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APPENDIX B

SERVICEABILITY CONSIDERATIONS

Serviceability refers to a building's functional performance as it relates to the expectations and perceptions of the building owners and/or users. Included in serviceability are such things as deflection, corrosion resistance, and expansion and contraction. The following discussion on each subject emphasizes standard practices used at ACI in our design and manufacturing processes.

If your project requires serviceability criteria other than the ACI standards as shown in this Appendix, the special criteria must be noted on the ACI Building Purchase Order Contract. In the absence of any stipulated special serviceability criteria, ACI standards will be used.

A. Building Deflection

Deflection is the displacement of a structural member or system under load. Vertical deflection can be illustrated by supporting a long member at the ends only. There will be some sag at the mid-point. This is vertical deflection caused by "dead load" (the weight of the member itself). If a heavy object is placed on the member, it will deflect (sag) even more, but will return to the previous state when the heavy object is removed. This is called "live load" deflection and is caused by something temporarily displacing the member. Horizontal deflection can be illustrated by holding a large flexible object perpendicular to moving air. If held loosely at the ends, the middle will bow. If the air becomes still, the object will return to its original shape.

Buildings react to vertical and horizontal loads in relatively the same way. In addition to wind, horizontal or lateral deflections can be induced by heavy supported equipment such as cranes or by seismic events. Under the influence

of these temporary loads, a building will deflect to some degree but will return to its original state when the load is removed.

It is important to understand that when components and structures are subjected to too much deflection, there may be an adverse effect. For instance, if there are masonry walls it is important to know the deflection of any member adjacent to the masonry, regardless of whether the member actually supports the masonry. If the structure supports the masonry, then the structure must be designed with a deflection limited to no more than the maximum deflection allowed for the masonry by the governing code. If the structure does not support the masonry, the weather seal between the masonry and the structure must be designed to accommodate the building's deflection to prevent damage to the masonry.

Deflection must also be considered for items such as interior wall finishes, ceilings, cranes, deflection sensitive equipment, storefront glass, and floor support member above the slab level. Failure to properly evaluate deflection can cause cracking of masonry or plaster walls, insufficient clearances, displaced ceiling tiles, or other building performance problems. All of these problems can be avoided if given proper consideration in the design stage.

ACI Engineering will use the following deflection limits in the absence of specific guidance from the designated building code, the purchase order, or the 2002 MBMA Low Rise Building Systems Manual:

ACI SERVICEABILITY STANDARDS FOR DEFLECTION LIMITS

Metal Roof or Wall Panels:	L/60 *
Metal Wall Panels:	
Frames and Portals:	H / 60 *
Wind Columns:	H / 60 *
Endwall and Soldier Columns:	L / 120 *
Girts:	L / 120 *

Concrete Tilt-Up Panels:

Frames, Portals, and Wind Columns:	H / 100 *
Endwall and Soldier Columns:	L / 240 *
Spandrel beams:	L / 2 40 *

ACI SERVICEABILITY STANDARDS FOR DEFLECTION LIMITS Continued….

Brick Veneer and Stucco:

Frames, Portals, and Wind Columns:	H/180 *
Endwall and Soldier Columns:	H/240 (1.5" max.) *
Girts:	L/240 (1.5" max.) *

Un-reinforced Concrete Masonry:

Frames, Portals, and Wind Columns:	H/100 or 1/16" crack at base (max.) *
Endwall and Soldier Columns:	H/240 (1.5" max.) *
Girts:	L/240 (1.5" max.) *

Reinforced Concrete Masonry and Synthetic Plaster (EIFS, Dryvit, etc.):

Frames, Portals, and Wind Columns:	H/100 *
Endwall and Soldier Columns:	H/240 (1.5" max.) *
Girts:	L/240 (1.5" max.) *

Glass Storefront:

Jambs and Headers:	L/175 (3/4" max.) *
Wind Columns and Portals	H/120 *

Masonry Lintels:

Vertical Deflection:	L/600 (0.3" max.)
Rotation (max)	1° (0.01745 rad)

Roof Members Supporting Ceilings:

Plaster:	L/360 *
Non-Plaster (Suspended Ceilings):	L/240 *
None:	L/150 *

Roof Members Supporting Mechanical Units: L/240

Roof Joists:

Live Load Deflection:	L/240

Mezzanines:	LL	DL + LL
Girders and Edge Beams:	L / 360	L / 240
Joists:	L / 360	L / 240

ACI SERVICEABILITY STANDARDS FOR DEFLECTION LIMITS Continued….

Crane Runway Beams:	
Top Running:	
CMAA Class A, B, and C	L/600
CMAA Class D	L/800
CMAA Class E and F	L/1000
Underhung:	
CMAA Class A, B, and C	L/450
Jib Crane Booms:	L/225
Lateral Deflection (All):	L/400
Crane Support Systems (Frames and Bracing):	
Pendant Operated Cranes:	H/100
Cab Operated Cranes:	H/240 (2" max.)
Elevators:	
Lateral Support Systems (Frames and Bracing):	H/500
Sheave Beams and Girders:	L/1666

* See Appendix B, 'E. Loading Combinations', for the wind load values used in the determination of member deflections for comparison against the deflection limits of this section.

