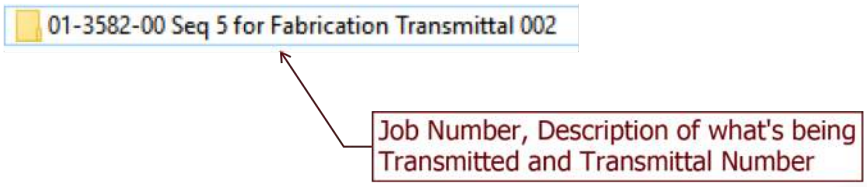
When providing the shop with revised drawings for any sub member to a frame, detailer must always change the revision level on the main member sheet that carries the Bill of Material.

11.8 Procedure to Transmit Files Electronically

a. Detailer will upload transmittal folder to ftp site to which detailer has been given access by SME.

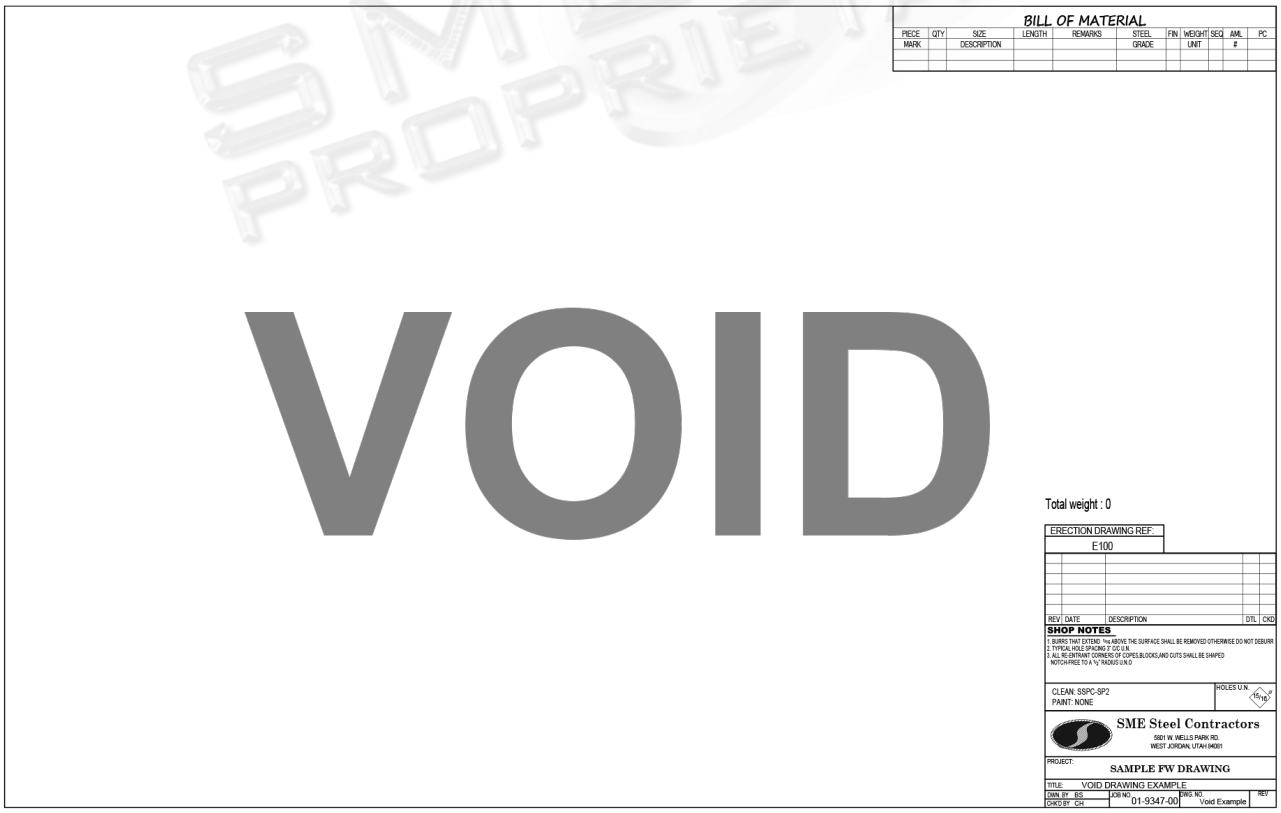
b. Once files have been uploaded, detailer will email copy of transmittal to the Project Manager as well as all of the Individuals provided to detailer when the project is turned over during handover meeting.

Note: Folder uploaded to ftp site must follow the labeling format below:



11.9 Void Drawings with Watermark

When submitting void drawings to SME, use correct naming. Example: 1025_Void and include void watermark on drawing.



SME STEEL CONTRACTORS

SECTION 12 SHOP AND FIELD WELDING

12.1 Field and Shop Welding Checklist

- ☐ Reviewed SME shop and field welding at kickoff meeting and applied requirements as directed.
- ☐ Used all elements required for welding symbols.
- ☐ Reviewed and applied all Field CJP and PJP requirements at weld joints.
- ☐ Identified all locations that require welding A913-65 to A913-65 material.
- ☐ Reviewed and applied all shop CJP and PJP requirements at weld joints.
- ☐ Provided direction for backing bar removal, reinforcing fillet if required, etc.
- ☐ Noted all demand critical welds.
- ☐ Reviewed and understand web doubler thickness and welding requirements.
- ☐ Reviewed current project and have applied the correct weld access hole information by code.

12.2 Shop and Field Welding Requirements

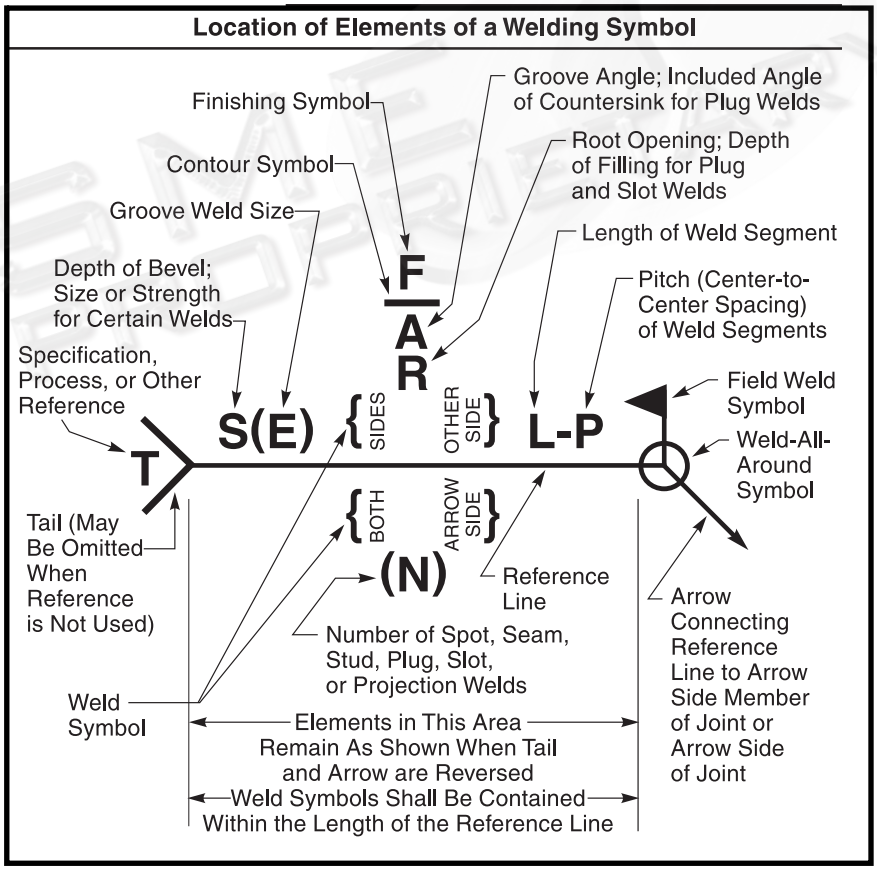
a. SME Requires detailer to use prequalified or qualified welds, unless given direction from SME to deviate from this requirement.

b. At the beginning of each project, SME requires Shop, Field, and Quality Control Departments to review project welding requirements if they find any conditions where they would like a specific weld. These locations will be identified and the detailer shall incorporate the details presented to them at the kickoff meeting and before the start of detailing the project.

c. Review Field and Shop welding section for the most cost effective weld preps.

12.3 Assignment of Complete Welding Symbols

a. Detailer is required to ensure all elements of a welding symbol are correct.



12.4 SME FIELD CJP Weld Joints at Column Splices

a. Field CJP is required at wide flange, applies to flanges and web.
"tf" <= 1 1/2" : 3/8" root, 30° degree single bevel prep with metal backing

Note: Work with section 12.9 for conditions with and without shims.

Work with section 12.10 for special condition when Field requests "0" root opening and land.

"tf" >= 1 1/2" : 0 root, 1/4" land with 1/3 - 2/3 double bevel

(1/3 portion to be at inside face of flange with 45° bevel)

(2/3 portion to be at outer face of flange with 34° bevel) CJP-BG

Note: Work with section 12.11 for example

b. Field CJP is required at square, rectangular, or round HSS.
Wall "t" = unlimited: 1/4" root, 45° single bevel prep with metal backing

Note: Work with section 12.13 for example and additional information.

12.5 SME FIELD CJP MOMENT GIRDER FLANGES, OTHER BEAM/GIRDER SPLICES

a. Where field CJP is required, applies to flanges ONLY. Flat and horizontal welds up to 2" use 3/8" root opening with 30° single bevel prep with metal backing. Preps over 2" to be discussed at kickoff meeting.

Note: 0 root 30 degree bevel if backing is required to be removed. Review with Project Manager for final direction before using.

12.6 SME FIELD CJP MOMENT GIRDER WEBS, OTHER BEAM/GIRDER SPLICES

a. Where field CJP is required, applies to webs ONLY. Vertical and overhead welds up to 2" use 1/4" root opening with 45° single bevel prep with metal backing. Preps over 2" to be discussed at kickoff meeting.

12.7 SME FIELD HSS or Pipe CJP Welds

a. For HSS CJP splices, use 1/4” root 45 degree single bevel with metal backing all around regardless of thickness.

12.8 SME FIELD Other CJP Welds

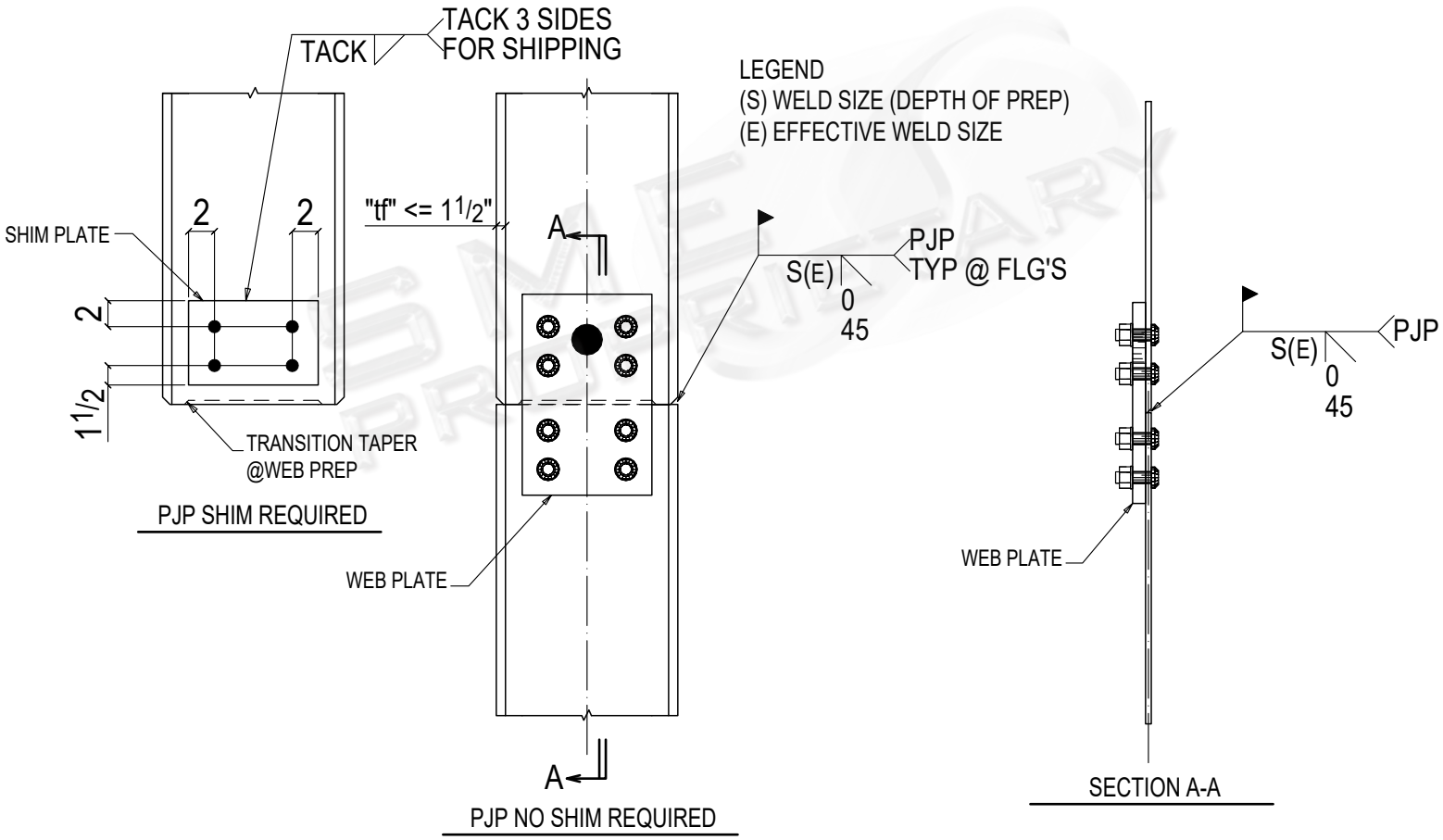
a. Generally, follow the SME field weld joints as outlined above for similar thicknesses and weld positions indicated. Ask questions; do not assume.

12.9 TYPICAL SME Field PJP WIDE FLANGE COLUMN SPLICE

a. Detail to be followed unless given other direction during project handover to detailing.

b. Work with section 13 for all other information: lifting lugs, erection ears, and any other safety items that might be required.

c. Any conditions where “tf” > than 1 1/2”, notify Project Management and get final direction after review with stability engineer.

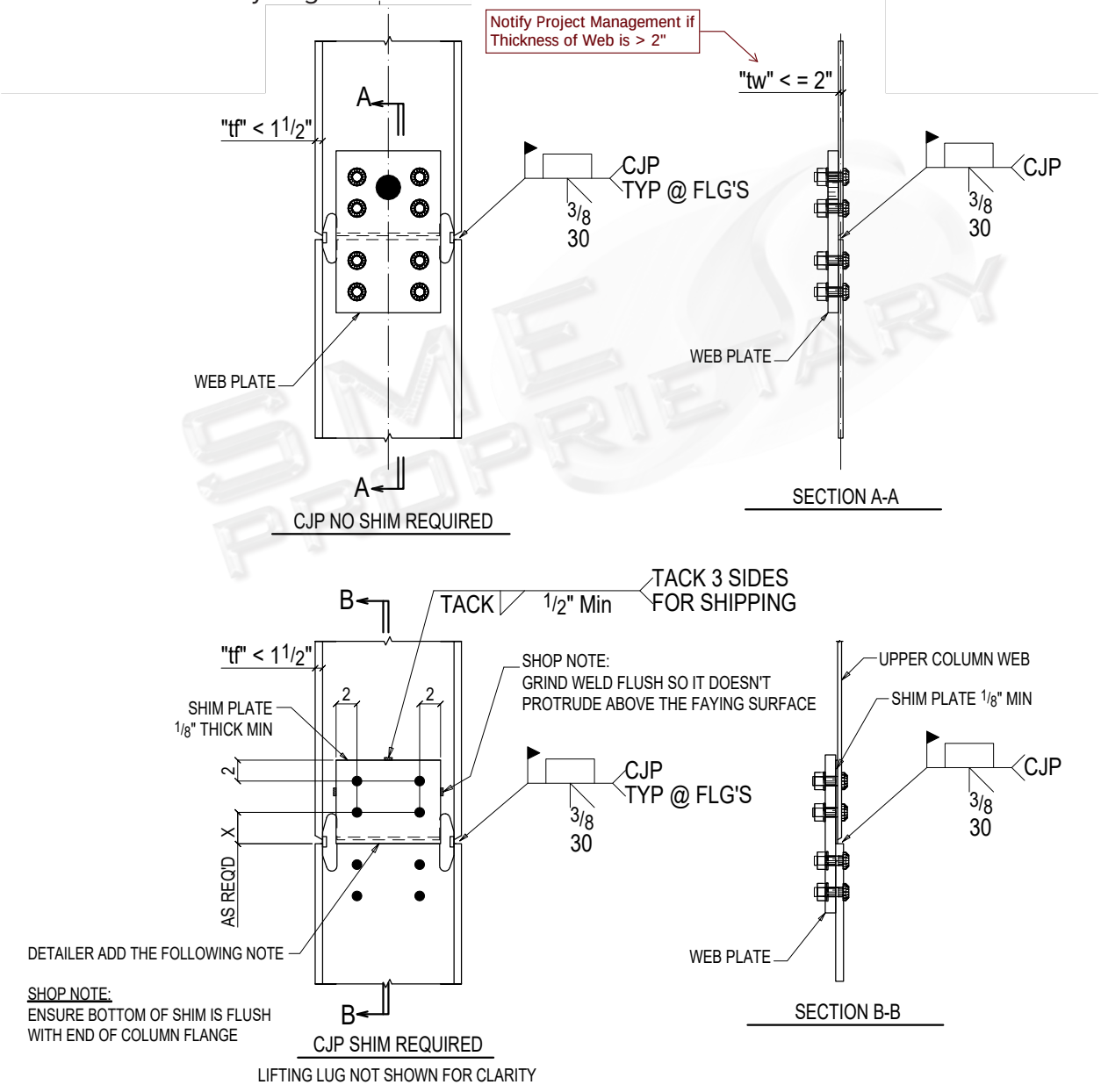


12.10 TYPICAL SME FIELD CJP WIDE FLANGE COLUMN SPLICE “tf” < 1 1/2” NO LAND

a. Detail to be followed unless given other direction during project handover to detailing.

b. Work with section 13 for all other information: lifting lugs, erection ears, and any other safety items that might be required.

c. Any conditions where “tw” Exceeds 2”, notify Project Management and get final direction after review with stability engineer.

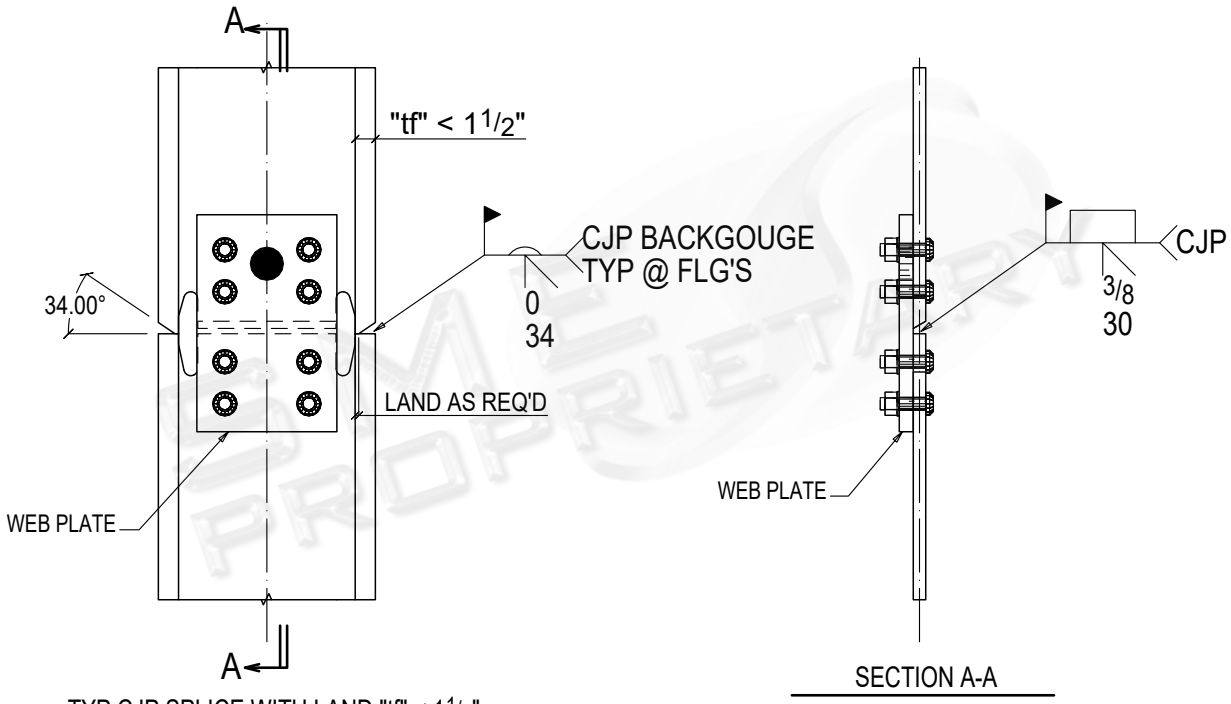


12.11 TYPICAL SME FIELD CJP WIDE FLANGE COLUMN SPLICE WITH LAND "tf" < 1 1/2"

a. Detail to be followed unless given other direction during project handover to detailing.

b. Work with section 13 for all other information: lifting lugs, erection ears, and any other safety items that might be required.

c. This detail only to be used if given direction from SME and erection engineer.



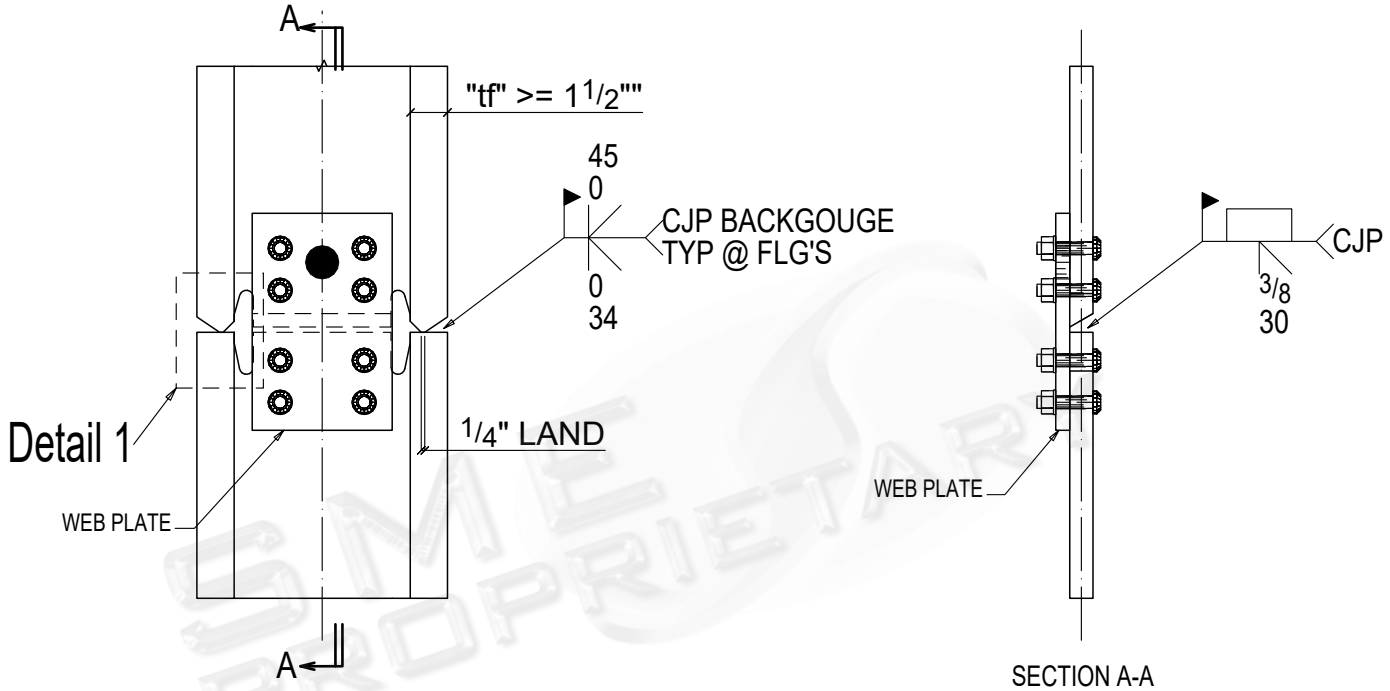
TYP CJP SPLICE WITH LAND "tf" < 1 1/2"

NOTE:
IF LAND IS REQUIRED SIZE WILL
BE DETERMINED BY ERECTION ENGINEER
AND PROVIDED TO DETAILER BY PROJECT MANAGEMENT

12.12 TYPICAL SME FIELD CJP WIDE FLANGE COLUMN SPLICE WITH LAND "tf" > = 1 1/2"

a. Detail to be followed ONLY if project requires it. Direction will be given to detailer during project handover to detailing.

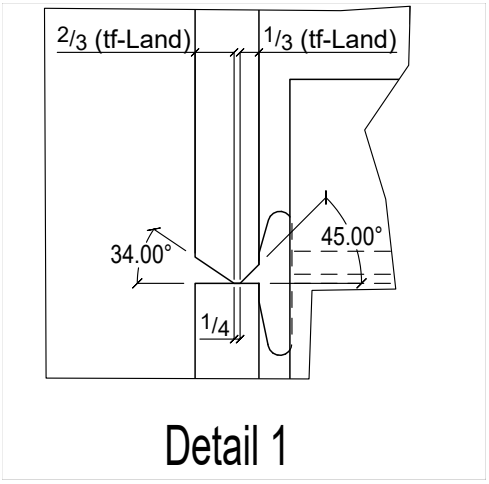
b. Work with section 13 for all other information: lifting lugs, erection ears, and any other safety items that might be required.



TYP CJP SPLICE WITH LAND "tf" >= 1 1/2"

SECTION A-A

NOTE:
1/4" LAND UNLESS DIRECTED OTHERWISE BY PROJECT MANAGEMENT

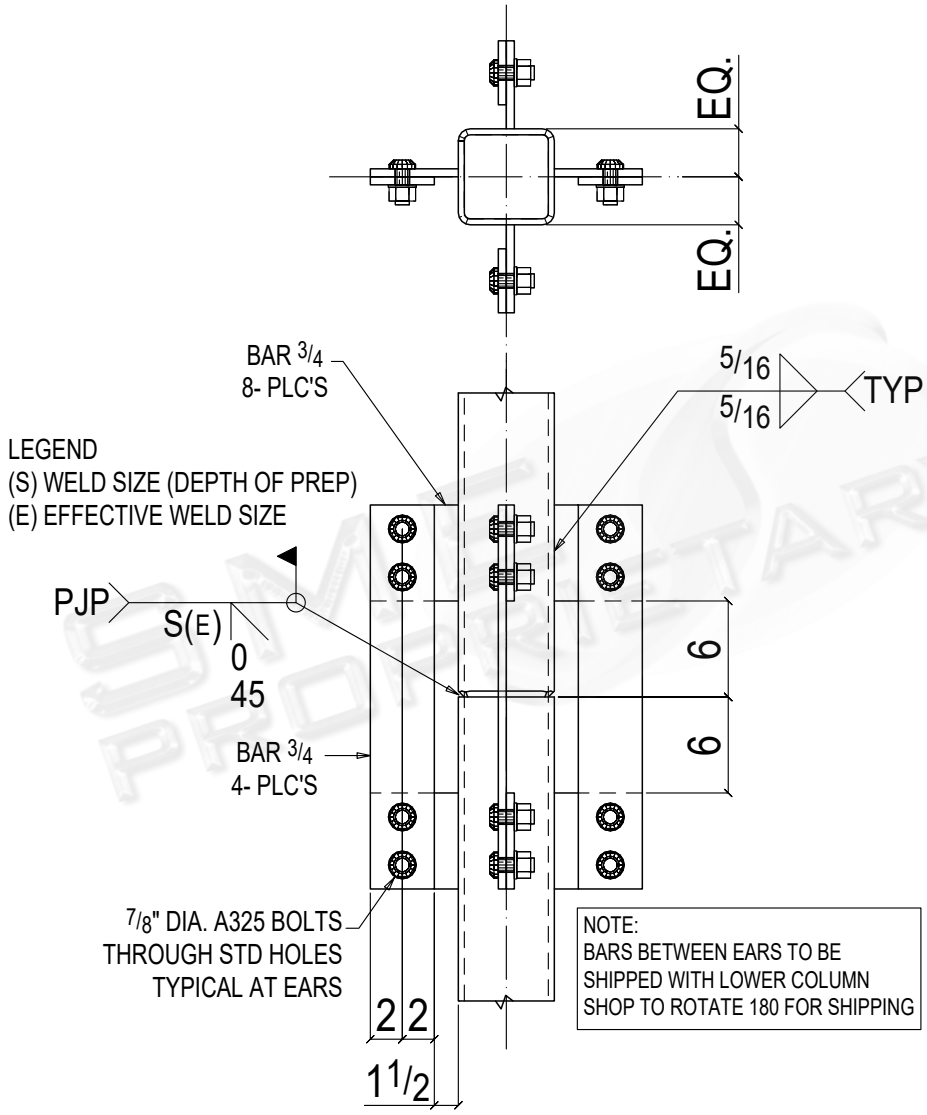


Detail 1

12.13 TYPICAL SME FIELD PJP HSS COLUMN SPLICE

a. Detail shows typical bar sizes and welding to be followed ONLY if approved by stability engineer. Project Management to have reviewed and give final direction to detailer.

b. Work with section 13 for all other information: lifting lugs, cable washers, and any other safety items that might be required.



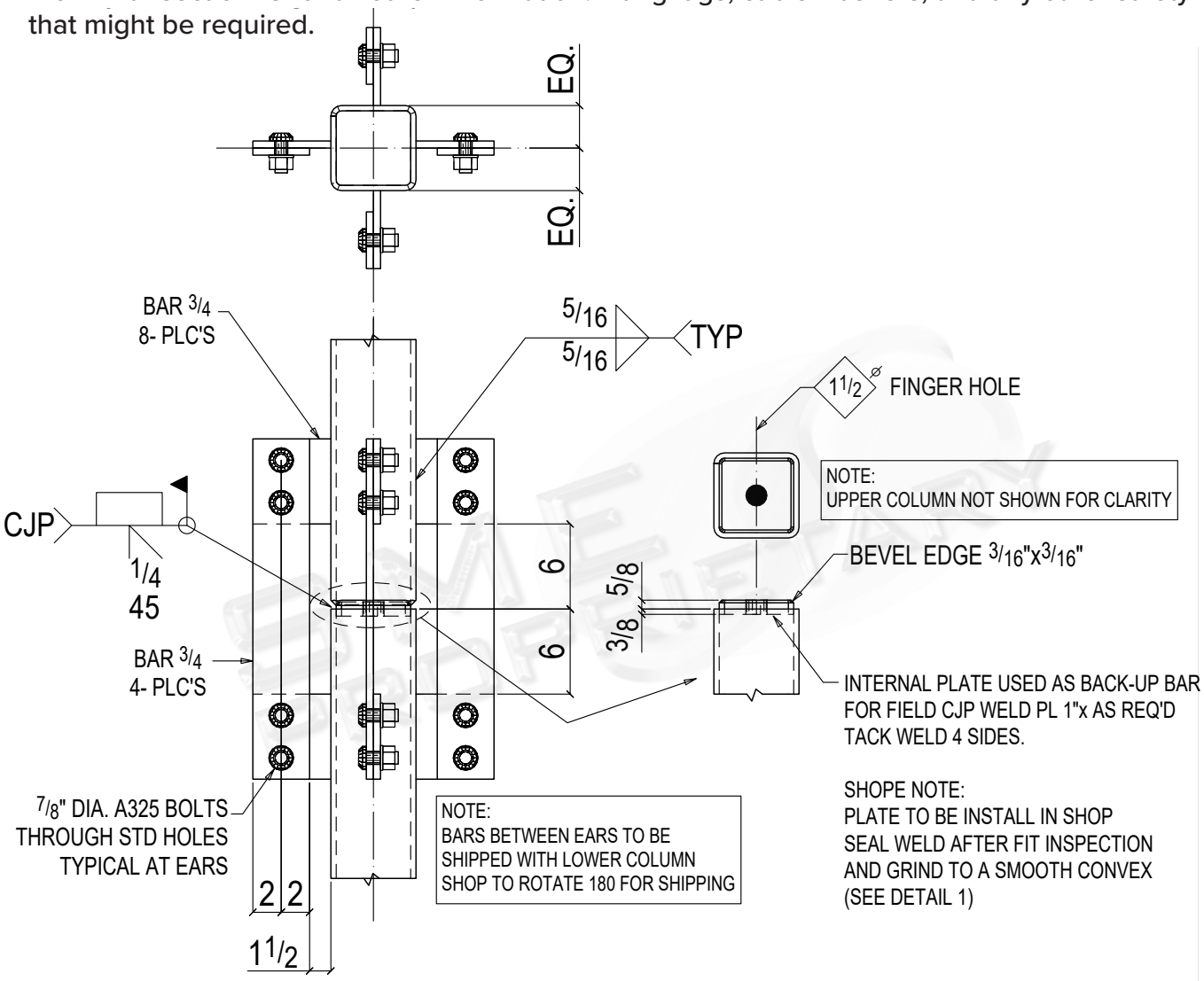
TYP HSS PJP SPLICE

NOTE:
REFER TO THE DESIGN DOCUMENTS FOR PJP PREP INFORMATION. THE MAXIMUM DEPTH OF A PARTIAL JOINT PENETRATION WELD IS: THICKNESS OF MATERIAL MINUS 1/8"

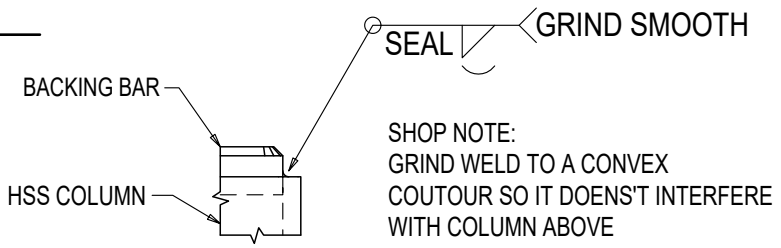
12.14 TYPICAL SME FIELD CJP HSS COLUMN SPLICE

a. Detail shows typical bar sizes and welding to be followed ONLY if approved by stability engineer. Project Management to have reviewed and give final direction to detailer.

Work with section 13 for all other information: lifting lugs, cable washers, and any other safety items that might be required.



TYP HSS CJP SPLICE

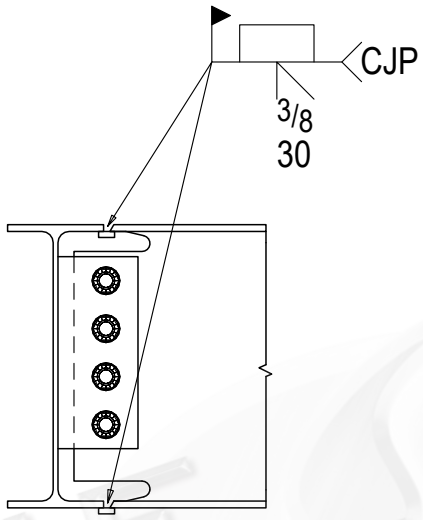


DETAIL 1

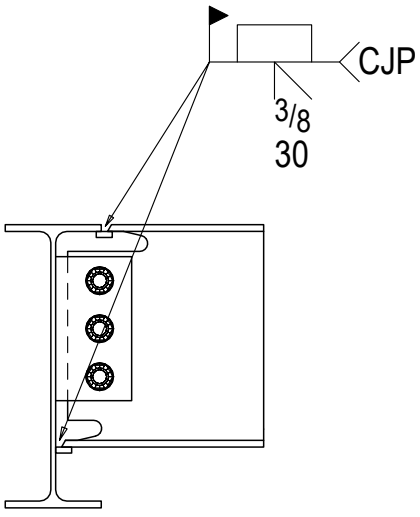
12.15 TYPICAL SME FIELD BEAM TO BEAM CJP FIELD WELD

a. Flat and horizontal welds up to 2” use 3/8” root opening with 30° single bevel prep with metal backing. Preps over 2” to be discussed at kickoff meeting.

b. Vertical and overhead welds up to 2” use 1/4” root opening with 45° single bevel prep with metal backing. Preps over 2” to be discussed at kickoff meeting.



TYP CJP BEAM TO BEAM EQUAL DEPTHS

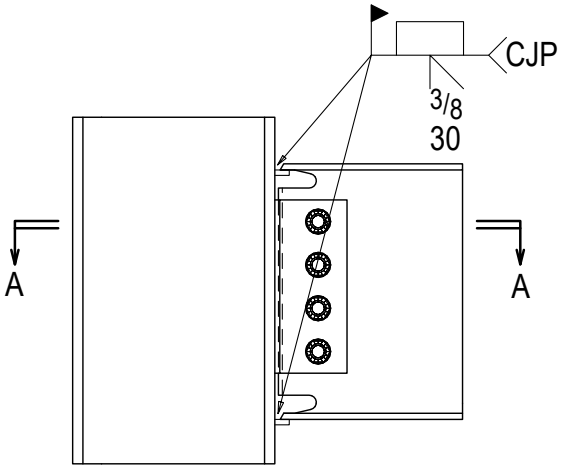


TYP CJP BEAM TO BEAM UNEQUAL DEPTHS

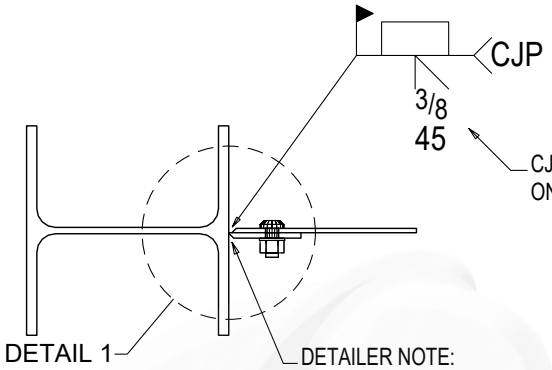
12.16 TYPICAL SME FIELD BEAM TO COLUMN CJP FIELD WELD

a. Flat and horizontal welds up to 2” use 3/8” root opening with 30° single bevel prep with metal backing. Preps over 2” to be discussed at kickoff meeting.

b. Vertical and overhead welds up to 2” use 3/8” root opening with 45° single bevel prep with metal backing. Preps over 2” to be discussed at kickoff meeting.



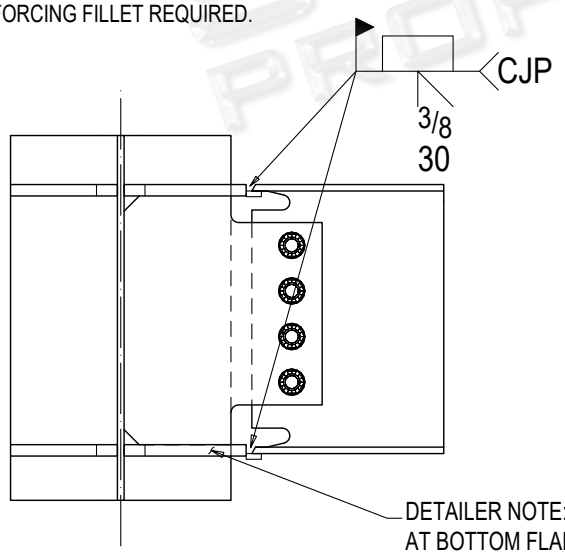
TYP CJP BEAM TO COLUMN FLANGE

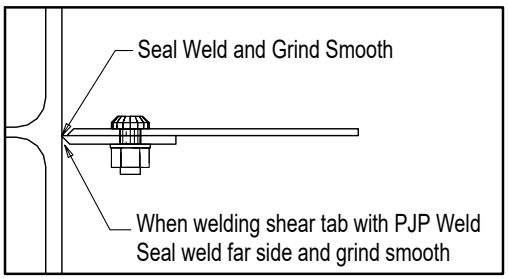


Section A-A

DETAILER NOTE:
IF CJP IS REQUIRED AT WEB MAKE SURE SHEAR PLATE IS SHOP WELDED FROM ONE SIDE WITH A PJP WELD TO LEAVE ROOT OPENING FOR WELD OF BEAM WEB CLEAR. IF DESIGN DOES REQUIRE WELDS BOTH SIDES WE WOULD NEED TO PJP FAR SIDE AND GRIND FLUSH WITH A FILLET WELD N/S
SEE DETAIL 1 FOR SPECIAL SHOP DIRECTION AT PJP WELD

NOTE: AT SLRS MEMBERS GIVE DIRECTION ON THE FOLLOWING
1. IDENTIFY BACKING THAT NEEDS TO BE REMOVED OR LEFT IN PLACE
2. DIRECTION FOR REINFORCING FILLET IF REQUIRED AT STEEL BACKING LEFT IN PLACE
3. DIRECTION FOR LOCATIONS WHERE BACKING IS REMOVED AND BACKGOUGE AND REINFORCING FILLET REQUIRED.





