STANDARD QUALITY ASSURANCE PLAN

I. PURPOSE

This Standard Quality Assurance (QA) Plan provides specifications, procedures, and illustrative details to comply with the requirements of the 2002 Los Angeles Building Code. The Quality Assurance requirements described in this Standard QA Plan are intended to promote public safety and welfare by standardizing inspections, tests, and all other applicable measures that ensure substantial compliance with the code performance objectives of steel moment frame connections.

II. HOW TO USE THIS STANDARD QA PLAN

To use this Standard QA Plan, follow the seven steps outlined below:

1. *Standard QA Plan shall be attached to and made part of the structural Plans.*
2. *Engineer of Record shall identify the type of steel moment frame to be used in the building or structure by placing an "X" mark in the box below:*

☐ *SPECIAL MOMENT FRAME (SMF)*

☐ *INTERMEDIATE MOMENT FRAME (IMF)*

☐ *ORDINARY MOMENT FRAME (OMF)*

3. *All of the Quality Assurance components listed in this Standard QA Plan shall be applied to special moment frames, intermediate moment frames, and ordinary moment frames, unless noted otherwise herein.*
4. *Engineer of Record shall place the following note on the structural plans stating "All specifications, tables, and notes in the City of Los Angeles' Standard Quality Assurance Plan for Steel Moment Frames shall be part of these approved structural plans."*
5. *Engineer of Record shall sign and stamp the Standard QA Plan in the box provided at the lower right corner of each sheet.*
6. *Organize all reports to be reviewed and submitted to the City Building Inspector as required by Table 1 on Sheet 2.*
7. *Any deviations in the quality assurance program from this Standard Plan shall require a separate written approval by the Engineer of Record and the Department. The procedures, specifications and illustrative details as described in this Standard QA Plan shall not exempt the Engineer of Record from using engineering judgment in determining the suitability of applying this Standard QA Plan to any welded connection.*

III. GENERAL REQUIREMENTS

1. Codes
The design and construction of steel moment frames shall be in compliance with the following codes:
a. 2002 City of Los Angeles Building Code,
b. AISC Seismic Provisions for Structural Steel Buildings, Part I (LRFD) and Part III (ASD), dated May 21, 2002, and
c. AWS D1.1/D1.1M:2002 Structural Welding Code - Steel.

2. Material Specifications
a. Structural steel shall comply with UBC Standard 22-1 and the following ASTM standard specifications:
i. Wide flange shapes..........ASTM A572 (50), A913 (50), A992
ii. Continuity, doubler and column base plates, shear tabs....ASTM A36
iii. Anchor bolts at column base plates..........ASTM F1554
iv. Fabricate and erect structural steel in compliance with either the 2001 Edition of AISC "Load and Resistance Factor Design Specification for Structural Steel Buildings" or 1989 Edition of the AISC "Allowable Stress Design Specification for Structural Steel Buildings."
b. High strength bolts shall comply with the following requirements and ASTM standard specifications:
i. High strength bolts, nuts, and washers..........ASTM A325, A490
ii. Shall be installed in accordance with the "Specifications for Structural Joints using ASTM A325 or A490 Bolts."
iii. Shall be tighten to a snug tight condition that is at least the minimum proper tension and verified using a calibrated tension measuring device.
iv. Shall be slip critical high strength bolts.
v. All faying surfaces of connections with high strength fasteners shall be prepared as required for Class A per the 2002 AISC Seismic Provision, Section 7.2.
c. Filler metal properties and specifications shall be as follows:
i. Electrodes shall be of a low-hydrogen type conforming to AWS specifications as referenced in Table 7 on Sheet 2.
ii. Filler metals shall be classified for nominal 70 ksi tensile strength.
iii. The maximum permitted electrode diameter shall be per Table 5 on Sheet 2.
iv. Filler metals shall have a minimum Charpy V-Notch (CVN) toughness of 20 ft-lbf at -20°F using AWS A5 classification test methods.
v. The use of intermixed welds shall not occur unless it can be demonstrated by testing in accordance with AWS D1.1/D1.1M:2002 Section 4.
vi. The parameters established by the electrode manufacturer shall be reflected in the WPS.
d. Other materials not listed in UBC Standard 22-1 or LABC Chapter 35 are not permitted without specific approval from the Department. Steel having dual ASTM designation shall be clearly identified on each specific plan detail.

3. Welding Processes
Structural welding shall be limited to the Shielded Metal Arc Welding or Flux Cored Arc Welding processes.

4. Base Metal Repairs or Restorations
Any repair or restoration of base metal shall comply with all of the following:
a. AWS D1.1/D1.1M:2002, Section 5.26, and ASTM A6/A6M-02, Section 9.2, 9.3, 9.4 and 9.5,
b. Engineer of Record shall review and approve the WPS for repair procedures prior to welding,
c. All welding shall be performed using low-hydrogen process or with SMAW using low-hydrogen electrodes,
d. Provide continuous visual inspection by the Deputy Inspector, and
e. Provide non-destructive testing.

5. Deviations From the Standard Quality Assurance Plan
When deviations from the Standard QA Plan are made, comply with all of the following:
a. Deviations from this Standard QA Plan shall be approved by the Deputy Inspector and City Building Inspector prior to commencement of work.
b. Alternate procedures, specifications, or details shall be reviewed and approved by the Engineer of Record.
c. Supplemental testing and additional specifications may be required to approve alternate procedures, specifications, or details.
d. Conformance with all applicable provisions of the 2002 LABC and AWS D1.1/D1.1M:2002 is required.