B. Corrosion Resistance

The ACI standard for coating of structural steel members is to use one shop coat of a red or gray-pigmented alkyd primer. This primer has proven to be quite satisfactory for enclosed buildings where the building's contents do not create a corrosive environment. It is also satisfactory for some external components that are protected from direct sun and rain exposure, such as canopy beams.

The steel substrate of our roof and wall panels is either galvanized or Galvalume™ coated. Galvalume™ coated panels are available with up to a twenty-year limited warranty on the exposed side. These coatings are standard in the industry and meet most performance requirements.

For buildings located in or near corrosive environments or for buildings that will house materials that will create a corrosive environment, the Buyer should obtain additional information from ACI concerning actual test data of our standard finishes. The Buyer should then consult with a licensed design professional to determine if the standard ACI product is suitable for the intended purpose. If it is determined that the ACI standard product is unsatisfactory for the intended use, the Buyer must provide complete specifications for an acceptable alternate coating.

C. Expansion and Contraction

Thermal expansion and contraction is caused by exposure to temperature differentials. For example, in direct sunlight a metal roof can reach very high temperatures causing the steel to expand. At night, the roof can cool down significantly causing the roof to contract. Although the supporting substructure may not be exposed to the same heating and cooling conditions as the steel roof material, there will still be enough change between temperature extremes to cause expansion and contraction.

For large building projects with average openings and standard steel roof and wall covering, ACI will design expansion joints as needed to compensate for expansion and contraction that is excessive or harmful to the building's performance. The following chart gives the maximum dimensions for standard ACI materials that will not require special design and detailing for expansion and contraction:

ACI STANDARD ROOF PANEL EXPANSION / CONTRACTION LIMITS

	Direction	Screw-Down Roof	Standing Seam Roof
Slope Length	- On Zee Purlins	100’	150’
	- On Joists	NA	120’
Length Perpendicular to Slope	- Ridge Caps	160’	160’
	- Standard Gutter	160’	160’
	- Valley Gutter	100’	100’

ACI STANDARD STRUCTURAL EXPANSION / CONTRACTION LIMITS

Direction	Structural	Covering Type	Limit
Length	- Cold-Formed Purlins or Girts	Metal Panel Masonry Walls	500' - 800' 500'
	-Bar Joists	Metal Panel Masonry Walls	500' - 800' 500'

Factors other than the building size must be considered to adequately compensate for thermal movement and/or stress. They are:

A. Climatic conditions when and where the building is erected
B. Roof insulation type, quantity, and quality
C. Building end use and interior temperature ranges.
D. Wall materials, firewalls, accessories, and perimeter conditions.

The decision to extend the above limits for an individual building should be made with appropriate consultation with ACI Engineering, as necessary.

If material other than steel panels is used on wall areas, there may be damage caused by differential expansion and contraction between the steel framing and the alternative material. Building projects that require large areas of glass,

masonry, or other less flexible components may also need attention to avoid unnecessary damage. If you are using a large area of alternate material in combination with an ACI building, ACI recommends that you consult a licensed design professional to determine compatibility requirements.

D. Vibration

Excess vibrations can be caused by activities of the building occupants or by certain types of mechanical equipment supported by the structure. ACI typically does not consider vibration requirements in the design process. If the intended use or occupancy of the building will require consideration of vibrations, ACI recommends that you consult a licensed design professional to determine the appropriate design criteria.

E. Loading Combinations

Each loading combination is the application of individual loads simultaneously onto a structure to generate a possible loading application that the structure may undergo during the structure's expected useful existence. An example would be a combination of full dead loads added with full snow loads (D + S). Design is based upon the load combination causing the most unfavorable effect. In some cases this may occur when one or more loads are not applied or when several loads are applied simultaneously in expected proportions. For example, wind loads and earthquake loads would not be assumed to act simultaneously, but the most unfavorable effects of each would be considered separately in design, where appropriate. In some applications, forces due to wind may be the worst case, but design may be controlled by ductility requirements determined by earthquake combinations.

By indicating the design of the structure is based upon the effect of the most unfavorable load combination, this means each element of the structure is designed based upon the load combination causing the worst effect upon that

particular element. For example, wall members may be designed due to the effects of wind load combinations while roof members may be designed due to the effects of snow load combinations. Even individual elements of the primary framing may be design based upon various load combinations. For example, the design of the rigid frame column inner flange may be due to the effects of snow combinations while the design of the outer flange may be due to the effects of wind load combinations.