DETAIL 1

DETAILER NOTE:
AT BOTTOM FLANGE CJP WELDS, INCREASE CONTINUITY PLATE THICKNESS TO "tf" + 1/4".
DETAIL PLATE TO BE CENTERED ON BOTTOM FLANGE.

TYP CJP BEAM TO COLUMN WEB

NOTE:
SEE TYPICAL NOTE FOR BACKING REQUIREMENTS

12.17 SME Shop CJP Wide Flange Splices with Backing

a. Shop CJP required at wide flange, applies to flanges and web.
"tf" < 1 1/2" : 1/4" root, 30° single bevel prep with metal backing

Note: Work with section 12.19 for example.

b. Shop CJP required at square, rectangular, or round HSS.
Wall "t" = Unlimited : 1/4" root, 45° single bevel prep with metal backing

Note: Work with section 12.22 for example and additional information.

Shop prefers to use backing bars at shop CJP welds as long as removal is not required.

This needs to be reviewed at kickoff meeting and detailer given final direction.

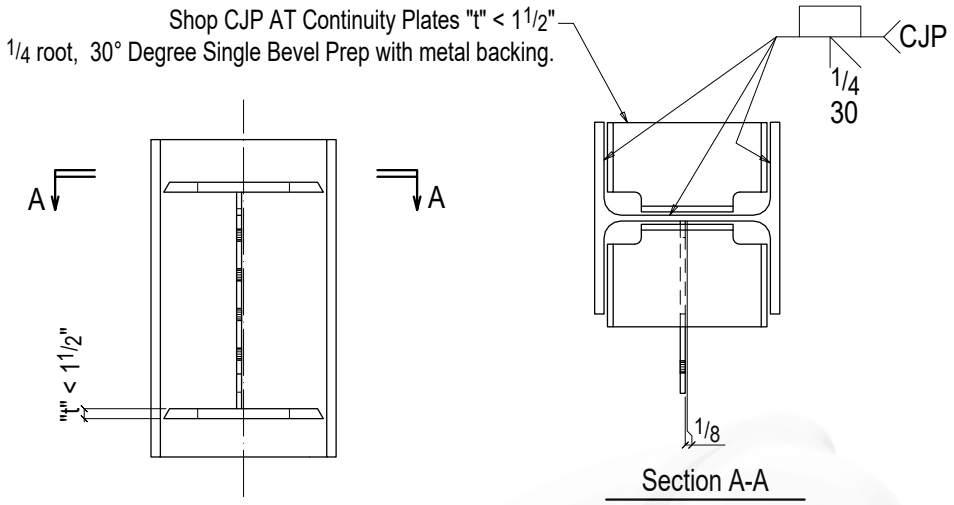
12.18 SME Shop CJP Wide Flange Splice without Backing

a. "tf" >= 1 1/2" : 0 root, 0" land with 1/3 - 2/3 double bevel applies to flanges only
(1/3 portion to be at inside face of flange with 40° bevel)
(2/3 portion to be at outer face of flange with 40° bevel) CJP-BG

Note: Work with section 12.20 for example.

12.19 TYPICAL SME SHOP CONTINUITY PLATE CJP SHOP WELD

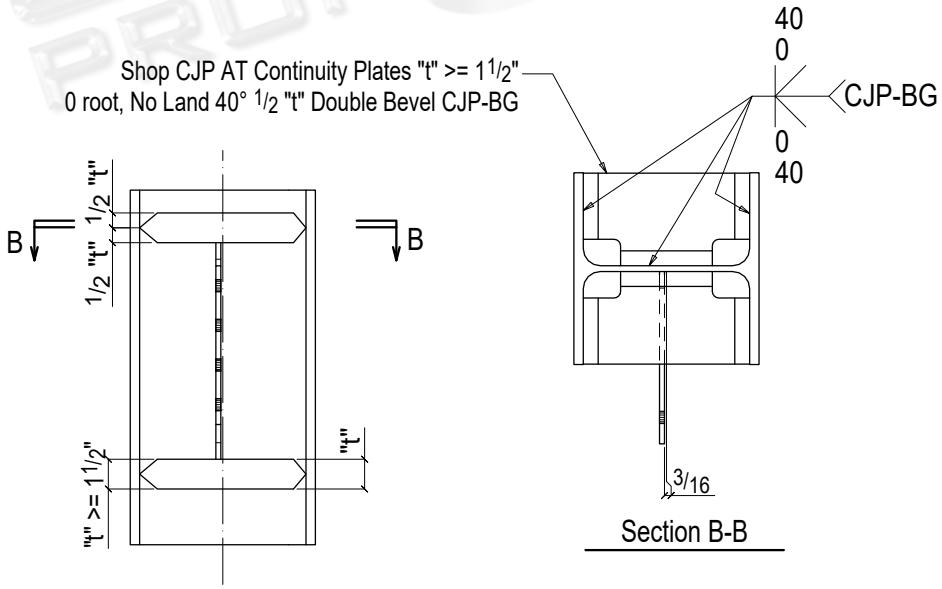
a. Plate thickness < 1 1/2” 1/4” root opening with 30° single bevel prep with metal backing.



TYP CJP AT CONTINUITY PLATES WITH BACKING

SHOP PREFERS TO USE BACKING BARS AT CJP WELDS
AS LONG AS REMOVAL IS NOT REQUIRED.
IF REMOVAL IS REQUIRED WELD WITH 0" ROOT NO LAND 30° SINGLE BEVEL PREP CJP-BG
REVIEW WITH SHOP AT KICKOFF MEETING FOR FINAL DIRECTION

b. Plate thickness >= 1 1/2” 0” Root No Land 40° Double Bevel Prep CJP-BG

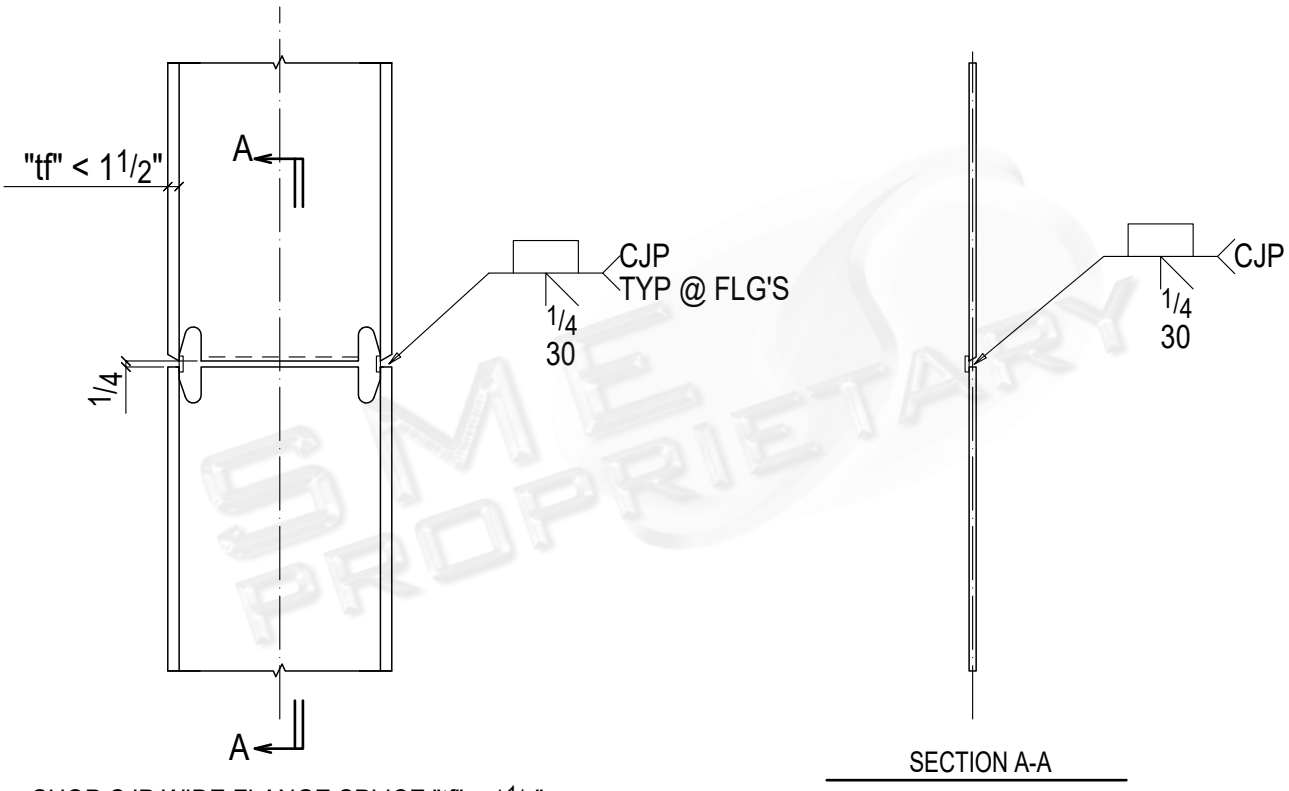


TYP CJP AT CONTINUITY PLATES WITHOUT BACKING

SHOP PREFERS TO USE BACKING BARS AT CJP WELDS
AS LONG AS REMOVAL IS NOT REQUIRED, IF REMOVAL IS REQUIRED
REVIEW WITH SHOP AT KICKOFF MEETING FOR FINAL DIRECTION

12.20 TYPICAL SME SHOP CJP WIDE FLANGE SPLICE “tf” < 1 1/2”

a. Detail to be followed unless given other direction during project handover to detailing. Plate thickness >= 1 1/2” 0” root no land 40° double bevel prep CJP-BG

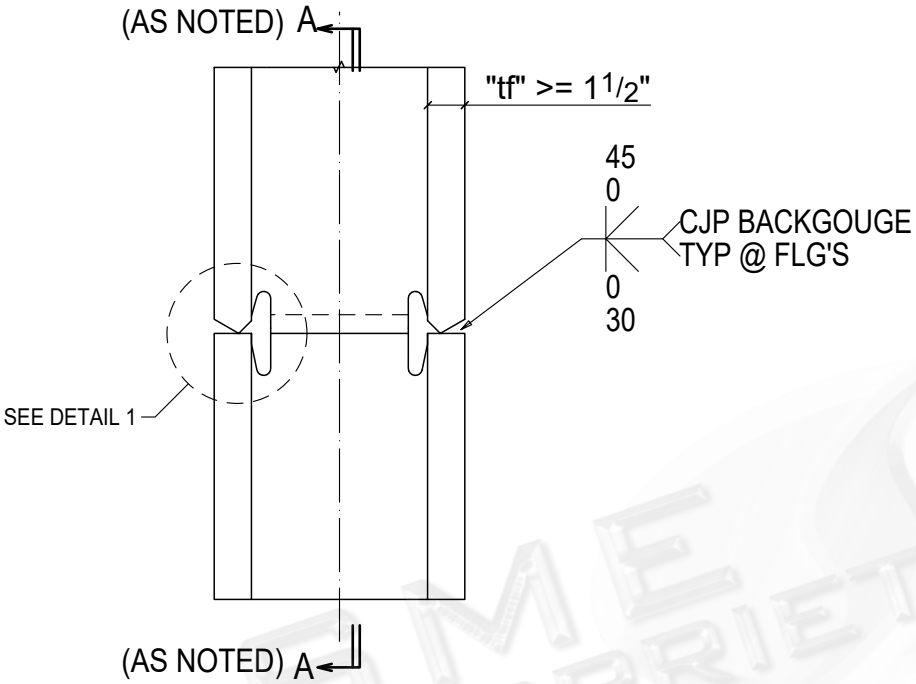


SHOP CJP WIDE FLANGE SPLICE "tf" < 1 1/2"

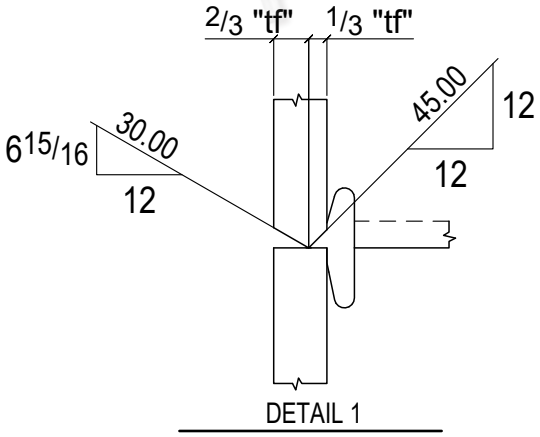
SECTION A-A

12.21 TYPICAL SME SHOP CJP WIDE FLANGE SPLICE “tf” >= 1 1/2”

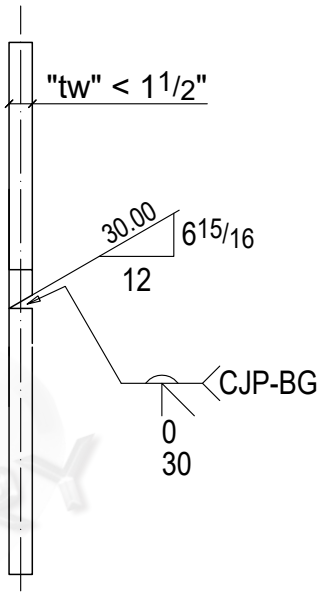
a. Detail to be followed unless given other direction during project handover to detailing.



SHOP CJP WIDE FLANGE SPLICE "tf" >= 1 1/2"

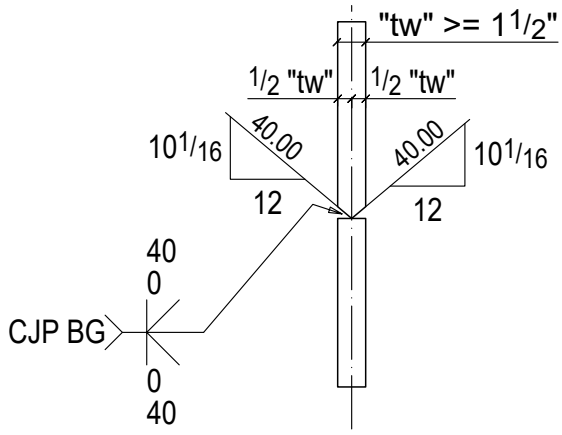


DETAIL 1



SECTION A-A

"tw" < 1 1/2"

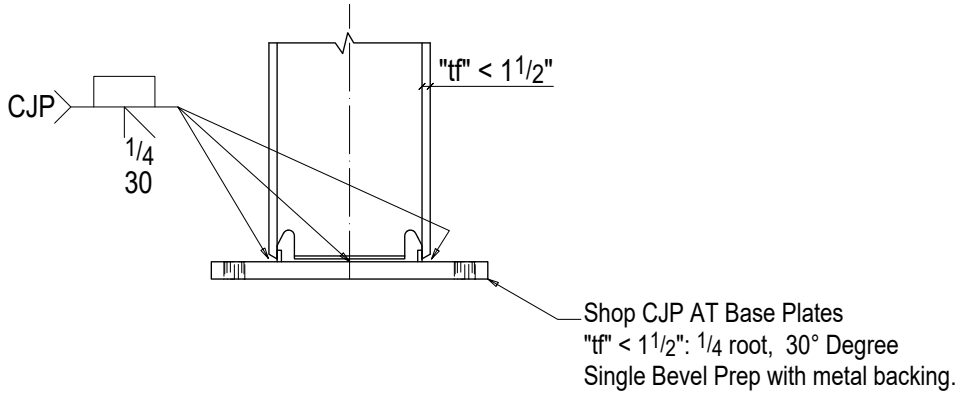


SECTION A-A

"tw" >= 1 1/2"

12.22 TYPICAL SME SHOP CJP AT BASE PLATE

a. “tf” < 1 1/2” : 1/4” root opening with 30° single bevel prep with metal backing.

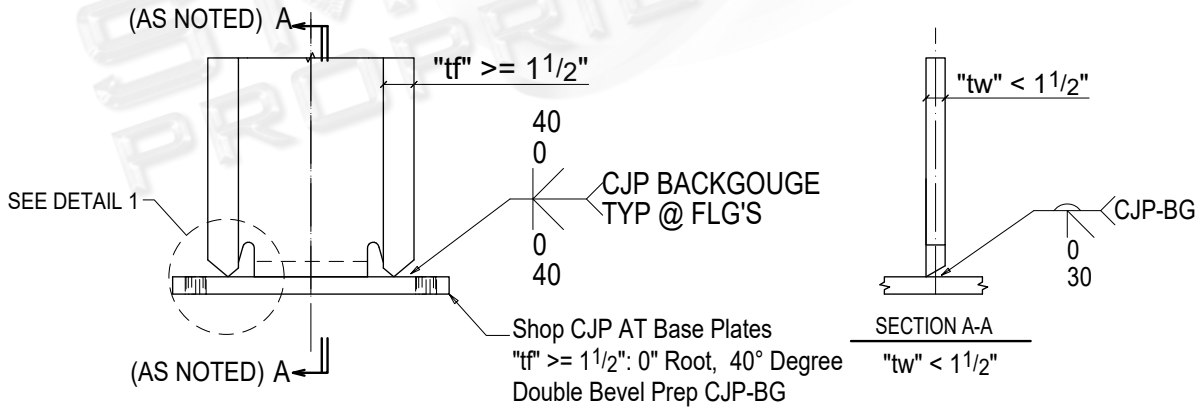


TYP CJP AT BASE PLATE "tf" < 1 1/2"

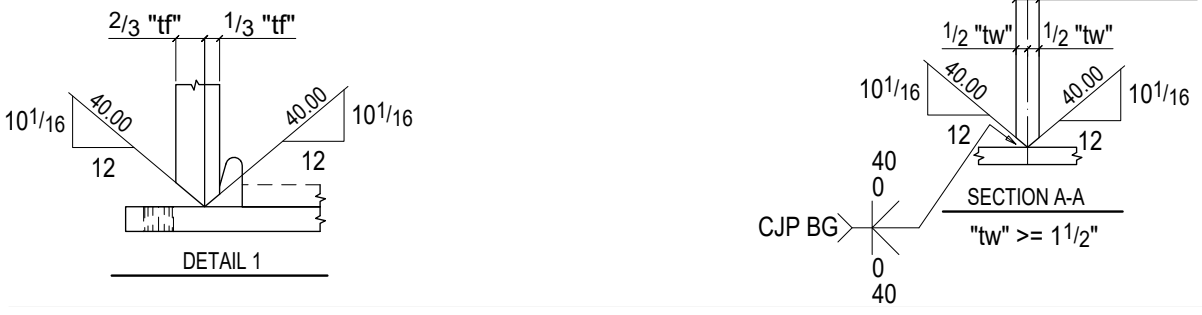
SHOP PREFERS TO USE BACKING BARS AT CJP WELDS
AS LONG AS REMOVAL IS NOT REQUIRED.
IF REMOVAL IS REQUIRED WELD WITH 0" ROOT NO LAND 30° SINGLE BEVEL PREP CJP-BG
REVIEW WITH SHOP AT KICKOFF MEETING FOR FINAL DIRECTION

NOTE: AT SLRS MEMBERS GIVE DIRECTION ON THE FOLLOWING
1. IDENTIFY BACKING THAT NEEDS REINFORCING FILLET IF REQUIRED
AT STEEL BACKING LEFT IN PLACE

b. “tf” >= 1 1/2” use a 0 root, No Land with 1/3 - 2/3 Double Bevel

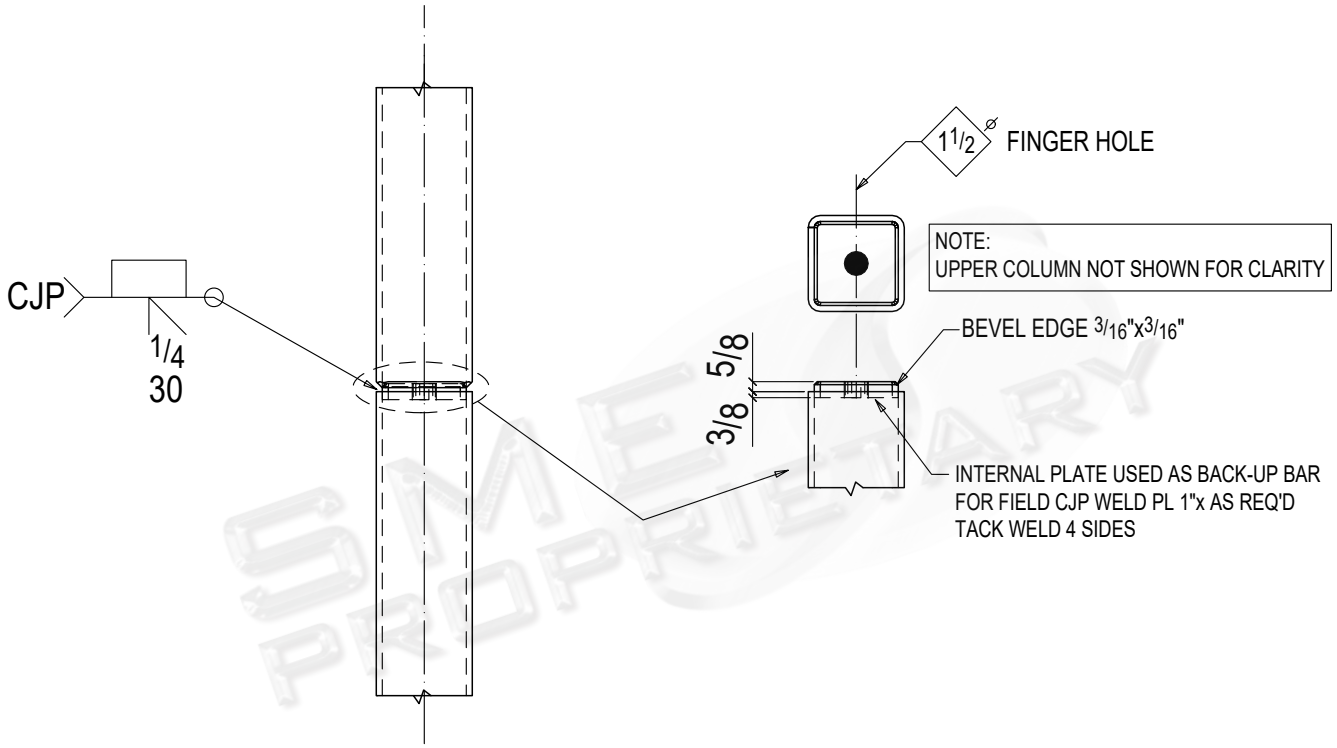


TYP CJP AT BASE PLATE "tf" >= 1 1/2"



12.23 SME SHOP CJP SPLICE HSS or Pipe

a. For HSS CJP splices, use 1/4” root 45 degree single bevel with metal backing all around, regardless of thickness.

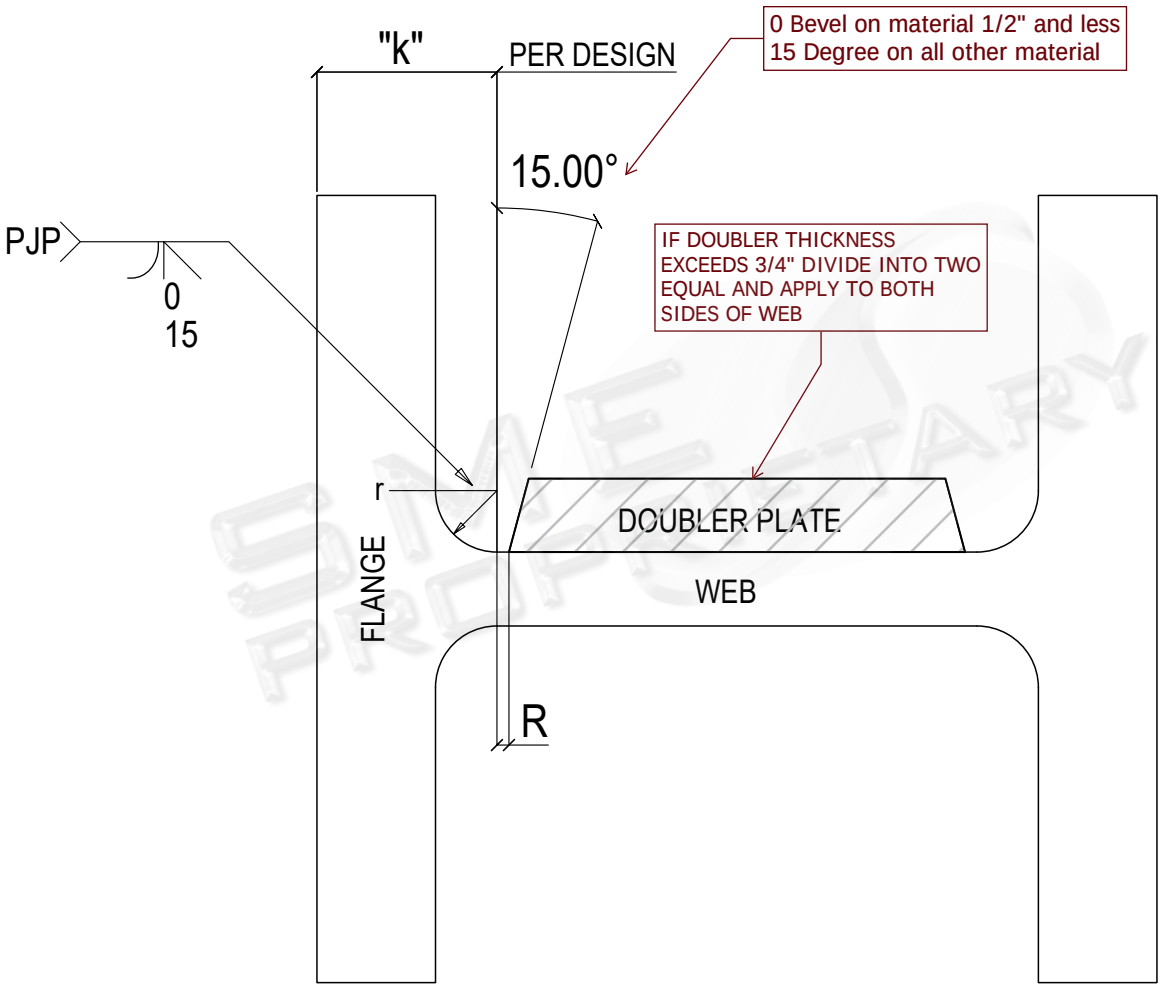


TYP HSS CJP SHOP SPLICE

12.24 WEB DOUBLER PLATE WELDING REQUIREMENTS

a. This applies to all doubler plates at beam or column webs. If doubler plate "t" exceeds 3/4", divide doubler in two equal thicknesses and apply to both sides of web. (Write RFI as required.)

Note: SME has a qualified 0 bevel weld procedure on material 1/2" and less. Add bevel to thicker material.



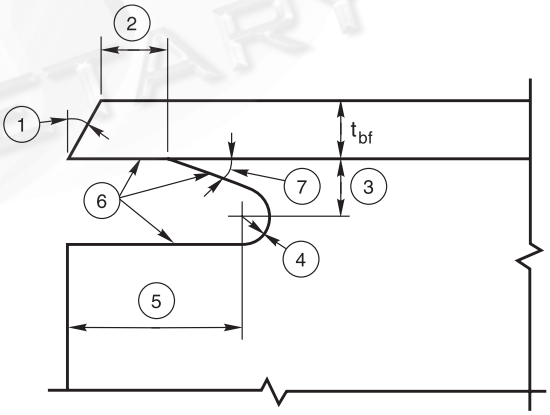
TYP PJP AT WEB DOUBLER PLATES

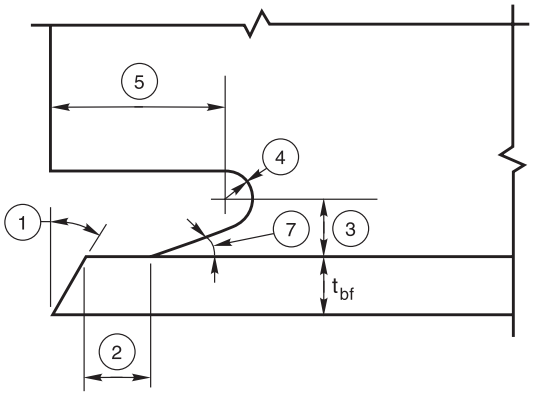
12.25 Typical Weld Access Holes by Code

Typical weld access hole requirements by code are shown below. Review your specific project and apply the correct weld access hole. Review with Project Management at kickoff meeting.

WELD ACCESS HOLE (WAH)			
NUMBER	AWS D1.1	AWS D1.8	AISC
1	WPS Defined	WPS Defined	WPS Defined
2	1/2" min.	Greater of 1/2" or tf	As needed for Backing
3	Greater of 3/4" or tw (r included), need not exceed 2"	Greater of 3/4" or 3/4tf, max tf + 1/4"	Greater of 3/4" or tw, need not exceed 2"
4	r - 3/8", 1/2" Typ	r - 3/8", 1/2" Typ	r - Not less than 3/8"
5	1.5tw (minus r)	3tf (+- 1/2")	1.5tw, 1 1/2" min
6	500 micro-inch finish	500 micro-inch finish	500 micro-inch finish
7	Not specified	< 25 Degrees	Required, not specified
Engineer specified will be on design drawings and shall be included on fabrication drawings and noted "Engineer Specified"			

Legend	
R	Rolled Member
BU	Built Up Member
w	Web
f	Flange
r	Radius
t	Thickness





SME STEEL CONTRACTORS

SECTION 13 LIFTING LUGS AND SAFETY

13.1 Lifting Lugs and Safety Checklist

- ☐ Reviewed SME lifting lug requirements and applied as directed.
- ☐ Provided rigging access in bent plate only where required.
- ☐ If lifting lugs required at beams, used center of gravity to place correctly.
- ☐ Contacted and reviewed with Project Management any conditions that would warrant additional engineering.
- ☐ Reviewed and applied all beam 100% tie off requirements.
- ☐ Identified all beams with flange widths greater than 9” and located tie off hole correctly.
- ☐ Reviewed and applied all engineered perimeter safety post system requirements.
- ☐ Reviewed and applied all perimeter safety items at column.
- ☐ Added all project specific stability items required for current project.

13.2 Lifting Lug Criteria

Lifting Lugs at Beams

a. Beams 14,000 pounds and under don't require lifting lugs if beam is < 50-0. If member is > than 50-0, member requires lifting lugs.

b. For beams with bent closure plate, provide rigging access hole for hoisting member. If lifting lugs are on beams that have bent plate, no rigging access holes in bent plate are required.

Lifting Lugs at Columns

c. All columns to receive lifting lugs. The exception to this is 10 to 15-0 stub columns. They won't need picking lugs unless directed by Project Management during handover meeting.

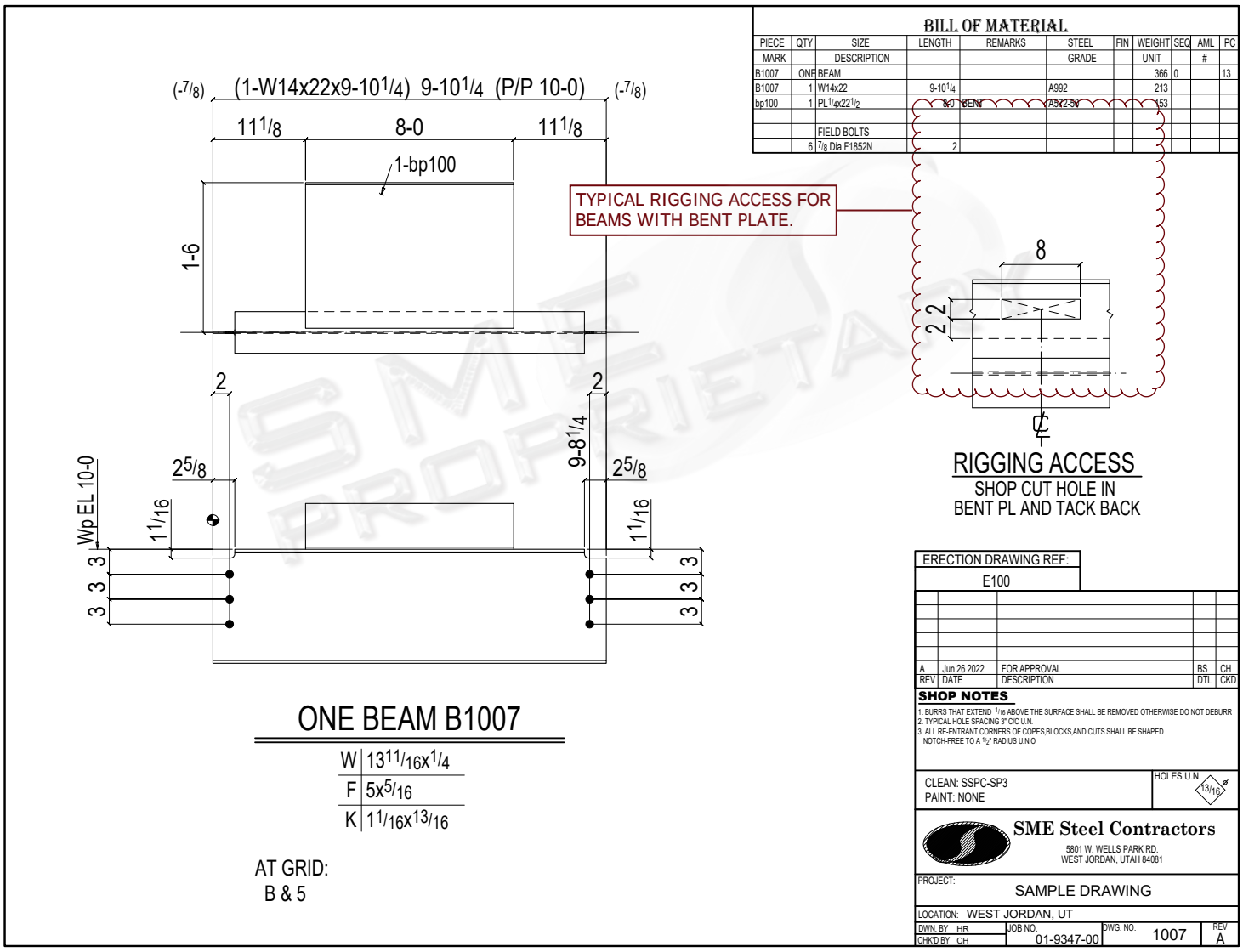
d. Columns that splice with base and cap plates will require a bolt on lifting lug. These will be reviewed by project and detailer will be given direction on detailing. Bolt on lifting lugs may be reused, if access is available to take them off and reuse on other columns. Quantities need to be discussed in kickoff meeting.

Note: Detailer will get project specific direction from Project Manager during kickoff meeting.

13.3 Beam Example with Rigging Access

- Typical rigging access detail for shop to be applied when bent plate extends beyond beam flange by greater than 12". Review at kickoff meeting for final direction.

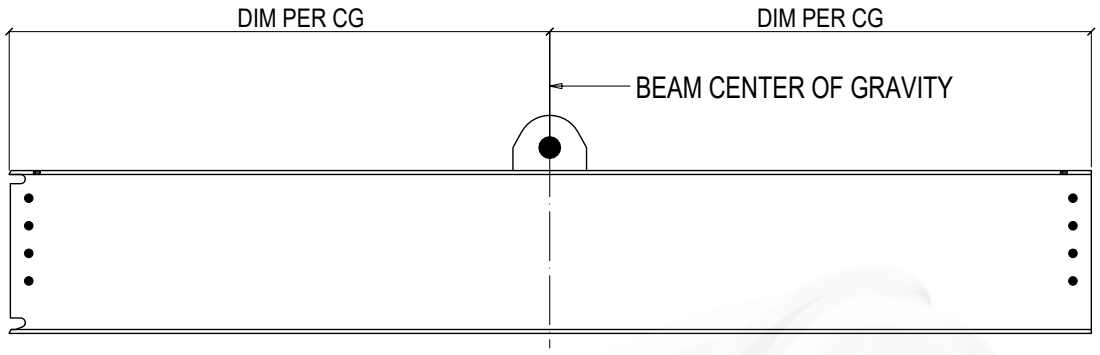
Note: If beam has lifting lugs, rigging access isn't required.



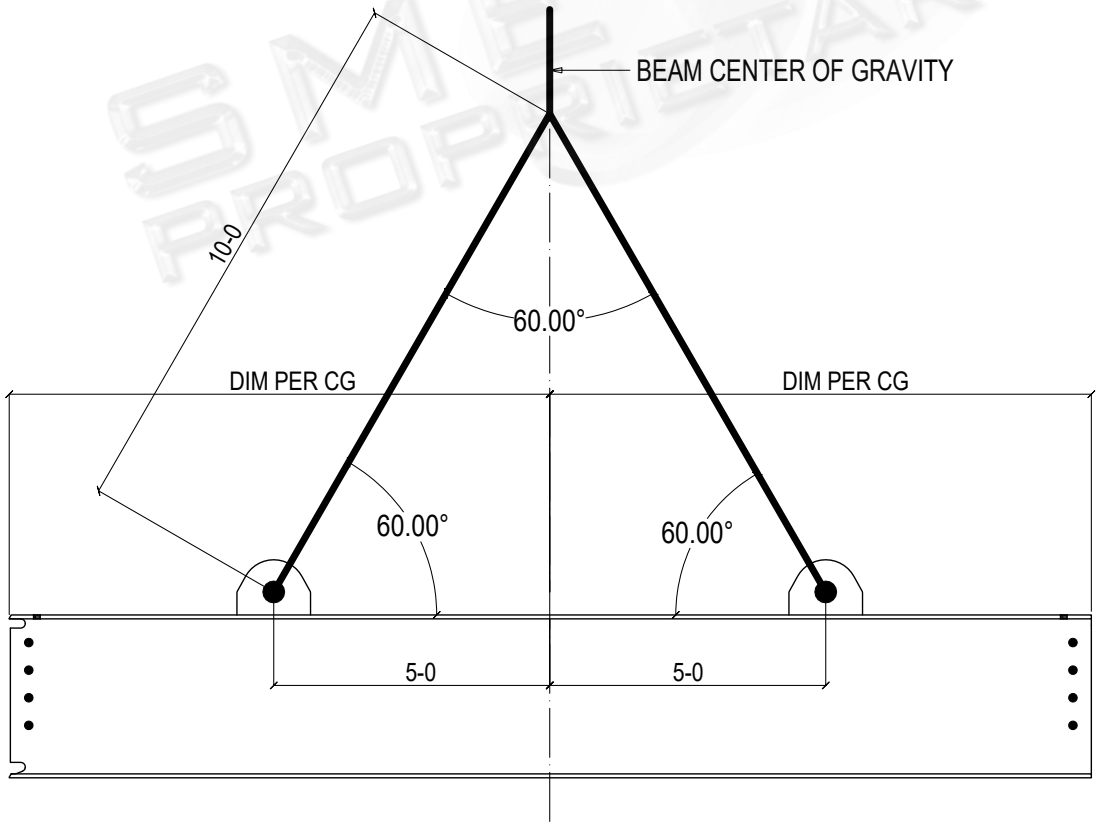
13.4 Beam Example with Lifting Lugs

- Example of beams with one or two lifting lugs

Note: If possible, keep lifting lugs below concrete pours to eliminate the need for removal. Review with Project Management at kickoff meeting for final direction.



One lifting Lug located at CG



Two lifting Lugs located Base on CG

13.5 Welded Column Lifting Lugs Design Criteria

- **Design Criteria:**
  - **a.** Lifting: F.O.S.= 5
  - **b.** Tripping: 50% of rated load using AISC LRFD standard design.
  - **c.** Check with SME engineering if member is top heavy (i.e., C.G. is above mid-height).

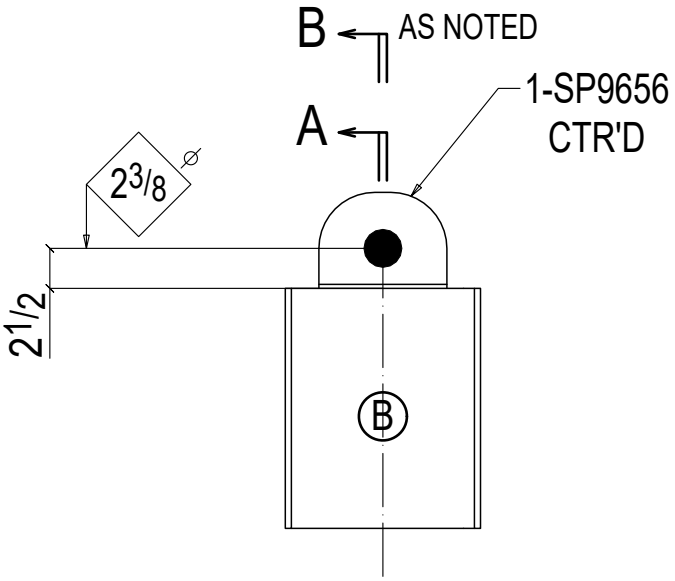
- **Notes:**
  - **d.** All plates GR50 U.N.O.
  - **e.** Applies to top tier columns with no cap plates
  - **f.** Notify SME engineering for webs thinner than allowed per Table A.