IV. QUALITY ASSURANCE

1. Certification
a. Inspectors shall be LADBS Certified Deputy Inspectors per LABC Section 1701.2 and Information Bulletin P/BC 2002-035 "Regulations Regarding Registration for Deputy and Controlled Activities Inspection." Employment shall be in accordance with Information Bulletin P/BC 2002-034 "Employment and Duties of a Registered Deputy Inspector."
b. Welders shall be LADBS Certified Welders for the Structural Steel classification per LABC Section 1701.18.1, 2205.10, and Information Bulletin P/BC 2002-045 "Welder Certification Rules and Regulations."
c. Shop welds shall be performed in an LADBS certified Fabricator's Shop per LAMC Section 98.204(g) and Information Bulletin P/BC 2002-042 "Application for Approval as Fabricator."
d. Technicians performing NDT shall be certified for Level II in accordance with ASNT SNT-TC-1A 2001 Edition by a Testing Agency approved per LAMC Section 98.0503 and Information Bulletin P/BC 2002-058 "Guidelines for Recognition of Testing Agencies."

2. Pre-Construction Meeting
a. The Owner (or owner's representative) shall arrange a pre-construction meeting(s) with the Engineer of Record (or Structural Observer designated by the Engineer of Record), the Contractor (or affected Sub-Contractor), and the Deputy Inspector to discuss and review welding procedures, bolting procedures, and inspection requirements for all welding and bolting operations.
b. The City Building Inspector shall be notified of such meeting(s) and may participate at his/her discretion.
c. Meeting record(s) shall be included in the first report submitted to the City Building Inspector.

3. Structural Observation
Structural observation shall be performed in accordance with Information Bulletin P/BC 2002-024. The Structural Observer shall:
a. Perform structural observation listed in Table 6 on Sheet 2.
b. Perform structural observation prior to placement of decking, covering by fireproofing, encasement in concrete or placement of other finishes.
c. Submit observation report(s) to the City Building Inspector at each stage observed and upon completion of the structural system.
d. State in the report that the steel moment frame system substantially conforms with the approved structural plans and specifications.
e. Use the Department's Structural Observation Report Form to report all observations. Structural Observation Report Form can be obtained at www.ladbs.org, keyword "Information Bulletin P/BC 2002-024".

4. Deputy Inspection
The following are the basic Quality Assurance responsibilities of the Deputy Inspectors:
a. Arrive on the job in sufficient time to verify the permit information, check for prior inspections and/or approvals by the City Building Inspector or previous Deputy Inspectors, check the quality of all materials and become familiar with the approved structural plans and specifications.
b. Verify that structural steel delivered is from a fabricator currently licensed by the Department.
c. Identify material from an offsite fabricator in accordance with LABC Section 2203 and compare to the approved plans and specifications.
d. Verify that each steel piece is labeled with the approved fabricator's shop name and license number.
e. Visual check shop welds, joint preparation, faying surfaces, indent stamps and color codes of high strength steel, excessive mill scale or lamination, and dimensional conformity with the approved plans.
f. Ensure that welding complies with AWS D1.1/D1.1M:2002.
g. Inspect, before any welding begins, joint preparation, fit-up, condition of surfaces to be welded, storage and use of electrodes, current license of all welders, and voltage/amperage of welding machines.
h. Measure voltage/amperages near the arc with a hand held calibrated averaging type meter. The meter shall be calibrated not less than once a year. This equipment shall be used by the Fabricator, Erector, and Deputy Inspector.
i. During welding operation, provide continuous inspection particularly on multiple pass welds to assure that each pass has been prepared correctly, preheat and interpass temperatures are maintained and that finished welds shall be the correct size and without rejectable discontinuities.
j. Verify type and size of bolts and washers, check mill certificates, and verify faying surfaces are free of burrs, scale, rust, grease or anything that may inhibit full contact.
k. Verify connections involving high strength bolts and welds are fabricated and erected in a sequence specified by the Engineer of Record.
l. Verify high strength bolts are not welded or damaged by preheating.
m. Verify washers are always installed with all bolts, except A-490 bolts which require washers under both elements.
n. Verify that any deficiency noted in the Structural Observation Report Form has been corrected.
o. Verify the Engineer of Record has approved the written welding procedure specification (WPS) prepared by the Fabricator or Erector. The WPS shall include the following:
i. All applicable code requirements, this Standard Plan, and any other information necessary to produce the welds.
ii. List the applicable base metal types and thicknesses.
iii. List the welding joint details, including joint type, weld type, joint geometry, and applicable dimensions. Individual weld passes shall be identified in sketches and numbered to identify the sequence of their deposition (see Detail 13 on Sheet 3 for example). The sketches shall identify the maximum layer thicknesses and bead widths. In no case shall layer thicknesses exceed 1/4 inch nor shall the maximum bead widths exceed 5/8 inch.
iv. List the welding processes.
v. Specify the required welding positions.
vi. List the filler metal per AWS D1.1 for electrode specification and classification (see Table 7 on Sheet 2), as well as information regarding shielding material to be used.
vii. Indicate the minimum preheat and interpass temperatures (see Table 4 on Sheet 2) and post weld heat treatment.
viii. List all applicable electrical characteristics for the welding process employed. WPS shall clearly indicate the specific values required for each welding pass. These electrical characteristics shall include at minimum the following:
(1) Electrode diameter (see Table 5 on Sheet 2),
(2) Type of current, and acceptable ranges of current measured in amperage,
(3) Voltage,
(4) Travel speed (range), and
(5) Amperage, voltage and electrode extension (as applicable) shall be within the filler metal manufacturer's recommendations.
ix. A copy of the electrode manufacturer's technical information with ID # listed shall be attached to the WPS.
p. Weld joints not conforming to Chapter 3 of AWS D1.1/D1.1M:2002 must be tested by an approved testing agency and accepted by both the Engineer of Record and the Department's Material Control Section before the weld is performed. Material Control Section can be contacted at:

LADBS Material Control Section
221 N. Figueroa St., Suite 1540
Los Angeles, CA 90012
(213) 482-0380 or 1-888-LA-4BUILD

q. Notify the Contractor, Engineer of Record, and City Building Inspector of any deviations or non-compliance with the approved WPS, plans or specifications.
r. "Deputy Inspection Report Form B-94" shall be submitted on a weekly basis to the City Building Inspector and Engineer of Record, unless determined otherwise by the City Building Inspector.
s. During the execution of the work, the Deputy Inspector shall not undertake or engage in any other task or occupation which will interfere with the proper performance of the duties of such inspection.