The basic load combinations are often included in the governing code. ACI designs are based upon the American Institute of Steel Construction's (AISC) Allowable Stress Design (ASD) procedures and therefore use the load combinations associated with the ASD method for steel construction. ACI will design supplied structures using combinations listed in the governing code when applicable or the ACI designers will apply the following combinations as a minimum. However, the individual designer will have the freedom to exercise engineering judgment in unique situations.

ACI STANDARD LOADING COMBINATIONS

D + L	**D = Dead**, L = Live**
D + L + (L_r or S or R)	**L_r = Roof Live, S = Snow, R = Rain**
D + (W or 0.7E) + L +(L_r or S or R)	**W = Wind**
0.6D + W	
0.6D + 0.7E	**E = Earthquake**
D + 0.75S + C	**C = Cranes**
0.6D + 0.5W + C	

**** Collateral Dead Loads are included with D or omitted from D to create the more severe design condition.**

It is permitted to multiply the combined effect of two or more variable loads by 0.75 and add to the effect of dead load.

Increases in allowable stresses shall not be used unless allowed in the appropriate governing code.

For determination of deflections for comparison to the Deflection Limits of Appendix B, 'A. Building Deflection', a value of 0.7 times design wind load will be used in the above combinations (unless a higher value is required by the Governing Code).

APPENDIX F

ACI GENERAL SPECIFICATIONS

GENERAL

1. The work covered by this section shall include all labor, material, equipment, and services necessary for the design and fabrication of an ACI building in accordance with these specifications and as shown on the contract drawings. The ACI building shall include all primary and secondary structural framing members, cladding, fasteners, trim, and those accessories such as roof ventilators, walk doors, and other miscellaneous items as shown or called for in the purchase order contract.
2. An anchor rod drawing shall be furnished by ACI and will be used to determine the exact perimeter dimensions for forming the foundation and setting of anchor rods by others. Dimensions shown on the contract drawings are nominal and shall not be used for concrete forming.
3. Complete erection drawings shall be furnished by ACI on jobs for approval. These drawings shall include the building size, design loads, type of construction, material, gauge of cladding, and type, quantity, and location of accessory items. Fabrication drawings are not furnished for approval.
4. ACI shall furnish complete erection drawings showing sidewall, endwall, and roof framing, transverse cross-sections, cladding and flashing details, and accessory installation details to clearly indicate the proper assembly of all building parts.
5. ACI utilizes those standards, specifications, and recommendations of professionally recognized agencies and groups such as AISC, AWS, ASTM, AISI, and MBMA as a basis for establishing design, fabrication and quality criteria, standards, practices, methods, and tolerances. Unless stipulated otherwise in the contract documents, ACI's design, fabrication and quality criteria, standards, practices, methods, and tolerances will govern the work.

STRUCTURAL DESIGN

A. GENERAL

1. All structural steel sections and welded plate members shall be designed in accordance with the 9th Edition of the AISC "Manual of Steel Construction, Allowable Stress Design."
2. All cold-formed steel members shall be design in accordance with the American Iron and Steel Institute's (AISI) standard, North American Specification for the Design of Cold-formed Steel Structural Members. The

edition of the AISI used will be the most acceptable edition at that time as determined by the ACI Director of Engineering.

B. DESIGN LOADS

1. The roof live, ground snow, and wind loads shall be as specified by the applicable building code or as determined in accordance with the Design Practices in the latest edition of the MBMA "Low Rise Building Systems Manual."
2. Roof live and snow loads shall be applied to the horizontal projection of the roof-framing members.
3. The magnitude and location of any auxiliary loads or collateral design loads such as cranes, material handling systems, sprinklers, mechanical and electrical systems, and other applied loads must be clearly set forth in the building Purchase Order Contract.

C. DESIGN CERTIFICATION

ACI shall furnish erection drawings and a letter of design certification with the seal of a registered professional engineer.

STRUCTURAL STEEL FABRICATION

A. GENERAL

1. All primary and secondary structural members shall be factory cut, formed, punched, welded, cleaned, and painted for assembly. All base plates, cap plates, stiffeners, and splice plates shall be shop fabricated complete with bolt connection holes.
2. All shop connections shall be welded in accordance with the latest editions of the American Welding Society Standards D1.1 and D1.3. Flange to web welds shall be applied using an automatic sub-arc process. All shop welds shall meet or exceed design requirements.
3. All field connections shall be bolted. High strength bolts shall be installed in properly aligned holes, but need only be tightened to the snug tight condition. The snug tight condition is defined as the tightness that exists when all plies are in firm contact. This may usually be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. In actuality, snug tight is a degree of tightness, which will vary from joint to joint depending upon the thickness and degree of parallelism of the connected materials. In most joints the plies will pull together; however, in some joints, it may not be possible at snug to have contact throughout the faying surface area. Bolts shall be:

Primary Connections
ASTM A325 or A490

Secondary Connections
ASTM A307

Cold-formed sections shall be manufactured by precision roll or press forming. All dimensions shall be within applicable AISI or MBMA accepted tolerances and the formed member should have no excessive fluting, buckling, or waviness.