MINIMUM WEB THICKNESS

LUG CAPACITY	LUG "tpl"	WEB "tw"
TON	IN	IN
2.5	1/2	.45
5	3/4	5/8
10	1	15/16
17	1 3/8	1 1/4

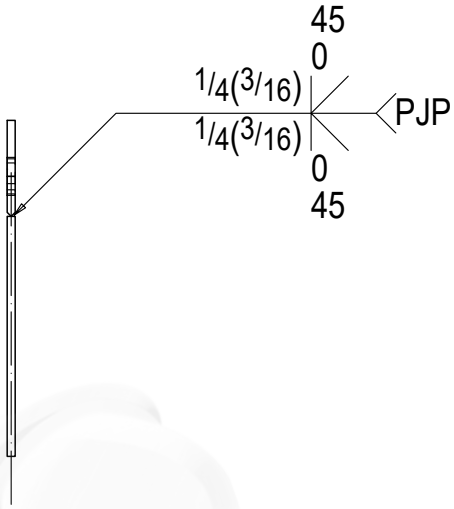
TABLE A

13.6 COLUMN LIFTING LUG 2.5 TON



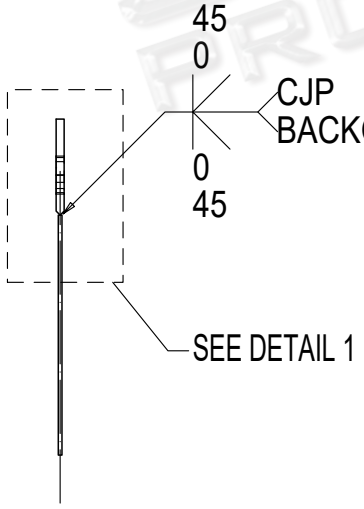
2.5 TON COLUMN LUG

AT TOP OF COLUMN W/NO CAP PLATE



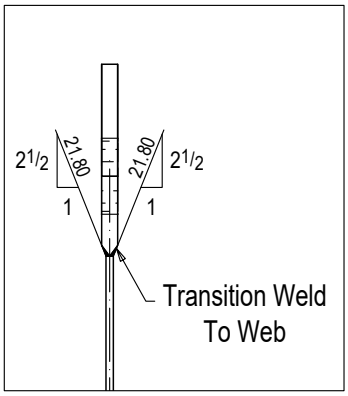
Section A

tw>= .45"



Section B

tw< .45"

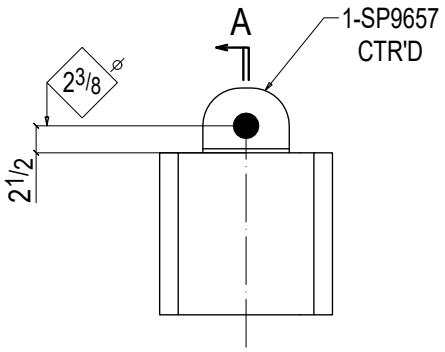


Detail 1

LUG CAPACITY	LUG "tpl"	WEB "tw"
TON	IN	IN
2.5	1/2	.45
5	3/4	5/8
10	1	15/16
17	1 3/8	1 1/4

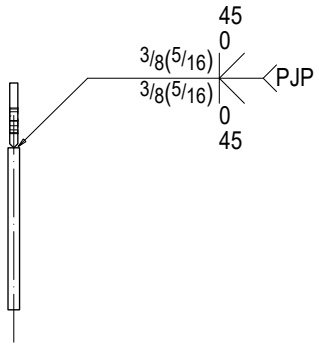
MINIMUM WEB THICKNESS

13.7 COLUMN LIFTING LUGS 5, 10, AND 17 TON

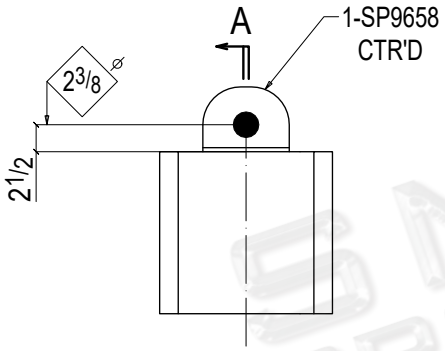


5 TON COLUMN LUG

AT TOP OF COLUMN W/NO CAP PLATE

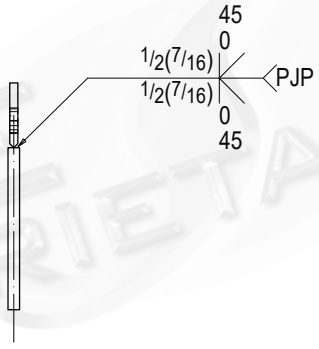


Section A

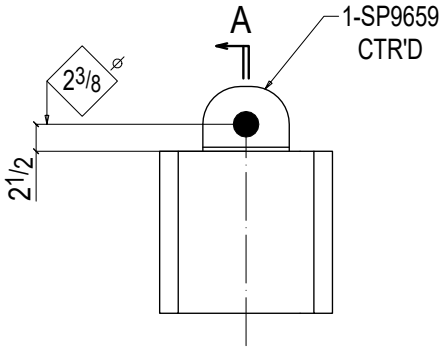


10 TON COLUMN LUG

AT TOP OF COLUMN W/NO CAP PLATE

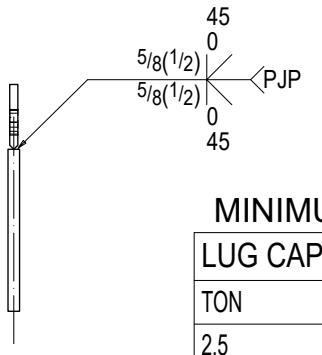


Section A



17 TON COLUMN LUG

AT TOP OF COLUMN W/NO CAP PLATE



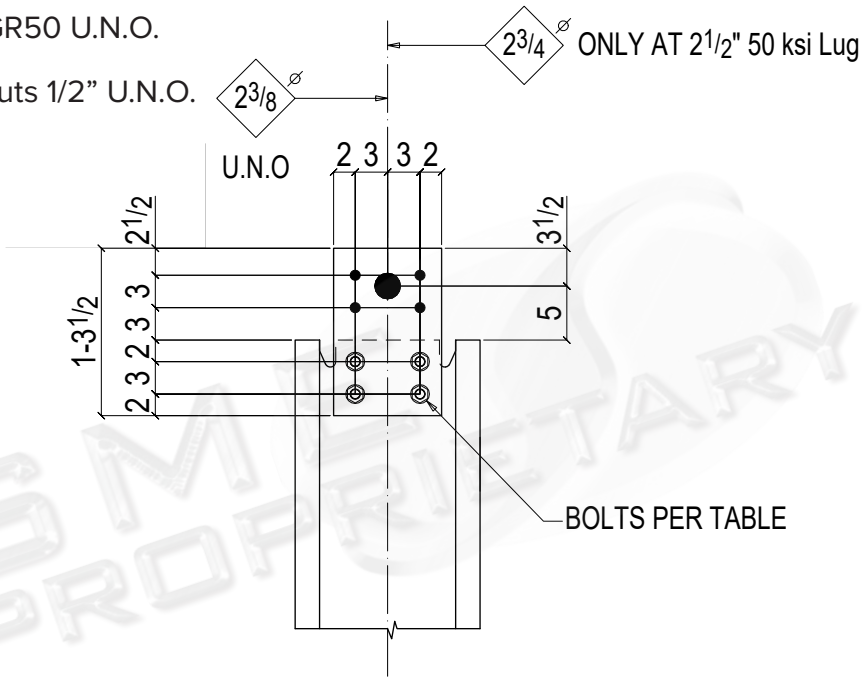
Section A

MINIMUM WEB THICKNESS

LUG CAPACITY	LUG "tpl"	WEB "tw"
TON	IN	IN
2.5	1/2	.45
5	3/4	5/8
10	1	15/16
17	1 3/8	1 1/4

13.8 BOLTED COLUMN LIFTING LUG

- **Design Criteria:**
  - **a.** Lifting: F.O.S.= 5
  - **b.** Tripping: 50% of rated load using AISC LRFD standard design.
  - **c.** Check with SME engineering if member is top heavy (i.e., C.G. is above mid-height).
- **Notes:**
  - **d.** All plates GR50 U.N.O.
  - **e.** All radius cuts 1/2" U.N.O.



W14 BOLTED COLUMN LIFTING LUG

AT TOP OF COLUMN W/NO CAP PLATE

LUG CAPACITY

PLATE THICKNESS "t"	BOLT	RATED LOAD
INCH	STANDARD	kips
1	7/8 Ø A325X	10
1 1/2	7/8 Ø A325X	20
2	7/8 Ø A325X	30
2 1/2*	1 1/8 Ø A490X	50

* ALLOY TYPE SHACKLE REQUIRED, PIN Ø = 2.25"

13.9 UNSTIFFENED LIFTING LUGS 6 TO 35 TONS

- **Design Criteria:**

  a. Lifting: F.O.S.= 5

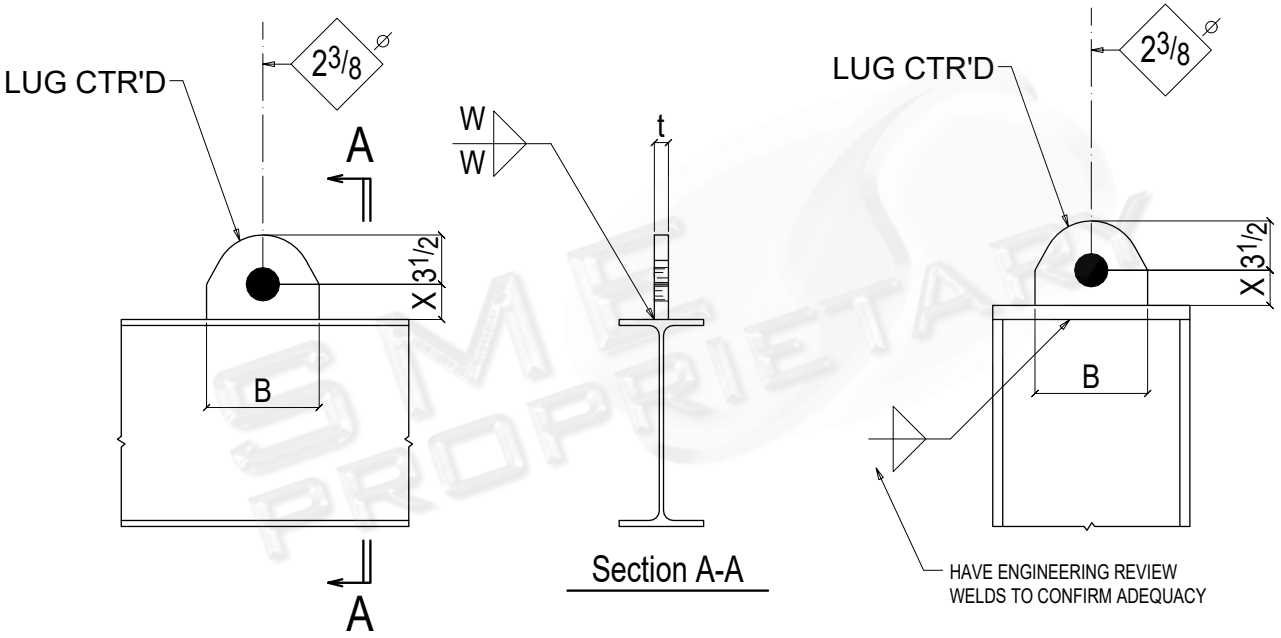
  b. Tripping: 50% of rated load using AISC LRFD standard design.

  c. Check with SME engineering if member is top heavy (i.e., C.G. is above mid-height).

- **Notes:**

  d. All plates GR50 U.N.O.

  e. All radius cuts 3/8” min U.N.O.



LUG DETAIL TO FLANGE

LUG DETAIL TO COLUMN CAP PL

CONTACT ENGINEERING FOR MIN WELD
WHEN NOT ATTACHED TO MAIN MEMBER
PER DETAIL A/B (E.G. AT CAP PL, WT, ETC

LUG SCHEDULE

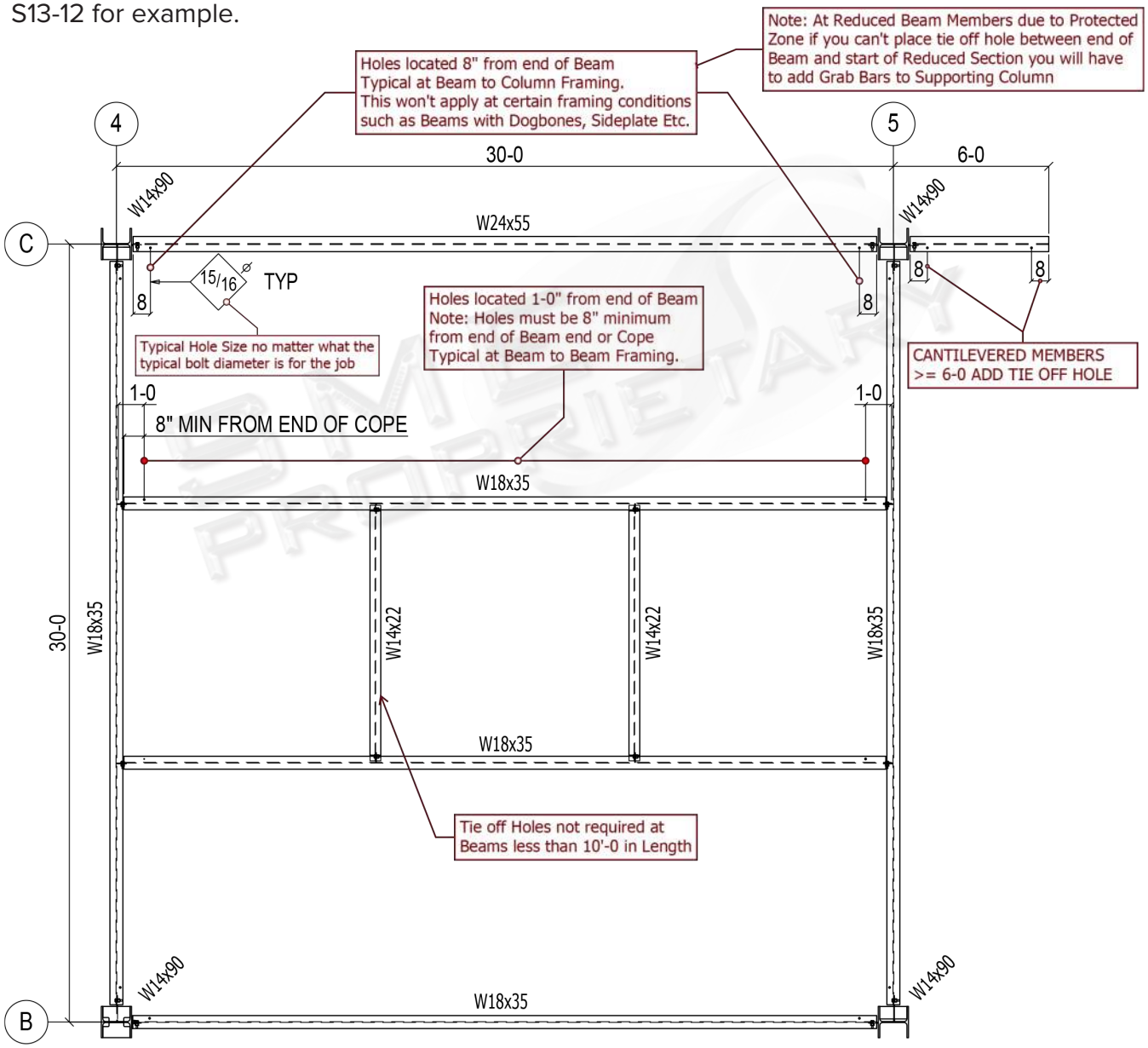
RATED LOAD	THICKNESS	DIM "Y"	WIDTH "B"	WELD "W"	LUG
TONS	"t" [IN]	[IN]	[IN]		MARK
6T	0.75	2.5	8	5/16	SP9660
10.5T	1	2.5	8	3/8	SP9662
20T	1.25	2.5	10	1/2	SP9663
25T	1.5	3.0	10	5/8	SP9664
35T	2.0	3.0	10	3/4	SP9665

13.10 100% TIE OFF REQUIREMENTS AT BEAMS

a. All beams greater than 10’-0” in length require safety cable holes in each end of member. Cantilevered beams >= to 6’-0” receive one tie off hole at perimeter.

b. For beams framing into column flange or web, hole will be located 8” from end of beam. For beam to beam framing, hole will be located 1’-0” from end of member but not less than 8” minimum from end of beam or cope.

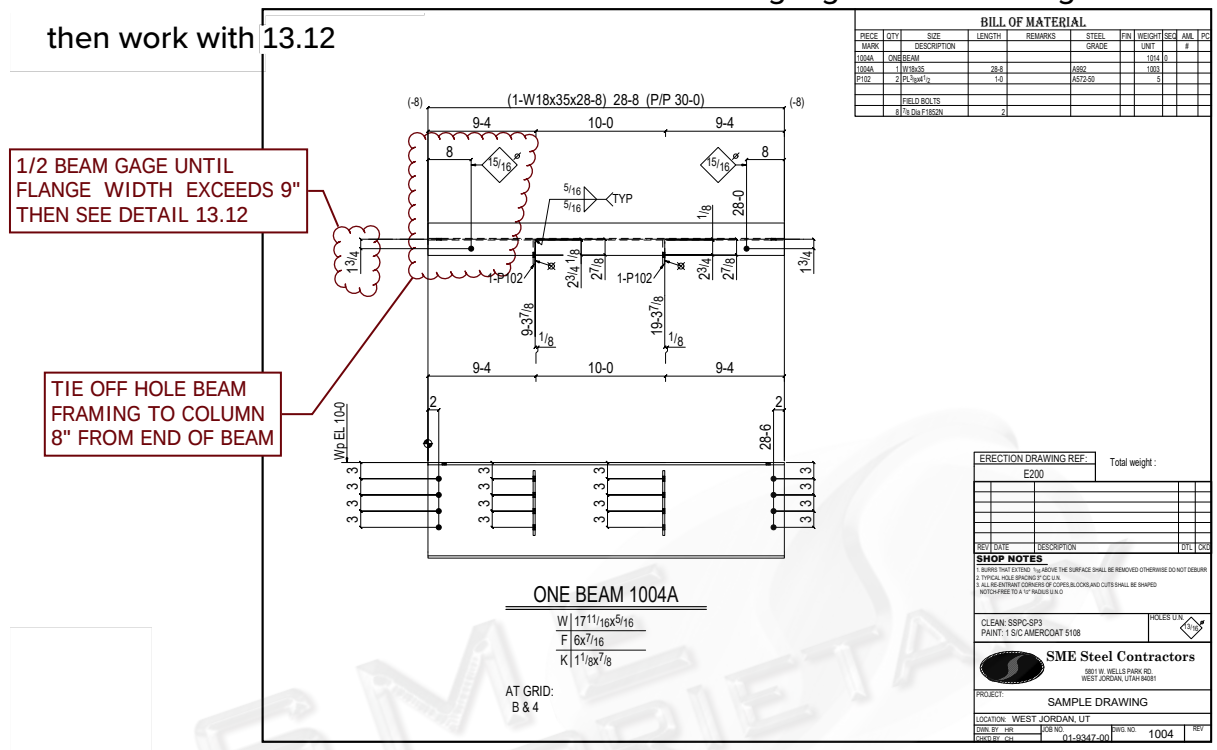
c. Holes will be located on beam standard gauge line and will be 15/16” diameter, unless flange width exceeds 9”. When this occurs, tie off hole will be located 1 1/2” from toe of beam flange. See sheet S13-12 for example.

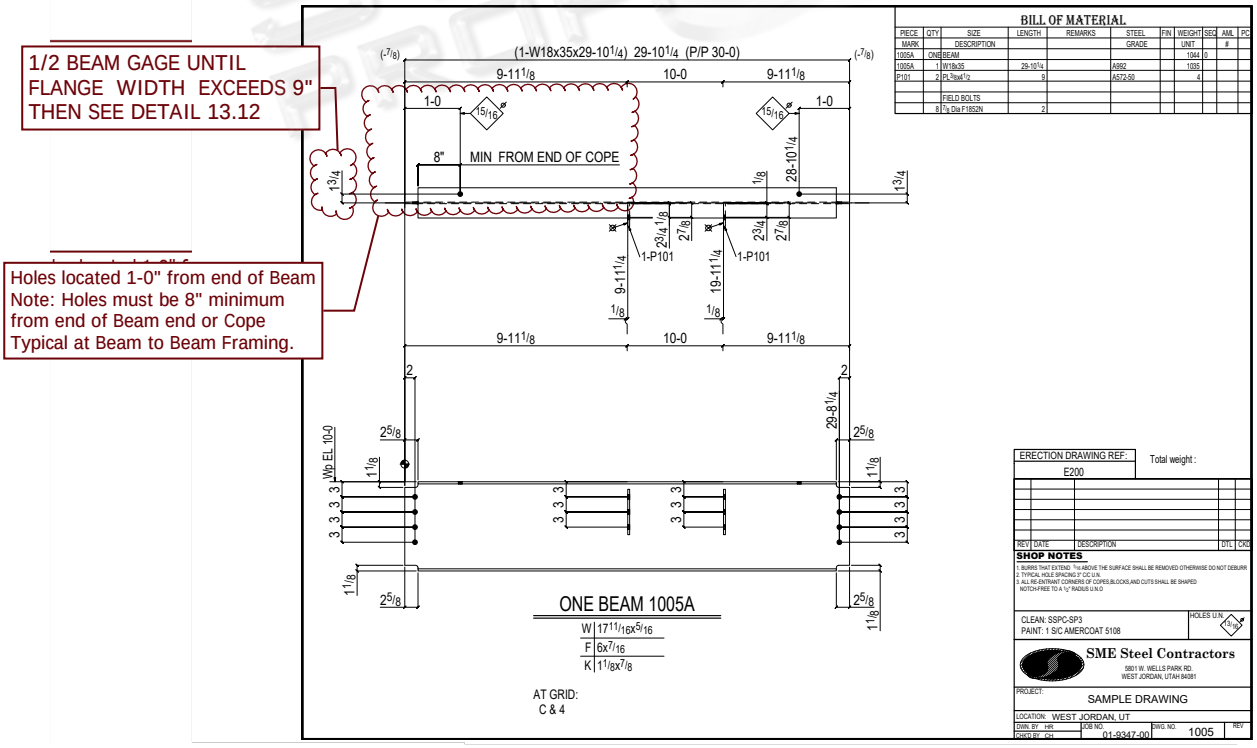


PARTIAL FRAMING PLAN

13.11 EXAMPLE BEAMS WITH TIE OFF HOLES

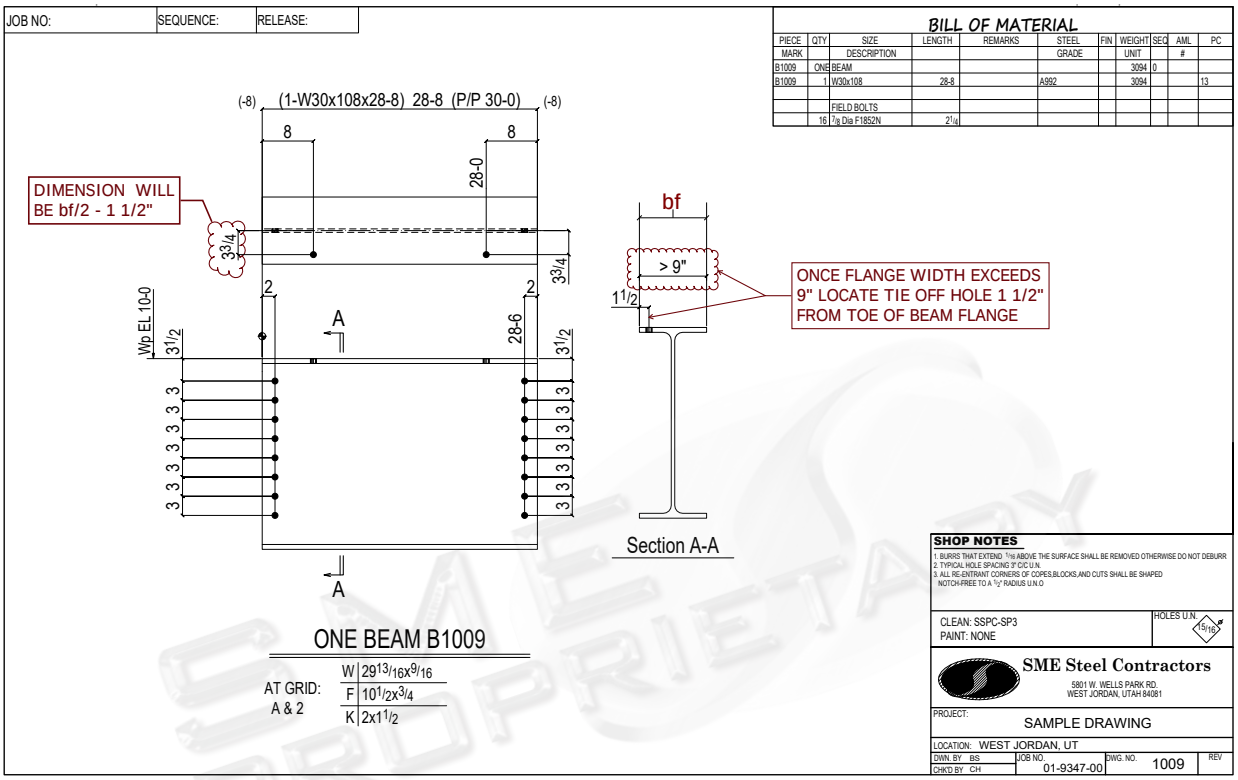
- Beams used for 100% tie off: holes required in all beams greater than 10'-0" in length or cantile-vered beam >= to 6-0. Locate holes at 1/2 standard gauge until total flange width exceeds 9", then work with 13.12





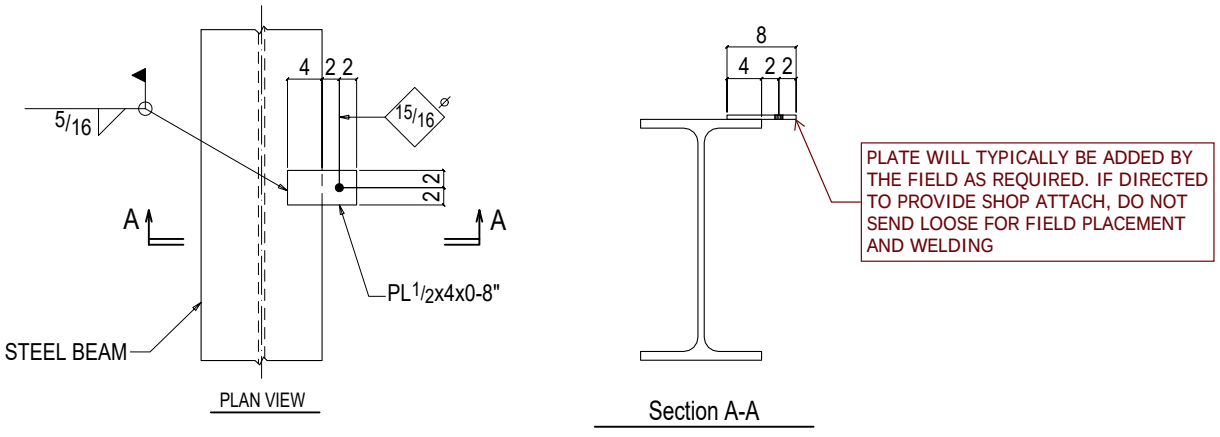
13.12 EXAMPLE BEAM WITH TIE OFF HOLES FLANGE WIDTH > 9”

- Beams used for 100% tie off: holes required in all beams greater than 10’-0” in length. Once total beam flange width exceeds 9”, detailer to locate tie off hole 1 1/2” from toe of flange rather than using standard gauge.



13.13 EXAMPLE BEAM WITH ALTERNATE TIE OFF STEEL PLATE

- ONLY TO BE USED IF GIVEN DIRECTION FROM PROJECT MANAGEMENT



ALTERNATE TIE OFF STEEL PLATE AT BEAM FLANGE

ONLY TO BE USED IF GIVEN DIRECTION FROM PROJECT MANAGEMENT

13.14 Engineered Perimeter Safety Post System

a. At the direction of SME Project Management, SME's engineered safety posts will be utilized for perimeter guarding. Unlike the standard angle safety post system, the engineered system allows direct tie-off to the cable for fall protection.

b. This system is "Job-Specific." The appropriate sleeves will be detailed on all perimeter beams as directed by SME Project Management at the kickoff meeting.

c. 1/4" minimum continuous perimeter bent plate must be designed. The sleeves may be located on the top flange of the beam; sleeve not allowed on gauge metal edge form. Regardless of the beam flange width or the bent plate off-set, the sleeves cannot be positioned more than 6" off the outside edge of the beam flange (see sketches).

d. The following sketches are generic. Each project will require job-specific, engineered and stamped sketches. Detailer need only detail the sleeves on all perimeter beams. All other components: posts, loop-eyes, braces, cable, and clamps are requisitioned by Project Management.

e. At interior openings, add sleeves as required only when opening exceeds 10-0. You don't provide any sleeves in the corners of openings. Example: Opening has a 12-0 opening, you would add one sleeve centered on opening.

2021.07.26_Catenary Line System_Signed.PDF

2020 SME Steel Perimeter Cable.PDF

SME STEEL CONTRACTORS

KEYNOTES:

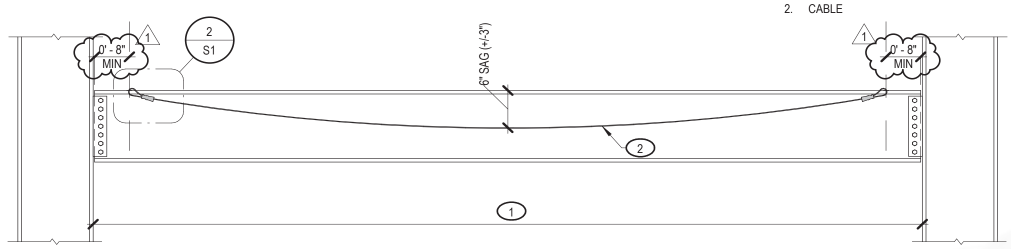
1. BEAM LENGTH (L). MIN = 10'-0", MAX = 90'-0"
2. CABLE

MISC:

A. CABLE SHALL BE REMOVED AND REPLACED IN THE EVENT OF BEING LOADED BY A FALL
B. CABLE SHALL BE REMOVED AND REPLACED IF WORN, FRAYED, KINKED, OR DAMAGED
C. SYSTEM IS DESIGNED TO SUPPORT TWO POINTS OF ATTACHMENT AT THE SAME TIME
D. THE DESIGN OF THIS SYSTEM DOESN'T TAKE INTO ACCOUNT THE BEAM CAPACITY AND BEAM TO COLUMN CONNECTIONS

CATENARY LINE NOTES

A. PROVIDE SAG SPECIFIED WHEN INSTALLING CATENARY LINE
B. PROVIDE 15/16"Ø HOLE UNO. DRILLED HOLE AT BEAM FLANGE TO RECEIVE CATENARY CABLE, SEE DETAIL "3" THIS SHEET FOR HOLE PLACEMENT
C. CABLE SHALL BE 3/8"Ø 7x19 GALVANIZED AIRCRAFT, MINIMUM BREAK STRENGTH = 14,400 LBS
D. PROVIDE 1/2" SHACKLE AT BEAM FLANGES LESS THAN 1/2". BEAMS WITH 1/2" OR GREATER FLANGE THICKNESSES DO NOT REQUIRE SHACKLE. HOWEVER, A MINIMUM OF 1/2" SHACKLE CAN BE USED IN ANY BEAM, REGARDLESS OF ITS FLANGE THICKNESS



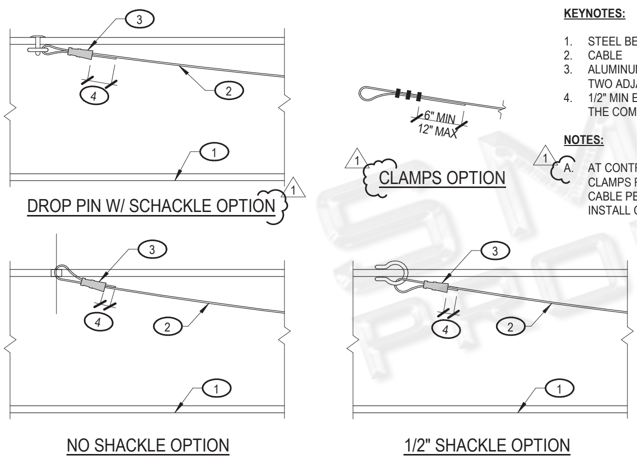
1 S1 BEAM CATENARY LINE SYSTEM

KEYNOTES:

1. STEEL BEAM
2. CABLE
3. ALUMINUM COMPRESSIVE SLEEVE CRIMPED IN TWO ADJACENT LOCATIONS
4. 1/2" MIN EXCESS WIRE ROPE PROTRUDING PAST THE COMPRESSIVE SLEEVE

NOTES:

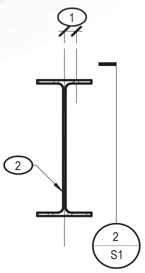
A. AT CONTRACTOR'S OPTION, PROVIDE (3) CABLE CLAMPS RATHER THAN SWAGES AT EA END OF CABLE PER MFR REQUIREMENTS AND SPECS. INSTALL CLAMPS PER MFR.



2 S1 CABLE CONNECTION AT BEAM FLANGE

KEYNOTES:

1. 1/2 STD BEAM GAUGE
2. STEEL BEAM



3 S1 HOLE AT BEAM FLANGE

Digitally signed by Gregory A. Meyer, PE, SE
Date: 2021.07.26

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07/26/2021

SEAL:

PROFESSIONAL ENGINEER STATE OF NEVADA GREG A MEYER Exp. 12/31/21 CIVIL/ STRUCTURAL No. 15053
07/26/2021

SEAL:

PROFESSIONAL ENGINEER No. 323926-2203 GREGORY ALLEN MEYER 07/26/2021 STATE OF UTAH
EXP: 03/31/23

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1677 EUREKA ROAD STE. #102 ROSEVILLE, CA 95661 PHONE: (916) 780-2030

PROJECT: SME CATENARY LINE
SME STEEL

SHEET TITLE: CATENARY LINE SYSTEM

ISSUE: PERMIT 08/21/20

REVISIONS: 1 CLIENT REQUESTED 07/26/21

DRAWN: EN CHECKED: GM

DATE: 08/21/20
PROJECT NUMBER: 20.2509
SHEET NUMBER: S1

SME STEEL CONTRACTORS

KEYNOTES:

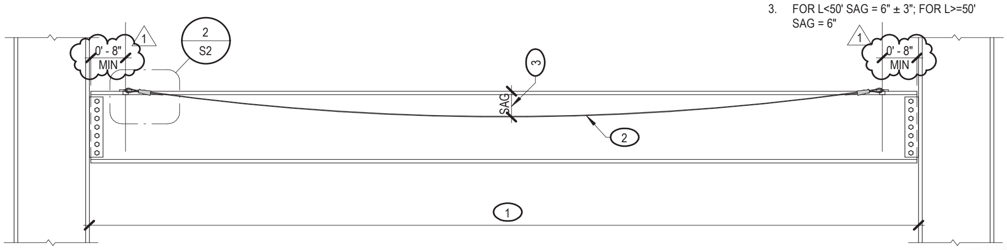
1. BEAM LENGTH (L). MIN = 10'-0", MAX = 90'-0"
2. CABLE
3. FOR L<50' SAG = 6" ± 3"; FOR L>=50' SAG = 6"

MISC:

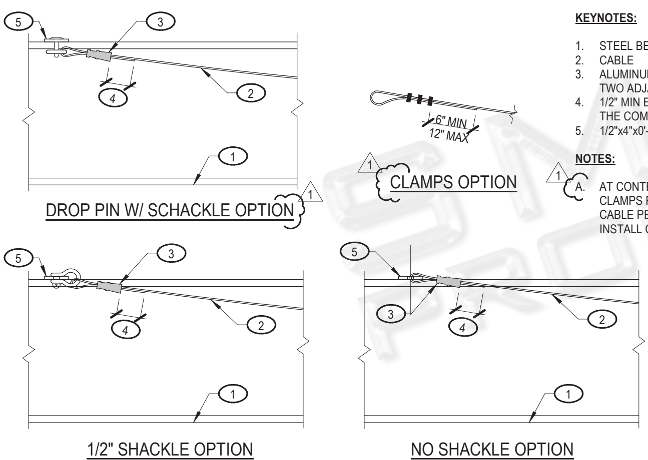
A. CABLE SHALL BE REMOVED AND REPLACED IN THE EVENT OF BEING LOADED BY A FALL
B. CABLE SHALL BE REMOVED AND REPLACED IF WORN, FRAYED, KINKED, OR DAMAGED
C. SYSTEM IS DESIGNED TO SUPPORT TWO POINTS OF ATTACHMENT AT THE SAME TIME
D. THE DESIGN OF THIS SYSTEM DOESN'T TAKE INTO ACCOUNT THE BEAM CAPACITY AND BEAM TO COLUMN CONNECTIONS

CATENARY LINE NOTES

A. PROVIDE SAG SPECIFIED WHEN INSTALLING CATENARY LINE
B. PROVIDE 15/16"Ø HOLE UNO. DRILLED HOLE AT BEAM FLANGE TO RECEIVE CATENARY CABLE, SEE DETAIL "3" THIS SHEET FOR HOLE PLACEMENT
C. CABLE SHALL BE 3/8"Ø 7x19 GALVANIZED AIRCRAFT, MINIMUM BREAK STRENGTH = 14,400 LBS
D. PROVIDE 1/2" SHACKLE AT BEAM FLANGES LESS THAN 1/2". BEAMS WITH 1/2" OR GREATER FLANGE THICKNESSES DO NOT REQUIRE SHACKLE. HOWEVER, A MINIMUM OF 1/2" SHACKLE CAN BE USED IN ANY BEAM, REGARDLESS OF ITS FLANGE THICKNESS



1 S2 BEAM CATENARY LINE SYSTEM



KEYNOTES:

1. STEEL BEAM
2. CABLE
3. ALUMINUM COMPRESSIVE SLEEVE CRIMPED IN TWO ADJACENT LOCATIONS
4. 1/2" MIN EXCESS WIRE ROPE PROTRUDING PAST THE COMPRESSIVE SLEEVE
5. 1/2"x4"x0'-8" STEEL PLATE

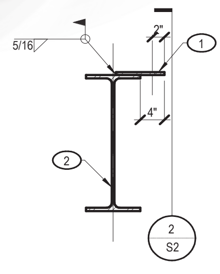
NOTES:

A. AT CONTRACTOR'S OPTION, PROVIDE (3) CABLE CLAMPS RATHER THAN SWAGES AT EA END OF CABLE PER MFR REQUIREMENTS AND SPECS. INSTALL CLAMPS PER MFR.