5. Electrode Storage and Atmospheric Exposure
a. Electrodes are considered to be exposed to the atmosphere if:
i. the manufacturer's sealed electrode containers or packagings are opened or damaged, or
ii. outside of baking or storage ovens.
b. Modification or lubrication of electrodes are not permitted.
c. Drying of electrodes in baking or storage ovens are permitted as recommended by the manufacturer.
d. Electrodes shall be identified to facilitate monitoring of total atmospheric exposure time.
e. Storage and atmospheric exposure of AWS A5.1-91/A5.5-96 low-hydrogen SMAW electrodes shall be in accordance with AWS D1.1/D1.1M:2002 Section 5.3.2.
f. FCAW electrodes not consumed within 24 hrs of accumulated atmospheric exposure time shall not be used. Manufacturer's recommendations that show that drying effectively removes moisture and restores electrodes to their designated diffusible hydrogen levels are permitted.
g. FCAW electrode welding suspended more than 8 hrs shall be removed from the machines and stored in an electrode wire baking or storage oven maintained at a temperature between 250° and 550°F, or as recommended by the electrode manufacturer.

6. Plastic Hinging Zone Protection
a. The plastic hinging zone shall be identified diagrammatically, as illustrated in Detail 15 on Sheet 3, on the structural plans by the Engineer of Record.
b. The Engineer of Record and Contractor shall be responsible for reviewing shop drawings of ALL relevant trades to ensure compliance. This shall be discussed and documented in pre-construction meetings.
c. The Contractor shall be responsible for developing a program to ensure that all workers on the project, including their subcontractors, are aware of and understand this requirement. Failure to comply with these requirements may cause the replacement of steel.
d. Plastic hinging zones shall be defined by permanent markings such as paint or ink.
e. A note, as illustrated in Detail 15 on Sheet 3, shall be prominently placed on the structural plans (general note sheet and adjacent to moment frame detail) and the construction documents of ALL trades.
f. Welded, bolted, screwed, or shot-in (powder driven) attachments for perimeter edge angles, shear studs, exterior facades, partitions, duct work, piping, or other connections shall not be permitted within the plastic hinging zones.
g. Any penetrations or damage from temporary welded attachments within the plastic hinging zones shall be repaired as required by the Engineer of Record.
h. Initially, the plastic hinging zone "Warning Sign", as illustrated in Detail 15 on Sheet 3, may be temporary. However, the temporary "Warning Sign" shall be replaced by a permanent "Warning Sign" before project completion. This sign and identification of the plastic hinging zone shall be maintained during construction; and may require repair after operations such as fireproofing.
i. Signs shall be affixed to the beam and located within the plastic hinging zone. The City Building Inspector may accept alternate methods of attaching the "Warning Sign" to the plastic hinging zone.

7. Additional Charpy V-Notch Toughness (not required for OMF)
Welds at the locations indicated below shall be made with filler metal having a CVN toughness of 20 ft-lbf at -20°F AND 40 ft-lbf at 70°F as determined by test procedure prescribed in the AISC Seismic Provisions, Appendix X "Weld Metal / Welding Procedure Specification Toughness Verification Test."
a. Beam flanges to columns,
b. Single plate shear connections to columns,
c. Beam webs to columns, and
d. Column splices.

8. Non-Destructive Testing (NDT) Requirements
a. The minimum non-destructive testing at each weld joints or parts shall be conducted at the locations and frequencies as specified in Table 2 and Table 3 on Sheet 2 respectively.
b. A copy of each NDT report shall be provided to the Contractor, Engineer of Record, Deputy Inspector, and City Building Inspector with the following information:
i. Document the accepted and rejected welds, parts, or joints.
ii. Identify the tested weld by piece mark and location in the piece.
iii. Identify the tested weld location in the structure.
c. NDT Technician shall perform the following tasks:
i. Coordinate the NDT scope and schedule with the Deputy Inspector.
ii. Perform NDT in a timely manner, so as not to hinder construction work, and to detect welding problems soon after occurrence so that corrective measures will be taken by the Contractor.
iii. Mark the inspected and accepted welds, parts, and joints with a distinguishing mark o die stamp.
d. Reduction Rate for NDT
i. The rate of UT testing on CJP groove welds may be reduced if approved by the Engineer of Record and the Department. The NDT rate for an individual welder or welding operator may be reduced to 25%, provided the reject rate is demonstrated to be 5% or less of the welds tested for the welder or welding operator. A sampling of at least 40 completed welds for a job shall be made for such reduction evaluation.
ii. The rate of MT testing on CJP groove welds may be reduced if approved by the Engineer of Record and the Department. The MT rate for an individual welder or welding operator may be reduced to 10%, provided the reject rate is demonstrated to be 5% or less of the welds tested for the welder or welding operator. A sampling of at least 20 completed welds for a job shall be made for such reduction evaluation. This reduction is not permitted on welds in the k-area, at repair sites, weld tab and backing removal sites and access holes.
iii. Reject rate shall mean the number of welds containing rejectable defects divided by the number of welds completed.