4. All structural framing members shall be cleaned to SSPC-2 and given one shop coat of industrial, quick-dry, lead-free, red or gray alkyd primer. This is a provisional shop coat. Recoating is not recommended.

B. PRIMARY STRUCTURAL FRAMING

1. Primary structural framing shall include the transverse rigid frames, lean-to rafters and columns, canopy beams, intermediate columns, mezzanine support girders, built-up endwall columns and rafters, portal frames, and wind columns.
2. Steel used in the fabrication of built-up and wide flange primary structural members shall have a minimum yield strength of 50 ksi. Pipes and tubes used in the fabrication of primary members shall have minimum yield strengths of 42 ksi and 46 ksi, respectively. Steels with different minimum yield strengths may be used when designated or approved by ACI's Director of Engineering.

C. SECONDARY STRUCTURAL MEMBERS

1. Secondary structural framing shall include the purlins, girts, eave struts, base angles, clips, and other miscellaneous structural parts.
2. Steel used in the fabrication of cold-formed structural members shall have a minimum yield of 55 ksi. ACI engineering may designate or approve Steels with different minimum yield strength.
3. Purlins and girts shall be roll-formed or press-formed with stiffening lips on the flanges. Stiffening lips on zee sections shall be formed at an angle of 50 degrees with the flanges, to facilitate nesting.
4. Eave struts shall be cold-formed Cee-sections with flanges angled to align with the roof slope and with webs aligned with the sidewall girt-line. Eave struts shall provide suitable fastening surfaces for both wall and roof sheets. Eave struts shall be fabricated using a 14-gage or 12-gage minimum substrate thickness.

5. A continuous base member shall be provided for attachment of the wall covering.
6. The structural framing members at all framed openings shall be adequate for the specified design loads.

ROOF, WALL, AND INTERIOR PANELS

A. GENERAL

Typical roof, wall, and interior panels shall be 29, 26, 24, or 22-gage galvanized or Galvalume™ coated steel (painted or unpainted) and roll-formed into various panel configurations.

B. BASE METAL

Galvanized coated steel used for roofing and wall panels shall conform to ASTM A653 SS50 Class 1 or SS80, G-90 coating class. Galvalume™ coated steel used for roofing and wall panels shall conform to ASTM A792 SS50 Class 1 or SS80, with a coating class of AZ50 for painted material or AZ55 for unpainted material.

C. PANEL DESCRIPTIONS

1. The "R" panel shall be precision roll-formed for a 3-foot wide coverage and shall have four major ribs tapering from 3 5/64 inches to 1 inch and spaced at 12 inches on center and 1 1/4 inches deep. The "R" panel is suitable for roofs, walls, liners, facades, and soffits.
2. The "PBR" panel has the same configuration as the "R" panel with the addition of a purlin bearing leg. The "PBR" panel is used primarily as a roof panel.
3. The "A" panel shall be precision roll-formed for a 3-foot wide coverage with a sloping contour shape. Major ribs shall be at 12 inches on center and shall be 1 1/8 inches deep. The "A" panel is suitable for walls, soffits, liners, and façades only.
4. The "M" panel shall be precision roll-formed for a 3-foot wide coverage and shall have 7 symmetrical ribs spaced at 6 inches on center and 51/64 inches deep. The "M" panel is suitable for roofs, walls, liners, facades, and soffits.
5. The "PBM" panel has the same configuration as the "M" panel with the addition of a purlin bearing leg. The "PBM" panel is used primarily as a roof panel.
6. The "R" and "PBR" panels are both classified by Underwriters Laboratory, Inc. for Class 90 wind uplift resistance under construction numbers 161 and 167 as referenced in the UL Building Materials Directory.

7. The "M" and "PBM" panels are both classified by Underwriters Laboratory, Inc. for Class 90 wind uplift resistance under construction number 39 as referenced in the UL Building Materials Directory.

D. FASTENERS

1. Panel to cold-formed fasteners shall be #12-14 x 1.25 inch (minimum) and panel-to-panel side lap fasteners shall be 1/4"-14 x 7/8 inch. All panel fasteners shall be zinc-plated self-drillers with steel backed flat bonded neoprene or EPDM washers and are available in color matched finishes.
2. Optional long-life corrosion resistant fasteners are available.

E. INSTALLATION OF ROOF AND WALL PANELS

1. Panels shall be continuous for roof and wall planes that are 30 feet long or less. Where required, panel laps shall be a minimum of 6 inches and shall occur at a supporting girt or purlin.
2. Sidewall and endwall panels shall be extended 1-1/2 inches below the finished floor elevation.