2 S2 CABLE CONNECTION AT BEAM FLANGE

KEYNOTES:

1. 1/2"x4"x0'-8" STEEL PLATE
2. STEEL BEAM



3 S2 STEEL PLATE AT BEAM FLANGE

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PROJECT: SME CATENARY LINE
SME STEEL

SHEET TITLE: CATENARY LINE SYSTEM

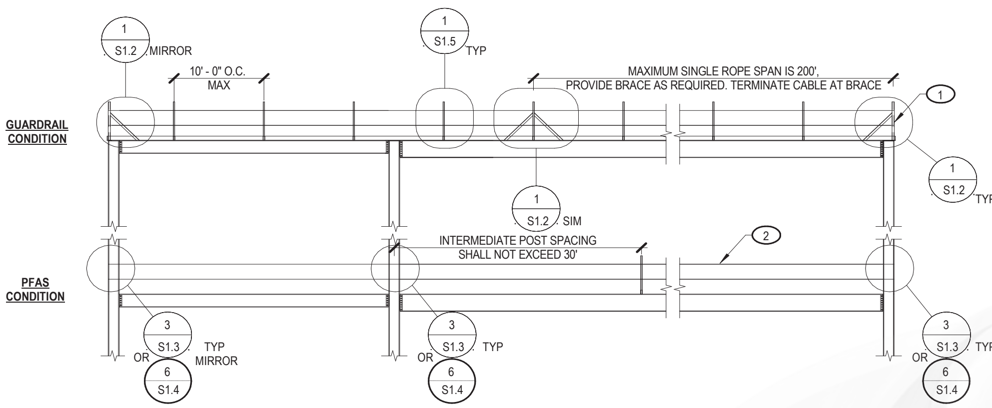
ISSUE: PERMIT 08/21/20

REVISIONS:
1 CLIENT REQUESTED 07/26/21

DRAWN: EN CHECKED: GM

SHEET NUMBER: S2

SME STEEL CONTRACTORS



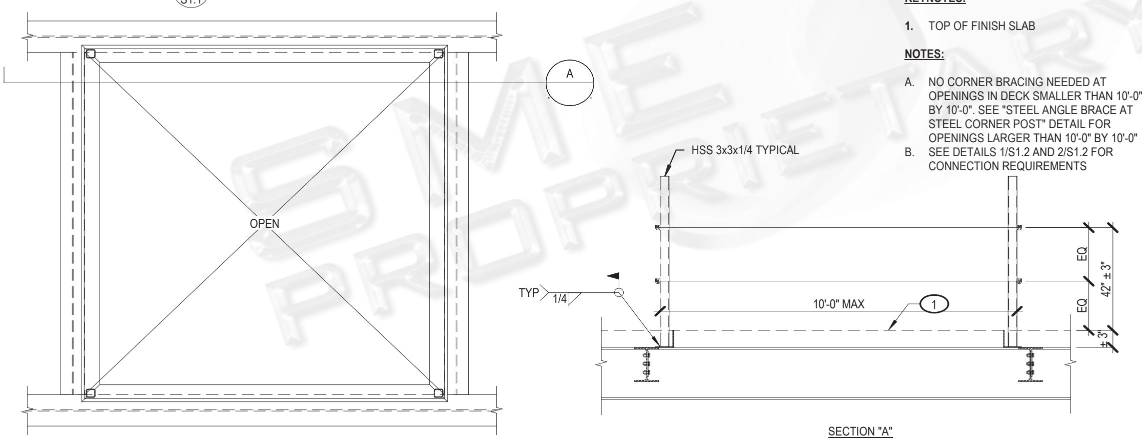
KEYTOES:

1. KICKER BRACE AT ALL ANCHOR POINTS, TYP
2. SEE DETAILS 2/S1.1 FOR HEIGHT REQUIREMENTS OF CABLES

NOTES:

A. CABLE SHALL BE 3/8" Ø 7x19 GALVANIZED AIRCRAFT, BREAK STRENGTH= 14,400 LBS
B. PROVIDE (3) FORGED CABLE CLAMPS AT EACH END OF CABLE
C. CONTINUOUS CABLE SHALL BE NO LONGER THAN 200'
D. THE PERIMETER CABLE RAIL SYSTEM IS DESIGNED AS FALL PROTECTION FOR (2) WORKERS BETWEEN ANCHORAGE POINTS. EITHER THE UPPER OR LOWER CABLE MAY BE USED SIMULTANEOUSLY. NO MORE THAN (2) WORKERS PER ANCHORAGE POINT
E. AFTER TURNOVER, THE SYSTEM COULD BE USED AS A GUARDRAIL SYSTEM ONLY UPON A WRITTEN AGREEMENT WITH SME STEEL INDUSTRIES. SME WILL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF THE SYSTEM AFTER TURNOVER

1 S1.1 TYPICAL SAFETY CABLE ERECTION VIEW



KEYNOTES:

1. TOP OF FINISH SLAB

NOTES:

A. NO CORNER BRACING NEEDED AT OPENINGS IN DECK SMALLER THAN 10'-0" BY 10'-0". SEE "STEEL ANGLE BRACE AT STEEL CORNER POST" DETAIL FOR OPENINGS LARGER THAN 10'-0" BY 10'-0"
B. SEE DETAILS 1/S1.2 AND 2/S1.2 FOR CONNECTION REQUIREMENTS

2 S1.1 SAFETY CABLE ERECTION VIEW

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SEAL: PROFESSIONAL ENGINEER No. 323926-2203 GREGORY ALLEN MEYER 04/15/2020 STATE OF UTAH EXP: 03/31/21

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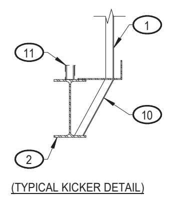
PROJECT: SME STEEL PERIMETER CABLE STATE OF NV, CA, & UT SME STEEL

SHEET TITLE: SAFETY CABLE ERECTION VIEWS

ISSUE: SUBMIT FOR PERMIT 04/15/2020

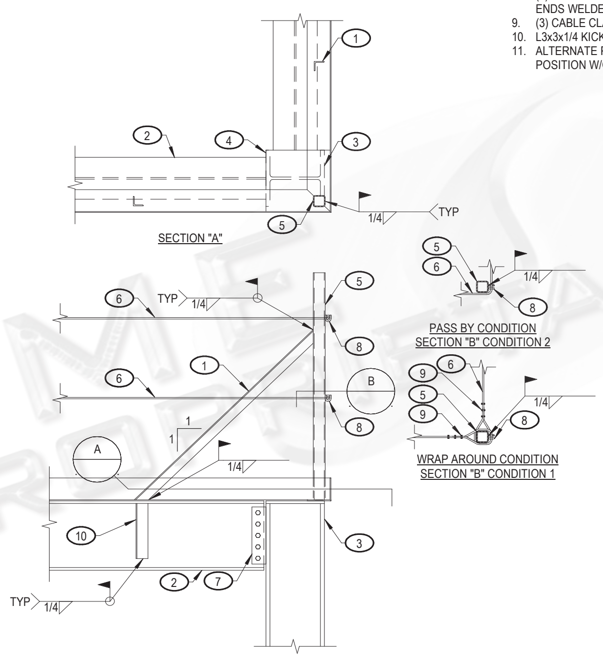
REVISIONS:

S1.1



KEYNOTES:

1. L3x3x1/4 BRACE
2. STEEL BEAM BY OTHERS
3. STEEL COLUMN BY OTHERS
4. STEEL COLUMN CAP BY OTHERS
5. HSS3x3x1/4 STEEL CORNER POST, IF POST OCCURS OVER EDGE OF BENT PLATE AND NOT OVER COLUMN PROVIDE KICKER PER KEYNOTE 10
6. 3/8" Ø 7x19 GALVANIZED AIRCRAFT CABLE
7. STEEL SHEAR PLATE BY OTHERS
8. (2) U SHAPED RODS W/ OPPOSED ENDS WELDED TO STEEL POST
9. (3) CABLE CLAMPS
10. L3x3x1/4 KICKER AT POST BRACE
11. ALTERNATE POST/BRACE POSITION W/O KICKER



1 / S1.2 STEEL ANGLE BRACE AT STEEL CORNER POST
NO SCALE

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PROJECT: SME STEEL PERIMETER CABLE
STATE OF NV, CA, & UT
SME STEEL

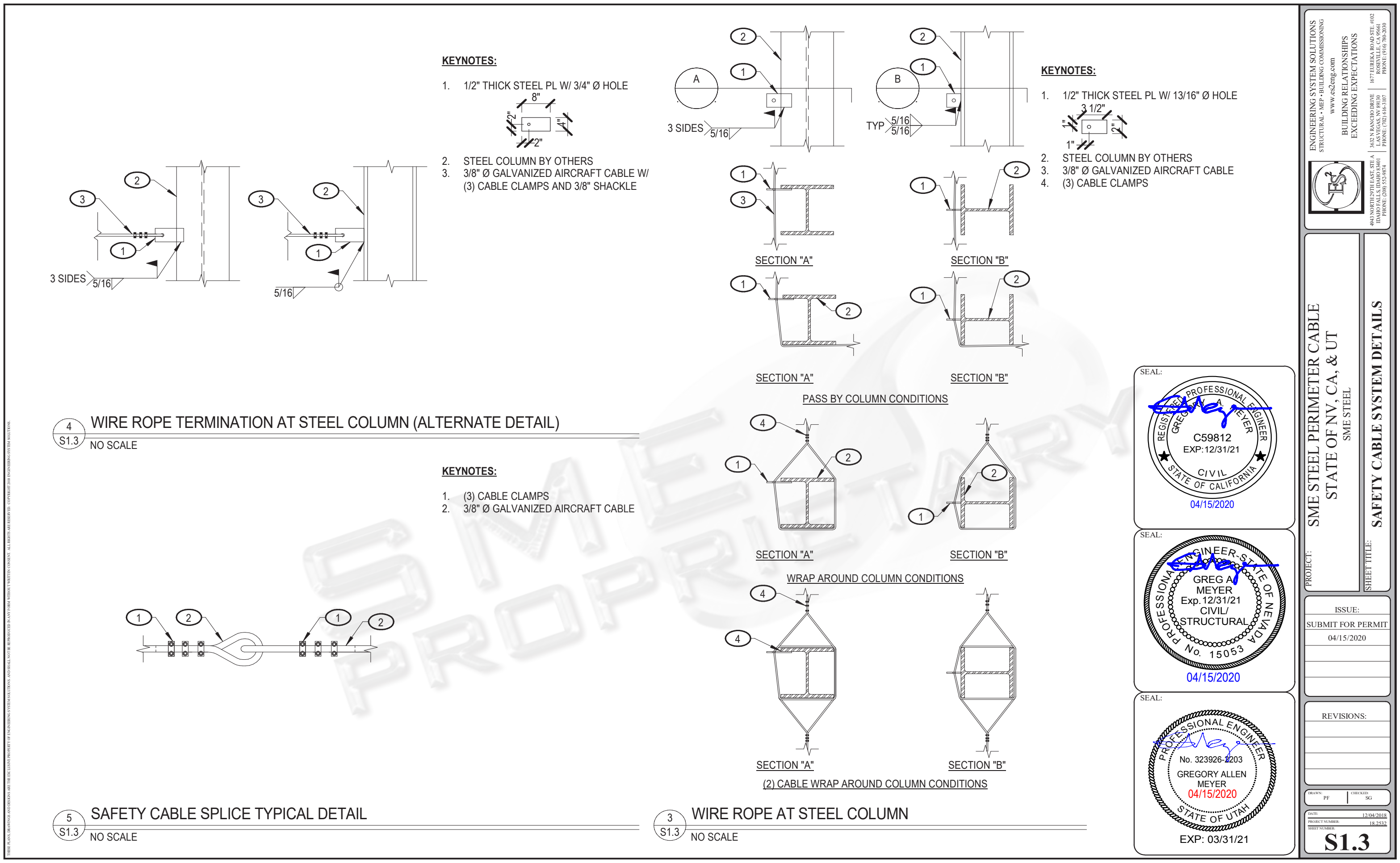
SHEET TITLE: SAFETY CABLE SYSTEM DETAILS

ISSUE: SUBMIT FOR PERMIT 04/15/2020

REVISIONS:

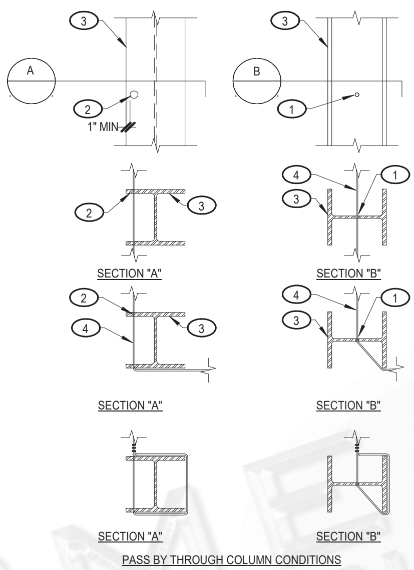
DRAWN: PF CHECKED: SDG/GAM
DATE: 12/04/2018
PROJECT NUMBER: 18.2532
SHEET NUMBER: S1.2

SME STEEL CONTRACTORS



CONSTRUCTING FOR THE FUTURE

SME STEEL CONTRACTORS



KEYNOTES:

1. 1" Ø HOLE CENTERED IN COLUMN WEB
2. 1" Ø HOLE IN FLANGE
3. STEEL COLUMN BY OTHERS
4. 3/8" Ø GALVANIZED AIRCRAFT CABLE

NOTES:

A. HOLES SHALL BE DRILLED OR PUNCHED, NOT FLAME CUT.
B. PROJECT ENGINEER OF RECORD TO ADDRESS WHETHER COLUMN FLANGE AND WEB HOLES NEED TO BE REPAIRED AT REMOVAL OF SAFETY CABLE.

6 / S1.4 WIRE ROPE AT STEEL COLUMN

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SME STEEL

SHEET TITLE: SAFETY CABLE SYSTEM DETAILS

ISSUE: SUBMIT FOR PERMIT 04/15/2020

REVISIONS:

DRAWN: PF | CHECKED: SG

DATE: 12/04/2018
PROJECT NUMBER: 18-2522

S1.4

STEEL ANGLE SCHEDULE	
CONDITION	STEEL ANGLE AT (8) AT 4' - 0" O.C.
2	L4x4x1/4
3	L3x3x1/4
4	L3x3x5/16

SLAB EDGE DISTANCE SCHEDULE		
CONDITION	DISTANCE AT (9)	
	MIN	MAX
3	2' - 6"	3' - 0"
4	3' - 0"	4' - 0"

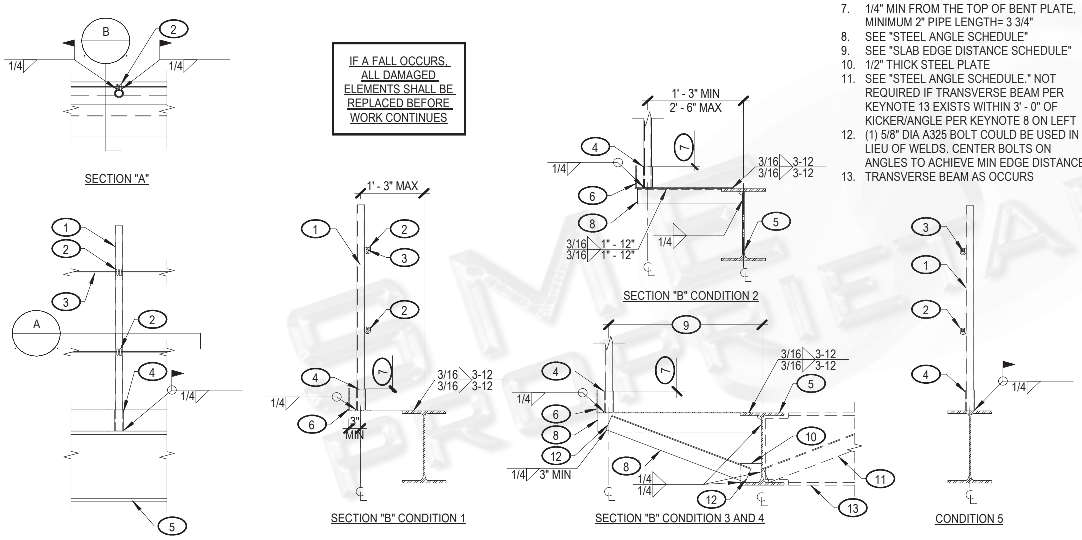
NOTES:

A. ALLOWABLE BENT PLATE CONDITIONS PER ATTACHED CALCULATIONS
B. KICKERS BY OTHERS NOT SHOWN FOR CLARITY
C. INSTALLATION AND SUPPORT OF BENT PLATE PER CONTRACT STRUCTURAL DRAWINGS

KEYNOTES:

1. 1 1/2" SCHED 40 PIPE
2. (2) U SHAPED RODS W/ OPPOSED ENDS WELDED TO STEEL POST
3. 3/8" Ø 7x19 GALVANIZED AIRCRAFT CABLE
4. 2" SCHEDULE 40 PIPE BASE SLEEVE
5. STEEL BEAM BY OTHERS
6. STEEL BENT PLATE BY OTHERS 1/4" THICK MIN
7. 1/4" MIN FROM THE TOP OF BENT PLATE, MINIMUM 2" PIPE LENGTH= 3 3/4"
8. SEE "STEEL ANGLE SCHEDULE"
9. SEE "SLAB EDGE DISTANCE SCHEDULE"
10. 1/2" THICK STEEL PLATE
11. SEE "STEEL ANGLE SCHEDULE." NOT REQUIRED IF TRANSVERSE BEAM PER KEYNOTE 13 EXISTS WITHIN 3' - 0" OF KICKER/ANGLE PER KEYNOTE 8 ON LEFT
12. (1) 5/8" DIA A325 BOLT COULD BE USED IN LIEU OF WELDS. CENTER BOLTS ON ANGLES TO ACHIEVE MIN EDGE DISTANCE
13. TRANSVERSE BEAM AS OCCURS

IF A FALL OCCURS, ALL DAMAGED ELEMENTS SHALL BE REPLACED BEFORE WORK CONTINUES



1 S1.5 SAFETY CABLE CONNECTION AT INTERMEDIATE POST
NO SCALE

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PROJECT: SME STEEL PERIMETER CABLE STATE OF NV, CA, & UT
SME STEEL

SHEET TITLE: **SAFETY CABLE SYSTEM DETAILS**

ISSUE: SUBMIT FOR PERMIT 04/15/2020

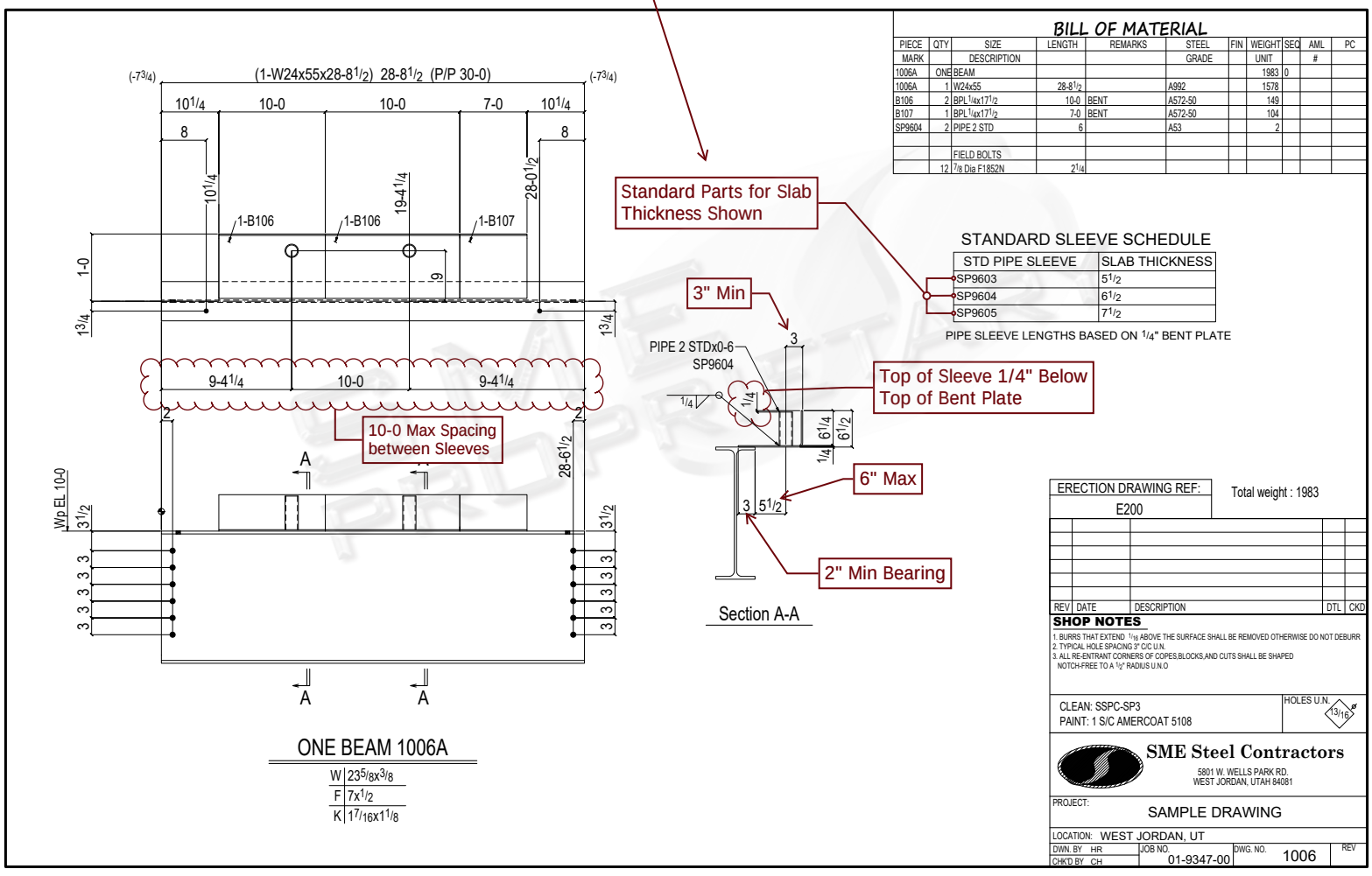
REVISIONS:

DRAWN: Author CHECKED: Checker
DATE: 12/04/2018
PROJECT NUMBER: 18.2532
SHEET NUMBER: **S1.5**

13.15 Example Beam With Sleeve for Perimeter Safety Post System

Note: Each project is unique. Detailer will get final direction on safety items from Project Management at kickoff meeting.

Note: If standard part not shown for your project use 2" std pipe as shown and let software assign the sub material mark per SME Numbering System in Section 2



BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
1006A	ONE	BEAM					1983	0		
1006A	1	W24x55	28-8 1/2		A992		1578			
B106	2	BPL 1/4x17 1/2	10-0	BENT	A572-50		149			
B107	1	BPL 1/4x17 1/2	7-0	BENT	A572-50		104			
SP9604	2	PIPE 2 STD	6		A53		2			
		FIELD BOLTS								
	12	7/8 Dia F1852N	2 1/4							

STANDARD SLEEVE SCHEDULE

STD PIPE SLEEVE	SLAB THICKNESS
SP9603	5 1/2
SP9604	6 1/2
SP9605	7 1/2

PIPE SLEEVE LENGTHS BASED ON 1/4" BENT PLATE

ONE BEAM 1006A

W	23 5/8x3/8
F	7x1 1/2
K	1 7/16x1 1/8

ERECTION DRAWING REF: E200

Total weight : 1983

REV	DATE	DESCRIPTION	DTL	CKD

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A 1/2" RADIUS U.N.O

CLEAN: SSPC-SP3
PAINT: 1 S/C AMERCOAT 5108

HOLES U.N. 13/16

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

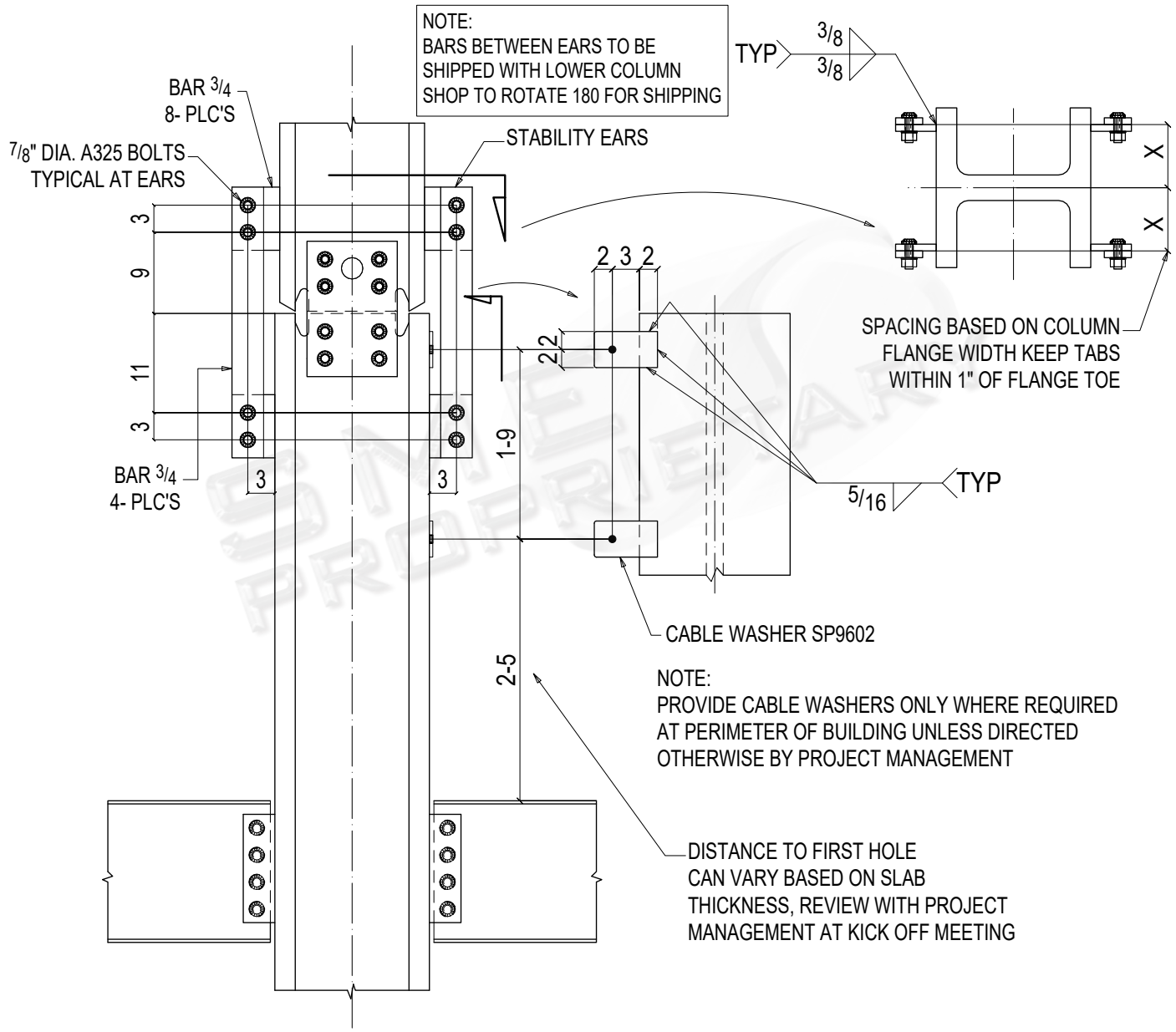
PROJECT: SAMPLE DRAWING

LOCATION: WEST JORDAN, UT

DWN. BY HR | CHK'D BY CH | JOB NO. 01-9347-00 | DWG. NO. 1006 | REV

13.16 Example Column with Cable Washers for Perimeter Safety Cable System

Note: Column shown with stability ears and safety cable washers. Review splice location at detailer turnover meeting with Project Management and verify you have enough room to fit both cable washers on lower column.



COLUMN STABILITY EARS AND SAFETY CABLE WASHERS

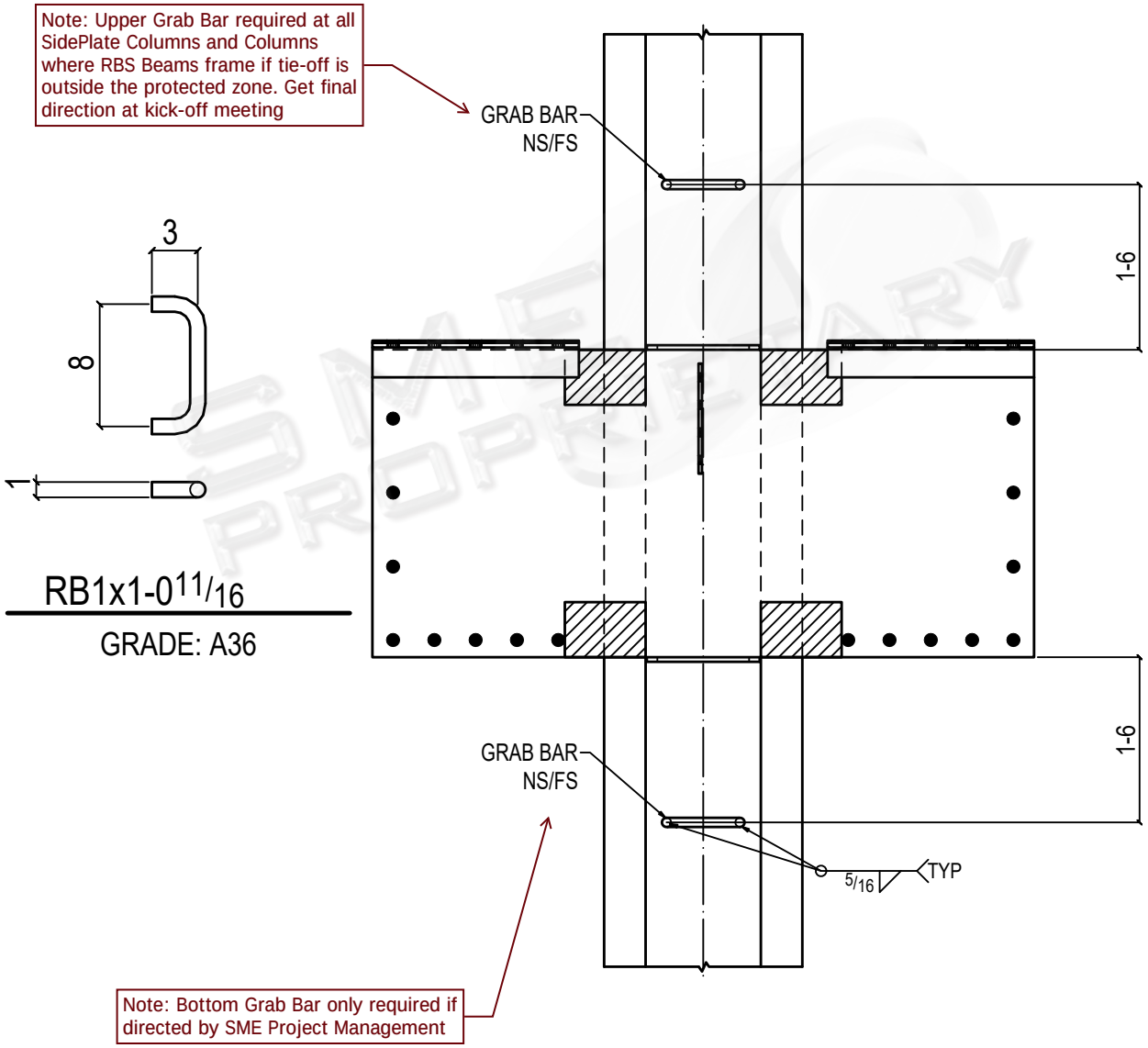
STABILITY EARS REQUIRED AT ALL COLUMN SPLICE'S UNLESS DIRECTED OTHERWISE BY PROJECT MANAGEMENT

13.17 Column Safety Tie Off Grab Bars at SidePlate Columns

a. Upper tie off grab bars are required at all SidePlate columns. Lower grab bar only required if given direction from Project Management.

b. If project has beams with RBS cutout in flange and tie off hole is required to be outside of the protected zone, detailer to add safety tie off bar to column.

c. Note: Each project is unique. Detailer will get final direction on safety items from Project Management at kickoff meeting.



SECTION 14 BENT PLATE

14.1 Bent Plate Checklist

- ☐ Reviewed drop in closures at columns and applied all requirements.
- ☐ Provided typical bent plate splice bars at required locations.
- ☐ Drop in closure plates assigned a sub-material mark and included with member to which it will be shipped.
- ☐ At interior corners, held plate back as required for field bolting of members.
- ☐ Bent plate to be detailed in 10-0 max lengths

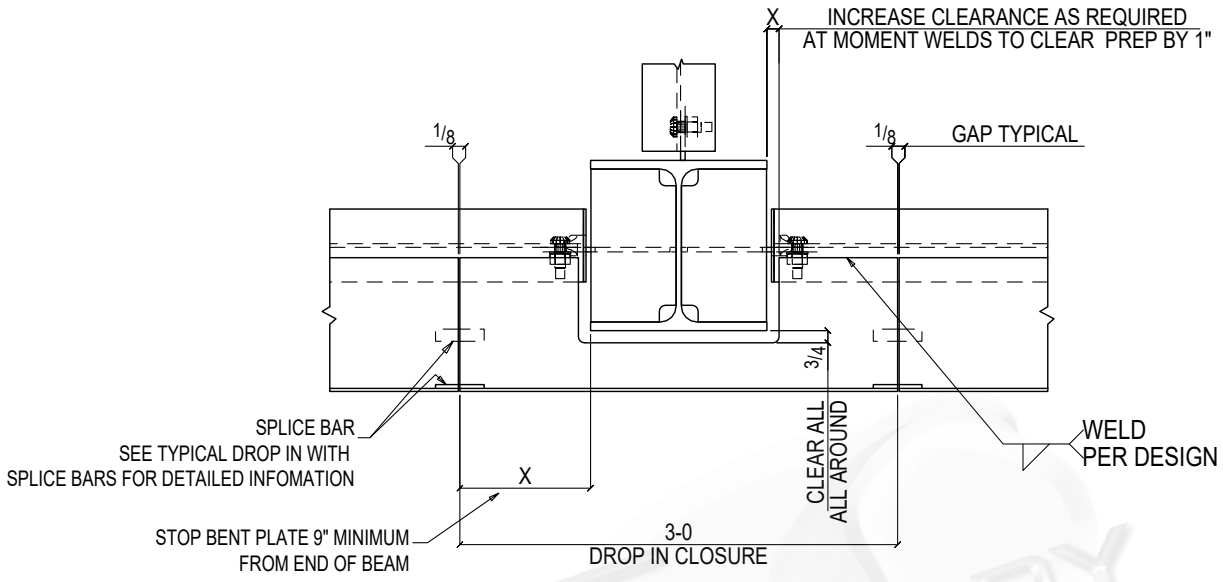
14.2 Bent Plate Overview

- Shop weld bent plate at all locations possible.
- Use 36” drop ins at columns along edge of structure.
- Use drop ins at corner columns as required.
- Back tack bent plates into adjacent beam for shipping when possible.
- Use drop ins at interior openings with horizontal leg extended to prevent openings in corners.

Note: These are typical requirements, bent closure plate will be reviewed with detailer at kickoff meeting and given project specific direction for unique conditions such as bolted bent closure, etc.

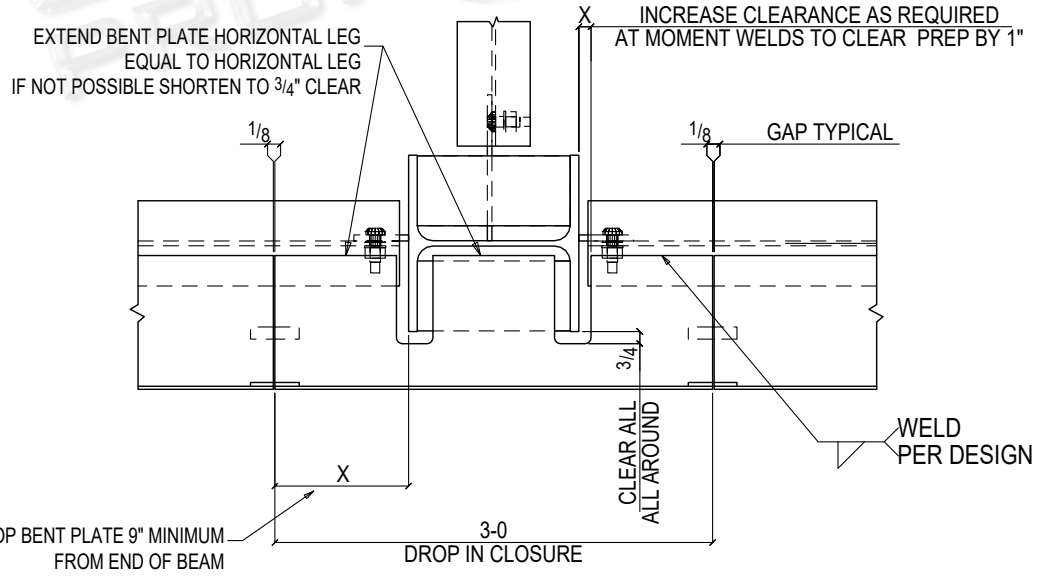
14.3 Drop In Closure at Column Examples

- Typical closures at columns shown below. Detailer will be given project specific direction.



DROP IN CLOSURE PLATE AT COLUMN

PARALLEL TO FLANGE

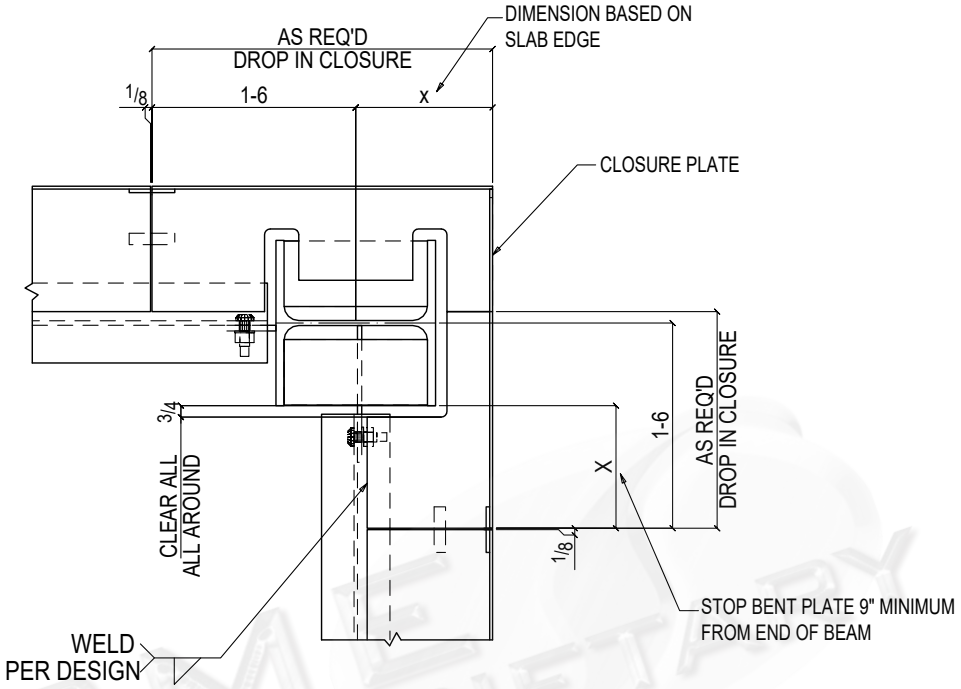


DROP IN CLOSURE PLATE AT COLUMN

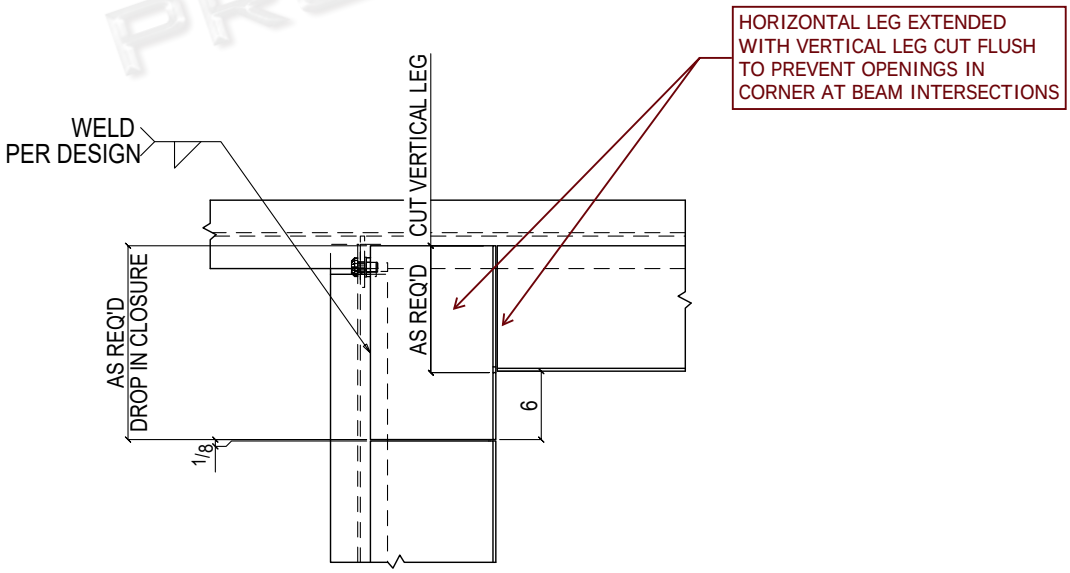
PARALLEL TO WEB

14.4 Drop In Closure at Corner Column and Interior Opening

- Typical closures at column and beam. Detailer will be given project specific direction.



