

CISC Code of Standard Practice

for structural steel



canadian institute of steel construction

Copyright © 2000

by

Canadian Institute of Steel Construction

*All rights reserved. This book or any part thereof must
not be reproduced in any form without the written
permission of the publisher.*

First Printing January 2000

ISBN 0-88811-093-6

PRINTED IN CANADA

by

Universal Offset Limited
Alliston, Ontario



CISC
CODE OF STANDARD PRACTICE
for
Structural Steel

Sixth Edition

Published by the

CANADIAN INSTITUTE OF STEEL CONSTRUCTION
201 Consumers Road, Suite 300
Toronto ■ Ontario ■ M2J 4G8

TABLE OF CONTENTS

PREFACE	vii
1. General Provisions.	1
1.1 Scope.	1
1.2 Definitions.	1
1.3 Governing Technical Standards	3
1.4 Responsibility for Design	3
1.5 Responsibility for Erection Procedure	3
1.6 Patented Devices	4
1.7 Scheduling.	4
2. Classification of Material	4
2.1 Structural Steel	4
2.2 Field Connection Material	5
2.3 Items Supplied by Others.	5
3. Quotations and Contracts	6
3.1 Standard Form of Contract.	6
3.2 Types of Contracts	7
3.3 Revisions to Contract Documents	7
3.4 Discrepancies	7
3.5 Computation of Units	7
3.6 Contract Price Adjustments	8
3.7 Scheduling.	9
4. Contract Documents	9
4.1 Tender Documents – Tender Drawings and Tender Specifications	9
4.2 Architectural, Electrical and Mechanical Drawings	10
4.3 Construction Drawings and Construction Specifications	10
5. Fabrication and Erection Documents	10
5.1 Erection Diagrams.	10
5.2 Connection Design Details	10
5.3 Shop Details	11
5.4 Erection Procedures	11
5.5 Field Work Details.	11
5.6 Review and Approval	11
5.7 Additions, Deletions or Changes	12
6. Material, Fabrication, Inspection, Painting and Delivery	12
6.1 Material	12
6.2 Identification.	12
6.3 Preparation of Material	12
6.4 Fitting and Fastening	12

6.5	Dimensional Tolerances	13
6.6	Inspection of Steelwork	13
6.7	Surface Preparation	13
6.8	Paint	13
6.9	Marking and Shipping.	13
6.10	Delivery of Materials	14
7.	Erection	14
7.1	Method of Erection.	14
7.2	Erection Safety.	14
7.3	Site Conditions.	14
7.4	Foundations	15
7.5	Bearing Surfaces.	15
7.6	Building Lines and Bench Marks	15
7.7	Installation of Anchor Rods and Embedded Items	15
7.8	Bearing Devices	15
7.9	Examination by Erector	16
7.10	Adjustable Shelf Angles and Sash Angles	16
7.11	Loose Lintels and Wall Bearing Members	16
7.12	Tolerances	16
7.13	Checking Erected Steelwork	16
7.14	Removal of Bracing	16
7.15	Correction of Errors when Material is Not Erected by the Fabricator.	16
7.16	Field Assembly.	17
7.17	Accommodation of Other Trades	17
7.18	Temporary Floors and Access Stairs	17
7.19	Touch-Up of Shop Paint	17
7.20	Final Painting	17
7.21	Final Clean-Up.	17
APPENDIX A	Structural Steel in Buildings	18
APPENDIX B	Guideline for Unit Price Application for Changes	20
APPENDIX C	A Suggested Format for Price Per Unit Contracts.	22
APPENDIX D	Tolerances on Anchor Rod Placement	25
APPENDIX E	Conversion of SI Units to Imperial Units.	26
APPENDIX F	Miscellaneous Steel	27
APPENDIX G	A Suggested Format for a Monthly Progress Payment Claim Form	29
APPENDIX H	Suggested Definitions for Progress Invoicing and Substantial Performance	30

CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL

PREFACE

The CISC Code of Standard Practice for Structural Steel is a compilation of usual industry practices relating to the design, fabrication and erection of structural steel. These practices evolve over a period of time and are subject to change as improved methods replace those of an earlier period. The Code is revised whenever a sufficient number of changes have occurred to warrant a new edition.

The first edition of the Code was adopted and published in November 1958. A second edition incorporating minor revisions was published in October 1962. The third edition, published in September 1967 and revised in May 1970, incorporated minor changes throughout with principal changes in Section 2 - Definition of Structural Steel and Section 3 - Computation of Weights for Unit Price Bids.

The fourth edition adopted in June 1980, revised December 1980, broadened the scope to include bridges and other structures. It also incorporated the CISC "Guide to Tendering Procedures" into Section 3 and Appendices B & C. The Code was converted to SI (metric) units and provided conversion factors and Imperial units in Appendix E.

The fifth edition (1991) reflected the steel standard's recognition of the preparation of five types of fabrication and erection documents which may be produced in fulfilling a steel construction contract. These documents may be in the form of drawings, diagrams, sketches, computer output, hand calculations and other data which can be supplied by the fabricator/erector. This data is generally referred to in contract documents as "shop drawings". The computation of mass has been changed by deleting the mass of welds and the allowances for paint and other coatings. Appendix B, Guideline for Unit Price Application for Changes, and Appendix C, A Suggested Format for Price Per Unit of Mass or Price Per Item Contracts were substantially revised. To foster uniformity, two new appendices were added; Miscellaneous Steel and A Suggested Format for a Monthly Progress Claim Form.

This sixth edition (1999) continues to clarify the role of the fabricator, the information required, and where that information is expected, as stipulated in the governing technical standards. Added are: definitions of Design Drawings, and Quotations, clauses on Quotations, Discrepancies, shims for bearing surfaces, the allowance for return of documents, the information required when painting is specified, and Appendix H, Suggested Definitions for Progress Invoicing and Substantial Performance. Changes have been made to Appendix C, the terminology for Unit Price contracts, connection types, and anchor rods - the latter two to be consistent with the changes in CSA Standard CAN/CSA-S16-01.

By documenting standard practices the Code aims to promote a clear understanding between the Canadian structural steel fabrication and erection industry and its clients.

Canadian Institute of Steel Construction

Adopted November 19, 1999

Amended November 15, 2002

CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL

1. General Provisions

1.1 Scope. This Code covers standard industry practice with respect to the furnishing of structural steel. In the absence of provisions to the contrary contained in contracts to which members of the Canadian Institute of Steel Construction are contracting parties, members will abide by the practices described herein.

1.2 Definitions.

<i>Approved for Construction Drawings</i>	Drawings and other documents approved by the client authorizing work to proceed. (May also be called “Issued for Construction Drawings”).
<i>Architect</i>	As defined under the appropriate Architect’s Act.
<i>Client</i>	A person, corporation, or authority with whom the fabricator has contracted.
<i>Connection Design Details</i>	Documents which provide details of standard and non-standard connections and other data necessary for the preparation of shop details.
<i>Construction Drawings</i>	Drawings used to govern the construction of the works.
<i>Construction Specifications</i>	Specifications used to govern the construction of the works.
<i>Contract</i>	The agreement between the fabricator and/or erector, and the client.
<i>Contract Documents</i>	The documents which define the responsibilities of the parties involved in tendering, purchasing, supplying, fabricating and erecting structural steel, including tender drawings and tender specifications and applicable revisions in effect and agreed to at the time of contract award.
<i>Cost Plus a Fee Contract</i>	An Agreement whereby the fabricator and/or erector agrees to fulfil the contract for a consideration which is calculated on the basis of the fabricator’s costs plus a specified fee as defined in the contract.
<i>Design Drawings</i>	Drawings, including computer output, electronic and other data, as prepared by the designer showing member sizes and dimensions and all required forces for connection design i.e. shears, axial forces, moments and torsions. (See governing technical standard).
<i>Designer</i>	The designer of the structure. See Engineer of Record.
<i>Engineer</i>	As defined under the appropriate Professional Engineer’s Act.
<i>Engineer of Record</i>	Professional Engineer who designs the structure, as defined under the appropriate Professional Engineer’s Act.
<i>Erection Bracing</i>	Bracing materials or members which are used to plumb, align and stabilize structural members or the structure during construction and are removed when the structural members or the structure is secured by bolting or welding of structural members.
<i>Erection Diagrams</i>	Are general arrangement drawings showing the principal dimensions and elevations of the steel structure, sizes of the steel mem-

	bers, piece marks, size (diameter) and type of bolts, bolt installation requirements, elevations of column bases, all necessary dimensions and details for setting anchor rods, and all other information necessary for the assembly of the structure.
<i>Erection Procedures</i>	Outline the construction methods, erection sequence, erection and temporary bracing requirements, and other engineering details necessary for shipping, handling, erecting, and maintaining the stability of the structural steel frame.
<i>Erector</i>	Means the party responsible for erection of the steelwork.
<i>Fabricator</i>	Means the party responsible for furnishing the structural steel.
<i>Field Work Details</i>	Are details that provide complete information for modifying fabricated members in the field (e.g. prepare existing steel to receive new steel).
<i>General Contractor, Constructor or Construction Manager</i>	The person or corporation who constructs, coordinates, and supervises the construction of the work.
<i>General Terminology e.g. Beams, Joists, Columns, etc.</i>	These terms have the meanings stated or implied in CAN/CSA-S16 (latest edition), CAN/CSA-S6 (latest edition) and Appendix A of this Code.
<i>Lump Sum Price Contract</i>	Also called Stipulated Price Contract. An agreement whereby the fabricator and/or erector contracts to fulfil the contract terms for a lump sum (stipulated price) consideration.
<i>Miscellaneous Steel</i>	Steel items described and listed in Appendix F of this code.
<i>Others</i>	Means a party or parties other than the fabricator and/or erector.
<i>Owner</i>	Means the owner of a structure and shall include his authorized agent and any person taking possession of a structure on the owner's behalf. Depending on the circumstances an authorized agent may be the architect, engineer, general contractor, construction manager, public authority or other designated representative of the owner.
<i>Price Per Unit Contract</i>	Also called Unit Price Contract. An agreement whereby the fabricator and/or erector contracts to fulfil the contract terms for a consideration which is based on the units of steel calculated in accordance with the CISC Code of Standard Practice for Structural Steel.
<i>Quotations</i>	Proposals by the fabricator based on structural steel as defined in Clause 2.1 and as included in the tender documents, and in accordance with the documents outlined in Clause 3.3.1.
<i>Revision</i>	A change in the contract documents.
<i>Shop Details</i>	Documents which provide complete information for the fabrication of various members and components of the structure, including the required material and product standards; the location, type, and size of all mechanical fasteners; bolt installation requirements; and welds.