9. Documentations
The reports listed in Table 1 on Sheet 2 shall be submitted to the City Building Inspector.

V. WELDING PROCEDURES

1. Bottom Beam Flange Moment Connection Welding
Welding the bottom flange to the column flange shall be completed in the flat welding position with the following sequence:
a. Start welding from Side A (one side of the beam) with a maximum 1/4 inch thick root pass beyond the center of the joint on Side B (other side of the beam), reaching past the beam web through the weld access hole.
b. After the arc is initiated, electrode travel shall progress toward the edge of the Side A beam flange, terminating on the Side A weld tab.
c. The Side A root pass, and the root pass deposit on Side B, shall be thoroughly cleaned to allow the Deputy Inspector to verify that the resulting bead profile is suitable for obtaining good fusion by the subsequent root pass to be initiated from Side B. If the profile is not conducive to good fusion, the start of the first root pass shall be grounded, gouged, chipped, or otherwise prepared to ensure adequate profile to achieve fusion.
d. Complete the root pass on Side B before any other weld passes are performed.
e. The arc shall be initiated at the start of the first Side A root pass, and electrode travel shall progress toward the edge of the Side B beam flange, terminating on the Side B weld tab.
f. The above sequence shall be repeated for subsequent weld layers, and each weld layer shall be completed on both sides of the joint before a new layer is deposited. The order of operations (Side A, then Side B, or vice versa) is not restricted and may vary for each weld layer. Weld passes shall be placed in horizontal layers. Each pass shall be thoroughly cleaned of slag and wire brushed. Each pass shall be visually inspected by the Deputy Inspector, as described above in Step (c).

2. Sequence for Welding at Multiple Locations
When welding occur at multiple locations of welded steel moment frame connections, the following sequence shall be followed:
a. Weld both top and bottom beam flanges prior to any supplemental welding to the beam web or shear tab.
b. Engineer of Record shall review and approve all field welding sequences prior to the start of work.
c. Field welding of web shear plates with bolts shall occur after field welding of beam flanges to column flange.
d. High strength bolts shall be in the snug tight condition prior to welding.
e. High strength bolts shall be fully tensioned upon completion of all welding activities.

3. Welding Technique
a. Stringer beads shall be used during all welding operations. Maximum bead width, bead thickness, and layer thickness shall be considered. Weaving is not permitted, except when the WPS approved by the Engineer of Record limits electrode oscillation transverse to the weld axis to a maximum of:
i. 3d for 1G/1F, 2G/2F, and 4G/4F weld positions, or
ii. 5d for the 3G/3F position, where d = electrode diameter.
b. Welding layers should progress from the face of the column flange outward toward the groove face of the beam flange as illustrated in Detail 13 on Sheet 3.

4. Preheat and Interpass Temperature
a. The minimum preheat and interpass temperature requirements in Table 4 of Sheet 2 shall be observed. Special attention shall be given to AWS D1.1/D1.1M:2002 Section 3.5.1 and Section 5.6 for the thickness of the base metal to be welded.
b. Preheat and all subsequent interpass temperatures shall be maintained during the welding operation for a distance at least equal to the thickness of the thicker welded part, but not less than 3", in all directions from the point of welding.
c. Where plates are of different thickness, the higher minimum preheat and interpass temperature requirements of the thicker plate shall govern.
d. Maximum preheat and interpass temperature shall not exceed the lesser of:
i. 550°F, or
ii. The maximum temperature recommended by the manufacturer.

5. Post Weld Heat Treatment
Post weld heat treatment may reduce cracking tendencies due to possible hydrogen embrittlement. Post weld heat treatment shall be provided as follows:
a. Apply heat in the 400°F to 600°F range after completion of welding.
b. Complying with the conditions of AWS D1.1/D1.1M:2002 Section 3.14 and Section 5.8.
c. Alternatively, the use of insulating blankets after the completion of welding is permitted to control the cooling of the connection to ambient temperature.

VI. WELDING AND FABRICATION DETAILS

1. Base Metal Joint Preparation
a. Base metal preparation shall be in comply with AWS D1.1/D1.1M:2002 Section 5.15.
b. All beam flange to column flange welds are to be made with an AWS prequalified CJP groove welded joint detail.
c. Bevel, fit-up and detail tolerances shall be as required by the selected prequalified welded joint detail.
d. Whenever possible, use the AWS prequalified CJP groove welded joint detail as illustrated in Detail 14 on Sheet 3 and the following:
i. Use single bevel CJP groove welds made with a 30° groove angle or double bevel CJP groove welds when flange thickness exceed 1-1/2 inch.
ii. "As Fit-Up" and "As Detailed" shall be the maximum tolerances.
iii. Meet all prequalified WPS variables in Table 5 on Sheet 2.

2. Weld Access Hole
a. Where weld access holes are provided, they shall be detailed as illustrated in Detail 12 on Sheet 3.
b. Notches and gouges shall be repaired following a WPS approved by ther Engineer of Record.
c. Weld access holes shall be prepared by grinding to a suitable finish in accordance with AISC LRFD Specification Section J1.6 and provided with a minimum radius of 3/8 inch as illustrated in Detail 12 on Sheet 3.

3. Backing Bar
a. Backing bar used in connections with a CJP groove weld of beam flange to column flange shall be removed except that top flange backing bar attached to the column by a continuous fillet weld on the edge below the CJP groove weld need not be removed.
b. Following removal of backing bar, the root pass shall be backgouged to sound weld metal, and back welded. A reinforcing fillet weld with a minimum leg size of 5/16 inch or the root opening plus 1/16 inch, whichever is larger, shall be provided. The reinforcing fillet weld need not be grounded.
c. When backing bar is other than AWS D1.1/D1.1M:2002 Table 3.1 and Section 5.2.2 approved base metal is used, the following shall apply:
i. Ceramic, flux or glass tape may be used provided the manufacturer's recommendations are followed.
ii. When a non-metallic backing bar is used, the WPS and the Welder shall be qualified using the type of backing bar intended for welding.
iii. Nonferrous metallic (e.g. copper) backing materials are not permitted.

4. Weld Tab
a. Weld tabs shall be aligned parallel to the joint preparation.
b. No weld dams are allowed.
c. Weld tabs shall extend beyond the edge of the joint a minimum distance equal to the part thickness, but not less than one inch.
d. Weld tab shall be removed upon completion of the welded joint as follows:
i. No more than 1/8 inch beyond the edge of the joint shall remain, except at continuity plate where up to 1/4 inch is acceptable.
ii. Edges of the weld tab shall be finished to a surface roughness value of 500 micro inch or better. Grinding to a flush condition is not required.
e. Gouges and notches are not permitted. The transitional slope of any area where gouges and notches have been removed shall not exceed 1:5.
f. Material removed by grinding that extends more than 1/16 inch below the surface of the base metal shall be filled with weld metal. The contour of the weld at the ends shall provide a smooth transition, free of notches and sharp corners.