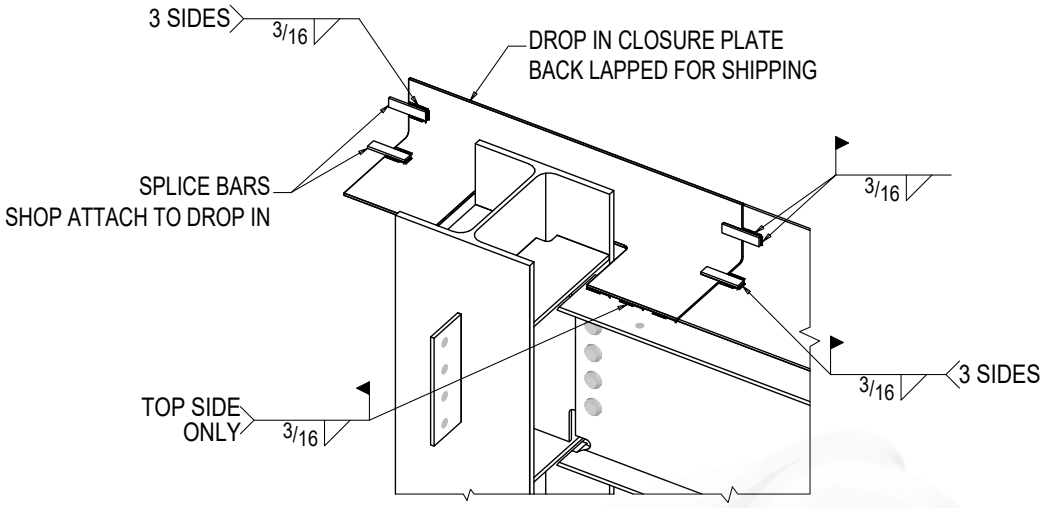
DROP IN CLOSURE AT CORNER COLUMN



DROP IN CLOSURE AT OPENING

14.5 Drop In Closure With Splice Bars for Field Erection

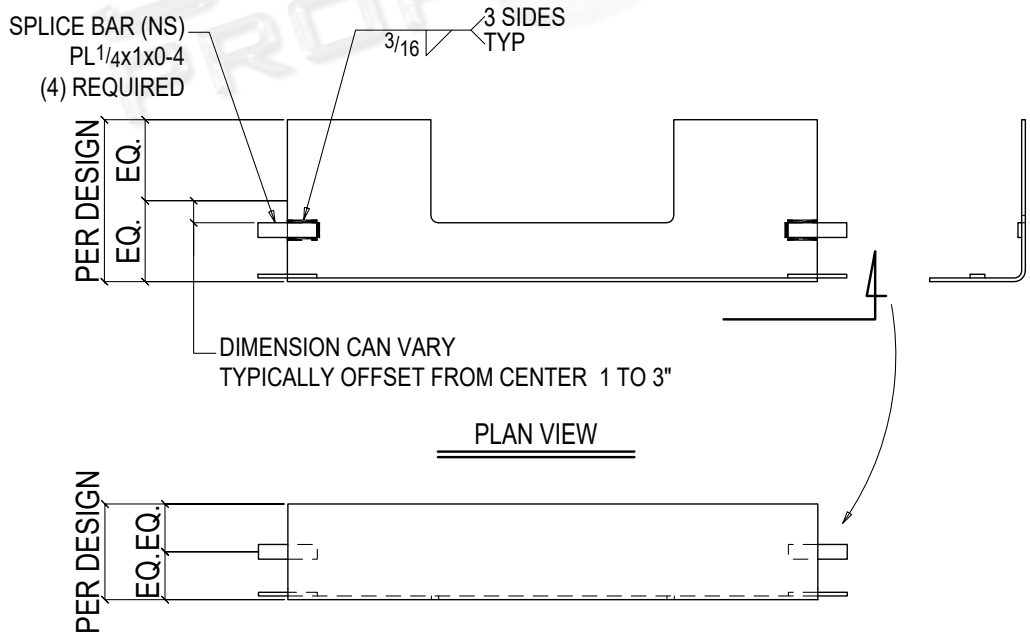
- Typical closure plate splice bars at drop in bent plate closure at columns



DROP IN CLOSURE PLATE SPLICE BARS AT COLUMN

IF SPLICE BARS ARE REQUIRED, RFI TO WELD
3 SIDES ONLY. ELIMINATING BOTTOM SIDE WELDING
COORDINATE SPLICE BAR FIELD VS. SHOP WELDING AT PROJECT KICKOFF

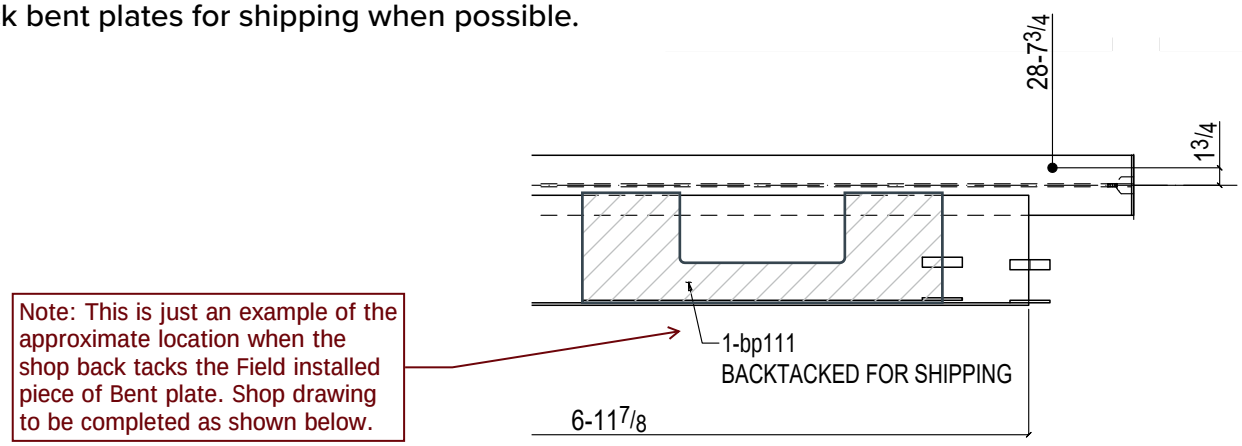
14.6 Drop In Closure Example With Splice Bars for Field Erection



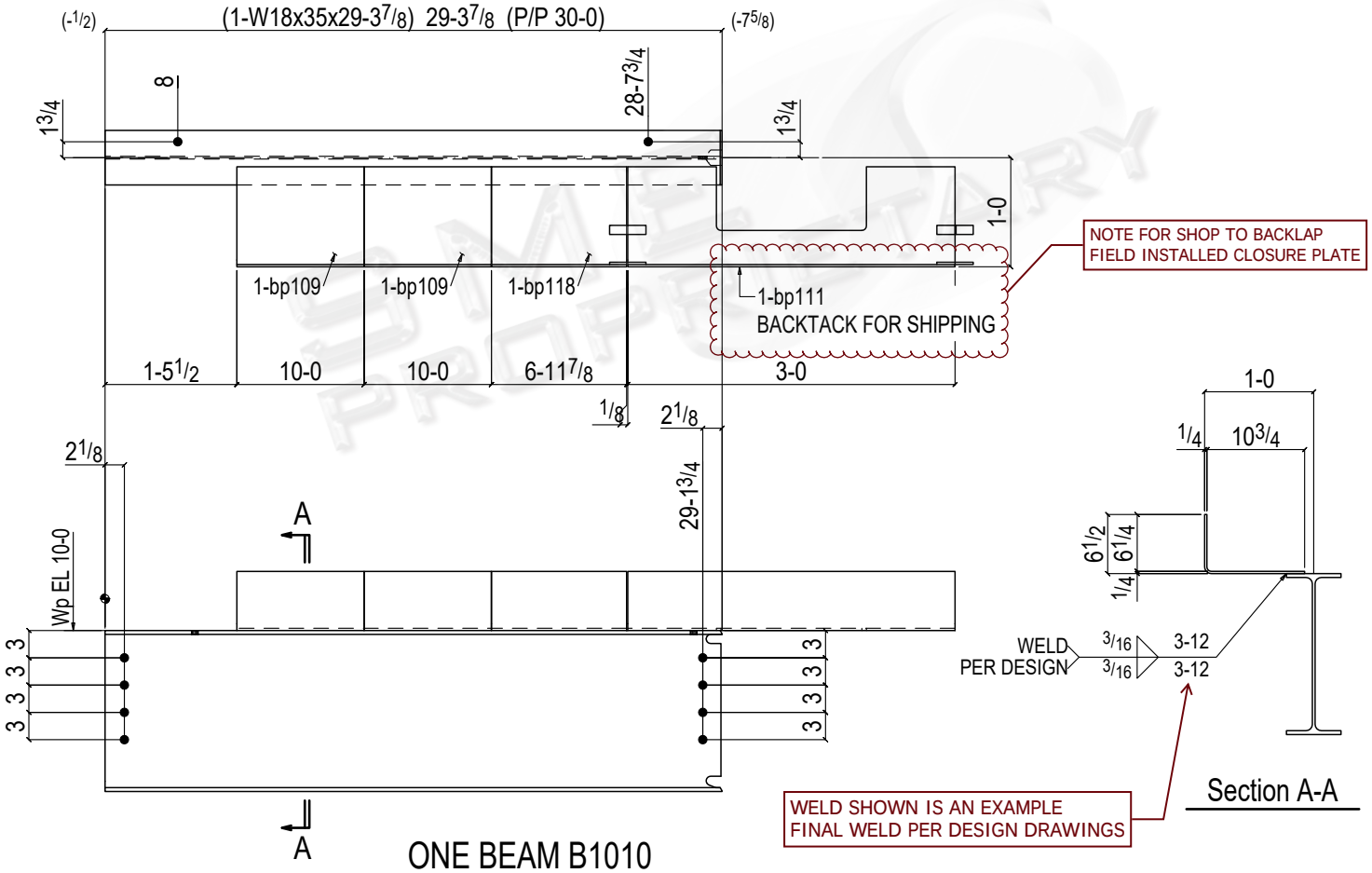
TYPICAL DROP IN CLOSURE PLATE AT COLUMN WITH SPLICE BARS

14.7 Sample Drawing with Back Lapped Bent Plate for Shipping

- Back tack bent plates for shipping when possible.



Note: This is just an example of the approximate location when the shop back tacks the Field installed piece of Bent plate. Shop drawing to be completed as shown below.



ONE BEAM B1010

W	17 11/16 x 5/16
F	6 x 7/16
K	1 1/8 x 7/8

AT GRID: B & 3

SECTION 15 FIELD WORK (FW) DRAWINGS

15.1 Field Work Drawing Checklist

- ☐ Reviewed field work drawing requirements and applied all requirements.
- ☐ Followed procedure for preparing field work drawings including correct naming.
- ☐ Identified all members on erection drawings with update FW shipping marks.
- ☐ Field work narrative included on all sheets requiring field work.
- ☐ Revision box has information included that created the change: RFI, design change, etc.

15.2 Corrective Work Drawings (FW Drawings)

a. A field work drawing shall be made when it is necessary to make revisions that cannot be processed through a normal drawing revision (Rev. 1, 2, etc.). Detailer must receive specific authorization from SME Project Management before making or issuing any FW drawings. Reason for such revisions may be one of the following:

b. To correct a detailing error discovered after the drawing has been issued for fabrication.

c. To correct a misfit or interference discovered during the field erection, where approval of the engineer is required for the modification.

d. Normal revisions, prior to completion of fabrication, should be handled through drawing revisions (Rev. 1, 2, etc.) FW drawings are not to be issued for shop revisions.

15.3 Procedure for Preparing (FW Drawings)

a. A drawing that requires corrective work will be issued, maintaining its original number and piece mark (example: drawing 1001 and piece mark B1001) with the additional drawing prefix FW (drawing 1001 becomes FW1001 and mark B1001 becomes FWB1001).

b. Remove any sections, dimensions, etc. that aren't required to complete the work in the field. Clearly label, dimension, and use correct weld symbols for all additions and deletions to the member.

c. Remove any line items in the Bill of Materials except for new material required to complete the work in the field.

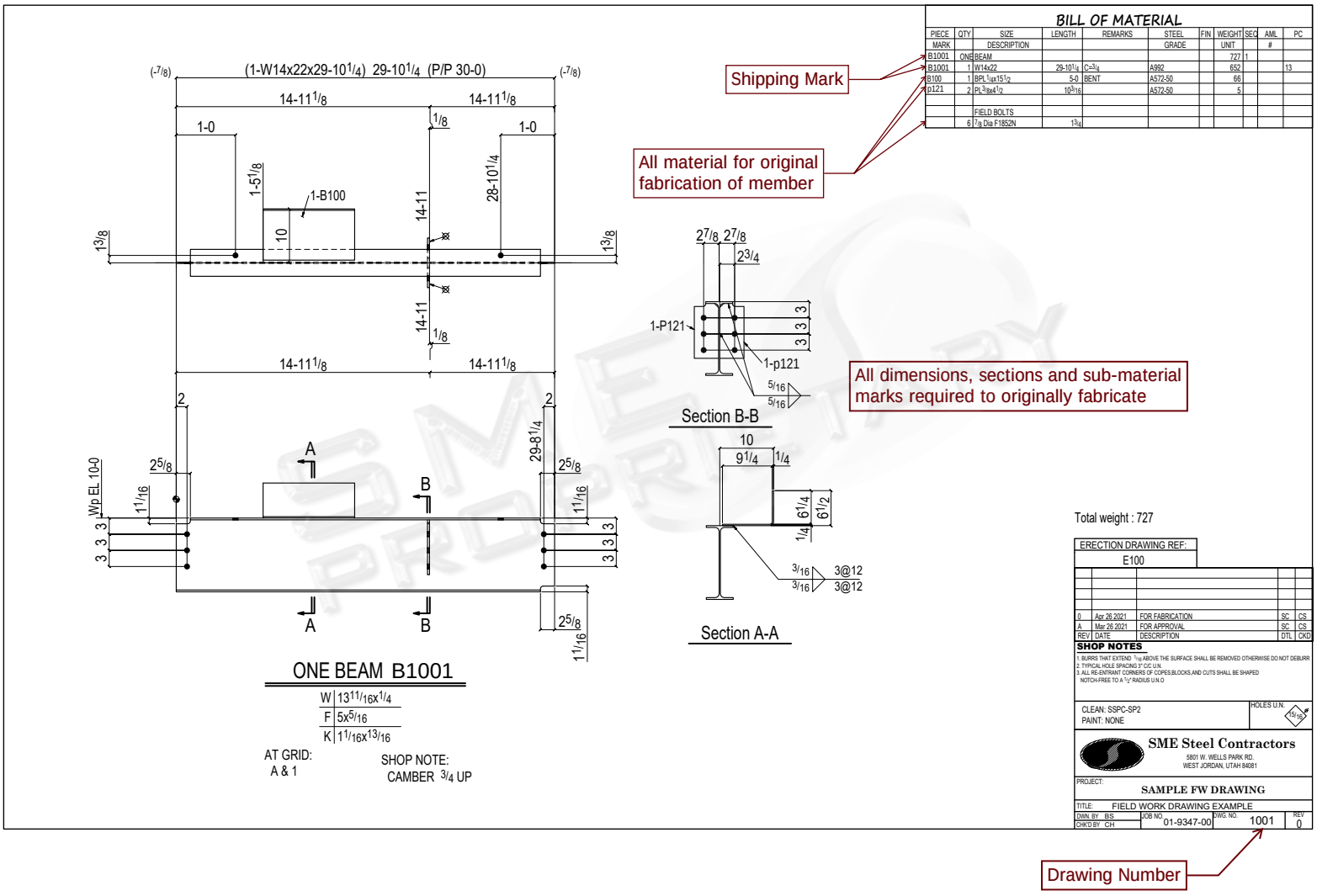
d. Update shipping marks on erection drawings for field to identify location of work.

e. Detailer shall maintain a separate drawing log for all FW drawings. All FW drawings will become part of the contract documents.

f. Detailer will include description in the revision title block with the reason field work is required (i.e., RFI number, CCD number, etc.).

g. All FW drawings will include a narrative of the work to be performed.

15.4 Sample Drawing Before Field Work Being Required



15.5 Sample Field Work Drawing

Shipping Mark W/FW Prefix

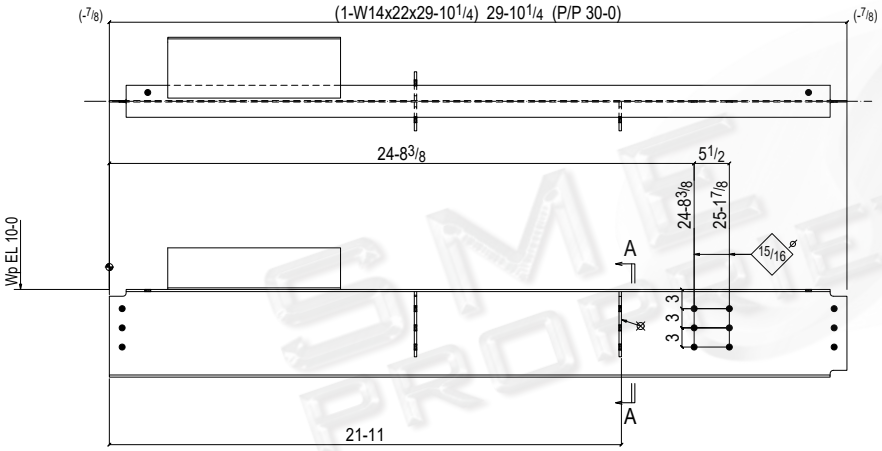
Only material required for Field Fabrication requirements

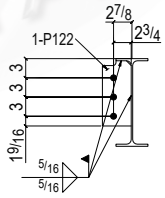
BILL OF MATERIAL

PIECE MARK	QTY	SIZE DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
FWB1001	ONE	BEAM					656	0		
FWB1001	1	W14x22	29-10 1/4	C=3/4	A992		651			
p122	1	PL 3/8x4 1/2	10 3/16		A572-50		4			

Summary of Field Work Required

FIELD WORK SUMMARY:
ADD ONE NEW SHEAR PLATE MK~p122
FIELD DRILL SIX NEW HOLES IN WEB AS SHOWN





Section A-A

ONE BEAM FWB1001

W | 13 11/16 x 1/4
F | 5x5/16
K | 1 1/16 x 13/16

AT GRID:
A & 1
SHOP NOTE:
CAMBER 3/4 UP

Only dimensions, sections and sub-material marks required for Field fabrication

Total weight : 656

ERECTION DRAWING REF:
E100

REV	DATE	DESCRIPTION	SC DTL	CS CKD
0	May 26 2021	FIELD WORK PER RFI #257		

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A 1/2" RADIUS U.N.O

CLEAN: SSPC-SP2
PAINT: NONE

HOLES U.N. 15/16

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT: SAMPLE FW DRAWING
TITLE: FIELD WORK DRAWING EXAMPLE
DWN BY BS | CHK'D BY CH | JOB NO 01-9347-00 | DWG NO FW1001 | REV 0

Drawing Number WITH FW PREFIX

SME STEEL CONTRACTORS

SECTION 16 PAINTING AND GALVANIZING

16.1 Paint and Galvanizing Checklist

- ☐ Applied finish code NP in Bill of Material for members that don't require any paint.
- ☐ Applied the correct finish code in Bill of Material for all members that required a finish.
- ☐ Identified all paint or galvanizing hold backs on painted members for field welding.
- ☐ Added typical note for no paint requirements on the top surface of beam flanges as required.
- ☐ Drawing title block contains all required information, surface prep, paint, etc.
- ☐ Detailer has reference hot-dip galvanizing technical guide and applied requirements to shop drawings.
- ☐ Provided Project Management sample drawings of galvanized members prior to finishing for submittals.
- ☐ Noted galvanized bolt requirements in Bill of Material.

16.2 Nonpainted Steel

a. Finish code NP in Bill of Material indicating NO paint requirement. All members will have NP in the finish section of the Bill of Material that Do Not receive paint, primer, galvanizing, or intumescent finish.

16.3 Painted Steel

a. Finish code in Bill of Material indicating paint requirements: NP = NO Paint, P = Paint or Primer, G = Galvanize, and I = Intumescent, for each paint specification type, as required.

b. When the entire main member piece paints, the finish code is required only on the shipping piece mark line in the Bill of Material.

c. If only a portion or parts require paint, the finish code is required on the line for each painted part in the Bill of Material.

d. Show all paint hold backs on 2D drawings with dimensions.

Identify each area as No Paint.

Clarify NS/FS or All Around.

Hold back 3” from all field CJP and PJP welds or as required by contract documents.

Hold back the faying surfaces of slip critical connections (unless the paint meets the required slip critical coefficient).

e. Add typical note “no paint on top flange of beams” if supporting metal decking and/or receiving through deck shear studs. Note: this needs to be coordinated with Project Management if this is contrary to project specifications.

f. Back to back angles/members with limited access for painting: get direction from Project Manager on specific notes required before detailing.

g. Title block should indicate surface prep, specific paint product, and color. If multiple coats of paint are required, list each product and color.

16.4 Galvanized Steel

a. Finish code in Bill of Materials indicating finish requirements: G = Galvanize.

b. When the entire main member piece galvanizes, the finish code is required only on the shipping piece mark line in the Bill of Materials.

c. If only a portion or parts require galvanizing, the finish code is required on the line for each galvanized part in the Bill of Materials.

d. Detail, dimension, and note the extents of "uncoated areas" as required at weld areas, etc. Masking: areas required to remain uncoated during hot-dip galvanizing will be masked by material designed to prevent galvanizing at designated areas on members.

e. Detailer will reference hot-dip galvanizing technical guide prior to the start of detailing in order to select adequate, yet economical details for vents and drains. It is necessary to understand how the product will be oriented as it is being lowered into the baths. This is a subject to which the fabricator must consult with galvanizer prior to detailing. Detailer will work with Project Management to set the maximum size of member or multi-member assembly so it doesn't exceed galvanizer bath width and height. Standardize the size of vent and drain holes that will need to be plugged as much as possible.

f. Note galvanized bolts in Bill of Material.

g. Note vent and drain holes that need to be plugged and include count with field bolts.

Note: Detailer will need to provide sample shop drawings before completing shop drawings for approval for SME review. As the detailer, we expect you to familiarize yourself with the technical guide attached and apply to your shop drawings, you are responsible for accuracy and compliance with galvanizing practices.

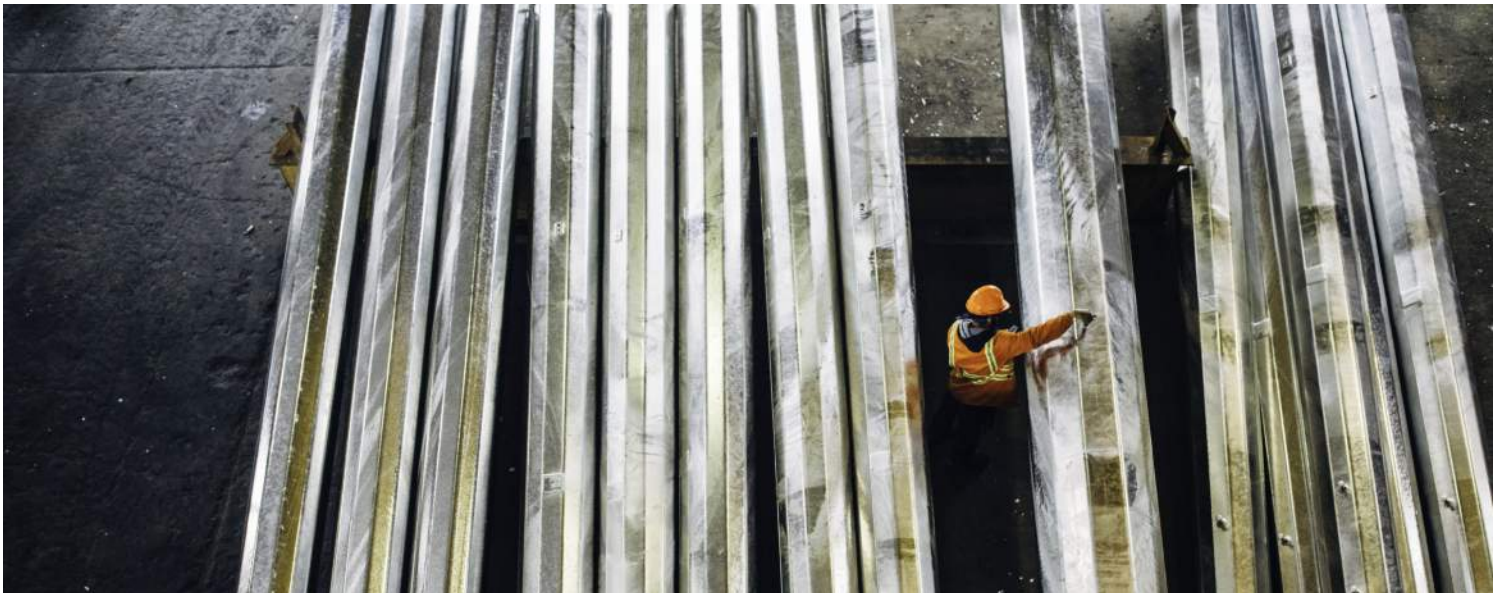
The following Hot-Dip Galvanizing Technical Guide is for reference only. The author may provide updates or changes as codes, standards, and business practices change. SME will use different galvanizing companies at its discretion

2020_Valmont Coatings_Hot-Dip Galvanizing Technical Guide.PDF

valmont COATINGS

Hot-Dip Galvanizing
Technical Guide

Galvanized to exceed your expectations.



THE LEADING GALVANIZER

As a full-service coating company, Valmont Coatings provides quality surface finishes that extend the service life and improve the appearance of metal products throughout the country. Our processes and transportation capacities are designed to efficiently handle steel products of all shapes and sizes, for customers anywhere in the country.

AGA Member Zn

OVERVIEW

The Valmont® Coatings Hot-Dip Galvanizing Technical Handbook provides detailed information about fabrication design for the hot-dip galvanizing process. This handbook was created for those involved in the design of steel products to better understand the galvanizing process in order to produce the most durable and cost-effect results possible. If you have additional questions, Valmont Coatings employees at all global locations are pleased to assist with advice on design and performance of hot-dip galvanized coatings and products.

TABLE OF CONTENTS

Valmont Coatings

ABOUT VALMONT COATINGS

Valmont Coatings is a recognized leader in protective metal coatings. We operate one of the largest networks of galvanizing facilities across North America and offer decades of experienced coating services to a diverse range of industries including construction, infrastructure, manufacturing, mining, oil & gas, and agriculture.

The strategic location of Valmont Coatings plants in major centers throughout the country allows large and complex projects to be galvanized efficiently through one or more facilities simultaneously. Each of these operations has experienced sales staff available to assist customers with designing fabrications for galvanizing and coordination of special requirements for specific projects.

Real-Time Order Tracking

Knowing exactly where your order is at any given time is important to anyone managing a supply chain and scheduling product delivery. That's why we've developed our own proprietary component tracking system for Valmont Coatings customers. Valmont Coatings Connector delivers real-time visibility from any device you choose, including your smart phone, tablet or desktop computer.

When you send an order to any of our coating facilities, it's tracked through each step of the coating process, similar to the package shipping industry. We can provide you with notifications regarding important order status updates and action items via text and/or email. Customers also have the ability to schedule a pickup or delivery of product through the online portal.

Visit www.valmontcc.com to register.

UNITED STATES

ALABAMA

Birmingham Galvanizing
475 Dietrich Road Steele, AL
+1 205.594.5555
Galvanizing Kettle: 58’ x 7’2” x 9’
CorroCote, Spin Galvanizing

CALIFORNIA

Calwest Galvanizing
2226 East Dominguez St. Carson, CA
+1 310.549.2200
Galvanizing Kettle: 60’ x 6’ x 10’
CorroCote, Deglaring, Spin Galvanizing

George Industries
4166 Whiteside St. Los Angles, CA
+1 323.264.6660
Anodizing, Powder Coating

FLORIDA

Miami Galvanizing
3350 NW 119th St. Miami, FL
+1 305.681.8844
Galvanizing Kettle: 35’ x 6’ x 9’

Tampa Galvanizing
9520 E. Broadway Ave. Tampa, FL
+1 813.621.8990
Galvanizing Kettle: 42’ x 6’ x 9’

ILLINOIS

Empire Galvanizing
10909 Franklin Ave. Franklin Park, IL
+1 847.455.0884
Galvanizing Kettle: 52’ x 4’8” x 7’6”
Spin Galvanizing

IOWA

Siouxland Galvanizing
2301 Bridgeport Dr. Sioux City, IA
+1 712.252.4101
Galvanizing Kettle: 31’ x 5’ x 6’
Spin Galvanizing

KANSAS

Salina Galvanizing
1100 North Ohio St. Salina, KS
+1 785.452.9630
Galvanizing Kettle: 55’ x 10’6” x 12’
CorroCote, Deglaring

MINNESOTA

Applied Coating Technology
2411 Pilot Knob Rd. Mendota Heights, MN
+1 651.454.7777
E-Coating, Liquid Coating, Powder Coating

NEBRASKA

Valley Galvanizing
7002 North 288th St. Valley, NE
+1 800.777.2201
Galvanizing Kettle: 58’ x 7’2” x 8’6”
CorroCote

West Point Galvanizing
1700 South Beemer St. West Point, NE
+1 888.310.2389
Galvanizing Kettle: 30’ x 8’6” x 10’

NEW JERSEY

American Galvanizing
1919 South RT 54 Folsom, NJ
+1 609.567.2090
Galvanizing Kettle: 55’ x 6’6” x 10’

OKLAHOMA

Oklahoma Galvanizing
25055 Alliance Drive Claremore, OK
+1 918.266.2800
Galvanizing Kettle A: 60’ x 6’ x 7’6”
Galvanizing Kettle B: 58’ x 7’6” x 10’
CorroCote, Deglaring

OREGON

Pacific States Galvanizing
9700 SW Herman Rd. Tualatin, OR
+1 503.692.8888
Galvanizing Kettle: 44’ x 5’3” x 8’9”
Spin Galvanizing

PENNSYLVANIA

Pittsburgh Galvanizing
#9 South 12th St. Midland, PA
Galvanizing Kettle: 54’ x 8’3” x 10’6”

SOUTH CAROLINA

Columbia Galvanizing
1445 Old Dunbar Rd. West Columbia, SC
+1 803.755.2550
Galvanizing Kettle: 35’ x 6’ x 9’

TEXAS

United Galvanizing
6123 Cunningham Rd. Houston, TX
+1 713.466.4161
Galvanizing Kettle A: 41'6" x 4'8" x 5'5"
Galvanizing Kettle B*: 60' x 7'1"-6'1" x 6'10"
CorroCote, Deglaring, Chemline Polyurethane
**Kettle Width Tapers*

UTAH

Intermountain Galvanizing
1085 West 400 North Lindon, UT
+1 801.785.7200
Galvanizing Kettle: 46’ x 6’ x 6’
Powder Coating, Spin Galvanizing,
Duplex Coating

VIRGINIA

Virginia Galvanizing
3535 Halifax Rd. Petersburg, VA
+1 804.733.0808
Galvanizing Kettle: 50’ x 6’ x 9’

CANADA

ONTARIO

Pure Metal Galvanizing– Brantford
32 Bodine Drive Brantford, ON
+1 519.758.5505
Galvanizing Kettle A: 45’ x 6’2” x 9’9”
Galvanizing Kettle B: 30’ x 4’4” x 6’
Spin Galvanizing

Pure Metal Galvanizing– Mississauga
7470 Bren Rd. Mississauga, ON
+1 905.677.7491
Galvanizing Kettle: 52’ x 4’4” x 6’
Spin Galvanizing

01 GALVANIZING PROCESS

INTRODUCTION

The size of products that can be hot-dip galvanized is determined by the size of the zinc kettles, the tanks in the cleaning line, the crane capacities, or the building structure clearances within a particular galvanizing plant.

The most economical and highest quality galvanizing is achieved when steel products are sized to enable the entire product to be totally immersed in the molten zinc in a single dip.

When needs dictate that the product to be galvanized must be longer or deeper than the galvanizer's kettle, it can often be galvanized by means of the progressive dipping procedure. With this method, 50% or more of the surface of the product is immersed in the molten zinc. When the galvanizing of that portion is completed, the product is turned over and the remaining uncoated portion is lowered into the zinc and galvanized.

We urge fabricators, engineers and architects to consult with the Valmont Coatings location most convenient to them, on what local and regional sizing considerations should be. Regardless of the requirements, Valmont will utilize its robust multi-plant capability to best fulfill customer needs.

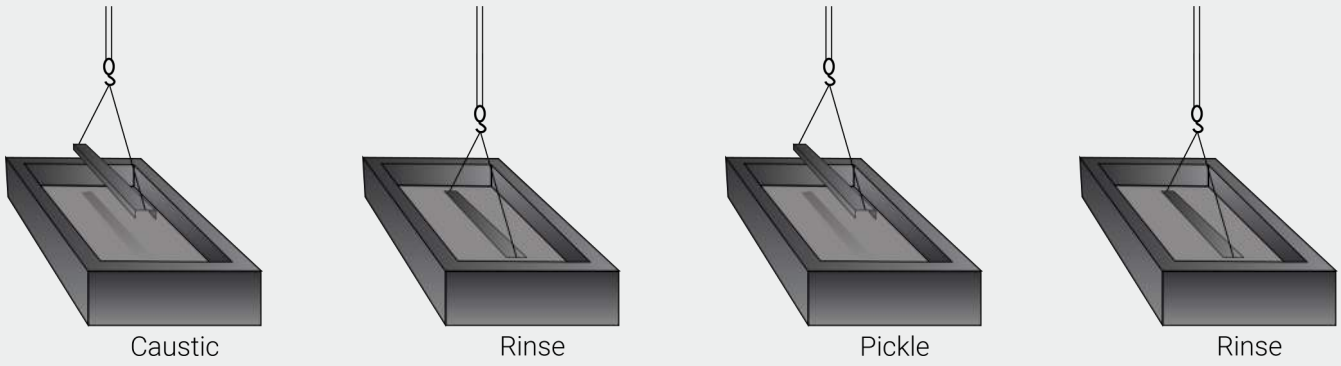


Figure 1: Process for ASTM A123

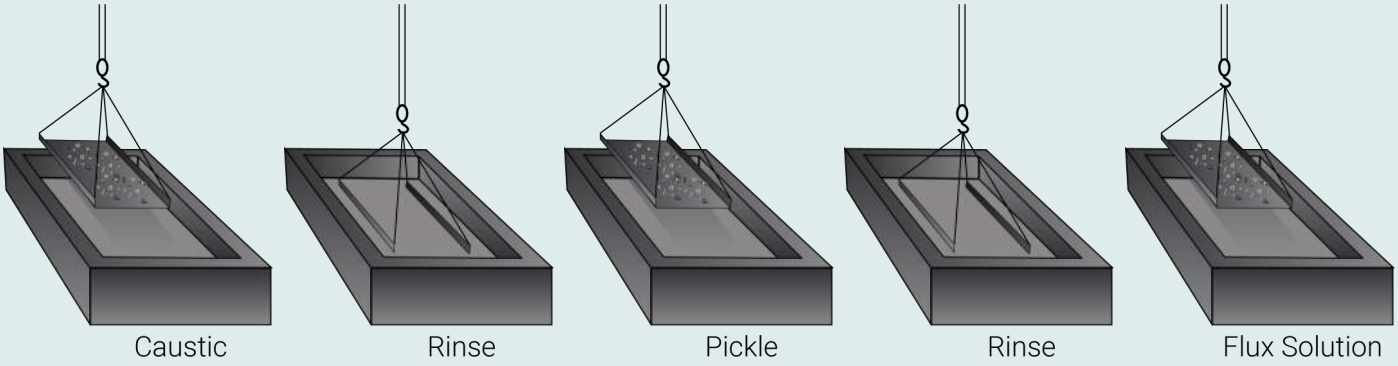


Figure 2: Process for ASTM A153

THE PROCESS

At the beginning of the process, products are batched into bundles, trays or racks to be handled in the most effective manner through the cleaning line. At this stage, each product is examined to determine the presence of adequate details for venting and draining of fluids during cleaning and galvanizing, and to assure that, when necessary, the product is provided with holes or lugs for lifting. If additional venting details or lifting holes/lugs are required, the customer is notified and arrangements are made to install them.

1. CAUSTIC– The caustic tank contains heated water with caustic soda and detergent additives. Oils, soil and soluble paint markings are removed from products during immersion at this stage, and also works its way under light mill scale.

2. RINSE– A tank containing water is used to remove residues of the caustic dip.

3. PICKLE– A bath of heated dilute sulfuric or ambient hydrochloric acid solution removes rust and mill scale from the products.

4. RINSE– Another tank containing water is used to remove residues from pickling.

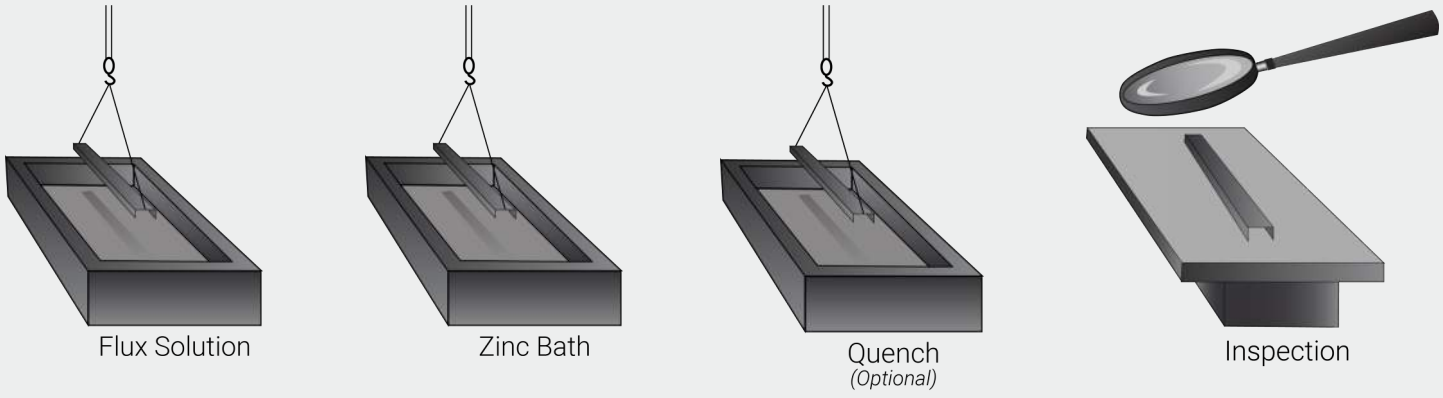
5. FLUX– Zinc ammonium chloride in the solution provides additional cleaning of the products being dipped. During galvanizing, the film of flux on the products improves wetting between the steel and the molten zinc.

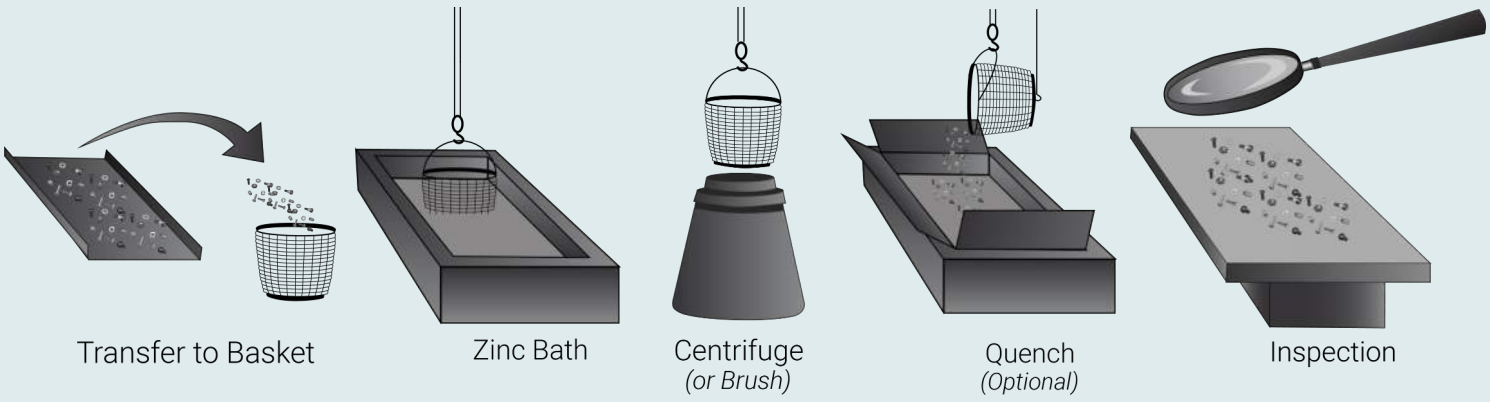
6. GALVANIZING– The fluxed, possibly re-fixtured, product is taken to the zinc kettle. The products are lowered into the molten zinc. Products remain in the molten zinc until they reach the approximately +840ºF molten zinc temperature.

7. CENTRIFUGING OR BRUSHING *(WHEN APPLICABLE FOR ASTM A153)*– When the perforated basket containing the product is removed from the molten zinc, it is transferred immediately to the centrifuge where excess zinc is spun away. Products that are too large to be centrifuged, but are still in need of removal of excess zinc, are subjected to brushing of the critical areas before the zinc solidifies.

8. QUENCH– After galvanizing (and centrifuging or brushing when applicable), the product may be immersed in a plain water quench as a means to reduce the time required for handling. Some galvanizing facilities offer a chromate quench as a passivation process to temporarily prolong the formation of zinc oxide and zinc hydroxide which naturally forms on the surface of the newly galvanized steel. This passivation process will wear away or be consumed within about six months. *(See figure 2).*

9. INSPECTION– Products are visually checked for coating integrity and measured to verify that coating thickness meets or exceeds ASTM Standards.