<i>Stipulated Price Contract</i>	See Lump Sum Price Contract.
<i>Structural Drawings</i>	Drawings showing the structural steel required.
<i>Structural Steel</i>	Those items listed under Clause 2.1
<i>Structural Steel Frame</i>	An assemblage of structural steel components (beams, columns, purlins, girts, etc.) for the purpose of resisting loads and forces. See Clause 2.1.
<i>Structural Steel Specifications</i>	The portion of the tender specifications containing the requirements for the fabrication and erection of the structural steel.
<i>Temporary Bracing</i>	Members designed by the Engineer of Record to be removed at a later date at his or her instruction.
<i>Tender Documents</i>	Drawings, specifications, general conditions, addenda, etc., used as the basis for preparing a tender.
<i>Tender Drawings</i>	Drawings used as the basis for preparing a tender.
<i>Tender Specifications</i>	Specifications used as the basis for preparing a tender.
<i>Unit Price Contract</i>	See Price Per Unit Contract.

1.3 Governing Technical Standards. The provisions of the latest edition of CAN/CSA-S16 “Limits States Design of Steel Structures”, shall govern the design, fabrication and erection of steel structures except bridges. The provisions of the latest edition of CAN/CSA-S6 “Design of Highway Bridges”, “The Ontario Highway Bridge Design Code” (in Ontario) or the American Railway Engineering Association’s “Specifications for Steel Railway Bridges” shall govern the design, fabrication and erection of structural steel for bridges. The provisions of the latest edition of CSA Standard W59 “Welded Steel Construction (Metal-Arc Welding)” shall govern arc welding design and practice. The provisions of other standards shall be applicable if called for in the tender drawings and tender specifications.

1.4 Responsibility for Design. When the client provides the structural drawings and specifications, the fabricator and the erector shall not be responsible for determining the adequacy of the design nor liable for the loss or damage resulting from an inadequate design. Should the client desire the fabricator to assume any responsibility for design beyond that of proposing adequate connections and details, and, when required, components, members, or assemblies standardized by the fabricator, the client shall state clearly his requirements in the invitation to tender or in the accompanying tender drawings and tender specifications. Even though proposed connections and design details may be prepared by the fabricator’s technical staff, the over-all behaviour of the structure remains the responsibility of the designer of the structure. (See also Clause 5.6).

1.5 Responsibility for Erection Procedure. When the erection of structural steel is part of his contract, the fabricator shall be responsible for determining the erection procedure, for checking the adequacy of the connections for the uncompleted structure and for providing erection bracing or connection details. When the erection of the structural steel is not part of his contract, the fabricator shall not be responsible for determining the erection procedure, for checking the adequacy of the connections for the uncompleted structure, or for providing erection bracing or connection details not included in the contract documents, nor shall the fabricator be liable for loss or damage resulting from faulty erection. However, the steel fabricator shall be informed by the client of the erection sequence to be used which may influence the sequence and process of the

manufacturing. (See also Clause 5.1 and 5.4).

1.6 Patented Devices. Except when the contract documents call for the design to be furnished by the fabricator or erector, the fabricator and erector assume that all necessary patent rights have been obtained by the client and that the fabricator and erector will be fully protected by the client in the use of patented designs, devices or parts required by the contract documents.

1.7 Scheduling. The client should provide a construction schedule in the tender documents. In the absence of such a schedule, one should be mutually agreed upon between the contracting parties, prior to the contract award.

2. Classification of Material

2.1 Structural Steel. Unless otherwise specified in the tender documents, a contract to supply, fabricate and deliver structural steel shall include only those items from the following list which are clearly indicated as being required by the structural drawings and tender specifications. (See Appendix A)

2.1.1.

Anchors for structural steel.

Base plates and bearings for structural steel members.

Beams, purlins, girts forming part of the structural steel frame.

Bearing plates and angles for structural steel members and steel deck.

Bins and hoppers of 6 mm plate or heavier, attached to the structural steel frame.

Bracing for steel members, trusses or frames.

Brackets attached to the structural steel.

Bridge bearings connected to the structural steel members.

Cables for permanent bracing or suspension systems.

Canopy framing if attached to the structural steel frame.

Cold formed channels when used as structural members as listed in the CISC Handbook of Steel Construction

Columns.

Conveyor galleries and supporting bents (exclusive of conveyor stringers, deck plate and supporting posts which are normally part of the conveyor assembly).

Crane rails and stops, excluding unless otherwise noted final alignment of the rails.

Curb angles and plates attached to the structural steel frame if shown on the structural steel drawings.

Diaphragms for bridges.

Deck support angles at columns, walls, if shown on the structural steel drawings.

Door frame supports attached to the structural steel frame.

Embedded items connecting structural steel.

Expansion joints connected to the structural steel frame (excluding expansion joints for bridges).

Field bolts to connect structural steel components.

Floor plates, roof plates (raised pattern or plain) and steel grating connected to the structural steel frame.

Girders.

Grillage beams of structural steel.

Hangers supporting structural steel framing.

Jacking girders.

Lintels if attached to steel frame and shown on the structural drawings.

Mechanical roof support and floor opening framing shown on structural drawings.
Monorail beams of standard structural steel shapes.
Open-web steel joists, including anchors, bridging, headers and trimmers; also, when specified to be included in the structural steel contract documents, light-gauge forms and temperature reinforcement.
Sash angles attached to the structural steel frame.
Separators, angles, tees, clips and other detail fittings essential to the structural steel frame.
Shear connectors/studs, except when installed through sheet steel deck by deck installer.
Shelf angles attached to the structural steel frame if shown on structural drawings.
Shop fasteners or welds, and fasteners required to assemble parts for shipment.
Steel tubes or cores for composite columns.
Steel window sills attached to the structural steel frame.
Struts.
Suspended ceiling supports of structural steel shapes at least 75 mm in depth.
Temporary components to facilitate transportation to the site.
Tie, hanger and sag rods forming part of the structural steel frame.
Trusses.

2.1.2. Only if shown on the structural drawings and specifically noted by the structural engineer to be supplied by the structural fabricator:

Steel stairs, walkways, ladders and handrails forming part of the structural steelwork.
[See Appendix A]

2.2 Field Connection Material.

2.2.1. When the fabricator erects the structural steel, he shall supply all material required for temporary and for permanent connection of the component parts of the structural steel.

2.2.2. When the erection of the structural steel is not part of the fabricator's contract, unless otherwise specified, the fabricator shall furnish appropriate bolts and nuts (plus washers, if required) or special fasteners, of suitable size and in sufficient quantity for all field connections of steel to steel which are specified to be thus permanently connected, plus an over-allowance of two per cent of each size to cover waste.

Unless otherwise specified in the tender documents, welding electrodes, back-up bars, temporary shims, levelling plates, fitting-up bolts and drift pins required for the structural steel shall not be furnished by the fabricator when the erection of the structural steel is not part of the fabricator's contract.

2.3 Items Supplied by Others. Unless otherwise specified in the tender documents, the following steel or other items shall not be supplied by the structural steel fabricator.

Bolts for wood lagging.
Bins and hoppers not covered in Clause 2.1 of this Code.
Bridge bearings not connected to structural steel items.
Canopy framing not attached to structural steel.
Catch basin frames.
Concrete for filling HSS columns. Concrete is to be supplied and poured in columns by others in the shop or field with the co-operation of the fabricator/erector.
Connection material for other trades (e.g. precast concrete).
Conveyor stringers, deck plate and supporting posts.