5. Continuity Plate
a. Continuity plates shall be detailed as illustrated in Detail 11 on Sheet 3.
b. The weld attaching the continuity plate to the column flange shall be as follows:
i. Use a CJP groove weld for the full length of the groove preparation.
ii. When backing bars are omitted, the root shall be backgouged and back welded.
iii. When backing bars are used and remain in place, backing bars shall be attached to the column flanges with a reinforcing fillet weld.
iv. Fillet weld shall not be used to connect backing bars to continuity plates.
v. The fillet weld size need not exceed the minimum size requirements of AWS D1.1/D1.1M:2002 Table 5.8.

SITE ADDRESS:

OWNER:

STANDARD QUALITY ASSURANCE PLAN
For Steel Moment Frames

The specifications and illustrative details presented in this Standard Quality Assurance Plan have been prepared in accordance with recognized engineering principles and are for general information only. This Standard Quality Assurance Plan should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by the Engineer or Architect of Record. By signing and sealing this Standard Quality Assurance Plan, the Engineer or Architect of Record assumes full responsibility for the application of all of the specifications and illustrative details associated with the subject property. Furthermore, by signing and sealing this Standard Quality Assurance Plan, the Engineer or Architect of Record acknowledge that the City of Los Angeles assumes no responsibility for the application of any of the specifications and illustrative details contained in this Standard Quality Assurance Plans and all liability arising from such use.

Engineer of Record

Date: 02/28/2005
Scale: Not to Scale
Sheet:

Sheet 1 of 3

Table 7. PREQUALIFIED BASE METAL - FILLER METAL COMBINATIONS FOR MATCHING STRENGTH (1,2,3,4)

Group	BASE METAL: Steel Specification	Welding Process	FILLER METAL: AWS Electrode Specification	Electrode Classification
I	ASTM A36 < 3/4 in.	SMAW	A5.1	E70XX
		SMAW	A5.5 (6)	E70XX-X
		FCAW	A5.20 (5)	E70XT-X, E7XT-XM
		FCAW	A5.29 (6)	E70XTX-X, E7XTX-XM
II	ASTM A36 ≥ 3/4 in., ASTM A572 Grade 50, ASTM A913 Grade 50, ASTM A992	SMAW	A5.1	E7015, E7016, E7018, E7028
		SMAW	A5.5 (6)	E70XX-X
		FCAW	A5.20 (5)	E70XT-X, E7XT-XM
		FCAW	A5.29 (6)	E70XTX-X, E7XTX-XM

RELATIONSHIP	BASE METAL(S)	FILLER METAL STRENGTH RELATIONSHIP REQUIRED
Matching	Any steel to itself or any steel to another in the same group	Any filler metal listed in the same group
	Any steel in one group to any steel in another	Any filler metal listed for a lower strength group [SMAW electrodes shall be the low-hydrogen classification]
Under-Matching	Any steel to any steel to any group	

NOTES:
1. The base metal/filler metal strength relationships above shall be used to determine whether matching or under-matching filler metals are required. Refer to AWS D1.1/D1.1M:2002, Section 3.3.
2. Preheating of joints involving base metals of different groups shall be in conformance with the requirements applicable to the higher strength group.
3. When welds are to be stress-relieved, the deposited weld metal shall not exceed 0.05 percent vanadium.
4. Adapted with permission from the AWS D1.1 Committee on Structural Welding, Structural Welding Code - Steel, AWS D1.1/D1.1M: 2002, Miami: American Welding Society, Table 3.1.
5. FCAW electrodes with the -2, -2M, -3, -4, -7, -10, -11, -13, -14, G, -GS suffix shall be excluded and electrodes with the -11 suffix shall be excluded for thicknesses greater than 1/2 in.
6. Filler metals of alloy group B3, B3L, B4, B4L, B5, B5L, B6, B6L, B7, B7L, B8, B8L, B9, or any BXH grade in AWS A5.5 or A5.29 are not prequalified for use in the as-weld condition.

CONTINUED FROM SHEET 1

c. Weld terminations near the end of the column flange tips may be completed using weld tabs as follows:
i. Weld tabs may be steel or nonfusible material.
ii. Weld terminations near the radius of the column need not be made using weld tabs. The use of small nonfusible weld tabs to assist in weld terminations is permitted.
iii. Weld tabs shall be removed following completion of welding.
d. Continuity plates may be welded to the column web with groove welds, fillet welds, or a combination of the two. Fillet welds shall terminate a minimum distance of 1/4 inch from each end of the joint.

6. Doubler Plate
Web doubler plates, as illustrated in Detail 2, 3, or 4 on Sheet 3, shall be welded using either Detail 5, 6, or 7 on Sheet 3.

7. Requirements for "k" Area
Welds shall terminate short of the "k" area for continuity plates as illustrated in Detail 11 on Sheet 3.

VII. EXEMPTIONS

1. Reduction from certain Quality Assurance components of this Standard Quality Assurance Plan, as listed in Part VII Item 2, are permitted for the following buildings or structures:
a. One or two family dwellings not more than 1 story in height and 2,500 sf of floor area,
b. Buildings or structures accessory to residential uses (such as carport, storage, garage), and
c. Miscellaneous structures (such as walkway, canopy, patio cover, gazebo, storage rack).
2. Buildings or structures, as listed in Part VII Item 1, are exempt from providing the following Quality Assurance components:
a. Electrode Storage and Atmospheric Exposure, Part IV, Item 5(f) and 5(g),
b. Plastic Hinging Zone Protection, Part IV, Item 6,
c. Additional CVN Notch Toughness Testing, Part IV, Item 7,
d. Non-Destructive Testing, Part IV, Item 8,
e. Preheat and Interpass Temperature, Part V, Item 4, or
f. Post Weld Heat Treatment, Part V, Item 5.