02 FABRICATORS GUIDE TO PIPE & TUBE GALVANIZING

INTRODUCTION & PURPOSE

The galvanizing of products that are made from tube or pipe requires special attention by the fabricator and the galvanizer. Installation of suitably sized holes in strategic locations on the product is essential to assure the correct galvanizing of all internal surfaces. The holes serve several purposes, namely to:

1. Prevent pressure build up and rupture of the product that could result from heating of enclosed air and moisture during partial or full immersion in the 840ºF galvanizing bath.
2. Provide for the rapid entry of cleaning fluids and molten zinc to overcome the natural buoyancy of hollow objects.
3. Enable air and galvanizers flux to escape from the last remaining upper corners of a product at the moment of total immersion. Elimination of air pockets allows cleaning fluids and molten zinc to reach all surfaces to permit complete internal cleaning and coating.
4. Eliminate the entrapment of pockets of zinc as the product is being withdrawn from the galvanizing bath. Properly sized and placed holes avoid large and costly volumes of zinc from solidifying in deep recesses.
5. Imperative to the safety of galvanizing plant personnel.

In order to select adequate, yet economical details for vents and drains, it is necessary to understand how the product will be oriented as it is being lowered into the baths. This is a subject that the fabricator must consult with Valmont on, prior to processing.

Holes, placed in products to fulfill the functions listed, are referred to as “vents” and “drains”* in the galvanizing industry. Size and location of such holes are a frequent topic of conversation between a galvanizer and the fabricator. Conservative recommendations on the size and location of openings are given in ASTM A385, “Standard Practice for Providing High Quality Zinc Coatings (Hot-Dip).” In order to select adequate, yet economical details for vents and drains, it is necessary to understand how the product will be oriented as it is being lowered into the baths. This is a subject that the fabricator must consult with Valmont on, prior to processing.

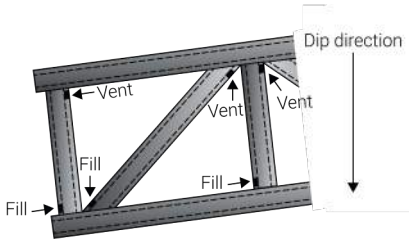
The purpose of this section is to acquaint you with the principles Valmont uses in determining how to position a work piece for lowering into the baths, and how this leads to a determination of where the vents and drains should be located.

Some examples are given to show how the principles are applied to tubular products but, since the type and configuration of products are so varied, we are relying on these principles, coupled with the fabricators’ knowledge of their own product, to enable them to determine where vents and drains are required.

**Holes that are used to “drain” as a part is being removed from the bath have earlier served as “fill” holes during the immersion of the part. Use of the terms “fill” and “drain” should be taken to describe the same hole, depending upon how it is functioning at a particular stage of the process.*

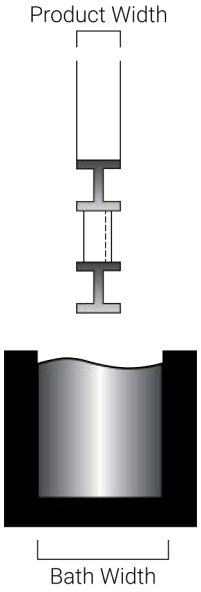
PRINCIPLES

1. Size, Style and Location of Openings are Adequate



For secondary components, as for primary members, fill holes need to be located as close as possible to the point on the member where the fluids first make contact during immersion. Similarly, vent holes on secondary members need to be as close as possible to the point where the member is finally and completely immersed.

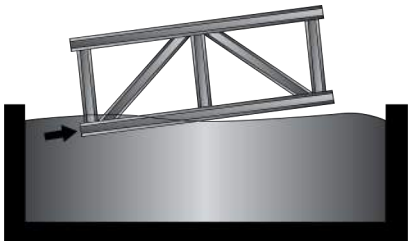
2. Product is Oriented to Maximize Bath/ Kettle Space



Generally, products are set up for galvanizing so that their smallest dimension parallels the bath width. Several identical pieces can often be galvanized side by side at the same time, thereby utilizing most of the width of the cleaning bath or zinc kettle.

It is with this orientation that the consideration of vent and drain openings begins.

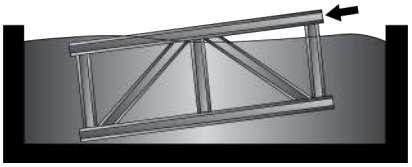
3. Initial Fill Location is at Largest Available End Opening



An opening at, or very near to, a lower end location of the product is selected as the initial entry opening to allow cleaning fluids and molten zinc to flow into the interior.

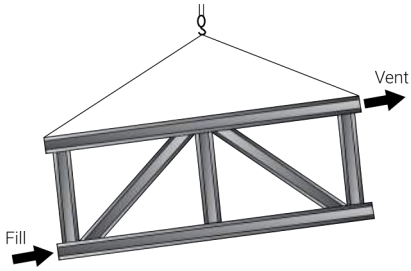
When a product has an opening at each of its two ends, and one of these openings is larger than the other, the larger opening will be chosen as the entry orifice, provided that it can be situated near the bottom of the product when suspended by a crane.

4. Final Vent is Positioned in the Spot Immersed Last



Good internal galvanizing depends on the ability of cleaning fluids and molten zinc to surge through the hollow product from the entry to the exit point, without compressing any air into packets in its path. In any hollow product, the last exit point must be located at the place where the last portion of the hollow component submerges into the bath.

5. Life Orientation is Suited to Initial Fill, Final Vent Locations



As the work piece is being lowered into each of the baths, the natural tendency of the cleaning fluid and molten zinc is to push upward through the product. To enhance this movement and to encourage a flow, especially along longitudinal components of the products, each work piece is arranged at a slight angle on the hoisting equipment as shown.

*Sealed off Hollow Structures

Internal members that seal off hollow structures require internal venting. These should be well vented with additional holes to allow the galvanizer to visually confirm the internal venting.

Additional Valmont Coatings recommendations relating to openings continue on the following page.

Minimum Size of Openings

Requirements for fill and vent opening size vary according to the size of tube or pipe being filled, and whether that tube or pipe is a primary or secondary component of the overall product. Fill and vent openings for primary members apply when these members have end closures of any kind.

The following tables provide guidelines on sizes that Valmont Coatings generally considers to be a minimum.

Pipe and Round Tube

Pipe & Tube Diameter	Minimum Fill & Vent Hole Diameter	
	Primary Member	Secondary Member
1-1/4", 1-1/2"	5/8"	3/8"
2"	7/8"	1/2"
4"	1-5/8"	7/8"
6"	2-3/8"	1-1/4"
8"	3-1/4"	1-5/8"
10"	4"	2"
12"	4-5/8"	2-3/8"
14"	5-1'4"	2-5/8"
16"	6"	3"
18"	7"	3-1/2"
20"	8"	4"

Square or Rectangular Tube

Triangular corner cutouts, rather than round holes, are suggested for fill or vent openings in end closures on primary members made of square or rectangular tube. Round holes, however, remain suitable to be fill or vent openings in secondary members made from this type of tube. The following table lists square-inch units for minimum opening sizes in primary members, and hole diameters in inch units for minimum openings in secondary members.

Tube Cross Section (square inches)	Minimum Fill & Vent Hole Diameter	
	Primary Member (square inches)	Secondary Member (inches)
2.25	.6	1/2"
4.0	1.0	5/8"
9.0	1.25	3/4"
16.0	2.75	1"
25.0	4.5	1-1/4"
36.0	5.5	1-3/8"
49.0	8.0	1-5/8"
64.0	11.0	1-7/8"
81.0	13.0	2"
100.0	15.0	2-1/4"

Quality of Openings

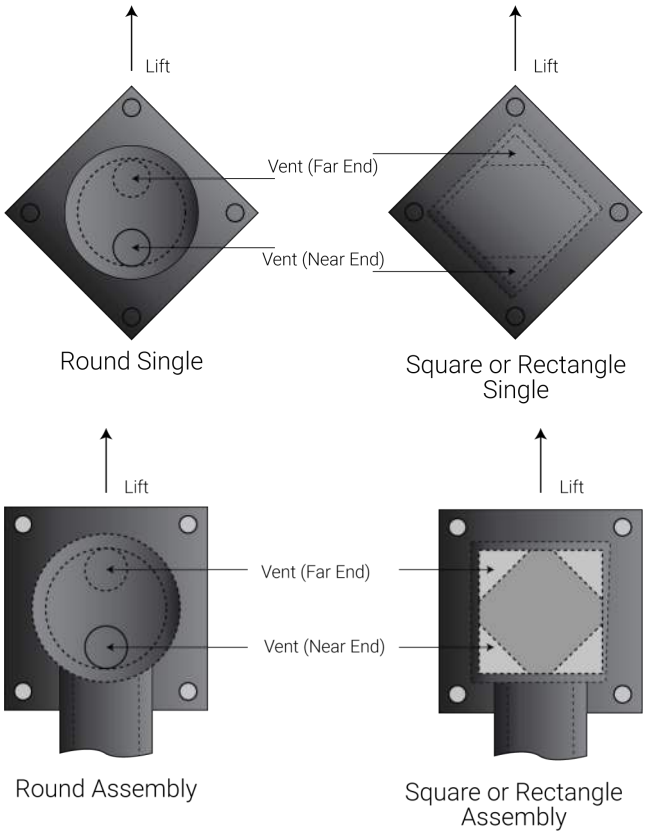
The evenness of the edge of an opening plays a significant part in helping Valmont Coatings achieve a good looking galvanized coating around it. Regular openings allow a smooth spill of molten zinc upon withdrawal from the bath. Irregular, ragged edge openings cause molten zinc to splatter as it pours and should be avoided.

Good Avoid

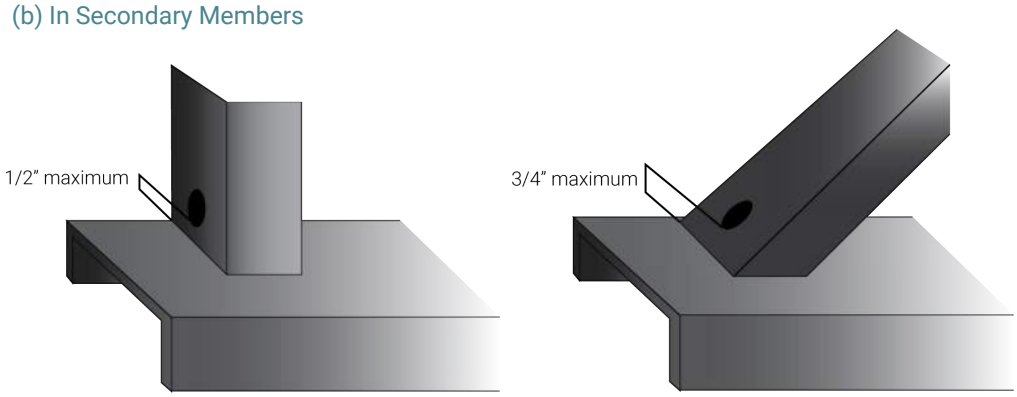
Location of Openings

Openings are best located where they will help to fill, vent, and drain the tubes most rapidly. Their location on individual components must be related to the lifting direction of the overall assembly.

(a) In Primary Members



(b) In Secondary Members



Perpendicular Member

Angled Member

6. Product Filled Promptly End to End

Proper fill, vent and drain openings allow for prompt immersion in the bath. This minimizes temperature variation in the product and therefore minimizes distortion.

7. Product is Drained Through Original Fill Holes

The sloped orientation of the work piece on the lifting equipment facilitates.

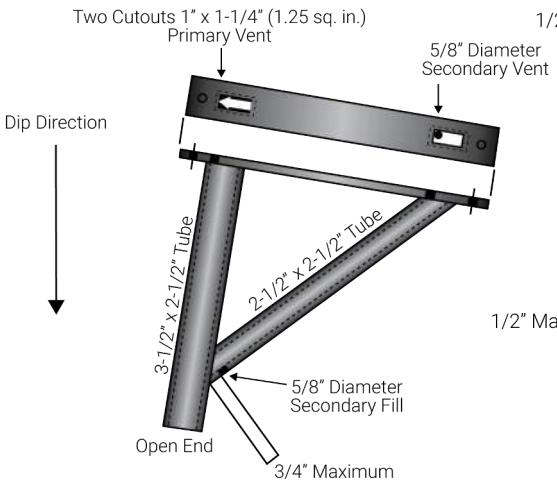
CUSTOMER ASSISTANCE

Valmont Coatings is happy to provide help to customers, upon request, to establish the size and location of vent and drain holes during the fabrication of an order.

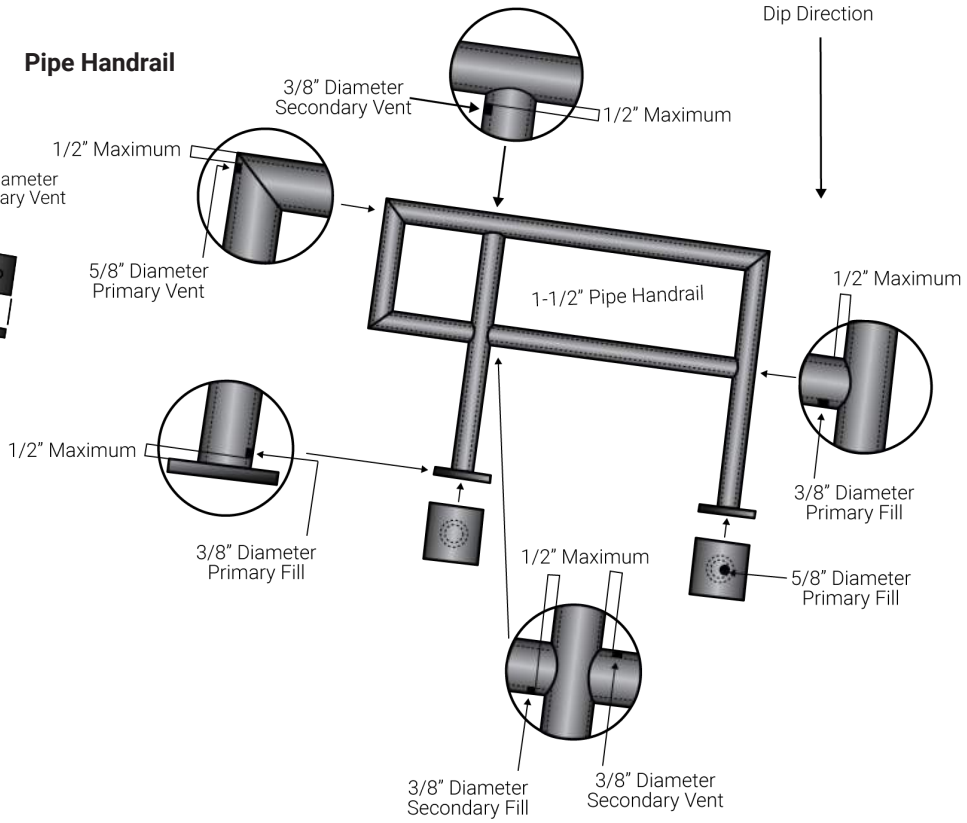
If Valmont Coatings technicians determine additional vent and drain fabrication is necessary once a product is in the Valmont plant, we will notify the customer, provide costs for appropriate modifications and request permission to install or modify the holes.

Examples

Tubular Bracket



Pipe Handrail



03 FABRICATORS GUIDE TO OPEN SECTION GALVANIZING

INTRODUCTION & PURPOSE

Fabricated steel products that are to be galvanized should have details that would allow the galvanizer's cleaning solutions and molten zinc to flow freely through the product at various stages throughout the hot-dip galvanizing process.

When such details are made, they eliminate the formation of air pockets during dipping. This helps to assure that the steel is thoroughly cleaned and coated in all corners. Improperly cleaned areas of steel will not galvanize.

Details that allow a clear path for the run-off of molten zinc when steel parts are being withdrawn from the galvanizer's kettle result in a coating that is more evenly formed throughout the product. Proper details prevent unwanted zinc build-ups which, ultimately, add tot eh customer's cost, look unsightly, and may interfere with the fit-up of adjoining parts.

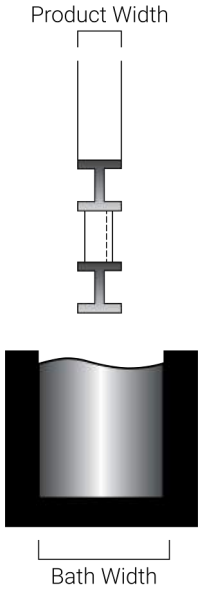
To determine how to avoid pockets and traps when a product is being hot-dip galvanized, the fabricator must first understand how a product will be oriented as it is being lowered into the lifted form the baths. This is not something that a fabricator could reasonably be expected to know without guidance from the galvanizer.

The purpose of this section is to acquaint you with the procedures that Valmont Coatings uses to: (1) determine how to position a work piece for lowering into, and lifting from, the baths, and (2) how this leads to a determination of where vents and drains should be located. The focus of this section is on the fabrication details for products made of open-sided components.

Examples are provided to show how the principles are applied to fabrications made of open-sided components. However, since the type and configuration of products are so varied, Valmont Coatings relies on these procedures, coupled with information provided by the fabricator's knowledge of their own product, to determine where vents and drains are required.

PRINCIPLES

1. Product is Oriented to Maximize Bath/ Kettle Space



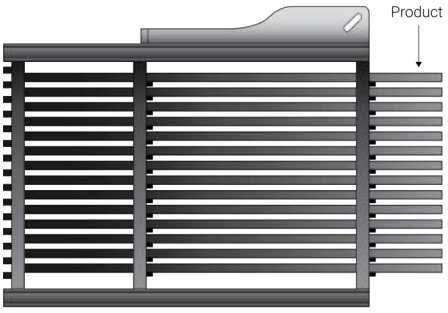
Generally, products are set up for galvanizing so that their smallest dimension parallels the bath width. Several identical pieces can often be galvanized side by side at the same time, thereby utilizing most of the width of the cleaning bath or zinc kettle.

2. Product Support Locations Depend on Size, Configuration and Number of Pieces per Lift.

Product is set up for galvanizing either by being placed into a rack, or by suspension from a harness of wires, hooks or chains that are attached through a suitably placed hole at the corner location near to the end of the product.

Rack

Use of a rack is preferable when: (1) there are many identical pieces to be galvanized, such as warehouse stock angle; or (2) these pieces are generally not more than 4" x 4" cross-section. Items galvanized in a rack do not need to be provided with a pick-up hole.



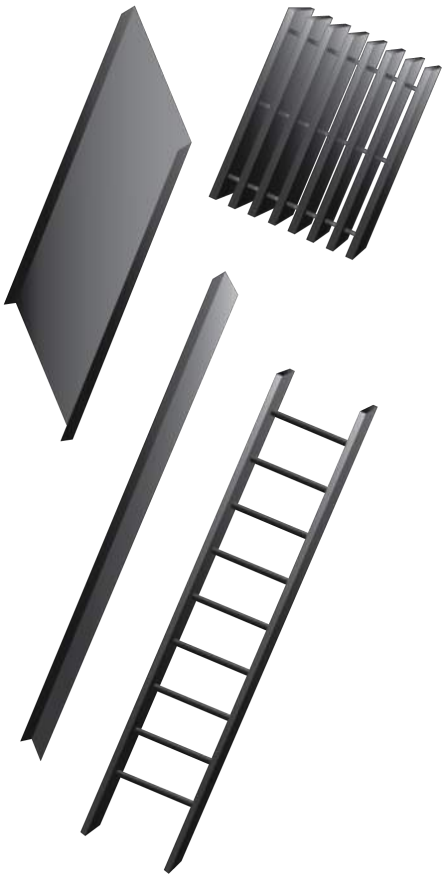
Side view of loaded rack

The majority of items that are hot-dip galvanized are suspended by wires, hooks or chains attached at one or more pick-up points on each work piece.

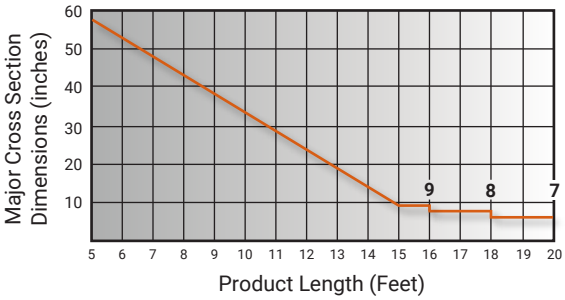
Single Point Pick-Up

Valmont Coatings will suspend from a single or corner pick-up point if: (1) the geometry of the product is reasonably streamlined along its length; (2) the product would give minimal drag through molten zinc as it was being moved along the length of the kettle; and (3) the length and major cross-section dimension of the product falls at or below the limits of the following graph.

Examples of products suited to single point pick-up



The graph is intended to provide only a very approximate guideline as to whether a product may be supported at a single pick-up point.



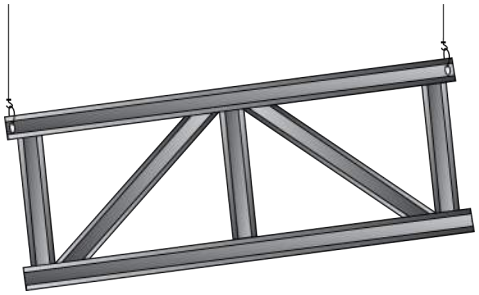
Example: A product with a major cross-section dimension of 20" and a minor cross-section dimension of 7" and a length of 11' will be lifted from a single pick-up point.

The required pick-up hole size is 3/8" diameter for items weighing less than 100 pounds, and 5/8th diameter for heavier items.

Two Point Pick-Up

Any product for which rack or single point pick-up is not practical is picked up from a wire harness, hooks or chain through a hole in each of its two ends.

The required pick-up hole size is 3/8" diameter for items weighting less than 200 pounds, and 5/8" diameter for heavier items.



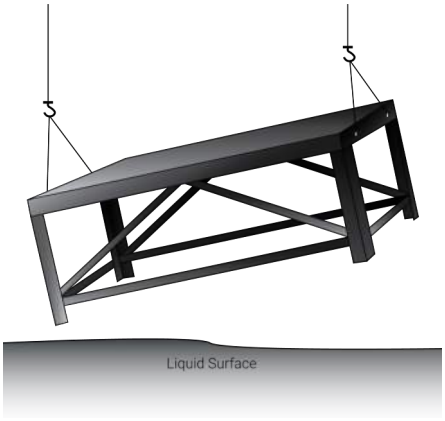
The product is arranged on the lifting equipment so that it enters the bath at an angle. The angular orientation is used to encourage a flow of molten zinc to move progressively along each component of the product form one end to the other. This provides a more uniform wetting action between the steel and the zinc, and better drainage upon withdrawal.

3. Choice is Top or Bottom Side Is Based on Openness

Determination is made as to which of two sides of a product will be first to be lowered into the bath. This is particularly significant when the ends (in the case of one point pick-up) or the sides (in the case of two point pick-up) or the sides (in the case of two point pick-up) are not the same.

Guidelines to help determine how a product will be hung, based upon its width, are provided in Principle No. 1. It must also be determined which remaining side will be the top, and which will be the bottom.

For each submersion of non-symmetrical products, Valmont Coatings will choose the side that is most open to be the bottom.



A table-like stand, for instance, would be lowered legs first.

4. Potential Air Pockets and Zinc Traps are Identified.

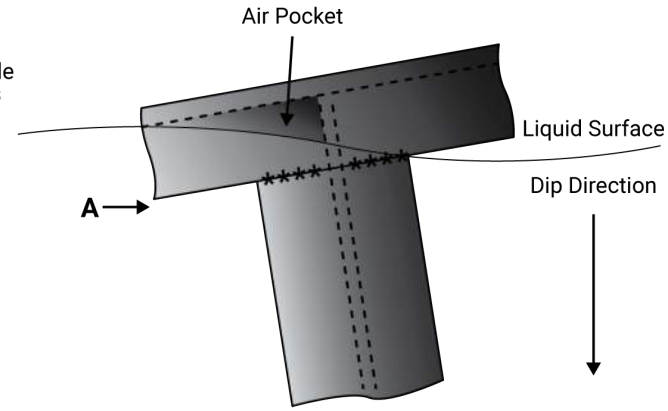
Once it has been determined how a product is likely to be picked up and oriented, it is possible to identify places where air pockets could potentially form during submersion, and also where molten zinc could be prevented from draining during withdrawal.

The illustrations provide examples of frequent problem areas and the proper methods to avoid them.

Venting at Structural Panel Point

Detail needed:
1/2" diameter hole made at each corner prevents air pocket formation.

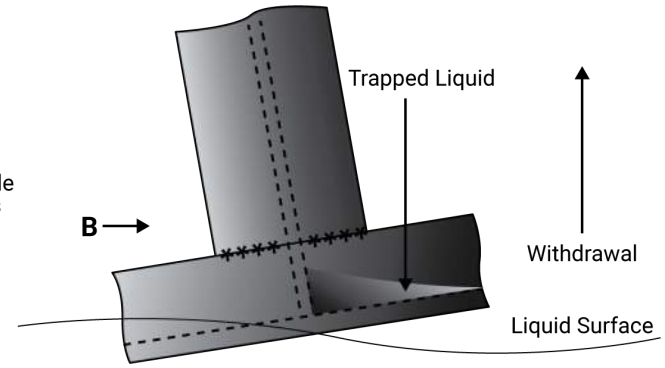
View A



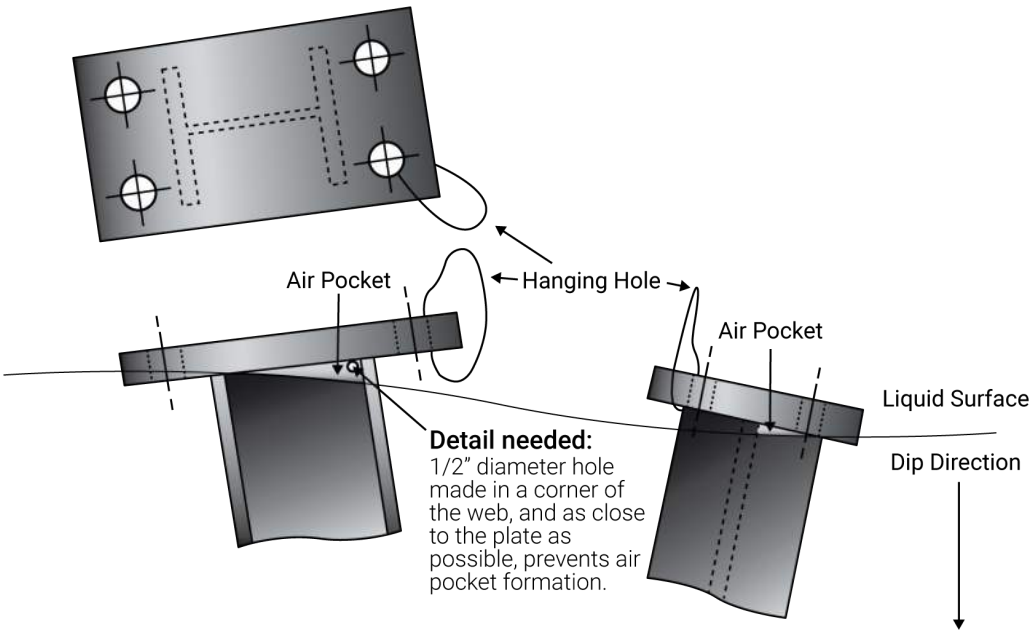
Draining at Structural Panel Point

Detail needed:
1/2" diameter hole made at each corner prevents a trap for galvanizing liquids.

View B

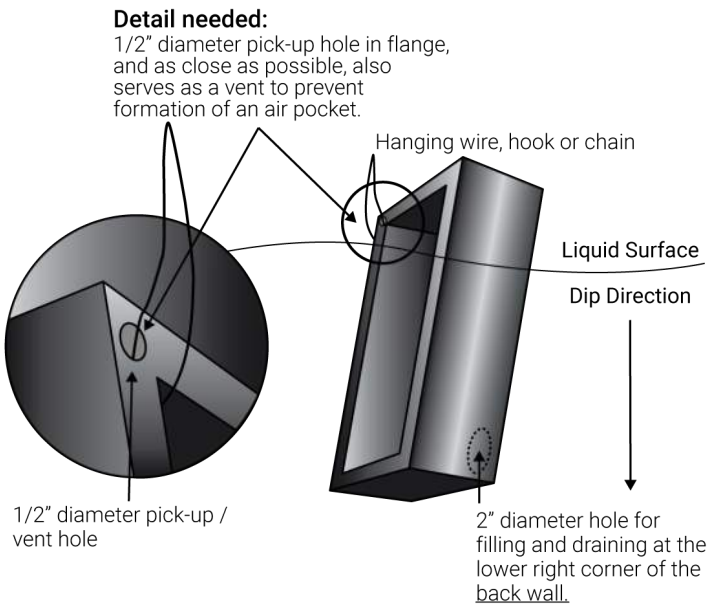


Venting at Base of Post



Detail needed:
1/2" diameter hole made in a corner of the web, and as close to the plate as possible, prevents air pocket formation.

Venting and Draining of Enclosure Body

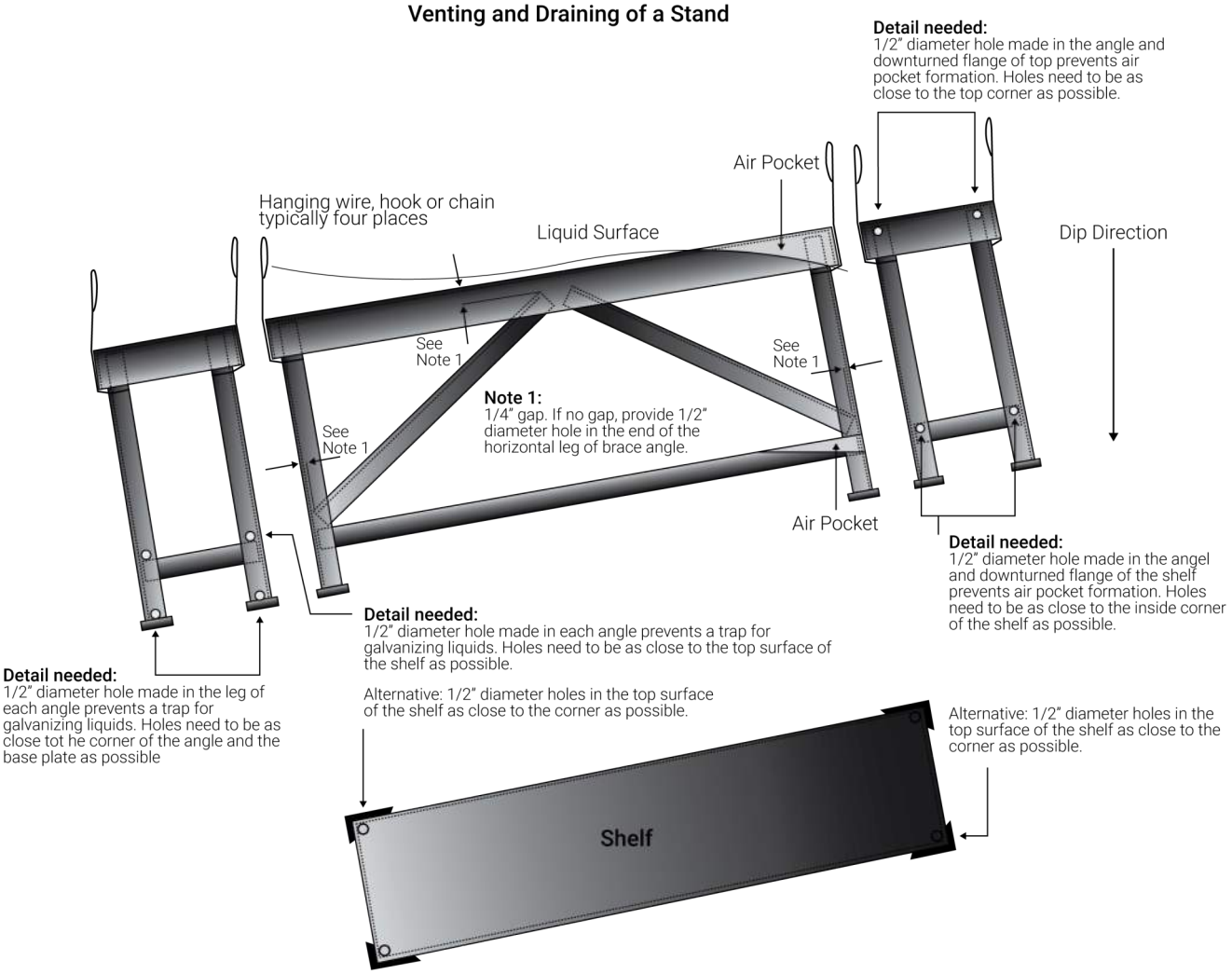


Customer Assistance

Valmont Coatings is happy to provide help to customers, upon request, to establish the size and location of vent and drain holes during the fabrication of an order.

If Valmont Coatings technicians determine additional vent and drain fabrication is necessary once a product is in the Valmont plant, we will notify the customer, provide costs for appropriate modifications

Venting and Draining of a Stand



Construction: Angle legs and braces; sheet or plate top and shelf with brake formed flanges.

04 CONTROL OF DISTORTION IN GALVANIZED PRODUCTS

INTRODUCTION & PURPOSE

This article describes major causes of distortion that become evident after hot-dip galvanizing and suggests ways to reduce the risk.

Considering the volume of products that are hot-dip galvanized, the occurrence of distortion is quite infrequent. When it does happen, however, distortion is a serious concern to the fabricator and galvanizer alike, involving extra costs and possibly delays to remedy the problem.

An understanding of the causes of warpage during galvanizing can lead to measures that will eliminate or substantially reduce the problem.

OVERVIEW

In many instances, the potential for distortion has been put into the product before its arrival at the galvanizing plant.

Distortion can be due to:

- Residual stresses induced at the mill during rolling of structural sections or plate.
- Residual stresses created by bending or welding.
- Lack of symmetry in simple sections such as channels or in built up sections.
- A combination of thick and thin material in the same assembly.
- Assemblies made so large that they require double dipping to be coated over their entire surface.

Considering the volume of products that are hot-dip galvanized, the occurrence of distortion is quite infrequent. When it does happen, however, distortion is a serious concern to the fabricator and galvanizer alike, involving extra costs and possibly delays to remedy the problem.

CAUSES AND PREVENTION

Cause & Prevention: Welding

There are several actions the fabricator should take to minimize the potential for distortion due to the release of stresses in welds. Those actions are as follows:

- Avoid over welding
- Use as few weld passes as possible
- Place welds near the neutral axis
- Balance welds around the neutral axis
- Use backstep welding
- Make weld shrinkage forces work in the desired direction
- Balance shrinkage forces with opposing forces
- Use a well planned, balanced welding sequence
- Remove weld shrinkage forces during and after welding
- Reduce the welding time

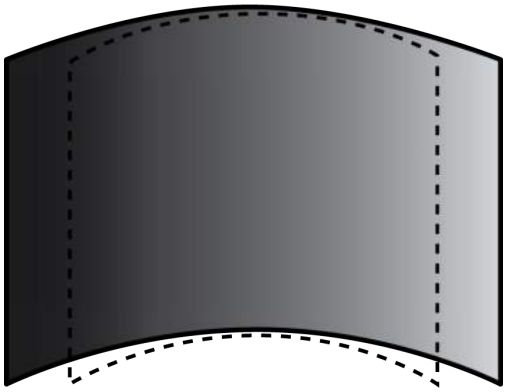
More information on these points and additional guidance on minimizing distortion in weldments is given in the brochure, "Distortion...How to Minimize It With Sound Design Practices and Controlled Welding Procedures, Plus Proven Methods for Straightening Distorted Members," written by Omer W. Blodgett, P.E., and Duane K. Miller, P.E., and published by Lincoln Electric Company.

Cause: Bending

While a product may have the correct form in the “as fabricated” condition, stresses induced in the product during bending operations at the fabricating plant may be released when the product is galvanized.

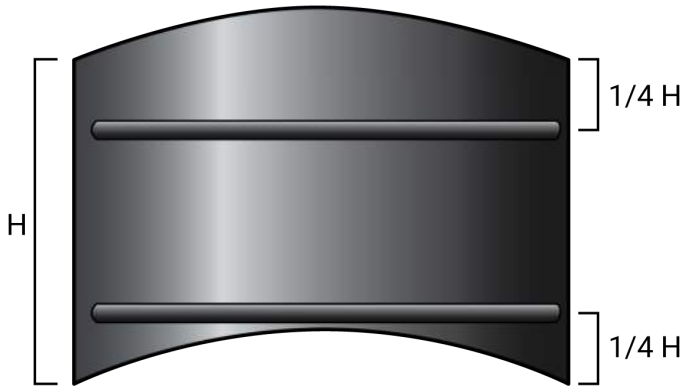
The galvanizing temperature is 840ºF, is at the low end of the stress relieving temperature range. Consequently, stresses induced by bending may be released during galvanizing with a resultant change in shape or dimension of the fabricated product.

Consider the case of a plate section that has a curve rolled into it so that when several such sections are joined, they form a circle. As a result of galvanizing, the plate would relax to a greater radius than the dimension originally fabricated.



Prevention: Bending

Installation of temporary struts across the chord of the circle will enable the curved section to retain its form. The struts would be structural angles or channels bolted or welded into position. Their size will be proportional to the size and thickness of the plate section. The struts should be located at the quarter points of the height of the section as shown below.



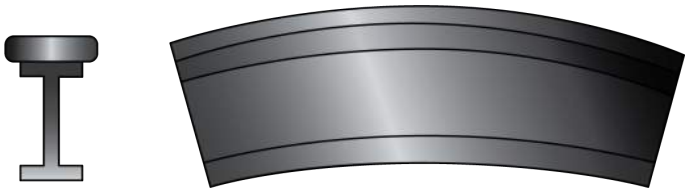
After galvanizing, it would be necessary for the fabricator to remove the struts and repair the area where they had been joined to the plate.

Valmont Coatings is pleased to assist customers in establishing strut and end connection details based on each particular case.

Cause: Lack of Symmetry in Product

The potential for warpage is greatly reduced when a product is symmetrical about its horizontal and vertical neutral axes. When a symmetrical section such as a simple I-beam is galvanized, thermal expansion forces above and below the neutral axis balance each other and leave the beam free of distortion.

However, in the case of unsymmetrical sections, such as a wide flange beam with a rectangular structural tube welded to its top flange, a geometric imbalance has been created. The wall of the tube is considerably thinner than the flange of the beam. Consequently, the tube material will be thoroughly heated to the temperature of the galvanizing bath, while the bottom flange of the beam lags behind it in coming up to bath temperature. As a result, the tube material is expanding fast, but the cooler bottom flange is unable to keep pace. If such a beam were to be galvanized in the configuration shown, it would experience upward bowing distortion.



Prevention: Lack of Symmetry in Product

This problem can be prevented in any of three ways, depending upon economics and desire to maintain the integrity of the corrosion protection:

(a) Galvanized the sections back-to-back if there are a number of identical pieces on the order that allow this to be an option.

Beams would be bolted back-to-back using pipe spacers to separate the beams to allow the flanges to be cleaned and galvanized. The bolts would be removed after galvanizing when the sections have cooled. Spots where the spacers contacted the beam flanges would be repaired with galvanizing repair material. Valmont Coatings is pleased to assist in the determination of the number and size of bolts to use. Separation and touch up of the sections would be the customer's responsibility unless other arrangements are made.

(b) Fabricate and galvanize the I-beam and tube as separate loose pieces. Then, weld them together after galvanizing. Touch up welds with galvanizing repair material.

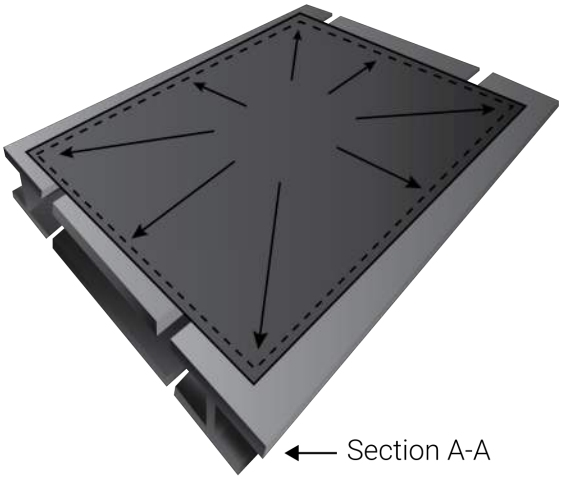
(c) Redesign the section to make it symmetrical.

Distortion in structural channels is typically a uniform bow in the weak direction with the toes of the channel pointing away from the radial center. This distortion can also be minimized by the back-to-back method.

Cause: Thick and Thin Material in Assembly

Thin material in an assembly expands faster than thicker materials nearby because it takes less time to be fully heated to the galvanizing temperature. Distortion will take place in thin material when thicker material restrains it from free expansion.