F. TRIM, FLASHING, GUTTERS, AND DOWNSPOUTS

1. Trim and/or flashing shall be furnished at the rake, corners, eaves, at framed openings, and wherever necessary to provide a weather tight and finished appearance.
2. Galvanized coated steel used for trim, flashing, gutters, downspout, and other miscellaneous uses shall conform to ASTM A653 SS50 Class 2 or CS Type B, with a G-90 coating class. Galvalume™ coated steel used for flashing shall conform to ASTM A792 SS50 B, with an AZ50 coating class for pre-painted and AZ55 coating class for unpainted material.
3. Gutters shall be formed to match the profile of the rake trim and equipped with adjustable supports at 36 inches on center. Downspouts shall be equipped with wall attachments and 45-degree elbows at the floor line.

ACCESSORIES

A. PERSONNEL DOORS

1. Door leaves shall be 1 3/4 inches thick, full flush, fabricated from 20-gage galvanized sheet and bonderized for paint adherence. The core material shall be a one-piece polystyrene core bonded to the face sheets with a two-component epoxy adhesive. Doors shall have a "U" factor of 0.16 and an STC of 32.
2. Doorframes shall be 16-gauge galvanized steel with reinforced recessed hinge plates.

3. Doors shall be furnished with cylindrical locksets and prepared for 4 1/2 inch x 4 1/2 inch NRP hinges.
4. Door leaves and frames shall be prime coated with one coat of white paint and oven-dried to produce a hard, long-lasting surface.
5. The threshold shall be an extruded aluminum shape and shall provide a positive weather seal.

B. ALUMINUM WINDOWS

Aluminum windows shall be specially designed for installation with the exterior wall panels. Windows shall be complete with latch, removable half-screens, weather-stripping, and provision for installation of a storm sash. Windows shall be factory glazed using vinyl-glazing beads and shall be back-bedded. All structural members shall be extruded aluminum.

C. VENTILATORS

Ventilators shall be gravity type fabricated from galvanized or Galvalume™ coated steel and shall be continuous, furnished in ten-foot lengths with end caps and splice components provided for continuous installation.

Continuous ventilators may also include an optional damper. When required, dampers shall provide an adjustable opening at the throat and shall be of the manually operated type.

Round ventilators are designed with interior baffles and exterior wind banks to provide maximum flow. Round ventilators shall be furnished with bird-screens.

Ventilators for roofs with colored painted panels shall be supplied in white or optional color.

D. LIGHT TRANSMITTING PANELS

Light transmitting panels (LTP) are fabricated from high strength fiberglass reinforced resin panels with a random strand mat of cut glass fibers. Roof LTPs also incorporate a heavy mesh of woven fiberglass cloth (2 ounces per square foot).

LTPs shall have a profile matching the roof or wall panel and are a minimum of 1/16 of an inch thick, with a nominal weight of 8 ounces per square foot.

Translucent panels are white and have a nominal light transmittance of 55% (± 5%) per ASTM D1494.

E. LOUVERS

Louvers can be furnished with either fixed or adjustable blades. Fixed louvers have blades set in a permanent position while adjustable louvers can be moved with a hand crank or chain operator.

Louvers shall be furnished to match the wall panel color.

F. OVERHEAD DOORS
Framing members as described in the secondary framing section shall be furnished for all overhead doors, complete with support headers.

G. INSULATION
Insulation, when required, shall be blanket type fiberglass with a vapor barrier or other specified type adequate to satisfy building occupancy requirements. Thickness and density shall be determined by the required "R" factor.

BUILDING ANCHORAGE AND FOUNDATION

A. ANCHORAGE
The building anchor rods and related anchorage shall be designed by a licensed design professional to resist the column reactions resulting from the loading combinations specified in the appropriate building code. ACI will size the anchor rods and recommend the minimum number required for each column based on the allowable tension and shear for ASTM A307 grade anchor material.

Anchor type and embedment is beyond the scope of work provided by ACI and must be provided by a licensed design professional retained by the Buyer.

B. FOUNDATION
The building foundation shall be designed by a licensed design professional to support the building reactions in addition to other loads imposed on the building by the use or occupancy. Foundation design is beyond the scope of work performed by ACI and must be provided by a licensed design professional retained by the Buyer.

Galvalume™ is a registered trademark of BIEC International, Inc.