Drain pipes.
Door and corner guards.
Door frames not covered in Clause 2.1 of this Code.
Drilling of holes into masonry or concrete, including core drilling of anchor rods for bridges and drilling for deck support angles.
Edge forming less than 3.2 mm thick for steel deck and not covered in Clause 2.1 of this code.
Embedded steel parts not required for structural steel or deck.
Embedded steel parts in precast concrete.
Flagpoles and supports.
Floor plates, roof plates and grating not covered in Clause 2.1 of this Code.
Grout.
Hoppers and chutes.
Hose and tire storage brackets.
Installation of embedded parts.
Lag bolts, machine bolts and shields or inserts for attaching shelf angles, trimmer angles and channels to masonry or concrete.
Lintels over wall recesses.
Lintels which are either an integral part of door frames or not attached to the structural steel frame.
Machine bases, rollers and pulleys.
Members made from gauge material except cold-formed channels indicated in Clause 2.1.
Metal-clad doors and frames.
Miscellaneous Steel, See Appendix "F".
Shear connectors through sheet steel deck by deck installer.
Sheet steel cladding.
Sheet steel deck.
Sheet steel flashing.
Shelf angles not covered in Clause 2.1 of this Code.
Shoring under composite floors and stub girders.
Steel doors.
Steel sash.
Steel stacks.
Steel stairs, landings, walkways, ladders and handrails, not covered in Clause 2.1.2 of this Code.
Steel tanks and pressure vessels.
Steel window sills not covered in Clause 2.1 of this Code.
Support for sheet steel deck at column cut outs and for openings not requiring framing connected to structural steel.
Temporary bracing for other trades.
Trench covers.
Trim angles, eave angles or fascia plates not directly attached to the structural steel frame.

3. Quotations and Contracts

3.1 Standard Form of Contract. Unless otherwise agreed upon, a contract to fabricate, deliver and/or erect structural steel shall be the appropriate Standard Construc-

tion Documents approved by the Canadian Construction Documents Committee, or the Canadian Construction Association.

3.1.1 Quotations. Quotations from fabricators are based on the following documents:

(1) *A Standard Form of Contract*. The generally accepted standard form of contract is the CCA 1-2001 Stipulated Price Subcontract Form, and

(2) Canadian Institute of Steel Construction (CISC) Code of Standard Practice for Structural Steel, latest edition

3.1.2 Progress Payment Claim Form. A suggested format for a progress payment claim form, is provided in Appendix G.

3.1.3 Progress Invoicing and Substantial Completion. For suggested definitions, see Appendix H.

3.2 Types of Contracts.

3.2.1. For contracts stipulating a “lump sum price”, the work required to be performed by the fabricator and/or erector must be completely defined by the contract documents.

3.2.2. For contracts stipulating a “price per unit”, the scope of the work, type of materials, character of fabrication, and conditions of erection are based upon the contract documents which must be representative of the work to be performed. For methods of computing mass, area, or quantity, see Clause 3.5. See Appendix C of this Code.

3.2.3. For contracts stipulating “cost plus fee”, the work required to be performed by the fabricator and/or erector is indefinite in nature at the time the contract documents are prepared. Consequently the contract documents should define the method of measurement of work performed, and the fee to be paid in addition to the fabricator’s costs.

3.3 Revisions to Contract Documents.

3.3.1. Revisions to the contract shall be made by the issue of dated new or revised documents. All revisions shall be clearly indicated. Such revisions should be issued by a Detailed Change Notice.

3.3.2. The fabricator shall advise the client or client representative of any impact such revision or change will have on the existing agreement between the two parties.

3.3.3. Upon agreement between the fabricator and the client or client representative as to the revision’s impact, the client or his representative shall issue a change order or extra work order for the revisions.

3.3.4. Unless specifically stated to the contrary, the issue of revision documents or changes indicated on drawing approvals is authorization by the client to release these revisions for construction.

3.4 Discrepancies.

In case of discrepancies between the structural drawings and specifications for buildings, the specifications govern. In case of discrepancies between the structural drawings and specifications for bridges, the structural drawings govern. In case of discrepancies between scale dimensions on the structural drawings and figures written on them, the figures govern. In case of discrepancies between the structural drawings and plans for other trades, the structural drawings govern.

3.5 Computation of Units.

Unless another method is specified and fully described at the time tenders are requested, the computed mass of steel required for the structure shall be determined by

the method of computation described herein. (Although the method of computation described does not result in the actual mass of fabricated structural steel and other items its relative simplicity results in low computational cost and it is based on quantities which can be readily computed and checked by all parties involved to establish the basis of payment). No additional mass for welds, or mass allowance for painting, galvanizing, and metallizing is to be included in the computation of mass.

- (a) *Mass Density*. The mass density of steel is assumed to be 7850 kilograms per cubic metre.
- (b) *Shapes, Bars and Hollow Structural Sections*. The mass of shapes, bars and hollow structural sections is computed using the finished dimensions shown on shop details. No deductions shall be made for holes created by cutting, punching or drilling, for material removed by coping or clipping, or for material removed by weld joint preparation. No cutting, milling or planing allowance shall be added to the finished dimensions. The mass per metre of length for shapes and hollow structural sections is the published mass. The mass per metre of length for bars is the published mass, or if no mass is published, the mass computed from the specified cross-sectional area.
- (c) *Plates and Slabs*. The mass/area of plates and slabs is computed using the rectangular dimensions of plates or slabs from which the finished plate or slab pieces shown on the shop details can be cut. No burning, cutting, trimming or planing allowance shall be added. When it is practical and economical to do so, several irregularly-shaped pieces may be cut from the same plate or slab. In this case, the mass shall be computed using the rectangular dimensions of the plate or slab from which the pieces can be cut. No cutting or trimming allowance shall be added. In all cases, the specified plate or slab thickness is to be used to compute the mass. The mass of raised-pattern rolled plate is that published by the manufacturer.
- (d) *Bolts*. The mass of shop and field bolts, nuts and washers is computed on the basis of the shop details and the nominal published mass of the applicable types and sizes of fastener.
- (e) *Studs*. If not included in the contract on a “price per unit basis”, the mass of studs is computed on the basis of the shop details and/or erection diagrams and the published mass of the studs.
- (f) *Grating*. The mass/area of grating is computed on the basis of the shop details and/or erection diagrams and published mass of the grating. The area to be used is the minimum rectangular area from which the piece of grating can be cut.
- (g) Where supplied, such items as shims, levelling plates, temporary connection material, back-up bars and certain field “consumables” shall be considered as part of the structural steel whether or not indicated specifically in the contract documents. Such items then will be added to, and become a part of, computed mass of steel for the structure.

3.6 Contract Price Adjustments.

3.6.1. When the responsibility of the fabricator and/or erector is changed from that previously established by the contract documents, an appropriate modification of the contract price shall be made. In computing the contract price adjustment, the fabricator and/or erector shall consider the quantity of work added or deleted, modifications in the character of the work, the timeliness of the change with respect to the status of material ordering, the detailing, fabrication and erection operations and related impact costs.

3.6.2. Requests for contract price adjustments shall be presented by the fabricator and/or erector and shall be accompanied by a description of the change in sufficient detail to permit evaluation and prompt approval by the client.

3.6.3. Price Per Unit Contracts generally provide for minor revisions to the quantity of work prior to the time work is approved for construction. Minor revisions to the quantity of work should be limited to an increase or decrease in the quantity of any category not exceeding ten percent. Should the quantity of steel of any category vary by more than ten percent, then the contract unit price of that category may require adjustment. Changes to the character of the work or the mix of the work, at any time or changes to the quantity of the work after the work is approved for construction, may require a contract price adjustment.

3.6.4. A suggested format for accommodating contract price adjustments is contained in Appendix B.

3.7 Scheduling.

3.7.1. The contract documents should specify the schedule for the performance of the work. This schedule should state when the approved for construction drawings will be issued and when the job site, foundations, piers and abutments will be ready, free from obstructions and accessible to the erector, so that erection can start at the designated time and continue without interference or delay caused by the client or other trades.

3.7.2. The fabricator and/or erector has the responsibility to advise the client of the effect any revision may have on the contract schedule.

3.7.3. If the fabrication and erection schedule is significantly delayed due to revisions, or for other reasons which are the client's responsibility, the fabricator and erector shall be compensated for additional costs incurred. Changes to the scope of the work shall provide additional time to the schedule, if required.

4. Contract Documents

4.1 Tender Documents – Tender Drawings and Tender Specifications.

4.1.1. At the time tenders are called, the steel fabricator shall receive a complete set of structural drawings and a complete set of tender specifications. In order to ensure adequate and complete tenders for Lump Sum Price Contracts*, these documents shall include complete structural drawings, conforming to the requirements for design drawings of the governing technical standard. Structural steel specifications should include any special requirements controlling the fabrication and erection of the structural steel, surface preparation and coating, and should indicate the extent of non-destructive examination, if any, to be carried out.

4.1.2. Design drawings shall be drawn to a scale adequate to convey the required information. The drawings shall show a complete design of the structure with members suitably designated and located, including such dimensions and detailed description as necessary to permit the preparation of fabrication and erection documents. Floor levels, column centres, and offsets shall be dimensioned. The term "drawings" may include computer output and other data. Stiffeners and doubler plates required to maintain stability and which are an integral part of the main member shall be shown and dimensioned.

4.1.3. Design drawings shall designate the design standards used, shall show clearly the type or types of construction to be employed, shall show the category of the structural system used for seismic design, and shall designate the material or product standards applicable to the members and details depicted. Drawings shall give the governing combinations of shears, moments, and axial forces to be resisted by the connections.

**For other types of contracts, it is desirable for the contract documents to be as complete as possible.*

4.1.4. Where connections are not shown, the connections shall be assumed to be in accordance with the requirements of the governing technical standard (see Clause 1.3).