Consider the case of steel sheet or plate placed on structural frame and securely attached by welds around its perimeter. Imagine that the sheet or plate is only half as thick as the material in the frame. The sheet soon reaches the galvanizing temperature of about 840ºF and its maximum potential expansion. The frame, being thicker, is still cooler and has not yet had the opportunity to expand as much as the sheet. Since the sheet cannot push its growth outwards at the edges because of the welds, its increase in size results in one or more buckles in the sheet surface.

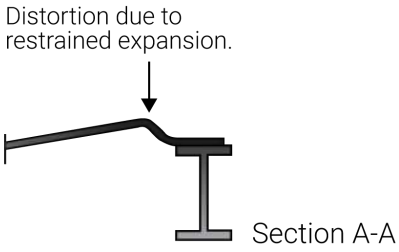


Prevention: Thick and Thin Material Assembly

Two approaches can be taken to avoid this condition:

(a) Galvanize the sheet and frame separately and join them after galvanizing.

(b) Use the same thickness of material for the frame and sheet.



Cause: Size of Assembly Requires Progressive Dip

The potential for warpage increase when an item is so large that the galvanizer must dip one portion at a time in order to fully coat it.

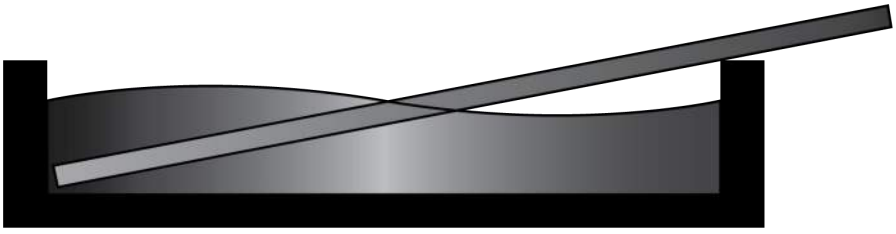
The portion immersed in the zinc is subjected to much higher temperature and greater thermal expansion than the portion projecting from the kettle, especially during the first dip. The differential heating and expansion between the two portions can cause distortion that will not be removed when the remainder of the product is placed into the molten zinc.

Simple pipes and poles do not experience distortion from double dipping, probably because of their symmetry and simplicity of design.

Whenever possible, it is preferable to size a product so that it can be totally immersed in a single dip.

Even though a product is small enough to be immersed in a single dip, it is important that fill and drain holes be large enough to enable the part to be immersed and withdrawn rapidly to avoid differential expansion.

Whenever possible, it is preferable to size a product so that it can be totally immersed in a single dip.



CUSTOMER ASSISTANCE

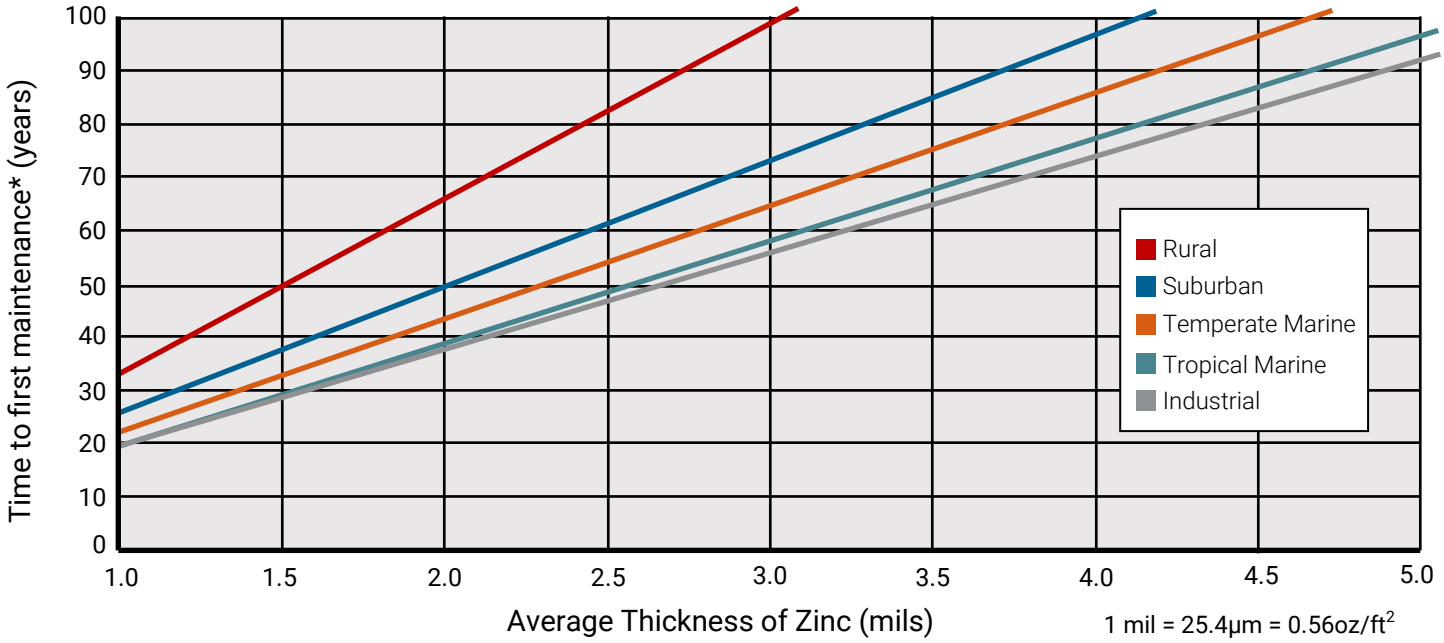
Upon request, Valmont Coatings will assist customers with countermeasures to minimize distortion issues during the fabrication of an order.

05 INSPECTION OF HOT-DIP GALVANIZING

COATING THICKNESS

One of the most appealing characteristics of Hot-Dip Galvanizing is longevity, offering decades of maintenance-free performance. The time to first maintenance for galvanizing is directly proportional to the zinc coating thickness. Therefore, the coating thickness is the most important component in determining a galvanized coating's quality. Additional important inspection criteria include adherence, appearance and finish.

Chart 1.0 Time to First Maintenance



Time to first maintenance is defined as 5% rusting of the base steel surface, which means 95% of the surface has some zinc coating remaining, and an initial maintenance is recommended to extend the life of the structure. Real data was collected from multiple locations within each environment (American Galvanizers Association, 2018).

ASTM A123, A153 and A767 provide requirements for the minimum zinc coating by material class during the hot-dip galvanizing process. The specifications include tables providing specific requirements for thickness or weight per surface area based upon the steel part type and the measure steel thickness.

Table 1.0 Minimum Average Coating Thickness Grade by Material Category

Material Category	All Specimens Tested Steel Thickness Range Measured in [mm]					
	<1/16 [<1.6]	[3]1/16 to <1/8 [[3]1.6 to <3.2]	[3]1/8 to <3/16 [[3]3.2 to <4.8]	[3]3/16 to <1/4 [[3]4.8 to <6.4]	[3]1/4 to <5/8 [[3]6.4 to <16]	[3]5/8 [[3] 16]
Structural Shapes	45	65	75	75	100	100
Strip & Bar	45	65	75	75	75	100
Plate	45	65	75	75	75	100
Pipe and Tubing	45	45	75	75	75	75
Wire	35	50	60	65	80	80
Reinforcing Bar	--	--	--	--	100	100

Table 1.1 Coating Thickness Grade

Coating Grade	mils	oz/ft^2	µm	g/m^2
35	1.4	.8	35	245
45	1.8	1.0	45	320
50	2.0	1.2	50	355
55	2.2	1.3	55	390
60	2.4	1.4	60	425
65	4.6	1.5	65	460
75	3.0	1.7	75	530
80	3.1	1.9	80	656
85	3.3	2.0	85	600
100	3.9	2.3	100	705

The values in micrometres (µm) are based on Coating Grade. The other values are based on conversions using the following formulas: mils= µm x 0.0937; oz/ft^2= µm x 0.02316; g/m^2= µm x 7.067

To ensure compliance with customer specifications, the galvanizer will complete a coating thickness test prior to final delivery of the product. There are two methods of measure zinc coating thickness after galvanizing: magnetic thickness gauge and optical microscopy.

- Magnetic Thickness Gauge: The simplest and non-destructive way to measure coating thickness. Galvanizers may use one of three different types of magnetic thickness gauges. The pencil-style gauge is pocket size but its accuracy is dependent on the skill of the inspector. If this tool is used, the measurement should be taken multiple times. Banana gauges provide inspectors an added advantage of the ability to measure the coating thickness in any position without recalibration or interference from gravity. Finally, an electronic or digital gauge offers the most accurate measurements and is the easiest to use. They can also store data and perform averaging calculations.
- Optical Microscopy: The use of optical microscopy to measure zinc coating thickness is not recommended. It is a destructive test and should only be used to resolve measurement disputes.

ASTM E376 provides galvanizers information for measuring coating thickness with magnetic and electromagnetic gauges as accurately as possible by explaining how and where to take measurements as well as guidelines for reducing errors.

Inspecting every piece of material galvanized in a project is not practical; therefore, ASTM adopted a sampling protocol to ensure high-quality products. Proper evaluation of hot-dip galvanized coatings requires the galvanizer to randomly select specimens to represent the lot. The lot size determines the inspection quantities and are detailed in ASTM specifications A123/A123M, A153/A153M and A767/A767M.

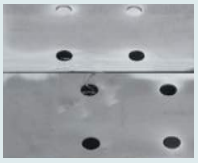
Coating Thickness Measurements Tools

APPEARANCE & FINISH

Several factors can affect the finish and appearance of hot-dip galvanized coatings. Some of these factors can be controlled by the galvanizers while others cannot. The inspection of finish and appearance is done with an unmagnified visual inspection at the galvanizing facility prior to shipment. The inspector observes surface conditions (both inside and out) and checks all contact points, welds, junctions and bend areas.

Appearance of hot-dip galvanized steel is hard to predict for a variety of reason, including steel chemistry, cooling rate, and stress induced during steel processing. Regardless of the initial appearance, all galvanized steel parts will take on a uniform matte gray appearance upon exposure to the environment, typically within six months to two years. As the coatings is exposed to natural wet/dry cycles, it develops a protective zinc patina; the result is a soft gray appearance – evening out any difference in appearance that may have existed originally. Because superior corrosion protection depends on the thickness of the zinc coating rather than visual appearance, all coating appearances are acceptable upon inspection as long as they meet thickness requirements and don't interfere with intended use.

Table 1.3 Hot-Dip Galvanized Steel Appearance

Spangled		A spangled appearance is the result of minor bath additions enhancing the appearance of zinc crystals on the coating surface. Achieving this look is not within the full control of the galvanizer. Steel chemistry, zinc bath chemistry, immersion time, and cooling time influence whether the coating has a spangled look.
Shiny		A shiny coating appearance is achieved when a zinc free layer (eta) is formed on top of the hot-dip galvanized coating. Steel chemistry has the greatest influence on achieving a shiny appearance; however, the addition of alloying elements, such as aluminum or nickel, to the zinc bath and quenching after galvanizing can also contribute to a shiny appearance.
Matte		A matte appearance occurs when the coating structure is comprised strictly of overgrown inter-metallic layers & contains no free zinc layer (eta). Hot dip galvanizing reactive steels will likely produce a matte appearance. Reactive steels contain elemental compositions beyond the recommended limits for galvanizing. This appearance is not within the galvanizer's control.
Mottled		A mottled appearance is caused by uneven cooling rates newly hot dip galvanized articles after withdrawal from the zinc bath. During air cooling, the zinc coating formation reaction can continue for a short time as long as the steel remains 550°F. This continued reaction can consume some of the existing shiny zinc coating layer on top, leaving a matte gray appearance in the thicker or internal areas of the article with a shiny appearance elsewhere. The occurrence of a mottled appearance can be greatly reduced by quench-cooling immediately following removal form the zinc kettle.
Mixed		Connecting different types or thicknesses of steel within the same assembly can result in a mixed appearance (shiny & matte areas) for example, welded areas can appear darker and thicker. To reduce the likelihood of a mixed appearance, use steel of the same grade and similar thickness. Welding should be performed with a welding rod of similar silicon content to the base steel.

Finish

In addition to variances in appearance, there are several surface imperfections that may be present. Some imperfections do not lessen the long-term performance of the piece and therefore acceptable. Others which do decrease the life are rejectable according to specification and must be touched up, repaired or stripped and re-galvanized. Some surface conditions are caused by the design and/or fabrication of the product and could be eliminated by following best practices.

A clear understanding of specification requirements and surface imperfections along with the impact on service life is essential for successful inspection. It is also beneficial to educate customers about the difference between acceptable and unacceptable finishes so they can recognize if a variance in appearance is cause for concern.

There are two primary considerations as to whether the surface condition is or isn't acceptable:

1. Effect on corrosion resistance: Does the surface condition have any bearing on the long-term corrosion protection of the part? If it comprises the life of the coating, it is rejectable; however, if it's merely cosmetic, it is acceptable.
2. Intended use: Some surface conditions do not impact the corrosion resistance but are still rejectable. An example is handrail with runs and/or zinc dross inclusions which make the surface bumpy. On other parts this might be acceptable but because the handrail needs to be smooth for its intended use, this might be cause for rejection.

Table 1.4A Hot-Dip Galvanized Steel Finishes

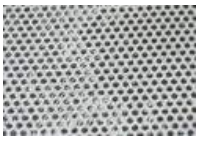
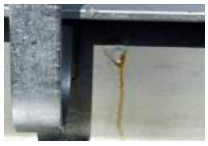
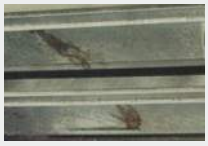
Bare Spots		Uncoated areas	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Blasting Damage		Blisters or flaking areas on the surface of galvanized product due to blasting damage after hot dip galvanizing.	**Not Acceptable**
Chain & Wire Marks		Marks or uncoated areas left by lifting devices during the hot dip galvanizing process	**Possibly Acceptable:** Superficial marks are acceptable unless the marks expose bare steel.
Coating Overlap Line		A darker and thicker area in the coating caused by double dipping the products.	**Acceptable:** Added thickness can be buffed or ground down.
Clogged Holes		Zinc metal that has not drained adequately and partially or completely fills holes.	**Possibly Acceptable:** As long as the holes are less than ½" in diameter.
Clogged Threads		Excess zinc metal that has not drained adequately and partially or completely clogs threads. Clogged threads must be cleaned after galvanizing.	**Acceptable:** Must be cleaned and free of excess zinc before shipment.
Delamination		Delamination (or peeling) creates a rough coating on the steel where the zinc has come off.	**Possibly Acceptable:** As long as minimum thickness levels are met.

Table 1.4B Hot-Dip Galvanized Steel Finishes

Distortion		The buckling of a thin, flat steel plate or other flat material such as wire mesh. **The galvanizer is not able to prevent buckling*	**Acceptable:** Unless it prevents the part from fulfilling its intended use.
Drainage Spikes		Teardrops of zinc along the edges of a product.	**Not Acceptable:** Must be removed before the part can be accepted.
Dross Inclusions		Distinct particles of zinc-iron intermetallic alloy that becomes entrapped or entrained in the zinc coating.	**Possibly Acceptable:** Small inclusions covered with zinc are acceptable. Large inclusions that prevent the full coating from forming must be removed and repaired.
Excess Aluminum in Galvanizing Bath		When excess aluminum is in the galvanizing bath, it creates black marks or spots on the surface of the steel.	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Fish-Boning		An irregular pattern over the entire surface of the steel part.	**Acceptable**
Flaking		Zinc that becomes flaking and separates from the steel surface. **Zinc coatings that are not adherent to the steel may be the result of reactive steel. Refer to Steel Selection ASTM-385/3.4-3.5*	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Flux Inclusions		Flux that fails to release during the hot dip galvanizing process creates inclusions which no coating can grow under.	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Oxide Lines		Light colored film lines on the galvanized steel surface.	**Acceptable**
Rough Surface Condition		Uniformly textured appearance over the entire product caused by steel chemistry or blasting.	**Acceptable**
Runs		Localized thick areas of zinc on the surface of the steel. Runs can be buffed.	**Acceptable:** Unless it prevents the part from fulfilling its intended use.
Rust Bleeding		Brown or red stain that leaks from unsealed joints after hot dip galvanizing.	**Acceptable**

Table 1.4C Hot-Dip Galvanized Steel Finishes

Sand Embedded in Casting		Rough or bare spots created by sand that is embedded in castings.	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Striations		Raised parallel ridges in the galvanized coating.	**Acceptable**
Surface Contaminant		Contaminants on the steel not removed by pretreatment will create an un-galvanized area where the contaminant was originally located.	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Touch-Up Areas		Touch-up materials can alter the appearance because they generally are not an exact color match.	**Acceptable**
Weeping Weld		Staining on the zinc surface at welded connections of the steel.	**Acceptable**
Welding Blowouts		Bare spot around a weld or overlapping surface hole caused by pretreatment liquids penetrating sealed and overlapped areas that boil out while immersed in the zinc.	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Welding Spatter		Lumps in the galvanized coatings adjacent to weld areas due to spatter left on the surface of the part from fabrication.	**Not Acceptable:** Must be repaired or stripped & re-galvanized
Wet Storage Stain (Light/ Medium)		A white, powdery surface deposit on freshly galvanized surfaces caused by newly galvanized surfaces being covered by moisture and having no airflow over the surface.	**Acceptable**
Wet Storage Stain (Heavy)			**Not Acceptable:** Must be removed mechanically or with chemical treatments.
Zinc Skimmings		Zinc skimming deposits trapped on zinc coating.	**Acceptable**
Zinc Splatter		Splashes and flakes of zinc loosely adhered to the galvanized coating surface.	**Acceptable**

ADDITIONAL TESTS

Every hot-dip galvanized steel part is inspected & tested for coating thickness, appearance, and finish. However, there are a few additional tests that may be conducted on certain types of parts or when there is a question or concern about a specific item.

Adherence

Testing zinc coating adherence is achieved using a stout knife and smoothly running it along the surface of the steel without whittling and gouging, as detailed in the ASTM specifications A123/A123M and A153/A153M. The knife should put a slight mark in the zinc metal surface, but should not cause any flaking or delamination of the layers. Paring or whittling with the knife is not acceptable, and the test should not be performed on corners or edges of the product. Because flaking or peeling of the zinc coating is usually quite obvious and uncommon, the stout knife test, which is a referee test, is rarely performed.

Embrittlement

When there is suspicion of potential embrittlement of a product, it may be necessary to test a small group of the products to measure the ductility according to the protocol in the specification ASTM A143/A143M. These tests are usually destructive to the zinc coating and possibly to the product as well. Depending on the service conditions the product will be exposed to, one of three embrittlement tests - similar bend radius test, sharp blow test, and steel angle test - may need to be performed. The embrittlement test uses a known force to provide a stress that should be lower than the yield stress of the part. If there is a fracture or permanent damage created during the testing process, the parts must be rejected.

Bend Tests

Peeling and flaking that occurs to the coating when bending rebar after galvanizing is not a cause for rejection and may be repaired. Bend tests on steel fabrications are only to test for embrittlement. The recommended bend radius is 3x the section thickness. There are various tests used to assess the ductility of steel when subjected to bending. One test may include the determination of the minimum radius or diameter required to make a satisfactory bend. Another test may include the number of repeated bends the material can withstand without failure when it is bent through a given angle and over a definite radius.

Presence of Chromate on Zinc

The specification to determine the presence of chromate on zinc surfaces is ASTM B201. This test involves placing drops of a lead acetate solution on the surface of the product, waiting 5 seconds, and then blotting it gently. If this solution creates a dark deposit or black stain, there is un-passivated zinc present. A clear result indicates the presence of a passivation coating.

FIELD INSPECTION

Inspection of hot-dip galvanized steel products does not end once they are accepted at the galvanizer's facility or job site. Once erected, any good corrosion protection strategy includes periodic inspection and maintenance to ensure the protective coating is performing as expected. When inspecting hot-dip galvanized steel in the field, the inspector should be aware of potential accelerated corrosion areas and aesthetic surface defects.

When inspecting a galvanized coating in the field, the number one concern is the number of years remaining before the coating will need to be touched-up or replaced. Fortunately, estimating the remaining time to first maintenance for hot-dip galvanized coatings in atmospheric exposures is relatively simple. For a ballpark estimation, use a magnetic thickness gauge to take a coating thickness measurement and check the thickness value against the AGA's Time to First Maintenance Chart (Chart 1.0).

In addition to coating thickness measurements, the galvanized coating can be visually inspected for signs of accelerated corrosion in specific areas. Thickness measurements should be taken in these areas to ensure adequate zinc coating remains or if touch-up should be performed. Corrosion-prone areas to inspect further include:

- Crevices including overlapped areas, mated sections between fasteners, and areas where the galvanized coatings is butted up against another surface.
- Dissimilar Metals in Contact
- Areas Where Water Pools
- Previously Touched-Up Areas
- Brown Staining: To distinguish between red rust and brown staining, simply test the area with a magnetic thickness gauge. If the gauge reading shows a coating thickness, it is brown staining and the corrosion performance of the galvanized coating is not affected.
- Wet Storage Stain
- Weeping Welds
- Bare Spots

06 TOUCH UP / REPAIR & POST GALVANIZING CONSIDERATIONS

REPAIRING HOT-DIP GALVANIZED STEEL

The touch-up and repair of hot-dip galvanized steel is important to maintain uniform barrier and cathodic protection as well as ensure longevity. Although the hot-dip galvanized coating is very resistant to damage, small voids or defects in the coating can occur during the galvanizing process or due to improper handling of the steel after galvanizing. Touch-up and repair of galvanized steel is simple whether newly galvanized or in service for years. The practice is the same, but there are more restrictions to the allowable repairs on a new product than one that has been in service.

The main restriction in the specification for repairing newly galvanized material is the size of the area which is outlined in the product galvanizing specifications:

ASTM A123

- 1" or less in narrowest dimension
- Total area can be no more than ½ of 1% of the accessible area to be coated or 36 in^2 per short ton per piece, whichever is less

ASTM A153

- The touch up area can not total more than 1% of the surface area to be coated excluding threaded areas of the piece

ASTM A767

- Total area in any 1ft length shall not exceed 1%

When it comes to repairing galvanized steel in the field, there is no limitation to the size that can be repaired. The zinc coating is difficult to damage, and field fabrication that requires removal of the coating should be minimized as much as possible. As noted before, the cathodic protection of the coating will provide some protection to uncoated areas, but the best practice for longevity is to touch-up any bare areas.

ASTM A780

ASTM A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings details how to repair a damaged hot-dip galvanized coating regardless if it is immediately after galvanizing or once it is in the field. The specification explains how to use the various repair methods as well as the required coating thickness for the repaired area. Touch-up materials are required to meet a coating thickness of at least 2.0 mils (50.8 µm) for one application, and the final coating thickness of the repair area is dictated by the material used to do the repair.

ASTM A780 contains three acceptable methods of touch-up and repair of hot-dip galvanized steel:

Zinc-Based Solders

Soldering is done with zinc-based alloys in either a stick or powder form. The area being repaired needs to be preheated to approximately 600 F (315 C). The acceptable material compositions of solders used for repair are included in the ASTM A780. The repair coating thickness must meet the specification requirement for the material category of the part with a maximum thickness of 4 mils (100 ?m). The thickness is measured by any of the non-destructive methods in A123/A123M. Zinc-based solder products closely match the surrounding zinc and blend in well with the existing coating appearance.

Zinc Spray (Metallizing)

Zinc spray, or metallizing, is done by melting zinc powder or zinc wire in a flame or electric arc and projecting the molten zinc droplets by air or gas onto the surface to be coated. The zinc used is nominally 99.5% pure or better. The renovated area shall have a zinc coating thickness at least as thick as that required in ASTM A 123/A 123M for the material category. For best results, thickness measurements for the metallized coating should be taken with either a magnetic or an electromagnetic gauge.

Zinc-Rich Paints

Zinc-rich paint is applied to a clean, dry steel surface by either a brush or spray. Zinc-rich paints must contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film. Paints containing zinc dust are classified as organic or inorganic, depending on the binder they contain. Inorganic binders are particularly suitable for paints applied in touch-up applications of undamaged hot-dip galvanized areas. The coating thickness for the paint must be 50% more than the surrounding coating thickness, but not greater than 4.0 mils, and measurements should be taken with either a magnetic, electromagnetic, or eddy current gauge to ensure compliance.

POST GALVANIZING CONSIDERATIONS

In addition to inspecting the part and performing any necessary touch up/repair, there are a few other post-galvanizing treatments sometimes utilized or needed. To ensure the highest quality hot-dip galvanized steel for your project, it is important for you to understand these considerations during the design phase so expectations are met.

Passivation

Although galvanized steel in typical use conditions is highly tolerant of diverse atmospheric and environmental conditions, passivation-quenching can be done when environmental, storage or shipping conditions warrant. Because the galvanized zinc coating is most vulnerable to the formation of excessive zinc oxides and zinc hydroxides during its first six weeks, the thin layer of passivation agent delays their formation. Once the passivating agent is gone, galvanized steel begins to form its protective zinc patina.

Chromate passivations can be used on galvanized reinforcing bar to control reactions between zinc and concrete while the concrete cures, particularly the hydrogen evolution that may affect bonding properties.

Passivation should be avoided if the part is going to be duplex coated (painting or powder coating over the galvanized steel) as quenching can affect adhesion of the top coat system.

Plugging Holes

Holes are frequently required in fabrications to allow the corrosion-inhibiting molten zinc to safely reach all interior and exterior surfaces. These holes facilitate venting and draining, allow for hanging/racking during the galvanizing process, and/or are needed for structural connection purposes.

If needed or desired, holes can be plugged after galvanizing. If filler material other than zinc is used, there is a chance of accelerated corrosion in the localized area due to dissimilar metals in contact.

Storage

Stacking galvanized articles closely together for extended periods of time, thereby limiting access to freely circulating air, can lead to the formation of a white powdery product commonly called wet storage stain. Fabricated assemblies that fully expose the galvanized surfaces to freely circulating air typically do not need a post-treatment to prevent the formation of wet storage stain.

The extent of damage by wet storage stain depends on the duration of exposure to the wet-storage-stain-inducing environment and retained moisture. The attack is accelerated when the retained moisture contains chlorides from seawater, sulfur compounds from industrial environments, or flux residues from galvanizing operations.

To minimize the possibility of wet storage stain, consider these guidelines:

- Whenever possible, avoid nested stacking
- Provide adequate ventilation between stacked pieces
- Incline parts to allow for maximum drainage
- Use spacers and tarp material during shipping if there is the likelihood of condensation or moisture
- Stagger or cross stack galvanized pieces
- Elevate and separate articles stacked outdoors with strip spacers (poplar, ash, spruce)
- Avoid stacking on wet soil or decaying vegetation
- Thoroughly dry small items that are quenched before packing in storage containers
- Include a dehumidifying agent in sealed containers
- Whenever possible, store material under cover in dry, well-ventilated conditions, away from doorways open to the environment
- Ensure the final product is free of flux residues
- Treat with a passivating agent
- Remove road salts from galvanized articles

07 SUGGESTED GUIDELINES FOR HOT-DIP GALVANIZING

PART 1: GENERAL

1.01 Scope

These guidelines cover the galvanized coating applied to general steel articles, structural sections, fabricated steel assembles and threaded fasteners.

Note: These guidelines do not apply to the galvanized coating on semi-finished products such as wire, tube or sheet galvanized in specialized or automatic plants.

1.02 Quality Assurance

A. Relevant Standards

American Society for Testing and Materials (ASTM)

A53	Pipe, Steel, Black and Hot-Dipped Zinc Coated Welded and Seamless
A123	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A143	Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
A153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A325	High Strength Bolts for Structural Steel Joints
A384	Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
A385	Providing Quality Zinc Coatings (Hot-Dip)
A563	Carbon and Alloy Steel Nuts
A780	Repair of Damaged Hot-Dip Galvanized Coatings
B6	Zinc (Slab Zinc)

B. Certification

When requested by the purchaser/designer (in writing prior to galvanization), a Certificate of Compliance will be provided by Valmont Coatings stating that the galvanizing complies with ASTM Specifications and Standards and all other applicable requirements specified herein.

C. Inspection and Tests

Inspections, tests and samples shall conform with ASTM Specifications and Standards. Inspections shall be carried out at the galvanizers plant by a designated party. Inspection rights and privileges, procedures and acceptance or rejection of galvanized steel material shall conform with ASTM A123 or A153 as applicable. Inspections and tests shall include the following:

1. visual examination of samples or finished products, appropriate;
2. tests to determine thickness or weight of zinc coating per square foot of metal surface;
3. adhesion.

1.03 Storage

Galvanized articles should be stored as follows to prevent the formation of wet storage stain:

> In storage, the articles shall be raised from the ground and, if necessary, separated with strip spacers to provide free access of air to most parts of the surface. They shall also be inclined in a manner which will give continuous drainage. Under no circumstances shall galvanized steel be allowed to rest on cinders or clinkers; nor shall it be stored on wet soil or decaying vegetation.

PART 2: PRODUCTS

2.01 Steel Materials

A. Structural shapes, plates and bars that are to be galvanized shall be manufactured from steel conforming to ASTM A36 or A572 except that silicon (Si) content shall be in the range of 0 to 0.04% of 0.15 to 0.20%, and phosphorus (P) content in the range of 0 to 0.02%. Steel with chemistry conforming to the formula %Si + 2.5%P < 0.09% is also acceptable. Mill certificates shall be furnished.

Note: Hot-dip galvanized coatings result from metallurgical reactions between molten zinc and steel. Galvanized coatings formed on steel of "normal" reactivity have a two-part composite structure. One part, a layer of iron-zinc alloy formed during galvanizing, metallurgically bonds the coating to the underlying steel. The other part of the coating is an outer layer of uniform appearance that has a chemical composition similar to the zinc in the galvanizing bath. Certain percentages of silicon and phosphorus in the chemistry of some steels increase the reactivity between the steel and molten zinc during galvanizing and produce coatings of a different structure and appearance. Galvanized coatings on steel with increased reactivity, due to the silicon and/or phosphorus levels, may be matte grey, mixed shades of grey, or include localized outbursts of grey colored iron -zinc alloy in otherwise bright surfaces. In some instances, steel with increased reactivity produce galvanized coatings that are very thick and consequently brittle. Galvanized coatings on the steel chemistries suggested in these guidelines should have acceptable adhesion and be substantially free from iron-zinc alloy outbursts. However, the coatings will tend to be thicker on steels having higher levels of silicon. For steels with silicon content in the range of 0.15 to 0.20%, phosphorus may increase the steel reactivity, but the galvanize coating should not show substantial iron-zinc alloy outbursting.

B. Steel for fasteners shall conform to the following ASTM specifications for each category.

C. Steel for sheet metal articles shall conform to ASTM A 569 or A 570

D. Steel for pipe or tubing shall conform to ASTM A

Category	Bolt Material	Nut Material
Carbon Steel	A 307 Gr. A or B	A563 Gr. A
High Strength	A 325 Type 1 or 2	A 563 Gr. DH or, A 194 Gr. 2H
Tower Bolts	A 394	A 563 Gr. A

53 or A 595 Gr. A or B

Note: Avoid use of steels with an ultimate tensile strength greater than 150 ksi.

2.02 Zinc for Galvanizing

Zinc for galvanizing shall conform to ASTM B 6.

2.03 Fabrication

Fabrication practice for products to be galvanized shall be in accordance with the applicable clauses of ASTM A 143, A 384 and A 385. Care shall be taken to avoid fabrication techniques that could cause distortion or embrittlement of the steel during galvanizing. Before fabrication proceeds, Valmont Coatings will use best efforts to notify the Architect/ Engineer/Fabricator of potential warpage problems which may require modification in design.

All welding slag and burrs shall be removed prior to delivery to the galvanizer.

Holes and/or lifting lugs to facilitate handling during the galvanizing process shall be provided at positions as agreed between the designer, fabricator and galvanizer.

Unsuitable marking paints shall be avoided, and consultation by the fabricator with the galvanizer about the removal of grease, oil, paint and other deleterious material shall be undertaken prior to fabrication.

Surface contaminants and coatings which would not be removable by the normal chemical cleaning process in the galvanizing operation shall be removed by the fabricator using blast cleaning or some other method.

2.04 Surface Preparation

Steel shall be prepared utilizing a caustic bath, acid pickle and flux. Where appropriate, the steel can be blast cleaned and fluxed.

2.05 Galvanizing

A. Steel members, fabrications, and assemblies shall be galvanized after fabrication by the hot-dip process in accordance with ASTM A123.

B. Bolts, nuts and washers, and iron and steel hardware components shall be galvanized in accordance with ASTM A153. Nuts and bolts shall be supplied in accordance with ASTM A194, A307, A325, A394, A563, as applicable.

Products shall be safeguarded against steel embrittlement in conformance with ASTM A143.

All articles to be galvanized shall be handled in such a manner as to avoid any mechanical damage and to minimize distortion.

When the galvanizer detects design features which may lead to difficulties during galvanizing, he shall point them out to the fabricator and arrange for modifications to be made prior to dipping.

The composition of the metal in the galvanizing bath shall not be less than 98% zinc.

2.06 Coating Requirements

A. Thickness/Weight: The thickness or weight of the galvanized coating shall conform with paragraph 6.1 of ASTM A123 or Table 1 of ASTM A 153, as appropriate.

B. **Surface Finish:** The galvanized coating shall be continuous, adherent, as smooth and evenly distributed as possible and free from any defect that is detrimental to the stated end use of the coated article.

The integrity of the coating shall be determined by visual inspection, coating thickness measurements, and adhesion testing.

Where slip factors are required to enable friction grip bolting, these shall be obtained after galvanizing by suitable treatment of the faying surfaces in accordance with the latest edition of the Specification for Structural Joints Using ASTM A 325 or A 490 Bolts as approved by the Research Council on Structural Connections of the Engineering Foundation.

C. Adhesion: The galvanized coating shall be sufficiently adherent to withstand normal handling during transport and erection.

PART 3: EXECUTION

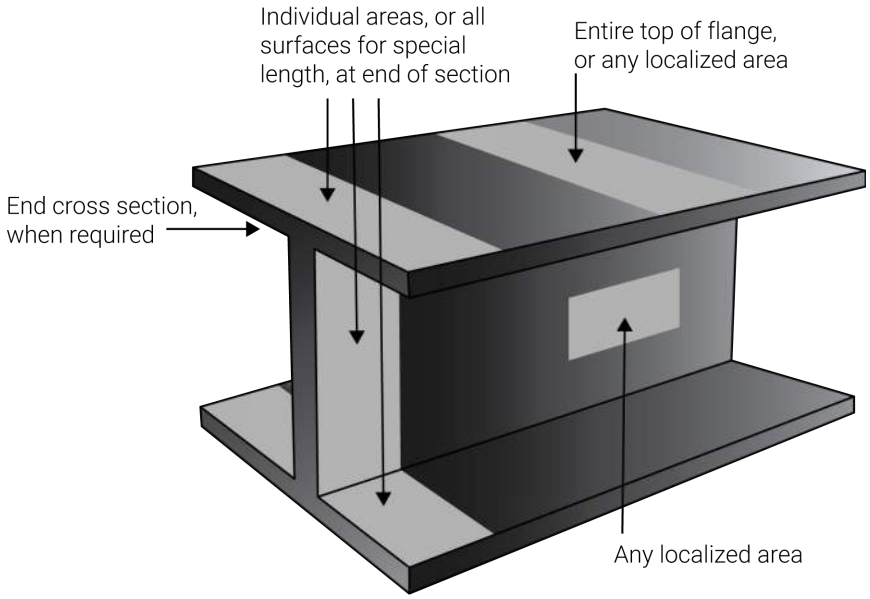
3.01 Welding

Where galvanized steel is to be welded, adequate ventilation shall be provided. If adequate ventilation is not available, supplementary air circulation shall be provided. In confined spaces, a respirator shall be used.

Welding shall be performed in accordance with the American Welding Society publication D19.0-72, Welding Zinc Coated Steel.

All uncoated weld areas shall be touched up.

A. Masking: Areas requiring to remain uncoated during hot-dip galvanizing will be masked by material designed to prevent galvanizing at designated areas on products.



3.02 Touch Up and Repair

A. Mechanical Damage: Areas damaged by welding, flame cutting, or during handling, transport or erection shall be repaired by one of the following methods:

i) Zinc-Rich Paint

Surfaces to be reconditioned with zinc-rich paint shall be clean, dry, and free of oil grease and corrosion products.

Areas to be repaired shall be power disc sanded to bright metal. To ensure that a smooth reconditioned coating can be effected, surface preparation shall extend into the undamaged galvanized coating.

Touch-up paint shall be an organic, cold galvanizing compound having a minimum of 65% zinc dust in the dry film.

The paint shall be spray or brush applied in multiple coats until a dry film thickness of 4 mils maximum has been achieved.

Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.

ii) Zinc Rich Solder

Surfaces to be reconditioned with zinc based solder shall be clean, dry, and free of oil, grease and corrosion products.

Areas to be repaired shall be wire brushed and given a thin layer of acidic paste flux.

Heat shall be applied slowly and broadly close to, but not directly onto, the area to be repaired. The zinc rich solder rod shall be rubbed onto the heated metal until the rod begins to melt. A flexible blade or wire brush shall be used to spread the melt over the area to be covered. The zinc rich solder shall be applied as a single coat.

Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.

iii) Metallizing

Surfaces to be reconditioned with zinc metal spray shall be clean, dry, and free of oil, grease and corrosion products.

The area to be repaired shall be grit blasted to white metal, followed by zinc metal spraying to a coating thickness equivalent to that of the undamaged coating.

B. Wet Storage Stain: Any wet storage stain shall be removed as follows:

i. The objects shall be arranged so that their surfaces dry rapidly.

ii. Remove light deposits with a stiff bristle (not wire) brush. Heavier deposits are to be removed by brushing with an acidic-based metal cleaner. The surfaces cleaned shall be thoroughly rinsed with water.

iii. A coating thickness check must be made in the affected areas to ensure that the zinc coating remaining after the removal of wet storage stain is sufficient to meet or exceed the requirements of the specification.

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16.5 Sample Drawing with P Finish Code and No Paint Notes

FINISH CODE IN BILL OF MATERIAL

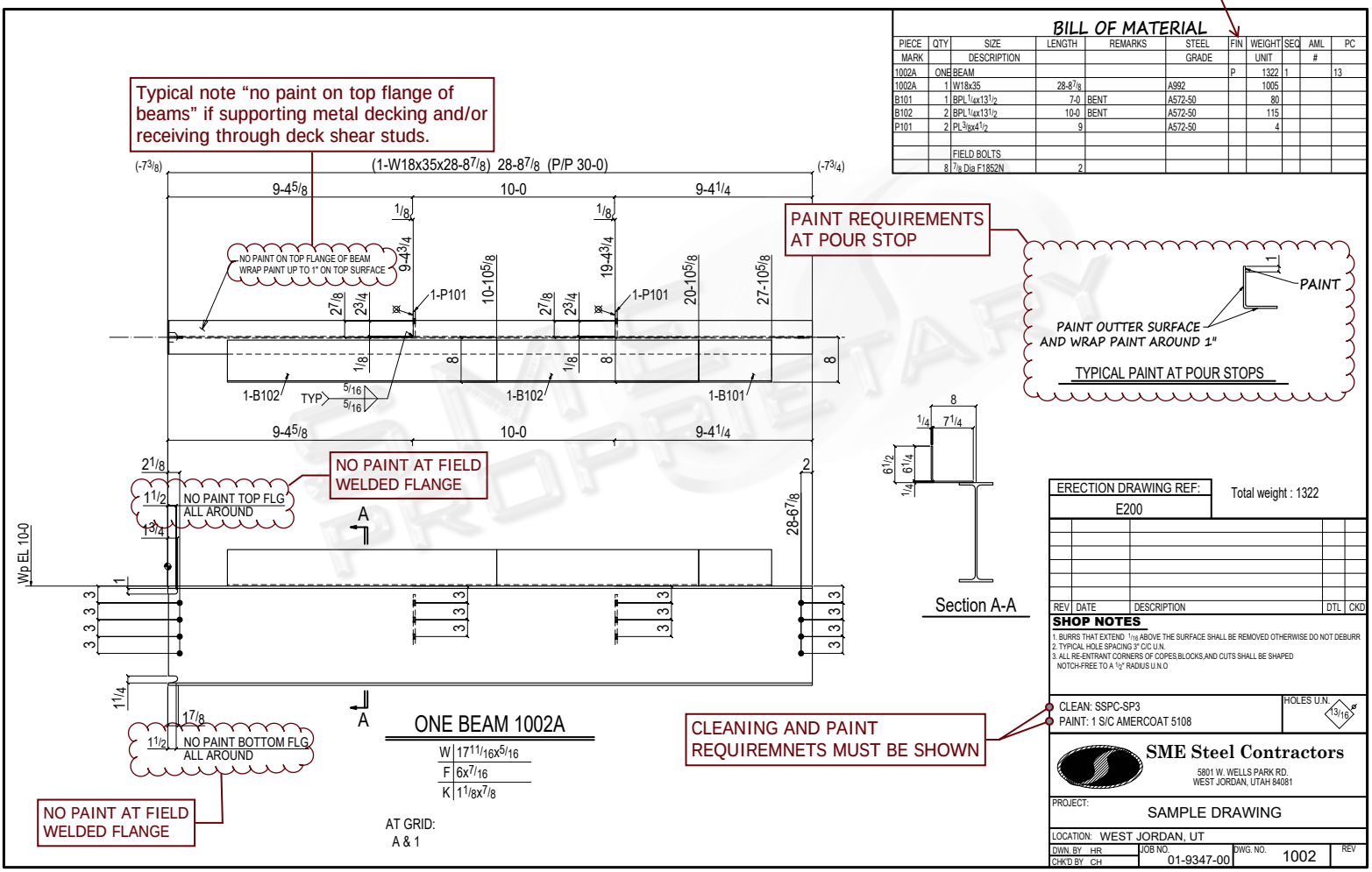
Typical note “no paint on top flange of beams” if supporting metal decking and/or receiving through deck shear studs.