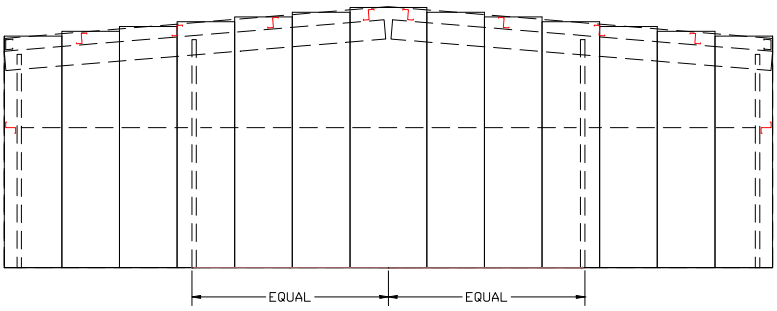
APPENDIX G

ACI STANDARD ENDWALL SYSTEMS

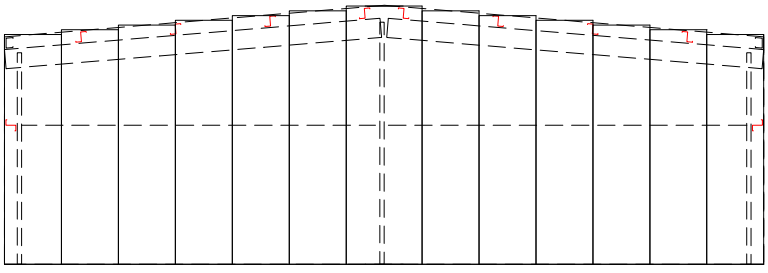
A. SHEETED ENDWALL SYSTEM

Type IR and IA endwalls have post and beam construction with flush or bypass endwall grits and cable or diaphragm bracing. Endwall columns are braced at girt locations.

The framing members are designed to support half of the roof and sidewall bay loads and the full endwall loads. This type of wall may be braced laterally either by diaphragm action or by cable bracing. Diaphragm bracing requires "R" or "M" panels and base angles continuously attached to a floor slab.



ENDWALL TYPE IR
STANDARD ENDWALL COLUMN SPACING

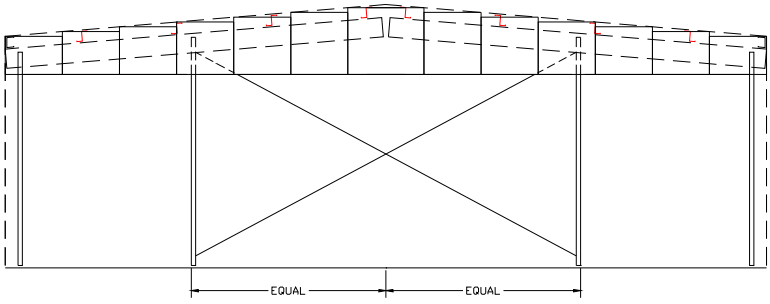


ENDWALL TYPE IA
ALTERNATE ENDWALL COLUMN SPACING
(Column located at ridge)

B. GABLE SHEETED ENDWALL SYSTEM

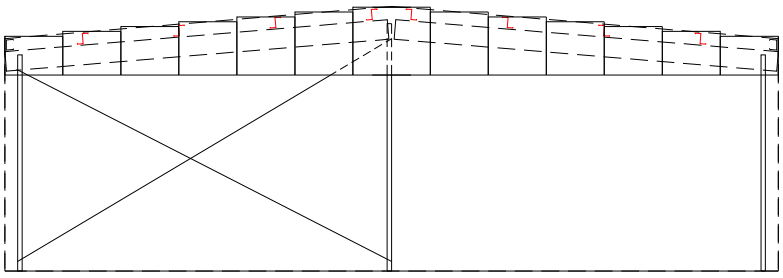
Type IIR and IIA endwalls have post and beam construction with flush or bypass endwall grits and cable bracing. Endwall columns may be braced by collateral wall system provided by others.

The framing members are designed to support half of the roof and sidewall bay loads and the full endwall loads. This type of wall must be braced laterally by cable bracing.



ENDWALL TYPE IIR

STANDARD ENDWALL COLUMN SPACING



ENDWALL TYPE IIA

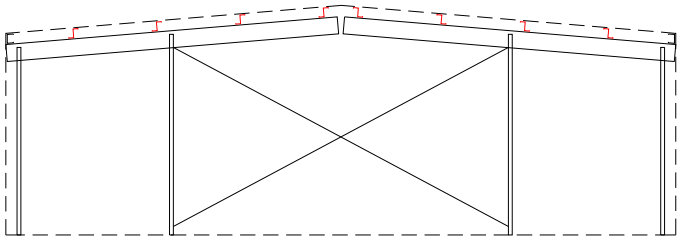
ALTERNATE ENDWALL COLUMN SPACING

(Column located at ridge)

C. NON-SHEETED ENDWALL SYSTEM

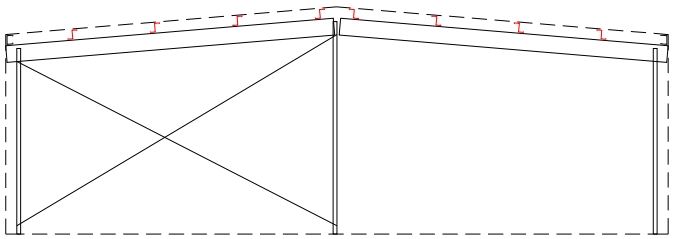
Type IIIR and IIIA endwalls have post and beam construction with flush or bypass endwall grits and cable bracing. Endwall columns may be braced by collateral wall system provided by others.