4.2 Architectural, Electrical and Mechanical Drawings. Architectural, electrical and mechanical drawings may be used as a supplement to the structural drawing to define detail configurations and construction information, *provided all requirements for the structural steel are noted on the structural drawings.*

4.3 Construction Drawings and Construction Specifications.

4.3.1. At the time specified in the tender documents or pre-award negotiations (if different), the client shall furnish the fabricator with a plot plan of the construction site, and a set of complete drawings and specifications approved for construction consistent with the tender drawings and tender specifications. These construction drawings and specifications are required by the fabricator for ordering the material and for the preparation and completion of fabrication and erection documents. The approved for construction drawings shall show:

- (a) all changes or revisions to the tender drawings, clearly indicated on the construction drawings,
- (b) the complete design of the structure with members suitably designated and located, including such dimensions and detailed description as necessary to permit preparation of the fabrication and erection documents. Floor levels, column centres, and offsets shall be dimensioned;
- (c) all materials to be furnished by the fabricator, together with sufficient information to prepare fabrication and erection documents, including the design standards used, the type or types of construction to be employed, the category of the system used for seismic design, the applicable material or product standards, and the governing combinations of shears, moments and axial forces to be resisted by connections.

The fabricator shall receive a complete set of the tender drawings and tender specifications.

5. Fabrication and Erection Documents

Note: The term “shop drawings”, frequently used in the construction industry, is replaced in this Code of Practice by the terms “fabrication and erection documents”. These terms more correctly describe the following five separate and distinct documents that may be prepared by a fabricator/erector. See also Clause 1.2 for definitions. Not all of these documents will be required for every project.

5.1 Erection Diagrams. Unless provided by the client, the fabricator will prepare erection diagrams from the approved construction drawings. In this regard, the fabricator may request reproducible copies of the structural drawings which may be altered for use as erection diagrams. When using reproducible copies of the structural drawings, the structural engineer’s name and seal shall be removed. Erection diagrams shall be submitted to the designer for review and approval. Erection diagrams are general arrangement drawings showing the principal dimensions of the structure, piece marks, sizes of the members, size (diameter) and type of bolts, bolt installation requirements, elevations of column bases, all necessary dimensions and details for setting anchor rods, and all other information necessary for the assembly of the structure. Only one reproducible copy of each diagram will be submitted for review and approval unless a larger number of copies is required by the client as part of the tender documents.

5.2 Connection Design Details. Connection design details shall be prepared in advance of preparing shop details and submitted to the designer for confirmation that

the intent of the design is met. Connection design details shall provide details of standard and non-standard connections, and other data necessary for the preparation of shop details. Connection design details shall be referenced to the design drawings, and/or erection drawings.

5.3 Shop Details. Unless provided by the client, shop details shall be prepared in advance of fabrication from the information on the approved construction drawings, the connection design details, and the erection diagrams. Shop details shall provide complete information for the fabrication of various members and components of the structure, including the required material and product standards; the location, type, and size of all attachments, mechanical fasteners, and welds. When shop details are required to be submitted for review and approval, only one reproducible copy of each shop detail will be submitted, unless a larger number of copies is required by the client as part of the tender specifications.

5.3.1 Shop Details Furnished by the Client. When the shop details are furnished by the client he shall deliver them in time to permit fabrication to proceed in an orderly manner according to the time schedule agreed upon. The client shall prepare these shop details, in so far as practicable, in accordance with the detailing standards of the fabricator. The client shall be responsible for the completeness and accuracy of shop details so prepared.

5.3.2 Clipped Double Connections. Where two beams or girders, framing at right angles from opposite sides of a supporting member, share the same bolts, a clipped double connection shall be used unless a seated connection or other detail is used to facilitate safe erection of the beams or girders. A clipped double connection is not applicable to a two-bolt connection or when the beams are equal to or deeper than half the depth of the girder. For a description of a clipped double connection, see Appendix A.

5.4 Erection Procedures. Erection procedures shall outline the construction methods, erection sequence, erection bracing, temporary bracing if required, and other engineering details necessary for shipping, erecting, and maintaining the stability of the steel frame. Erection procedures shall be supplemented by drawings and sketches to identify the location of stabilizing elements. Erection procedures shall be submitted for review when so specified.

5.5 Field Work Details. Field work details shall be submitted to the designer for review and approval. Field work details shall provide complete information for modifying fabricated members on the job site. All operations required to modify the member shall be shown on the field work details. If extra materials are necessary to make modifications, shop details may be required.

5.6 Review and Approval. Erection diagrams, non-standard connection design details, shop details and field work details, are normally submitted for review and approval. The fabricator includes a maximum allowance of fourteen (14) calendar days in his schedule for the return of all documents submitted for approval. Approval, by the designer, of shop details prepared by the fabricator and/or erector, indicates that the fabricator has interpreted correctly the contract requirements. Approval by the designer of shop details prepared by the fabricator does not relieve the fabricator of the responsibility for accuracy of the detail dimensions on shop details, nor of the general fit up of parts to be assembled.

The preparation of fabrication and erection documents is governed by the following sequence of procedures.

- (a) Sufficient information must be indicated in the construction drawings as stipulated in Clause 4.3 of this Code to permit the completion of fabrication and erection documents.

- (b) The fabrication and erection documents are prepared by skilled technicians using industry and company standards, and represent the fabricator's interpretation of intent of the contract documents, particularly as described by the construction drawings. Connection design details are reviewed by the fabricator's technical staff prior to submission to the designer.
- (c) The connection design details, shop details, erection diagrams and field work details are submitted to the designer for review and approval. Erection procedures are submitted when so specified.
- (d) It is assumed by the fabricator that the fabrication and erection documents, when approved, have been reviewed by the client for accuracy in the interpretation of the contract requirements. Connection design details and shop details are reviewed and approved by the designer for structural adequacy and to ensure conformance with the loads, forces and special instructions contained in the contract documents.
- (e) Shop details are prepared from the approved connection design details and erection diagrams.

If the client does not wish to review and approve the fabricator's fabrication and erection documents, the basis for interpreting the contract requirements, as well as the adequacy of connection details, is limited to the information contained in the structural steel specifications and shown on the structural drawings. This information shall be sufficient, as indicated in Clause 4.3, to permit proper execution of the work. However, the Engineer of Record is ultimately responsible for the structural integrity of the structure and the connections.

5.7 Additions, Deletions or Changes. Additions, deletions or changes, when approved, will be considered as contract revisions and constitute the client's authorization to release the additions, deletions or revisions for construction. See also Clauses 3.3 and 3.6.

6. Material, Fabrication, Inspection, Painting and Delivery

6.1 Material. Materials used by the fabricator for structural use shall conform to structural steel material standards of the Canadian Standards Association, or the American Society for Testing and Materials, or to other published material specifications, in accordance with the requirements of the construction drawings and construction specifications.

6.2 Identification.

6.2.1. The method of identification stipulated in CAN/CSA-S16 shall form the basis for a fabricator's identification of material. Control and identification procedures may differ to some extent from fabricator to fabricator.

6.3 Preparation of Material.

6.3.1. Flame cutting of structural steel may be by hand or mechanically guided means.

6.3.2. Surfaces noted as "finished" on the drawings are defined as having a roughness height rating not exceeding 500 (12.5 m) as defined in CSA Standard B95, Surface Texture (Roughness, Waviness and Lay), unless otherwise specified. Any fabricating technique such as friction sawing, cold sawing, milling, etc., that produces such a finish may be used.

6.4 Fitting and Fastening.

6.4.1. Projecting elements of connection attachments need not be straightened in the connecting plane if it can be demonstrated that installation of the connectors or fitting aids will provide adequate contact between faying surfaces.

6.4.2. When runoff tabs are used, the fabricator or erector need not remove them unless specified in the contract documents, required by the governing technical standard or the steel is exposed to view. When their removal is required, they may be hand flame-cut close to the edge of the finished member with no more finishing required, unless other finishing is specifically called for in the contract documents or governing technical standard.

6.5 Dimensional Tolerances. Tolerances on fabricated members shall be those prescribed in the applicable governing technical standard. Tolerances on steel material supplied by the fabricator shall meet those prescribed in Canadian Standards Association Standard G40.20.

6.6 Inspection of Steelwork. Should the client wish to have an independent inspection and non-destructive examination of the steelwork, he shall reserve the right to do so in the tender documents. Arrangements should be made with the fabricator for inspection of steelwork at the fabrication shop by the client's inspectors. The cost of this inspection and testing is the responsibility of the client. Inspectors are to be appointed prior to start of fabrication and client is to advise the fabricator of the arrangement made.

6.7 Surface Preparation. If paint is specified, the fabricator shall clean all steel surfaces to be painted of loose rust, loose mill scale, prominent spatter, slag or flux deposit, oil, dirt and other foreign matter by wire brushing or other suitable means. Unless specified, the fabricator shall not be obliged to blast-clean, pickle or perform any specific surface preparation operation aimed at total or near-total removal of tight mill scale, rust or non-deleterious matter.

6.8 Paint. When structural steel is specified to receive a shop coat of paint, the fabricator shall be responsible only to the extent of performing the surface preparation and painting in the specified manner. The painting requirements specified in the tender documents for the shop coat should include the identification of the members to be painted, surface preparation, paint specification, if applicable, the manufacturer's product identification, and the required minimum and maximum dry film thickness. Unless otherwise agreed upon as part of the contract documents the fabricator shall not be responsible for the deterioration of the paint that may result from exposure to the weather for more than ninety days after completion of the painting.

6.9 Marking and Shipping.

6.9.1. Except for weathering steel surfaces exposed to view and for architecturally exposed steel, erection marks shall be painted or otherwise legibly marked on the members. Preferably, members which are heavy enough to require special erection equipment shall be marked to indicate the computed or scale mass and the centre of gravity for lifting.