Table 5. PREQUALIFIED WPS REQUIREMENTS (1,2,3)

VARIABLE	POSITION OF WELD	WELD TYPE	SMAW	FCAW
Maximum Electrode Diameter	Flat (F)	Fillet (4)	5/16 in.	1/8 in.
		Groove (4)	1/4 in.	
		Root Pass	3/16 in.	
	Horizontal (H)	Fillet	1/4 in.	1/8 in.
		Groove	3/16 in.	
	Vertical (V)	All	3/16 in.	3/32 in.
	Overhead (OH)	All	3/16 in.	5/64 in.
Maximum Current	All	Fillet	Within the range of recommended operation by the filler metal manufacturer and a WPS approved by engineer of record.	Within the range of recommended operation by the filler metal manufacturer and a WPS approved by engineer of record.
		Groove weld root pass with opening		
		Groove weld root pass without opening		
		Groove weld fill passes		
		Groove weld cap pass		
Maximum Root Pass Thickness (5)	Flat (F)	All	3/8 in.	3/8 in.
	Horizontal (H)		5/16 in.	5/16 in.
	Vertical (V)		1/2 in.	1/2 in.
	Overhead (OH)		5/16 in.	5/16 in.
Maximum Fill Pass Thickness	All	All	3/16 in.	1/4 in.
Maximum Single Pass Fillet Weld Size	Flat (F)	Fillet	3/8 in.	1/2 in.
	Horizontal (H)		5/16 in.	3/8 in.
	Vertical (V)		1/2 in.	1/2 in.
	Overhead (OH)		5/16 in.	5/16 in.
Maximum Single Pass Layer Width	All	Root opening > 1/2 in.	Not applicable.	Split layers
		Any layer of width w		(6)

NOTES:
1. Applicable provisions of AWS D1.1/D1.1M:2002 Section 3 "Prequalification of WPSs" must be maintained for prequalified status of SMAW and FCAW WPSs.
2. Refer to Detail 13 on Sheet 3 for diagram of weld pass sequence.
3. Adapted with permission from the AWS D1.1 Committee on Structural Welding, Structural Welding Code - Steel, AWS D1.1/D1.1M: 2002, Miami: American Welding Society, Table 3.7.
4. Except root passes.
5. See AWS D1.1/D1.1M:2002, Section 3.7.2, for width-to-depth limitations.
6. In the F, H, or OH positions for nontubulars, split layers when the layer width w > 5/8 inch. In the V position for nontubulars or the 5G or 6G for tubulars, split layers when the width w > 1 inch.

Table 6. STRUCTURAL OBSERVATION CHECKLIST

STRUCTURAL OBSERVATION PROGRAM (Steel Moment Frame for Seismic Application)
☐ Orientation and placement of connected components.
☐ Removal of backing bars, as required on the plans.
☐ Removal of runoff tabs, as required on the plans.
☐ Presence of continuity plates, as required on the plans.
☐ Presence of doubler plates, as required on the plans.
☐ Configuration and finish of weld access holes, if applicable.
☐ Contour of RBS profile, if applicable.
☐ Verify that no welded attachments occur in the plastic hinging region.
☐ Review NDT and deputy inspection reports for general compliance.

NOTES:
1. Weld qualities shall be verified by the Deputy Inspector.
2. The structural observations listed in this Table are in addition to the structural observations that may be required on the structural plans.

Table 1. REPORTS TO BE SUBMITTED TO THE CITY BUILDING INSPECTOR

	PREPARED BY	TYPE OF REPORT
1.	Structural Observer(s)	☐ Structural Observation Reports
2.	Deputy Inspector(s)	☐ Deputy Inspection Reports
3.	NDT Technician(s)	☐ Non-Destructive Testing Reports

Table 2. NON-DESTRUCTIVE TEST LOCATIONS

	REQUIRED LOCATIONS	OMF	IMF	SMF
1.	**CJP Groove Weld** Ultrasonic test shall be performed on all CJP groove welds in materials 5/16 inch (8 mm) thick or greater. In addition, magnetic particle test shall be performed on all beam-to-column CJP groove welds.	B	A	A
2.	**"K" Area** When welding of doubler plates, continuity plates, or stiffeners has been performed in the k-area, the web shall be tested for cracks using magnetic particle testing. The magnetic particle test area shall include the k-area base metal within 3 in. (75 mm) of the weld.	C	B	B
3.	**Beam Cope and Access Hole** At welded splices and connections, thermally cut surfaces of beam copes and access holes shall be tested using magnetic particle testing, when the flange thickness exceeds 1-1/2 in. (38 mm) for rolled shapes.	C	B	B
4.	**Reduced Beam Section Repair** Magnetic particle testing shall be performed on any weld and adjacent area of the RBS plastic hinge region that has been repaired by welding, or on the base metal of the RBS plastic hinge region if a sharp notch has been removed by grinding.	B	B	A
5.	**Base Metal Lamellar Tearing and Laminations at CJP Groove Weld** Base metal thicker than 1-1/2 in. (38 mm) shall be ultrasonically tested for discontinuities behind and adjacent to the fusion line when the base metal is loaded in tension in the through thickness direction in tee and corner joints and the connected material is greater than 3/4 in. (19 mm). Any base metal discontinuities found within t/4 of the steel surface shall be accepted or rejected on the basis of criteria of AWS D1.1 Table 6.2, where t is the thickness of the part subjected to the through-thickness strain.	B	B	A
6.	**End of Weld at Weld Tab Removal Site** Magnetic particle testing shall be performed on the end of welds from which the weld tabs have been removed, except for continuity plate weld tabs.	C	B	B
7.	**PJP Groove Weld** Ultrasonic testing shall be performed on PJP groove welds used in column splices with an effective throat of 3/4 in. (19.1 mm) thick or greater.	C	B	A

NOTE: A, B, and C are the frequencies of non-destructive tests listed in Table 3.