The framing members are designed to support half of the roof and sidewall bay loads and the full endwall loads. This type of wall must be braced laterally by cable bracing.



ENDWALL TYPE IIIR

STANDARD ENDWALL COLUMN SPACING



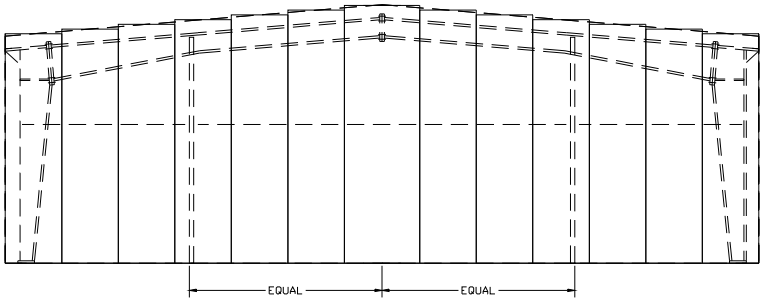
ENDWALL TYPE IIIA

ALTERNATE ENDWALL COLUMN SPACING

(Column located at ridge)

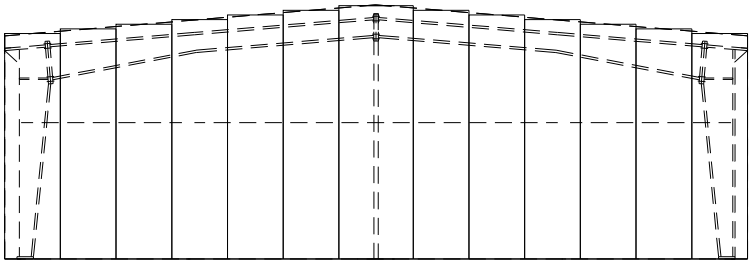
D. SHEETED ENDWALL SYSTEM

Type IVR and IVA endwalls have full- or half-load rigid frames. Endwall columns are braced at wall girt locations. This type of wall does not require cable bracing and modular rigid frame columns may be turned to support endwall girts.



ENDWALL TYPE IVR

STANDARD ENDWALL COLUMN SPACING



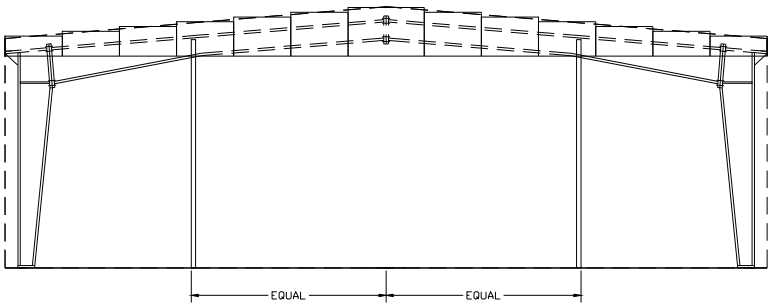
ENDWALL TYPE IVA

ALTERNATE ENDWALL COLUMN SPACING

(Column located at ridge)

E. GABLE SHEETED ENDWALL SYSTEM

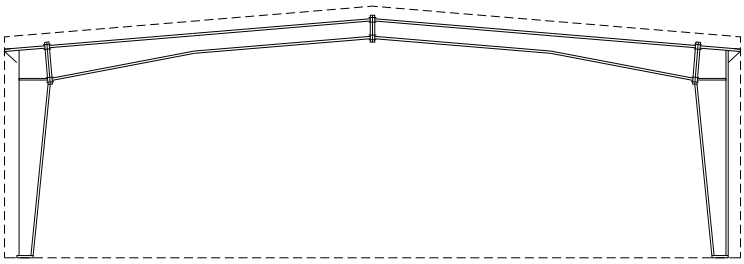
Type V endwalls have full- or half-load rigid frames. Endwall columns are braced at wall girt locations. This type of wall does not require cable bracing and modular rigid frame columns may be turned to support endwall girts.



ENDWALL TYPE V

F. NON-SHEETED ENDWALLS

Type VI endwalls have full- or half-load rigid frames with no girts, endposts, or panels. This type of wall does not require cable bracing.



ENDWALL TYPE VI

G. ENDWALL BY OTHERS

ENDWALL TYPE VII

Type VII endwalls are completely open for load bearing framing or walls by others.