6.9.2. Bolts of the same length and diameter, and loose nuts and washers of each size shall be packaged separately. Pins, bolts, nuts, washers and other small parts shall be shipped in boxes, crates, kegs or barrels, none of which exceed 135 kg gross mass. A list and description of material contained therein shall be marked plainly on the outside of each container.

6.9.3. When requested by the erector, long girders shall be loaded and marked so that they will arrive at the job site in position for handling without turning. Instructions for such delivery shall be given to the carrying agency when required.

6.9.4. For each shipment, the fabricator shall furnish a shipping bill listing the items in the shipment. Such bill shall show the erection mark, the approximate length, the description (whether beam, column, angle, etc.) of each item. Such bill shall be signed by the receiver and returned to the fabricator within 48 hours of receipt of the shipment with a note regarding shortages or damages, if any, and the bill shall act as a receipt for the shipment. When the shipments are made by truck transport, the bills should accom-

pany the shipment. When shipments are made by rail or water, the bills shall be sent to the receiver to arrive on or before receipt of the shipment.

6.9.5. Unless otherwise specified at time of tender, steel during shipment will not be covered by tarpaulins or otherwise protected. When such protection is specified, the shipper is to notify the carrier of the protection requirements.

6.10 Delivery of Materials.

6.10.1. Fabricated structural steel shall be delivered in a sequence which will permit the most efficient and economical performance of shop fabrication and erection. If the client contracts separately for delivery and erection, he must coordinate planning between the fabricator, erector and general contractor.

6.10.2. Anchor rods, washers and other anchorages, grillages, or materials to be built into masonry or concrete should be shipped so that they will be on hand when needed. The client must give the fabricator sufficient notice to permit fabrication and shipping of materials before they are needed.

6.10.3. The quantities of material shown by the shipping bill are customarily accepted by the client, fabricator and erector as correct. If any shortage or damage is claimed, the client or erector should, within 48 hours, notify the carrier and the fabricator in order that the claim may be investigated.

6.10.4. The size and mass of structural steel assemblies may be limited by the shop capabilities, the permissible mass and clearance dimensions of available transportation or government regulations and the job site conditions. The fabricator determines the number of field splices consistent with economy.

6.10.5. On supply only contracts the unloading of steel is the responsibility of others. Unless stated otherwise the unloading of steel is part of the steel erection.

7. Erection

7.1 Method of Erection. Unless otherwise specified or agreed upon, erection shall proceed according to the most efficient and economical method available to the erector on the basis of continuous operation consistent with the drawings and specifications.

7.1.1 Temporary Bracing. Temporary bracing of the steel frame shall only be removed on instruction from the Engineer of Record.

7.2 Erection Safety. Erection shall be done in a safe manner and in accordance with applicable provincial legislation.

7.3 Site Conditions. The client shall provide and maintain adequate, all-weather access roads cleared of snow and ice and other material that impedes entry into and through the site for the safe delivery of derricks, cranes, other necessary equipment, and the material to be erected. The client shall provide for the erector a firm, properly graded, drained, convenient and adequate space and laydown area for steel of sufficient load carrying capacity at the site for the operation of erection equipment and shall remove at the client's cost all overhead obstructions such as power lines, telephone lines, etc., in order to provide a safe and adequate working area for erection of the steelwork. The erector shall provide and install the safety protection required for his own operations or for his work forces to meet the safety requirements of applicable Acts or Codes. The general contractor shall install protective covers to all protruding rebar, machinery anchor rods, etc., which are a hazard to workers. Any protection for pedestrians, property, other trades, etc., not essential to the steel erection activity is the responsibility of the client. When the structure does not occupy the full available site, the client shall provide adequate storage space to enable the fabricator and erector to operate at maximum

practicable speed and efficiency. Cleaning of steelwork required because of site conditions, mud, site worker traffic, etc., shall not be to the fabricator's/erector's account.

7.4 Foundations. The tender specifications preferably shall specify the time that foundations will be ready, free from obstruction and accessible to the erector. Unless otherwise agreed upon, the work of erection shall be tendered on the basis that it will start at the time designated in the tender specifications without interference or delay caused by others. Neither the fabricator nor the erector shall be responsible for the accurate location, strength and suitability of foundations.

7.5 Bearing Surfaces. Levelling plates shall be set by others true, level and to the correct elevation.

7.6 Building Lines and Bench Marks. The erector shall be provided with a plot plan accurately locating building lines and bench marks at the site of the structure.

7.7 Installation of Anchor Rods and Embedded Items.

7.7.1. Anchor rods and foundation rods shall be set by the client in accordance with the erection diagrams. They must not vary from the dimensions shown on the erection diagrams by more than the following (see also Appendix D):

- (a) 3 mm centre to centre of any two rods within an anchor rod group, where an anchor rod group is defined as the set of anchor rods which receives a single fabricated steel shipping piece;
- (b) 6 mm centre-to-centre of adjacent anchor rod groups;
- (c) Maximum accumulation of 6 mm per 30 000 mm along the established column line of multiple anchor rod groups, but not to exceed a total of 25mm. The established column line is the actual field line most representative of the centres of the as-built anchor rod groups along a line of columns;
- (d) 6 mm from the centre of any anchor rod group to the established column line through that group.
- (e) Shims: the finished tops of all footings shall be at the specified level which will not exceed the maximum specified grouting allowance to predetermine the amount of shimming that will be required.

The tolerances of paragraphs (b), (c), and (d) also apply to offset dimensions, shown on the construction drawings, measured parallel and perpendicular to the nearest established column line for individual columns shown on the drawings to be offset from established column lines.

7.7.2. Unless shown otherwise, anchor rods shall be set perpendicular to the theoretical bearing surface, threads shall be protected, free of concrete, and nuts should run freely on the threads. Shear pockets shall be cleaned of debris, formwork, ice and snow by the client prior to steel erection.

7.7.3. Other embedded items or connection materials between the structural steel and the work of others shall be located and set by the client in accordance with approved erection diagrams. Accuracy of these items must satisfy the erection tolerance requirements of Clause 7.12.

7.7.4. All work performed by the client shall be completed so as not to delay or interfere with the erection of the structural steel.

7.8 Bearing Devices. The client shall set to lines and grades all levelling plates and loose bearing plates which can be handled without a derrick or crane. All other bearing devices supporting structural steel shall be set and wedged, shimmed or adjusted with levelling screws by the erector to lines and grades established by the client. The

fabricator and/or erector shall provide the wedges, shims or levelling screws that are required, and shall scribe clearly the bearing devices with working lines to facilitate proper alignment. Promptly after the setting of any bearing devices, the client shall check lines and grades, and grout as required. The final location and proper grouting of bearing devices are the responsibility of the client.

When steel columns, girders or beams which will be supported on concrete or masonry have base plates or bearing plates fabricated as an integral part of the member, the bearing area of the support shall be suitably prepared by others so as to be at exact grade and level to receive the steelwork.

7.9 Examination by Erector. Prior to field erection, the erector shall do a random check to examine the work of all others on which his work is in any way dependent and shall report to the client any errors or discrepancies as discovered that may affect erection of structural steel before or during erection. The accurate placement and integrity of all anchor rods /embedment etc., remains the responsibility of the client.

7.10 Adjustable Shelf Angles and Sash Angles. The erector shall position at time of erection all adjustable shelf angles and sash angles attached to the steel frame true and level within the tolerances permitted by the governing technical standard. Any subsequent adjustment that may be necessary to accommodate the work of others shall be performed by others.

7.11 Loose Lintels and Wall Bearing Members. Unless otherwise specified, loose lintels, shelf angles, wall bearing members and other pieces not attached to the structural steel frame shall be received and set by others.

7.12 Tolerances. Unless otherwise specified, tolerances on erected structural steel shall be those prescribed in the applicable governing technical standard.

7.13 Checking Erected Steelwork. Prior to placing or applying any other materials, the owner is responsible for determining that the location of the structural steel is acceptable for plumbness, level and alignment within tolerances with bolts correctly installed and welds inspected. The erector is given timely notice of acceptance by the owner or a listing of specific items to be corrected in order to obtain acceptance. Such notice is rendered immediately upon completion of any part of the work and prior to the start of work by other trades that may be supported, attached or applied to the structural steelwork.

7.14 Removal of Bracing.

7.14.1 Removal of Erection Bracing. Guys, braces and falsework or cribbing supplied by the erector shall remain the property of the erector. The erector shall remove them when the steel structure is otherwise adequately braced unless other arrangements are made. Guys and braces temporarily left in place under such other arrangements shall be removed by others provided prior permission by the erector for their removal has been given, and returned to the erector in good condition, see Clause 7.14.2

7.14.2 Removal of Temporary Bracing. Temporary bracing required by the designer shall only be removed on instruction from the Engineer of Record.

7.15 Correction of Errors when Material is Not Erected by the Fabricator. Correction of minor misfits and a moderate amount of cutting, welding, and reaming shall be considered a part of the erection; in the same manner as if the Fabricator would be erecting the work. Any major rework required due to incorrect shop work shall be immediately reported to the Fabricator, before rework commences. The Fabricator shall then either correct the error, resupply the item within a reasonable time period, or approve the method of correction including applicable costs, whichever is the most economical.

7.16 Field Assembly. Unless otherwise specified, the fabricator shall provide for suitable field connections that will, in his opinion, afford the greatest overall economy.