Table 3. NON-DESTRUCTIVE TEST FREQUENCY

	Frequency Designation A	B	C
Ultrasonic Testing (UT)	100% of joints	50% of joints	25% of joints
Magnetic Particle Testing (MT)	50% of joints	25% of joints	Not Required

NOTES:
1. Refer to Table 2 for locations of non-destructive testing.
2. Rate of non-destructive testing may be reduced as permitted in Sheet 1, Part IV, Item 8(d).

Table 4. PREQUALIFIED MINIMUM PREHEAT AND INTERPASS TEMPERATURE

STEEL SPECIFICATION	WELDING PROCESS	THICKNESS OF THICKEST PART AT POINT OF WELDING (in.)	MINIMUM PREHEAT AND INTERPASS TEMPERATURE (°F)
ASTM A36, ASTM A572 Grade 50, ASTM A913 Grade 50, ASTM A992	SMAW with low-hydrogen electrodes, FCAW	1/8 to 3/4 incl.	32
		Over 3/4 to 1-1/2 incl.	50
		Over 1-1/2 to 2-1/2 incl.	150
		Over 2-1/2	225

NOTES:
1. Surfaces to be welded and surfaces adjacent to welds shall be free of moisture pursuant to AWS D1.1/D1.1M:2002 Section 5.15. Use a higher preheat temperature from this Table to remove moisture.
2. Adapted with permission from the AWS D1.1 Committee on Structural Welding, Structural Welding Code - Steel, AWS D1.1/D1.1M: 2002, Miami: American Welding Society, Table 3.2.

SITE ADDRESS:

OWNER:

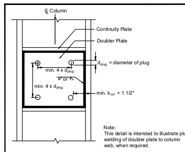
STANDARD QUALITY ASSURANCE PLAN
For Steel Moment Frames

The specifications and illustrative details presented in this Standard Quality Assurance Plan have been prepared in accordance with recognized engineering principles and are for general information only. This Standard Quality Assurance Plan should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by the Engineer or Architect of Record. By signing and sealing this Standard Quality Assurance Plan, the Engineer or Architect of Record assumes full responsibility for the application of all of the specifications and illustrative details associated with the subject property. Furthermore, by signing and sealing this Standard Quality Assurance Plan, the Engineer or Architect of Record acknowledge that the City of Los Angeles assumes no responsibility for the application of any of the specifications and illustrative details contained in this Standard Quality Assurance Plans and all liability arising from such use.

Engineer of Record

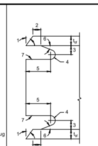
Date: 02/28/2005
Scale: Not to Scale
Sheet:

Sheet 2 of 3



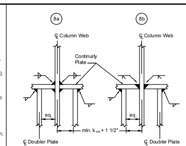
Note: This detail is intended to illustrate plug welding of doubler plate to column web, when required.

Plug Welding of Doubler Plate to Column — Detail 16 (Scale: Not to Scale)

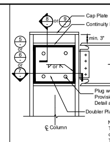


Notes:
1. Bevel as required by a selected AWS prequalified CJP groove welded joint detail.
2. Larger of t_{bf} or 1/2" (plus 1/2 t_{bf}, or minus 1/4 t_{bf}).
3. 3/4 t_{bf} to t_{bf}, 3/4" minimum (± 1/4").
4. 3/8" minimum radius (plus not limited, or minus 0).
5. 3 t_{bf} (± 1/2").
6. Tolerances shall not accumulate to the extent that the angle of the access hole cut to the flange surface exceed 25°.
7. Weld access hole shall be ground smooth to a surface roughness value not to exceed 500 micro inch; and shall be free of notches and gouges.

Weld Access Hole Detail — Detail 12 (Scale: Not to Scale)



Doubler Plate Welds to Continuity Plate — Detail 8 (Scale: Not to Scale)

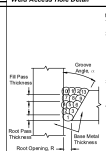


Note: This detail is intended to illustrate doubler plate connection to column. Top and bottom of doubler plate terminates at the continuity plates.

Web Doubler Plate Detail — Detail 4 (Scale: Not to Scale)

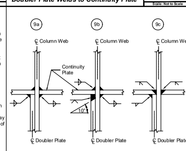
TYPICAL SHEET 3 GENERAL NOTES:
1. The size of columns or beams, continuity or doubler plate thickness, size and length of fillet welds, beam to column moment connections, steel column frame to foundation connections, and length of plastic hinging zone shall be determined by the Engineer or Architect of Record.
2. The Engineer or Architect of Record shall appropriately dimension and specify the minimum detailing information illustrated on this Sheet to the structural plans. The details illustrated herein shall not be used to substitute for actual structural details.
3. The details provided herein are intended to illustrate the minimum fabrication and welding details that shall be reflected on the structural plans and details.

Typical Sheet 3 Notes

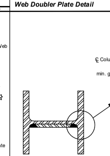


Notes:
1. For maximum fill pass thickness, see Table 5 on Sheet 2.
2. For moment connection at bottom beam flange to column flange, the maximum root pass thickness shall not exceed 1/4" per Part V, Item 1. For welded connection at all other locations, see Table 5 on Sheet 2 for maximum root pass thickness.
3. Root Opening, R, and Groove Angle, α, shall be per selected AWS prequalified CJP groove welded joint detail.
4. Welding pass numbers are shown diagrammatically to indicate sequence. Quantity of passes may vary due to depth and/or position of weld. This figure is intended to illustrate recommended welding sequence for FCAW and SMAW welding process only.

Weld Pass Sequence — Detail 13 (Scale: Not to Scale)

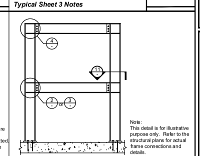


Doubler Plate Welds to Continuity Plate — Detail 9 (Scale: Not to Scale)



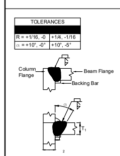
Note:
1. A square-edge plate and square groove weld between doubler plate and column is not permitted.
2. Double plate Fy shall have the same as the column Fy.