PAINT REQUIREMENTS AT POUR STOP

CLEANING AND PAINT REQUIREMNETS MUST BE SHOWN

NO PAINT AT FIELD WELDED FLANGE

NO PAINT AT FIELD WELDED FLANGE



BILL OF MATERIAL

PIECE MARK	QTY	SIZE / DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
1002A	ONE	BEAM				P	1322	1		13
1002A	1	W18x35	28-8 7/8		A992		1005			
B101	1	BPL 1/4x13 1/2	7-0	BENT	A572-50		80			
B102	2	BPL 1/4x13 1/2	10-0	BENT	A572-50		115			
P101	2	PL 3/8x4 1/2	9		A572-50		4			
		FIELD BOLTS								
	8	7/8 Dia F1852N	2							

ERECTION DRAWING REF: E200

Total weight : 1322

REV	DATE	DESCRIPTION	DTL	CKD

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A 1/2" RADIUS U.N.O

CLEAN: SSPC-SP3
PAINT: 1 S/C AMERCOAT 5108

HOLES U.N. 13/16"

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT: SAMPLE DRAWING
LOCATION: WEST JORDAN, UT
DWN. BY HR | CHK'D BY CH | JOB NO. 01-9347-00 | DWG. NO. 1002 | REV

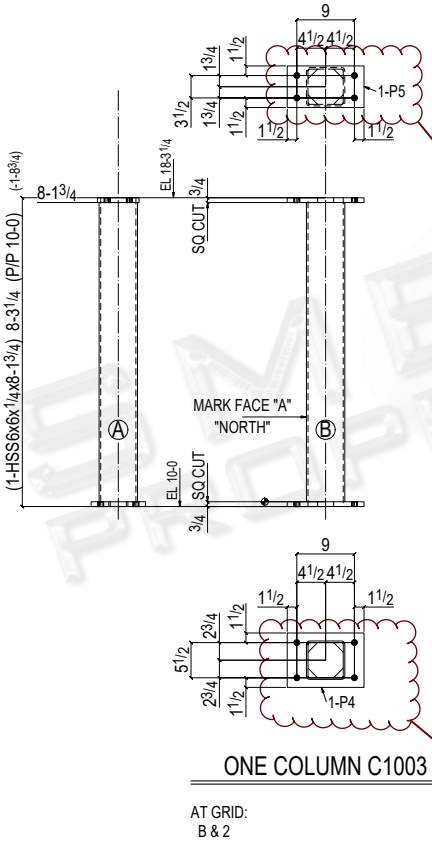
16.6 Sample Drawing with G Finish Code

FINISH CODE IN BILL OF MATERIAL

BILL OF MATERIAL

PIECE MARK	QTY	SIZE / DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
C1003	ONE	COLUMN		Galv		G	192	0		
C1003	1	HSS6x6x1/4	8-1 3/4	S2E	A500B		155			
P4	1	PL 3/4x8 1/2	1-0		A572-50		21			
P5	1	PL 3/4x6 1/2	1-0		A572-50		16			
		FIELD BOLTS								
	4	7/8 Dia F1852N	2 1/2	GALV						

BOLTS NOTED AS GALVANIZED



CAP PLATE WITH DRAIN AND VENT HOLES

CLEANING AND PAINT REQUIREMNETS MUST BE SHOWN

BASE PLATE WITH DRAIN AND VENT HOLES

ONE COLUMN C1003

AT GRID: B & 2

ERECTION DRAWING REF: E200

Total weight : 192

REV	DATE	DESCRIPTION	DTL	CKD

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A ½" RADIUS U.N.O

CLEAN: AS REQUIRED
PAINT: HOT DIP GALVANIZE PER ASTM 123

HOLES U.N. 13/16

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT: SAMPLE DRAWING

LOCATION: WEST JORDAN, UT

DWN. BY	CHK'D BY	JOB NO.	DWG. NO.	REV
HR	CH	01-9347-00	1003	

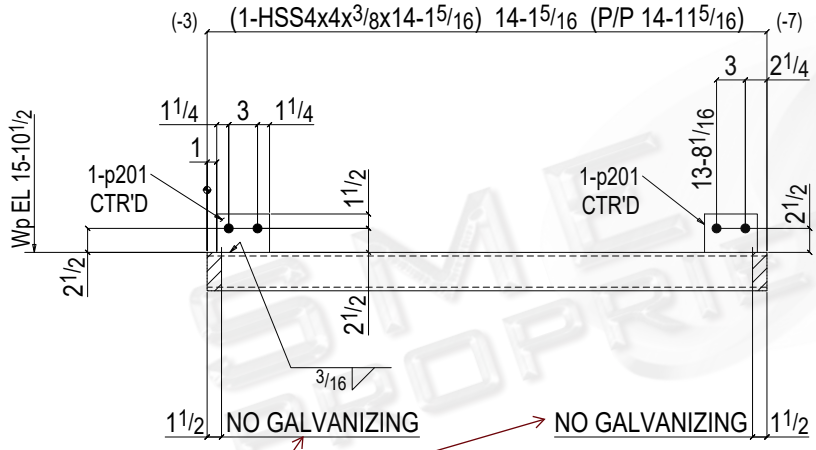
16.7 Sample Drawing with NO GALVANIZED Areas Shown

Note:

Drawing shown below is only an example. This doesn't mean this is the only condition detailer is required to provide No Galvanizing Areas. No galvanizing must be noted for all conditions where field welding occurs or design documents specifically give you direction.

BILL OF MATERIAL

PIECE MARK	QTY	SIZE / DESCRIPTION	LENGTH	REMARKS	STEEL GRADE	FIN	WEIGHT UNIT	SEQ	AML #	PC
B1008	ONE	BEAM		Galv			248	0		
B1008	1	HSS4x4x3/8	14-15/16		A500B		244			
p201	2	PL3/8x4	5 1/2		A572-50		2			



CLEARLY DEFINE ALL AREA'S THAT GALVANIZING NEEDS TO BE HELD BACK FOR FIELD WELDING

ONE BEAM B1008

AT GRID:
B & 2

ERECTION DRAWING REF: E200

Total weight : 248

REV	DATE	DESCRIPTION	DTL	CKD

SHOP NOTES

1. BURRS THAT EXTEND 1/16 ABOVE THE SURFACE SHALL BE REMOVED OTHERWISE DO NOT DEBURR
2. TYPICAL HOLE SPACING 3" C/C U.N.
3. ALL RE-ENTRANT CORNERS OF COPES,BLOCKS,AND CUTS SHALL BE SHAPED NOTCH-FREE TO A ½" RADIUS U.N.O

CLEAN: AS REQUIRED
PAINT: HOT DIP GALVANIZE PER ASTM 123

HOLES U.N. 13/16

SME Steel Contractors
5801 W. WELLS PARK RD.
WEST JORDAN, UTAH 84081

PROJECT: SAMPLE DRAWING

LOCATION: WEST JORDAN, UT

DWN. BY	CHK'D BY	JOB NO.	DWG. NO.	REV
HR	CH	01-9347-00	1008	

SECTION 17 SHIPPING

17.1 Shipping and Detailing Considerations

a. Anything over 8'-6" wide will require permits

b. Anything over 12'-0” wide will require pilot cars

c. Anything over 16'-0” wide, California considers a super load and will require a police escort

d. Any one piece that is over 48,000 lbs will require permits and special equipment

e. Any one piece that is over 60'-0” in length will require permits and special equipment

Note: All items listed above are subject to route changing due to construction. This is a State by State decision and out of SME's control. Detailer will be given project specific direction from Project Manager at kickoff meeting.

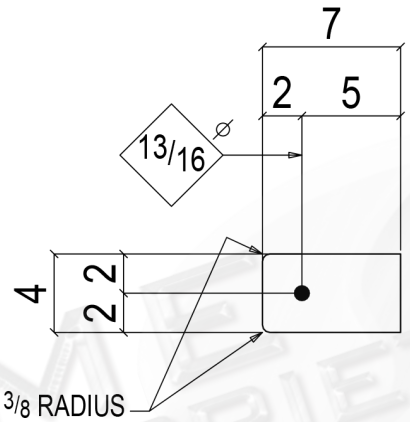
SECTION 18 STANDARD PARTS FOR DETAILING

18.1 Standard Parts Checklist

- ☐ Used correct standard part number SP9602 for all safety cable washers at perimeter columns.
- ☐ Used correct standard part number for all safety post sleeves at perimeter beams when slab thickness allows.
- ☐ Used correct standard lifting lugs at all columns and beams that required lugs unless stability engineer on your current project has provided information that you've been instructed to follow.

18.2 Standard Safety Cable Washer

REF: Used at columns for safety cable.



PL 1/2x4x0-7 SP9602

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT: SME STANDARD PART	
TITLE: Standard Safety Cable Washer at Columns	
DWG. NO. SP9602	REV

18.3 Standard Safety Post Sleeve 5 1/2” Slab with 1/4” Bent Plate

REF: Used perimeter and interior beam flanges where required for safety post.

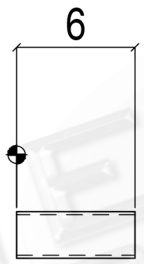
PIPE 2 STDx0-5 SP9603

GRADE: A53

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Standard Safety Post Sleeve 5 1/2" Slab W/ 1/4" Plate
DWG. NO.	SP9603
REV	

18.4 Standard Safety Post Sleeve 6 1/2” Slab with 1/4” Bent Plate

REF: Used perimeter and interior beam flanges where required for safety post.



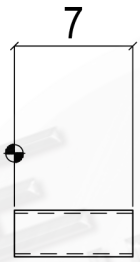
PIPE 2 STDx0-6 SP9604

GRADE: A53

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT: SME STANDARD PART	
TITLE: Standard Safety Post Sleeve 6 1/2" Slab W/ 1/4" Plate	
	DWG. NO. SP9604 REV

18.5 Standard Safety Post Sleeve 7 1/2” Slab with 1/4” Bent Plate

REF: Used perimeter and interior beam flanges where required for safety post.



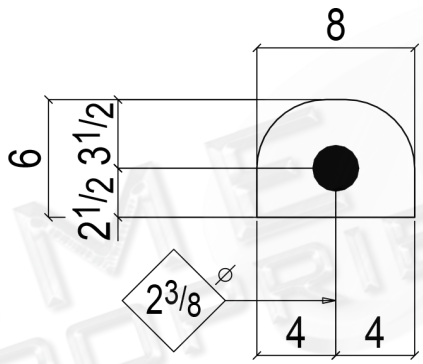
PIPE 2 STDx0-7 SP9605

GRADE: A53

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Standard Safety Post Sleeve 7 1/2" Slab W/ 1/4" Plate
DWG. NO.	SP9605
REV	

18.6 Column Lifting Lug 2.5 Ton

REF: Lifting lug used at columns without cap plate welds directly to column web.



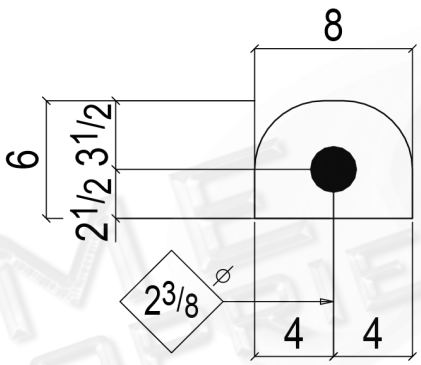
PL 1/2x6x0-8 SP9656

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Column Lifting Lug 2.5 Ton
DWG. NO.	SP9656
REV	

18.7 Column Lifting Lug 5 Ton

REF: Lifting lug used at columns without cap plate welds directly to column web.



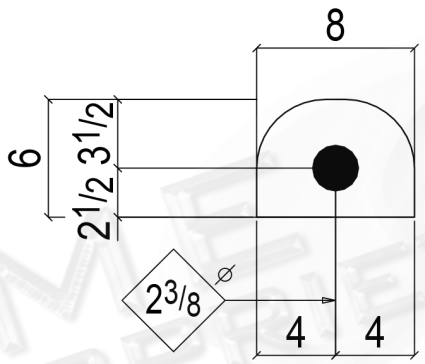
PL 3/4x6x0-8 SP9657

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Column Lifting Lug 5 Ton
DWG. NO.	SP9657
REV	

18.8 Column Lifting Lug 10 Ton

REF: Lifting lug used at columns without cap plate welds directly to column web.



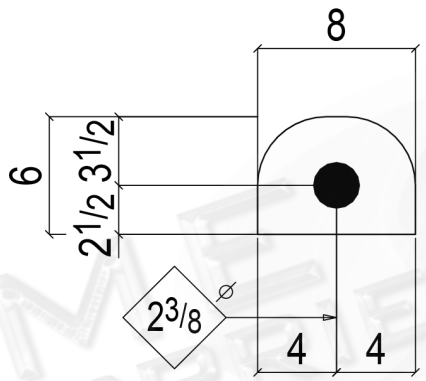
PL1x6x0-8 SP9658

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Column Lifting Lug 10 Ton
DWG. NO.	SP9658
REV	

18.9 Column Lifting Lug 17 Ton

REF: Lifting lug used at columns without cap plate welds directly to column web.



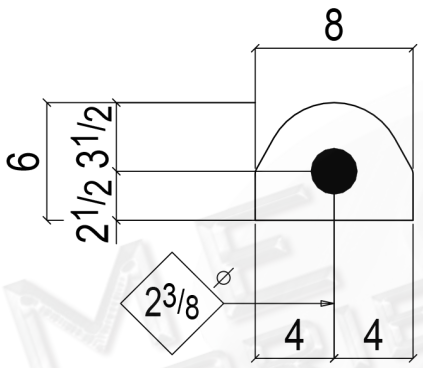
PL1 3/8x6x0-8 SP9659

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Column Lifting Lug 17 Ton
DWG. NO.	SP9659
REV	

18.10 Unstiffened Lifting Lug 6 Ton

REF: Lifting lug used at beams and columns with cap plate



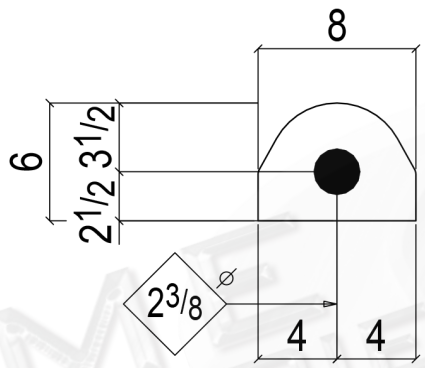
PL 3/4x6x0-8 SP9660

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Unstiffened Lifting Lug 6 Tons
DWG. NO.	SP9660
REV	

18.11 Unstiffened Lifting Lug 10.5 Ton

REF: Lifting lug used at beams and columns with cap plate



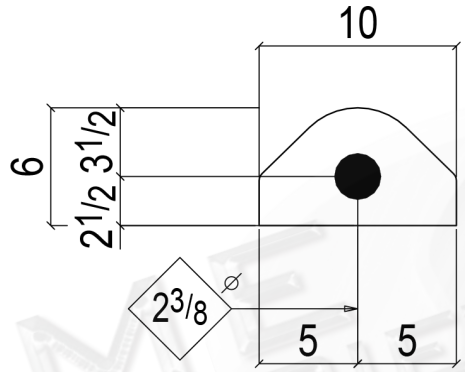
PL1x6x0-8 SP9662

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Unstiffened Lifting Lug 10.5 Tons
DWG. NO.	SP9662
REV	

18.12 Unstiffened Lifting Lug 20 Tons

REF: Lifting lug used at beams and columns with cap plate



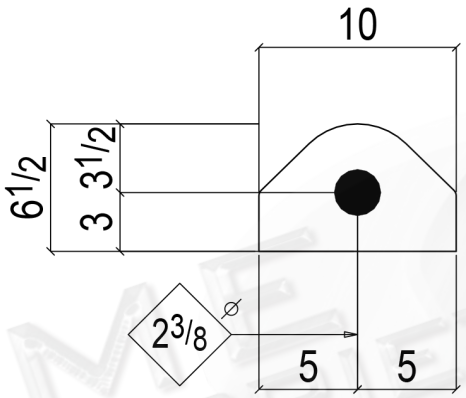
PL1 1/4x6x0-10 SP9663

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Unstiffened Lifting Lug 20 Tons
DWG. NO.	SP9663
REV	

18.13 Unstiffened Lifting Lug 25 Tons

REF: Lifting lug used at beams and columns with cap plate



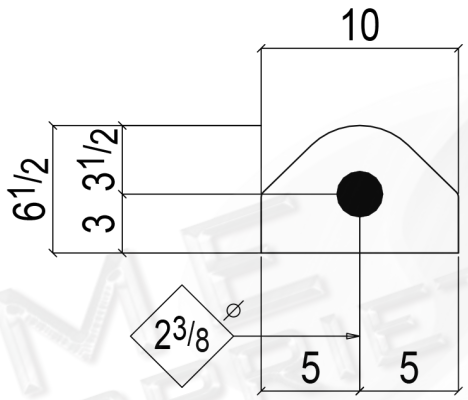
PL1 1/2x6 1/2x0-10 SP9664

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Unstiffened Lifting Lug 25 Tons
DWG. NO.	SP9664
REV	

18.14 Unstiffened Lifting Lug 35 Tons

REF: Lifting lug used at beams and columns with cap plate



PL2x6 1/2x0-10 SP9665

GRADE: A572-50

SME Steel Contractors 5801 W. WELLS PARK RD. WEST JORDAN, UTAH 84081	
PROJECT:	SME STANDARD PART
TITLE:	Unstiffened Lifting Lug 35 Tons
DWG. NO.	SP9665
REV	

SECTION 19 CHECKING FOR FABRICATION AND CONSTRUCTION

19.1 Checking Requirements Checklist

- ☐ Manually checked geometry as required to verify model accuracy.
- ☐ Verified use of correct connections.
- ☐ Applied proper shop and field notes.
- ☐ Used proper material as applicable.
- ☐ Shop Bill of Material contains all required information.
- ☐ Verified all elements or welding symbols are correct.
- ☐ Noted proper coatings and preparation.
- ☐ Verified all required information is represented correctly on erection drawings.
- ☐ Verified all steel included in the contract has been detailed.
- ☐ Identified detailer and checker in title block.
- ☐ Reviewed internal drawing review procedure.

19.2 Detailing Functions Overview

Personnel who perform detailing or checking of shop, manufacturing and erection drawings shall have experience in drawing projects similar to the project the fabricator or manufacturer provides and shall have knowledge of applicable material specifications and of mill rolling practices as they affect the detailing of structural steel.

Note: Detailer's in training shall work under the supervision of a trained detailer or checker.

19.3 Digital Document Production

a. For digital fabrication, manufacturing, erection and installation documents, the documented procedure for producing these documents shall identify the data, variables, graphics, calculating formulas, and other output as appropriate that are checked to determine that the software is functioning correctly.

b. Even though software is tested and reliable, checkers are required to verify the accuracy of the data, variables, graphics and calculating formulas the model outputs. This would include elevations, distances between grid lines, work point to work point dimensions indicated on details, minus dimensions, camber, material grades, hole sizes, materials dimensions. The shop and field drawings become record of this verification, all data, variables, graphics and calculation formulas that the model produces shall be color coded to indicate that you have checked data and agree that it is accurate and conforms to contract documents. When check is complete checker identify themselves by signing or placing initials on sheet.

Note: Items listed above may not be the only items you are responsible to review, each job will have individual circumstances that will produce other data and variables that will require a thorough review in order to verify its accuracy.

19.4 GEOMETRY

Even though software is tested and reliable, checkers are required to verify the accuracy of the data the model outputs. This would include, but not be limited to the items shown below:

- ☐ Elevations
- ☐ Distance between grid lines
- ☐ Work point to work point dimensions given on drawings
- ☐ Member minus dimensions
- ☐ Correct angular dimensions and bevels for skewed fittings
- ☐ Hole locations and diameters
- ☐ Perimeter and interior slab edge
- ☐ Mechanical penetration locations
- ☐ Member locations

19.5 Use of the Correct Connections

Detailer is required to ensure modeled connections conform to contract documents as well as AISC Code of Standard Practice. Any items not in conformance will require an RFI and direction from the Project Manager.

19.6 Proper Notes

Detailer will include adequate notes for any special conditions requiring special attention for fabrication and erection.

19.7 Proper Material Usage

Detailer is required to ensure proper material is being used for all main members and connection material per the contract documents as well as calling out material per applicable ASTM specifications.

- ☐ ASTM spec for various structural shapes
- ☐ ASTM spec for plates and bars
- ☐ ASTM spec for various types of structural fasteners

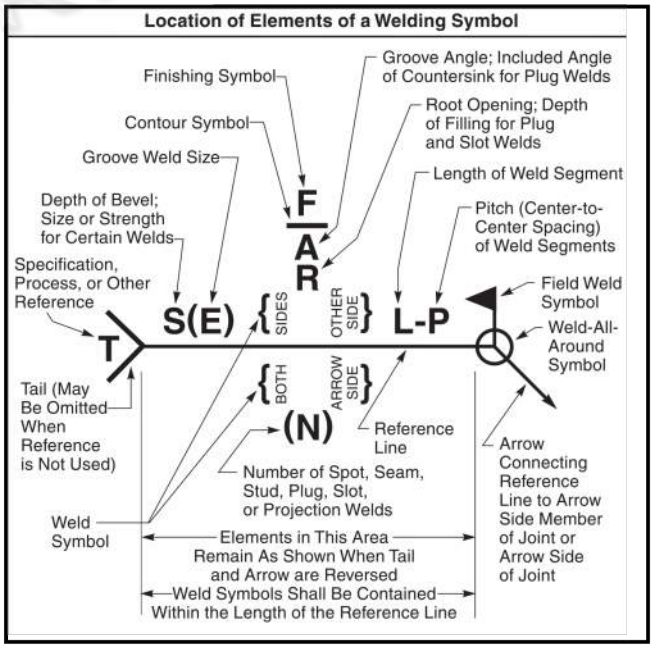
19.8 Shop Bills of Materials

Shop Bills of Materials contain all required information to fabricate main member and all sub-material including at a minimum items noted:

- ☐ Shipping mark
- ☐ Sub-material marks
- ☐ Finish requirements
- ☐ Correct ASTM Spec for all material and fasteners
- ☐ Fabrication phase code
- ☐ Shop and field bolts
- ☐ Camber if required
- ☐ CVN in remarks if Charpy testing required

19.9 Assignment of Complete Welding Symbols

Detailer is required to ensure all elements of a welding symbol are correct.



19.10 Proper Coatings and Preparation

Detailer is required to ensure correct surface prep and coatings are applied to shop drawings per the contract documents with correct ASTM specifications and SSPC standards.

Cleaning Requirements for Paint or Galvanizing

- ☐ Identify primer type
- ☐ Identify paint intermediate and finish coats
- ☐ Identify paint hold back areas for field welding
- ☐ Identify surface preparation requirements

19.11 Proper Representation on Erection Framing Drawings

Detailer is required to ensure items listed below are included on erection drawings.

- ☐ Bay to bay dimensions
- ☐ Dimensions locating all members
- ☐ Top of steel elevation
- ☐ Location and dimensions to all interior and exterior slab edge
- ☐ Member sizes
- ☐ Identify all members with camber and indicate camber requirement
- ☐ Connection plate locations will be indicated with a tick mark
- ☐ Key plan of project indicating area of work being performed
- ☐ Moment symbols at all locations requiring moment welded connections
- ☐ Notation of any necessary instructions and depiction of details necessary to conduct all work in the field
- ☐ Symbol representing beam locations that shake hands with shear plates

19.12 Proper Presentation

Detailer is required to ensure all information is accurately presented and in compliance with the AISC Code of Standard Practice requirements for all shop and field drawings.

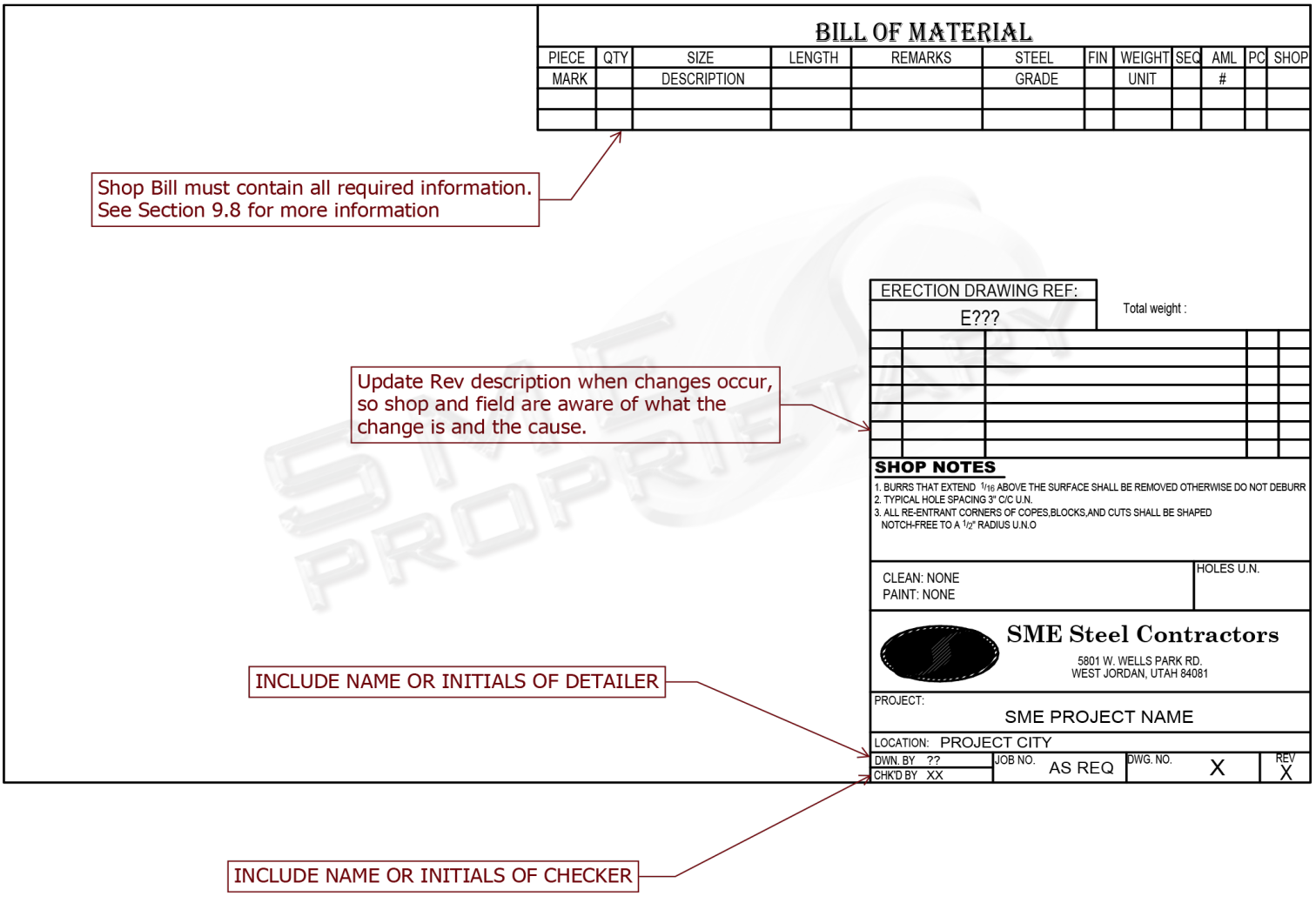
19.13 Scope of Work Verification

a. Verify all steel included in the contract documents has been detailed.

b. Verify all steel included in the stability plan has been detailed.

19.14 Identify Detailer and Checker in Title Block

Detailer and checker are required to include initials in title block as shown below:



19.15 Drawing Internal Review

1. Shop drawings submitted for approval
2. Project Management creates Bluebeam session
3. Send invites to designated individuals in each department:
    - **a.** Shop
    - **b.** Field
    - **c.** Internal checker
    - **d.** Project Management
    - **e.** QC Department
    - **f.** Other design engineers as applicable
    - **g.** Production Support
4. Each department to review and mark-up any needed corrections
    - **a.** Review in a timely manner; mark-up direction is clear
    - **b.** Identify all items that will required and RFI for approval of change requested
    - **c.** Notify Project Manager when review is complete
    - **d.** Setup internal review of noted corrections with all departments
5. Once internal review with all departments is complete, notify detailer
    - **a.** Detailer provided correction mark-ups for review
    - **b.** Detailer to review and note any markups that need further clarification
    - **c.** Once markups are reviewed, notify Project Management
6. Project Management to schedule online review between detailer and all departments
    - **a.** Review each mark-up and verify detailer understands and agrees with change requested
    - **b.** Answer all detailer questions
    - **c.** Modify document as required to represent final corrections required
    - **d.** Detailer to incorporate all reviewed corrections required before releasing for fabrication
7. Shop drawings returned from approval
    - **a.** Detailer notified of returned approval; detailer to review and make corrections noted
    - **b.** If any noted corrections need more information to complete, write RFI as required
    - **c.** If additional items outside of current detailing scope has been added, notify Project Management and provide a change order documenting the change.
    - **d.** Detailer to verify all RFIs and design changes have been incorporated
    - **e.** Detailer to verify all stability and safety items have been incorporated as required
8. Shop drawings released for fabrication
    - **a.** Final review of shop drawings to be completed by internal checker to verify all corrections have been incorporated in final shop and field drawings.
    - **b.** Drawings will not be released to Shop until internal checker has given approval to do so.
    - **c.** Any corrections required will be provided to the detailer to make final changes prior to submitting to the Shop.

SECTION 20 MODEL SUBMITTAL REQUIREMENTS

20.1 Weekly Model Submittals in .ifc Format

a. Detailer is required to upload a current model for all projects currently being detailed for SME Steel. The model will be uploaded to ftp site no later than Monday morning, in the A.M, weekly. Upload and provide letter of transmittal.

b. IFC file name should not change throughout the project.

c. The model provided weekly must encompass the entirety of the job.

20.2 Approval and Fabrication Model Submittals in .ifc Format

a. Detailer is required to upload a current model when submitting drawings for approval or fabrication.

20.3 Model Submittals in Native Format

a. Detailer is required to upload a current model in its native format when requested by SME Steel. If model is not requested during detailing, at the completion of the project, model will be required in native format (example: Tekla, SDS2, etc.) Uploaded native model will contain the entire electronic database which includes all shop and field drawings for as-built project. Included in the submittal, provide software used to produce the model along with the year and version.

SECTION 21 SUPPLEMENTAL QUALITY ASSURANCE GUIDELINES

21.1 Supplemental Quality Assurance Checklist

- ☐ Reviewed and completed all requirements of contract and specification review.
- ☐ Verified detailing and Project Management resource library is available and up to date.
- ☐ Reviewed and understand all requirements of document control.
- ☐ Reviewed and followed requirements for selecting subcontractors for fabrication.
- ☐ Have reviewed and understand requirements and responsibilities for detailing shop and field drawings.
- ☐ Have reviewed and understand requirements and responsibilities for checking shop and field drawings.

21.2 Contract and Specification Review

a. Within two weeks of receiving a new contract and prior to conducting a formal kickoff meeting, a "handover meeting" shall take place between SME Estimating, Sales, and Project Management teams. The purpose of this meeting will be to review the contract documents and relay all information to Project Management regarding how the project was sold.

b. Attendees shall include but not be limited to: VP Sales, Estimator, VP Project Management, Project Manager, Purchasing Manager, QA/AC Manager, Shop Manager, and Detailing Manager.

c. The review shall include plans, specifications, all addenda, and any supplementary information issued during the time of bidding as well as any and all terms and conditions that may have been agreed to including schedule and SME's proposal.

d. The review shall include but not be limited to the following:

- Structural and architectural drawings, as well as specifications, shall compare in number, date, and revision level as sold and identified in the proposal. Also, all documents shall be compared to those stipulated by the customer and as required by the contract.
- Technical requirements such as material specs., CVN/ND testing, welding and bolting, special preparation and/or painting, inspection/FEMA, and any variations from SME's usual shop or detailing standards.
- Selection of subcontractors including detailer, deck, and/or joists. Additionally, if there is a potential for any subcontracted fabrication.
- Schedules and critical milestone dates.
- If there is any missing or questionable information identified or discovered during the project review, Project Management will follow up with an RFI. Meeting minutes shall be taken and distributed to all attendees. These minutes shall be referred to and reviewed at the subsequent kickoff meeting.

21.3 Detailing and Project Management Resource Library

a. SME shall maintain current and make available to all departments the following reference material library:

- AISC Selected ASTM Standards for Structural Steel Fabrication from the AISC Code of Standard Practice
- LRFD specification for the design of steel hollow structural sections
- LRFD specification for single-angle members
- Specification for structural joints using ASTM A325 or A490 bolts
- AISC Code of Standard Practice for Steel Buildings and Bridges
- AISC Guide to Engineering and Quality Criteria for Steel Structures (optional)
- ANSI/ASS D1.1 Structural Welding Code – Steel
- ANSI/AWS A2.4 Symbols
- ANSI/AWS A3.0 Terms and Definitions
- Steel Structures Painting Manual, Volume I, Good Painting Practice
- Steel Structures Painting Manual, Volume II, Systems and Specifications
- AISC Detailing for Steel Construction

21.4 Document Control

a. Specifications shall be logged, filed, and maintained by the Project Manager. Copies may be made and distributed as required. All subsequent revisions and additions shall be dated and logged.

b. The Project Manager shall maintain the original copy of the structural and architectural design drawings as well as all subsequent, revised design drawings. All design drawings shall be entered into the drawing log as they are received, identifying the date and revision level. It is recommended that the Project Manager copy and maintain a working design drawing set which includes all drawings issued. Revised drawings received would be inserted into the working set and the previous drawing marked "Void" or "See Revised". Upon receipt of any and all additional or revised design drawings, the Project Manager shall direct copies be issued to the detailer and all subcontractors.

c. A copy of all shop detail drawings and field erection drawings shall be electronically maintained in the project job folder and segregated from all other projects. Drawings shall be maintained current by sequence and in sequential order. Revised drawings shall be maintained with the correct labeling identifying the **revision level or labeled void if member is no longer required. Shop drawing logs shall be maintained current with the latest date and revision level for each drawing and accessible to any and all departments.**

d. Upon completion and closeout of every project, all quality records shall be collected and filed by the Project Manager and/or the Assistant Project Manager in a designated storage area. The records shall be orderly, boxed, and clearly labeled with the project name, job number, and close-out date. These records shall be maintained for a period of not less than 7 years. The designated storage area shall be a suitable environment, safe from deterioration, damage, or loss. Project quality records shall include but not be limited to the following:

- One copy each of the original structural and architectural design drawings, as well as all subsequent design revisions
- All addendums
- Project specifications
- Executed contract, as well as all subcontracts
- Change order log, as well as all executed change orders
- RFIs and the RFI log
- All internal and external correspondence
- As-built shop and erection drawings
- All drawing logs
- Purchase orders for all mill and consumable materials, along with mill test reports (MTRs)
- All inspection records, NDT reports, non-compliance, and corrective action reports
- Certificates of compliance and warranties
- Above records may either be in hard copy or electronically stored

21.5 Selection of Subcontractors (Fabrication)

a. In the event that subcontract fabrication becomes necessary, the Project Manager and QA/QC Manager shall be responsible for the evaluation and selection process. A formal meeting shall be held by the above mentioned participants to discuss the project requirements – such as: total tonnage, type of fabrication, duration, etc.

b. The selection of a subcontract fabricator shall be on the basis of their ability to meet SME's subcontract requirements (schedule, price, delivery, etc.), their QA/QC quality management system, SME's standards, and inspection requirements. They shall have the required level of AISC certification, if any, as well as any local certification requirements.

c. Evaluation shall be accomplished by any of the following means: personal interview with or without a visit to the facility, telephone interview, and/or previous experience with input from SME personnel involved.

d. Procedures and criteria shall include but not be limited to the following:

- The customer or Engineer of Record must be notified and must authorize SME to use subcontract fabrication.
- The customer or Engineer of Record must approve in writing any subcontractor that is not AISC certified, if required.
- Compile key information on the company, including an outline of the fabricator's facilities and equipment, resumes of key personnel, and a list of recently completed projects.
- Compile information from any SME Project Managers who have previously worked with the subcontractor. Provide information on the type of work performed and whether it was completed satisfactorily, with both positive and negative comments documented.
- SME QA/QC Manager shall visit the facility and interview key personal. Qualification of staff and copies of their welding, bolting, painting, NDT testing procedures, and Quality Assurance Manual shall be obtained in order to thoroughly review their QA/QC program.

e. Once a subcontract has been awarded, SME's QA/QC Manager shall monitor material handling, fabrication, and shipping. Performance records shall be maintained and kept on file including test reports and certificates of compliance or other evidence of quality control.

f. If materials are supplied by the fabricator, the fabricator shall provide copies of all purchase orders and MTRs. If materials are supplied by the customer, fabricator shall verify, store, and maintain materials in an appropriate fashion.

COMMENTARY:
Since subcontract fabrication is such a rare exception with SME, it is not feasible to maintain a current and active list of approved subcontractors. SME shall, however, maintain files for all subcontract fabricators including records of the evaluation process, audits, and acceptance along with a final performance report by the Project Manager.

21.6 Detailing of Shop and Field Drawings

a. The purpose of the following procedures is to summarize the detailing responsibilities and authority and shall apply to all subcontract detailers engaged in detailing for SME Steel Contractors.

1. Responsibilities

- SME's Detailing Manager is responsible for establishing and formulating this procedure, as well as modifications and revisions.
- SME's management team is responsible for approving this procedure.
- The subcontract detailers are responsible for implementing, distributing, and maintaining these procedures with their detailing staff.
- SME's Project Managers are responsible for ensuring these procedures are followed during the course of their respective projects.

2. Preparation of Shop and Erection Drawings

- Upon receipt of a project, the subcontract detailer will proceed with direction from SME's Project Manager. All rules and procedures as defined in all sections of the SME Detailing Manual are to be followed.

21.7 Checking of Shop and Field Drawings

a. Once the subcontract detailer has completed a drawing or set of drawings, the drawings will be checked according to their checking procedures. Subcontract detailers are responsible for checking their drawings.

b. Once checking is completed, the subcontract detailer will make the noted corrections before releasing to SME Steel Contractors for approval, fabrication, or any other purpose as dictated by the project's schedule.

c. Drawings received from the subcontract detailer will be reviewed by SME's assigned Project Manager or Assistant Project Manager for conformance to contract requirements and SME standards requirements.

21.8 SHOP DRAWINGS SUPPLIED BY OTHERS

Overview: A documented procedure shall be developed for the approval of approval documents and shall describe the method used to document owner approval of approval documents released for fabrication whether produced in-house or through a subcontractor.

a. When shop and erection drawings are not prepared by an SME subcontract detailer but are furnished by the customer for fabrication by SME, a job number will be assigned and the contract documents will be given to and managed by an assigned SME Project Manager. All procedures for processing, filing, and fabrication from these drawings will be followed as defined in SME's Detailing Manual.

b. The Project Manager will review the supplied drawings with the Estimating and Sales teams for scope, pricing, schedule, etc. A record of this meeting will be made and filed.

c. The Project Manager will be responsible to ensure the most current drawings are issued for fabrication.

d. SME Steel shall neither be responsible for the completeness or accuracy of the supplied shop and erection drawings so furnished, nor the general fit-up of the members that are fabricated from them (per AISC Code of Standard Practice, Section 4.5).

SME STEEL CONTRACTORS

Detailing Manual Revision History

Revisions on this manual will be only approved by the Detailing Manager. Revisions shall be clearly identifiable by mechanisms such as underlining, bolding, italicizing, etc. Changes made from the previous edition of the document. The table below will serve as a log to identify, summarize, and approve such revisions. At a minimum, this document shall be reviewed and re-approved annually per AISC 207-20.

Edition #	Date:	Description of Changes	Approved By
1st Edition	07/19/2022	SME Detailing Manual 1st Edition_ Rev 0	Approved for Release Brett Stapel 07/19/2022 10:24:52 AM

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