7.17 Accommodation of Other Trades. Neither the fabricator nor the erector shall cut, drill or otherwise alter the work of others or his own work to accommodate other trades unless such work is clearly defined in the tender drawings and tender specifications and unless detailed information is provided before the erection diagrams are approved. Any subsequent cutting, drilling or other alteration of the structural steel performed by the fabricator or the erector for the accommodation of other trades, shall be specifically agreed upon and authorized by the client before such work is commenced.

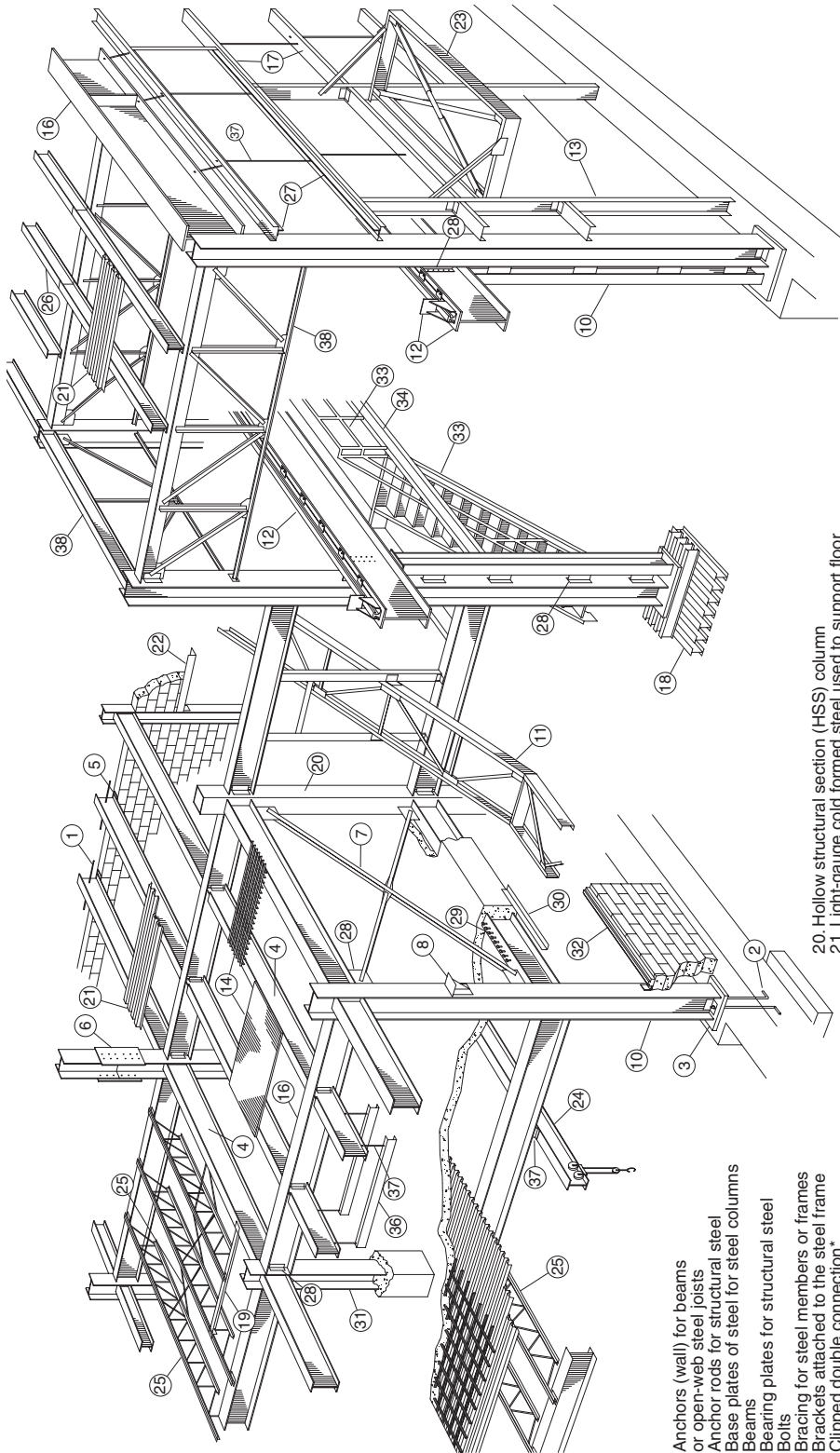
7.18 Temporary Floors and Access Stairs. Unless otherwise required by law, all temporary access stairs shall be provided by others, except for the floor upon which erecting equipment is located. On this floor the erector shall provide such temporary flooring as he requires, moving his planking, etc., as the work progresses.

7.19 Touch-Up of Shop Paint. Unless so specified, the fabricator/erector will not spot-paint field fasteners and field welds nor touch-up abrasions to the shop paint.

7.20 Final Painting. Unless so specified, the fabricator/erector will not be responsible for cleaning the steel after erection in preparation for field painting, nor for any general field painting that may be required.

7.21 Final Clean-Up. Except as provided in Clause 7.14, upon completion of erection and before final acceptance, the erector shall remove all falsework, rubbish and temporary building furnished by him.

APPENDIX A – Structural Steel in Buildings



1. Anchors (wall) for beams or open-web steel joists
2. Anchor rods for structural steel
3. Base plates of steel for steel columns
4. Beams
5. Bearing plates for structural steel
6. Bolts
7. Bracing for steel members or frames
8. Brackets attached to the steel frame
9. Clipped double connection*
10. Columns
11. Conveyor structural steel frame work
12. Crane, girders, rails and stops
13. Door frames constituting part of and connected to the steel frame
14. Floor and roof plates (raised pattern or plain), grating, connected to steel frame
15. Gerber girder
16. Girders
17. Girts
18. Grillage beams of steel
19. Headers or trimmers for support of open-web steel joists where such headers or trimmers frame into structural steel members

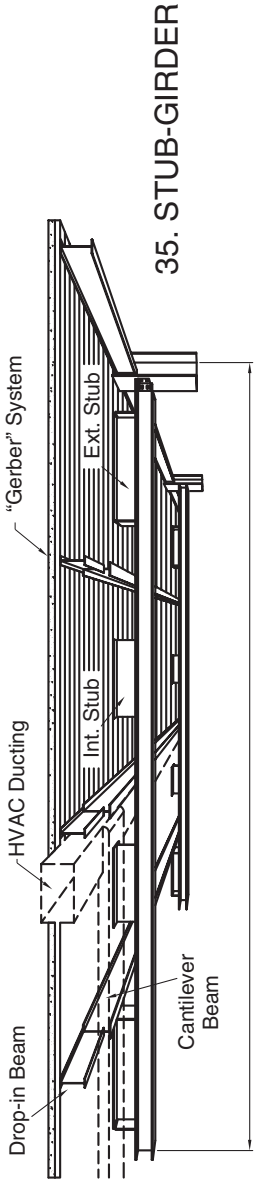
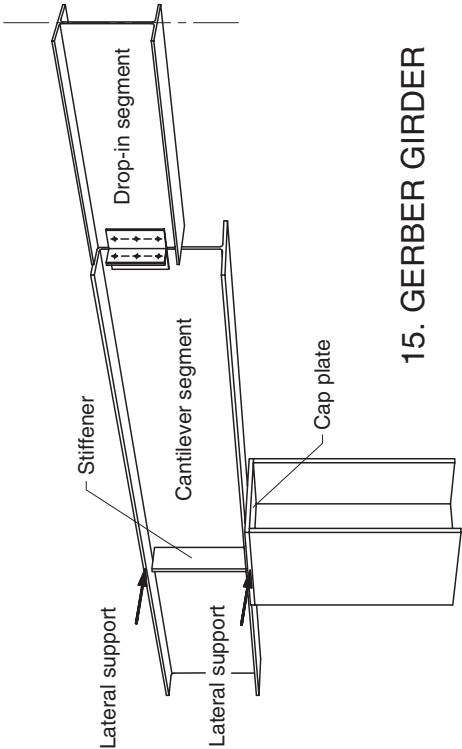
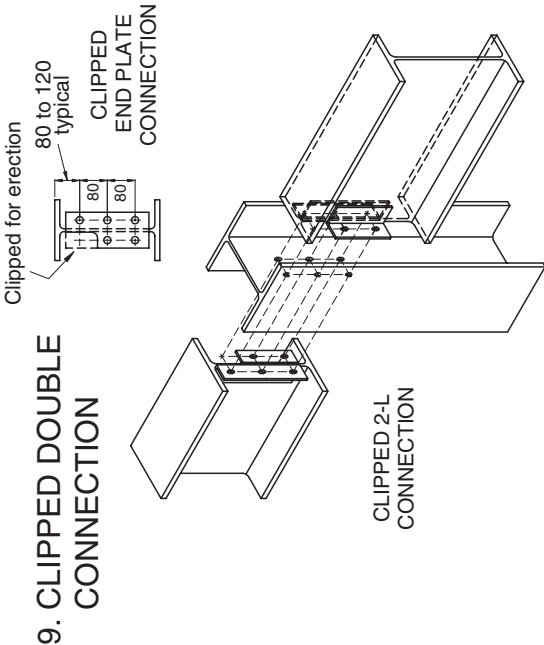
20. Hollow structural section (HSS) column
21. Light-gauge cold formed steel used to support floor and roofs**
22. Lintels attached to steel frame
23. Marquee or canopy (structural frame only) when forming an integral part of the steel frame
24. Monorail beams of standard structural shapes, attached to steel frame
25. Open-web steel joists, bridging and accessories when supplied with steel joists
26. Purlins
27. Sash angles connected to the steel frame
28. Separators, angles, tees, clips and other detail fitting essential to the structural steel frame
29. Shear connectors