Groove Welded Doubler Plate — Detail 5 (Scale: Not to Scale)



Note: This detail is for illustrative purpose only. Refer to the structural plans for actual frame connections and details.

Sample Steel Moment Frame — Detail 1 (Scale: Not to Scale)

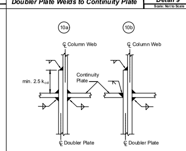


TOLERANCES		
R = +1/16, -0	+1/4, -1/16	
α = +10°, -0°	+10°, -5°	

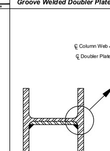
Welding Process	Joint Designation	Base Metal Thickness (U = unlimited) T_1	T_2	Groove Preparation: Root Opening	Groove Angle	Allowed Welding Positions	Gas Shielding for FCAW
SMAW	TC-U4a	U	U	R = 1/4	α = 45°	All	-
				R = 3/8	α = 30°	F, V, OH	-
FCAW	TC-U4a-GF	U	U	R = 3/16	α = 30°	All	Required
				R = 3/8	α = 30°	F	Not required
				R = 1/4	α = 45°	All	Not required

Notes:
1. Groove welds in corner and T-joints of cyclically loaded structures shall be reinforced with fillet welds equal to T_1/4, but need not exceed 3/8 inch.
2. For corner joints, the outside groove preparation may be in either or both members, provided the basic groove configuration is not changed and adequate edge distance is maintained to support the welding operations without excessive edge melting.
3. Adapted with permission from the AWS D1.1 Committee on Structural Welding, Structural Welding Code - Steel, AWS D1.1/D1.1M: 2002, Miami: American Welding Society, Figure 3.4 pg. 92 (top left).

AWS Prequalified CJP Groove Welded Joint Detail — Detail 14 (Scale: Not to Scale)

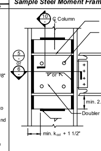


Doubler Plate Welds to Continuity Plate — Detail 10 (Scale: Not to Scale)



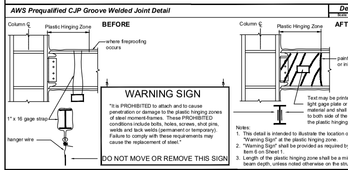
Notes:
1. The plate shall be chamfered to miss the radius of the column.
2. The fillet weld, in both throat and leg size shall be equal to or larger than the chamfer dimensions used for the plate.
3. Double plate Fy shall have the same as the column Fy.

Fillet Welded Doubler Plate — Detail 6 (Scale: Not to Scale)



Note: This detail is intended to illustrate doubler plate connection to column web. Doubler plate extend beyond continuity plate a distance not less than min. 2.5 k_{col}.

Web Doubler Plate Detail — Detail 2 (Scale: Not to Scale)



WARNING SIGN

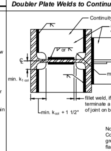
"It is PROHIBITED to attach and to cause penetration or damage to the plastic hinging zones of steel moment-frames. These PROHIBITED conditions include bolts, holes, screws, shot pins, welds and tack welds (permanent or temporary). Failure to comply with these requirements may cause the replacement of steel."

DO NOT MOVE OR REMOVE THIS SIGN

Text may be printed on either light gage plate or adhesive material and shall be affixed to both side of the beam within the plastic hinging zone.

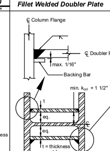
Notes:
1. This detail is intended to illustrate the location of the "Warning Sign" at the plastic hinging zone.
2. "Warning Sign" shall be provided as required by Part IV Item 6 on Sheet 1.
3. Length of the plastic hinging zone shall be a min. of 2 x beam depth, unless noted otherwise on the structural plans.

Warning Sign at Plastic Hinging Zone — Detail 15 (Scale: Not to Scale)



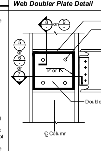
Note: Continuity plate shall have a thickness greater than or equal to the beam flange or beam flange connection plate.

Continuity Plate Detail — Detail 11 (Scale: Not to Scale)



Notes:
1. Pair of plates shall be of equal thickness, t.
2. Plates shall be equally spaced apart from column web, but not less than min. k_{col} + 1 1/2".
3. Double plate Fy shall have the same as the column Fy.

Groove or Fillet Welded Doubler Plate — Detail 7 (Scale: Not to Scale)



Note: This detail is intended to illustrate doubler plate connection to column. Top and bottom of doubler plate terminates at the continuity plates.

Web Doubler Plate Detail — Detail 3 (Scale: Not to Scale)

SITE ADDRESS:

OWNER:

STANDARD QUALITY ASSURANCE PLAN
For Steel Moment Frames

The specifications and illustrative details presented in this Standard Quality Assurance Plan have been prepared in accordance with recognized engineering principles and are for general information only. This Standard Quality Assurance Plan should not be used or relied upon for any specific application without competent professional examination and verification of its accuracy, suitability, and applicability by the Engineer or Architect of Record. By signing and sealing this Standard Quality Assurance Plan, the Engineer or Architect of Record assumes full responsibility for the application of all of the specifications and illustrative details associated with the subject property. Furthermore, by signing and sealing this Standard Quality Assurance Plan, the Engineer or Architect of Record acknowledge that the City of Los Angeles assumes no responsibility for the application of any of the specifications and illustrative details contained in this Standard Quality Assurance Plans and all liability arising from such use.

Engineer of Record

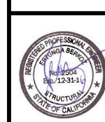
Date: 02/28/2005
Scale: Not to Scale
Sheet:

Sheet 3 of 3

REVISION	BY
8-5-2016	

SINGLE FAMILY RESIDENCE
683 N. CRESCENT DR.
LOS ANGELES, CA

BERKOZ & ASSOCIATES, INC.
CONSULTING STRUCTURAL ENGINEERS
5530 CORBIN AVENUE, SUITE 355
TARZANA, CA 91356
(818) 668-8536 • FAX (818) 668-8596



DATE 6-15-2016

JOB #

STRUCTURAL

SD-7