APPENDIX H

ACI STANDARD FRAME TYPES

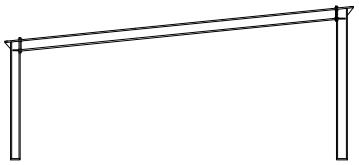
SCF
Straight Column Frame
Single Span
Straight Columns
Straight or Tapered Rafters

SCFM
Straight Column Frame Multi-span
Multi-Span
Straight Columns
Straight or Tapered Rafters

TCF
Tapered Column Frame
Single Span
Tapered Columns
Tapered Rafters

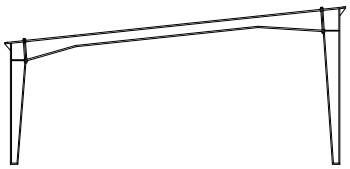
TCFM
Tapered Column Frame Multi-span
Multi-Span
Tapered Columns
Tapered Rafters

SSF
Single Slope Frame
Single Span
Single Slope
Straight Columns
Straight or Tapered Rafter

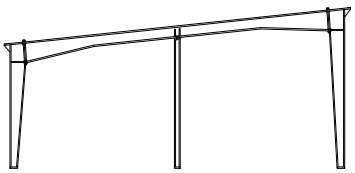


SSFM
Single Slope Frame Multi-span
Multi-Span
Single Slope
Straight Columns
Straight Rafter

SST
Single Slope Frame Tapered Column
Single Span
Single Slope
Tapered Columns
Tapered Rafter



SSTM
Single Slope Frame Tapered Column Multi-span
Multi-Span
Single Slope
Tapered Columns
Tapered Rafter



APPENDIX J

SPECIAL INSPECTION REQUIREMENTS

A. Introduction

Buildings with a B wind exposure located in an area with 120 mph or greater design wind speed or buildings with a C or D wind exposure in an area with 110 mph or greater design wind speed require special inspections and a Quality Assurance Plan. In addition, buildings with a seismic design category of C or greater must also have a Quality Assurance Plan involving special inspections. According to **Sections 1706** and **1707** of the 2000 IBC, the following quality assurance plan shall be implemented for structures in high seismic or high velocity wind zones.

B. Periodic Special Inspections

The following items will require periodic special inspection during the erection process:

1. Placement, size, and extension of anchors.
2. Installation of cable or rod bracing.
3. Verification of identification markings for high strength bolts and nuts.
4. Installation of high strength bolts pre-tensioned by the turn-of-the nut method when match-marking is used.
5. Attachment of secondary members to primary framing.
6. Attachment of panels to secondary members.
7. Installation of sub-framing at window and walk door openings.
8. Installation and load rating of overhead doors.
9. Field placement of single pass fillet welds less than or equal to 5/16".
10. Field placement of floor deck puddle welds.

C. Continuous Special Inspections

The following items will require continuous special inspection during the erection process:

1. Installation of high strength bolts pre-tensioned by the turn-of-the nut method when match-marking is not used.
2. Field placement of single pass fillet welds greater than 5/16", multi-pass fillet welds, and complete or partial penetration groove welds.

D. Definitions

Section 1702 of the code gives the following definitions:

Continuous Special Inspection - The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

Periodic Special Inspection - The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of work.

E. Special Inspectors

According to **Section 1704** of the code, it is the responsibility of the owner or the registered design professional in responsible charge acting as the owner's agent to employ one or more special inspectors to provide inspections during construction. The special inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the building official, for inspection of the particular type of construction or operation requiring special inspection.

It is the responsibility of the permit applicant to submit this statement of special inspections as a condition for permit issuance. In addition to this list of required

inspections, the permit applicant shall include a list of the individuals, approved agencies, or firms intended to be retained for conducting such inspections.

Special inspectors shall keep records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge (not the Systems Engineered Metal Building Structural Engineer of Record). Reports shall indicate that work inspected was performed in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge (not the Systems Engineered Metal Building Structural Engineer of Record) prior to the completion of that phase of the work. A final report of inspections documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted periodically at a frequency agreed upon by the permit applicant and the building official prior to the start of work.

F. Reference Standards

Welding inspection shall be in compliance with **AWS D1.1** and **D1.3**. The basis for welding inspector qualification shall be **AWS D1.1** and **D1.3**.

Bolt and nut material identification shall be in compliance with the **AISC Manual of Steel Construction (ASD), 9th Edition, Section A3.4** and **ASTM A325** or **ASTM A490**.Inspection of high-strength bolted connections shall be in compliance with **Section 8(d)(1) of the Research Council on Structural Connections, Specification for Structural Joints Using ASTM A325 or A490 Bolts**.

Inspection of the installation of all supplied components shall be in accordance with the **ACI Erection Manua**l and the details shown on ACI erection drawings marked "For Construction" and sealed by a professional engineer.

Inspection of the installation of overhead doors shall be in accordance with the Erection Manual and/or details provided by the door manufacturer. Verification of the load rating for overhead doors shall be required from the door manufacturer.

G. Statement of Responsibility

Section 1706.3 of the code requires each contractor responsible for the construction of the components listed in this Quality Assurance Plan to submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work. The contractor's statement of responsibility shall contain the following:

1. Acknowledgement of awareness of the special requirements contained in the quality assurance plan;
2. Acknowledgement that control will be exercised to obtain conformance with the construction documents approved by the building official;
3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting, and the distribution of reports; and
4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.