30. Shelf angles attached to the steel frame
31. Steel cores for composite columns
32. Steel window sills attached to the steel frame
33. Steel stairs and handrails
34. Struts
35. Stub girders*
36. Suspended ceiling supports of structural steel shapes 75 mm or greater in depth
37. Ties, hangers and sag rods forming part of the structural frame
38. Trusses and brace frames

* see separate diagram

** supplied by others

APPENDIX A – Structural Steel in Buildings (continued)



APPENDIX B

Guideline for Unit Price Application for Changes

1. Unit rates shall apply on their own, only up until commencement of material order or shop detail drawings, whichever is the earlier.
2. The following amounts, additional to the unit rate, shall be charged on additions at the various stages of the contract.
 - (a) If the addition affects drawings (e.g. of support members) already in progress or complete, then the changes to such drawings or redetailing shall be charged extra at an agreed hourly rate.
 - (b) If the addition requires additional work to material manufacture or erection (e.g. supporting members) in progress or complete, then such additional work shall be charged extra at an agreed hourly rate.
 - (c) "Detail" or "Connection" materials added to existing or supporting members, whether due to an additional member or not, shall be charged on a cost plus basis.
 - (d) If the timing of the addition causes the added material to be shipped as a part load, then transportation shall be charged extra at cost plus an agreed percentage markup.
3. The following amounts, additional to the unit rate, shall be charged for deletions at the various stages of the contract.
 - (a) If the deleted material has been ordered or delivered and cannot be used elsewhere then a restocking charge shall be levied.
 - (b) If the deleted member has been detailed or drawings are in progress, then the cost of such drawings shall be charged extra at an agreed hourly rate.
 - (c) If the deletion affects drawings already completed or in progress, then the changes to such drawings or the redetailing shall be charged extra at an agreed hourly rate.
 - (d) If the deleted member has been manufactured or erected or manufacture or erection is in progress, then the cost of such manufacture or erection shall be charged extra at an agreed hourly rate.
 - (e) If the deletion affects members already manufactured (e.g. supporting members) then the changes to such members shall be charged extra at an agreed hourly rate.
 - (f) If the deleted member has already been shipped, then no credit shall be given.
4. All unit rates shall be applied in accordance with CISC Code of Standard Practice Clause 3.5.
5. Hourly Rates are as follows:

(a) Engineering Design	-	\$	/labour hour
(b) Drawing Office Labour	-	\$	/labour hour
(c) Shop Labour	-	\$	/labour hour
(d) Field Labour	-	\$	/labour hour

 - (e) Equipment used for revisions will be charged at negotiated rental rates, according to Canadian Construction Association standard practice.

6. Revisions involving the use of grades of steel, sources of supply, or types of sections, other than specified, will be subject to price adjustments.
7. Units will be computed in accordance with Clause 3.5 of the CISC Code of Standard Practice for Structural Steel.

APPENDIX C

A Suggested Format for Price Per Unit Contracts

The following is a list of suggested categories for which unit prices could be tendered, *such categories being selected or added to*, depending upon the nature of the project.

For payment purposes, the connection material required to connect an individual member to its supporting member is assumed to be part of the member to which it is attached for shipping purposes.

A. STRUCTURAL STEEL

1. COLUMNS

(a) Rolled Shapes

1. Up to and including 30 kg/m
2. Over 30 — up to and including 60 kg/m
3. Over 60 — up to and including 90 kg/m
4. Over 90 — up to and including 150 kg/m
5. Over 150 kg/m

(b) WWF or Plate Fabricated

1. Up to and including 90 kg/m
2. Over 90 — up to and including 150 kg/m
3. Over 150 kg/m

(c) Hollow Structural Sections

1. Up to and including 30 kg/m
2. Over 30 — up to and including 60 kg/m
3. Over 60 — up to and including 90 kg/m
4. Over 90 — up to and including 150 kg/m
5. Over 150 kg/m

2. BEAMS

(a) Rolled Shapes

1. Up to and including 30 kg/m
2. Over 30 — up to and including 60 kg/m
3. Over 60 — up to and including 90 kg/m
4. Over 90 — up to and including 150 kg/m
5. Over 150 kg/m

(b) WWF or Plate Fabricated

1. Up to and including 90 kg/m
2. Over 90 — up to and including 150 kg/m
3. Over 150 kg/m

(c) Stud Shear Connectors

___diam. ___mm long

3. CRANE RAILS

(a) Rail complete with Rail Clips

1. Up to and including 30 kg/m
2. Over 30 kg/m

(b) Stops

- (c) Monorails
 - 1. Straight
 - 2. Curved
- 4.1 TRUSSES - where principal members are:**
 - (a) Tees, Angles or W Shapes
 - (b) Hollow Structural Sections
- 4.2 OPEN WEB STEEL JOISTS**
- 5. BRACING**
 - (a) Rolled Shapes
 - 1. Up to and including 30 kg/m
 - 2. Over 30 kg/m
 - (b) Hollow Structural Sections
 - 1. Up to and including 30 kg/m
 - 2. Over 30 kg/m
 - (c) WT Sections
 - 1. Up to and including 30 kg/m
 - 2. Over 30 kg/m
- 6. PURLINS, GIRTS, and SAG RODS**
 - (a) Rolled Shapes
 - 1. Up to and including 30 kg/m
 - 2. Over 30 kg/m
 - (b) Cold -Formed Sections
 - 1. Up to and including 5.75 kg/m
 - 2. Over 5.75 kg/m
 - (c) Hollow Structural Sections
 - 1. Up to and including 30 kg/m
 - 2. Over 30 kg/m
 - (d) Sag Rods
- 7. FRAMING**
 - Wall and Roof Openings
- 8. STAIR STRINGERS**
- 9. LADDERS (Galvanized or Painted)**
 - (a) Without safety cage
 - (b) With safety cage
- 10. UTILITY BRIDGES (Plus Interior Framing)**
 - (a) Tees, Angles or W Shapes
 - (b) Hollow Structural Sections
- 11. CONVEYOR GALLERIES**
 - (a) Tees, Angles or W Shapes
 - (b) Hollow Structural Sections
 - (c) Open Conveyor Trusses
- 12. MISCELLANEOUS PLATFORMS (Tees, Angles or W Shapes)**
 - 1. Up to and including 30 kg/m
 - 2. Over 30 kg/m

B. MISCELLANEOUS STEEL & GRATING

1. GRATING

- (a) Floors
 - 1. Galvanized
 - 2. Painted
- (b) Stair Landings
 - 1. Galvanized
 - 2. Painted

2. CHECKERED PLATE (6mm thick)

- (a) Steel – Galvanized
- (b) Steel – Painted

3. STAIR TREADS

- (Maximum 1000 mm long)
- (a) Grating – Galvanized
 - (b) Grating – Painted

4. HANDRAIL (without kickplate)

- (a) Horizontal
 - 1. Steel – Galvanized
 - 2. Steel – Painted
- (b) Sloping
 - 1. Steel – Galvanized
 - 2. Steel – Painted

5 KICKPLATE

- (a) Plate attached to handrail
 - 1. Steel – Galvanized
 - 2. Steel – Painted
- (b) Banding - attached to grating
 - 1. Steel – Galvanized
 - 2. Steel – Painted

C. MOBILIZATION AND DEMOBILIZATION

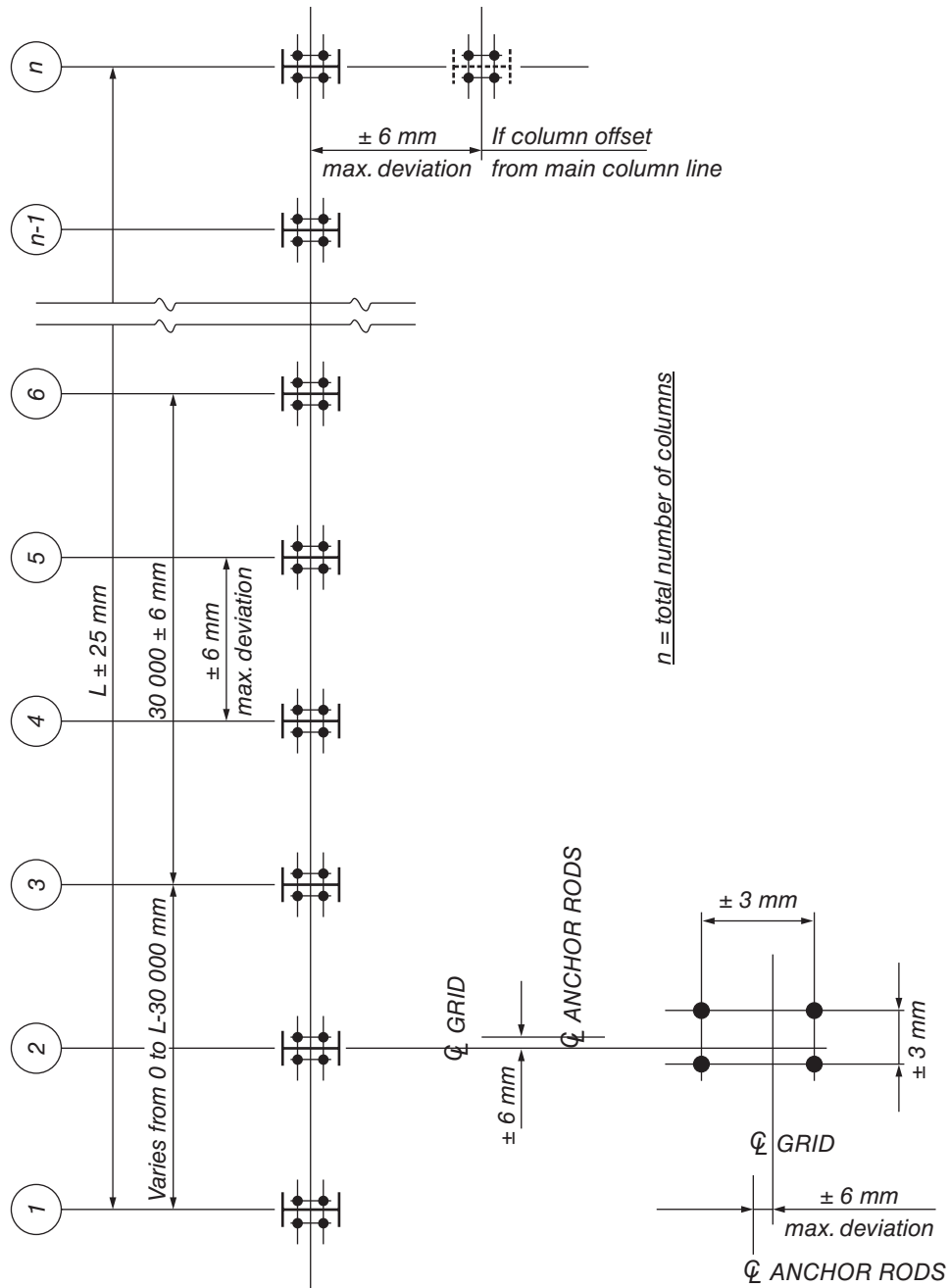
- 1. Mobilization for erection and demobilization

D. UNIT RATES FOR EXTRA WORK

- 1. For extra engineering design _____/hr.
- 2. For extra detailing work _____/hr. all inclusive (composite rate)
- 3. For extra shop labour _____/hr. all inclusive (composite rate)
- 4. For extra field erection _____/hr. all inclusive (composite rate)
- 5. Field labour work week _____/hrs. per week

NOTE: "All inclusive" shall mean, all labour cost including overheads and profits, and in the field all small tools (up to \$1000 value).

APPENDIX D Tolerances on Anchor Rod Placement



APPENDIX E

Conversion of SI Units to Imperial Units

When Imperial units are used in contract documents, unless otherwise stipulated, the SI units used in the CISC Code of Standard Practice for Structural Steel shall be replaced by the Imperial units shown, for the clause as noted.

Clause 3.5(a). Unit Weight. The unit weight of steel is assumed to be 0.2833 pounds per cubic inch.

For other clauses, the standard conversion factors (for length, mass, etc.) stipulated in CISC handbooks should be used.

Note: Imperial projects should be entirely in the imperial designation including shape sizes. Metric projects should be entirely in the S.I. designation, including, shape sizes. Units should not be intermixed on the same project.

APPENDIX F

Miscellaneous Steel

Miscellaneous Steel. Unless otherwise specified in the tender documents, the following items are considered miscellaneous steel of ferrous metal only, fabricated from 2.0 mm (14 ga.) and more of metal, including galvanizing, cadmium and chrome plating, but not stainless steel and cast iron items.

This list of items is to be read in conjunction with Clause 2.1 Structural Steel and Clause 2.3 Items Supplied by Others, and shall include all steel items not included in Clauses 2.1 and 2.3 unless specified otherwise.

- Access doors and frames — except trade-name items and those required for servicing mechanical and electrical equipment.
- Angles and channel frames for doors and wall openings — drilling and tapping to be specified as being done by others.
- Benches and brackets.
- Bolts — only includes those bolts and anchors required for anchoring miscellaneous steel supplied under this list.
- Bumper posts and rails.
- Burglar/security bars.
- Clothes line poles, custom fabricated types only.
- Coat rods, custom fabricated types only.
- Corner protection angles.
- Expansion joint angles, plates custom fabricated, etc., including types made from steel, or a combination of steel and non-ferrous metal.
- Fabricated convector frames and enclosures.
- Fabricated items where clearly detailed or specified and made from 2.0 mm (14ga.) and heavier steel, except where included in another division.
- Fabricated steel framing for curtain walls and storefronts where not detailed on structural drawings and not enclosed by architectural metal.
- Fabricated wire mesh and expanded metal partitions and screens.
- Fire escapes.
- Flag poles — steel custom fabricated. (Excluding hardware)
- Custom fabricated footscrapers, mud and foot grilles, including pans, but less drains.
- Frames, grating and plate covers for manholes, catch basins, sumps, trenches, hatches, pits, etc., except cast iron, frames and covers and trade-name floor and roof drains.
- Gates, grilles, grillwork and louvres, excluding baked enamel or when forming part of mechanical system.
- Grating type floors and catwalks — excluding those forming part of mechanical system.
- Handrails, balusters and any metal brackets attached to steel rail including plastic cover, excluding steel handrails forming part of structural steel framing.
- Joist hangers, custom fabricated types only.
- Joist strap anchors.
- Lintels, unless shown on structural drawings.
- Mat recess frames, custom fabricated types only.
- Mobile chalk and tackboard frames, custom fabricated types only.
- Monorail beams of standard shapes, excluding trade name items, unless shown on structural drawings.
- Shop drawings and/or erection diagrams.
- Shop preparation and/or priming.
- Sleeves if specified, except for mechanical and electrical division.

Stair nosings, custom fabricated types only.
Steel ladders and ladder rungs not forming part of structural steel or mechanical work.
Steel stairs and landings not forming part of structural steel.
Table and counter legs, frames and brackets, custom fabricated types only.
Thresholds and sills, custom fabricated types only.
Vanity and valance brackets, custom fabricated types only.
Weatherbars — steel.

Miscellaneous Steel Items Excluded

Bases and supports for mechanical and electrical equipment where detailed on mechanical or electrical drawings.
Bolts other than for anchoring items of miscellaneous steel.
Cast iron frames and covers for manhole and catch basins.
Chain link and woven wire mesh.
Glulam connections and anchorages.
Joist hangers, trade-name types
Metal cladding and covering, less than 2.0 mm (14 ga.)
Precast concrete connections and anchorages in building structure.
Reinforcing steel or mesh.
Roof and floor hatches when trade-name items.
Sheet metal items, steel decking and siding and their attachments, closures, etc., less than 2.0 mm (14 ga.)
Shoring under composite floors and stub-girders.
Steel stacks.
Steel reinforcement for architectural metal storefronts, curtainwalls and windows.
Stud shear connectors when used with steel deck.
Stone anchors.
Temporary bracing for other trades.
Thimbles and breeching, also mechanical fire dampers.
Window and area wells.

When miscellaneous steel fabricator erects miscellaneous steel, all material required for temporary and/or permanent connections of the component parts of the miscellaneous steel shall be supplied.

APPENDIX G

A Suggested Format for a Monthly Progress Payment Claim Form

MONTHLY PROGRESS CLAIM FORM

_____ (FIRM NAME)

PROJECT: _____
 CONTRACT NO.: _____
 PROGRESS CLAIM NO.: _____
 DATE: _____

ITEM	ORIGINAL BASE CONTRACT	APPROVED CHANGES TO-DATE	REVISED BASE CONTRACT	PROGRESS TO-DATE	PREVIOUS AMOUNT CLAIMED	THIS PROGRESS CLAIM	% COMPLETE
1. ENGINEERING & DRAWING PREPARATION							
2. RAW MATERIALS IN YARD							
3. FABRICATION							
4. FREIGHT TO SITE							
5. ERECTION							
6. PLUMB / BOLT / CLEAN UP							
7. TOTAL GROSS AMOUNT							
8. HOLDBACK ___ %							
9. NET AMOUNT							
10. G S T ___ % OF LINE 9							
11. TOTAL AMOUNT DUE							

APPROVED CHANGE ORDER(S) TO-DATE:

APPENDIX H

Suggested Definitions for Progress Invoicing and Substantial Performance

1. Progress Invoicing

- (a) The submission of erection diagrams and/or shop details will initiate progress invoicing. Payments of invoices will be in accordance with the terms of the contract.
- (b) Any and all materials fabricated will initiate additional progress invoicing with payment as per contract.
- (c) Any and all materials shipped to the site and/or erected in place will initiate additional progress invoicing with payment as per contract.
- (d) Final invoicing will be made after all steel has been delivered to site, erected and all work completed.
- (e) Substantial completion is based on the completion of the WORK of the steel Fabricator or Erector and therefore release of holdback will be 41 days (or as per applicable lien legislation) after issuance of the Certificate of Completion of this work.

2. Substantial Performance

- (a) The word “WORK” shall be defined as the product or services provided by the steel Fabricator or Erector.
- (b) Substantial performance and total performance shall be directly related to product or services provided by the steel Fabricator or Erector.
- (c) Certification of completion by the owner’s representative applies to the work performed by the steel Fabricator or Erector.
- (d) Payment shall be governed by certified completion of the work.

ISBN 0-88811-093-6