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Structural Building Evaluation Report

of the

Fine Arts Building

for

Houston School District

423 W. Pine
Houston, Missouri 65483

August 8, 2008

By Ronald Hamme, P.E.

1715 S. Kansas Ave.
Springfield, MO 65807
417-731-3001
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PINNACLE
DESIGN CONSULTANTS

August 8, 2008

Dr.Dan Vandiver
Houston School
423 W. Pine
Houston, MO 65483

Re: Evaluation of the Fine Arts Building

Dear Dr. Vandiver:

On July 23, 2008, I inspected the above-referenced structure with respect to its use and sustainability for future uses within the district.

This structure is a three story masonry structure completed in 1921. It currently has classrooms, offices, restrooms, as well as an auditorium.

A visual inspection of the exterior was performed first and the following photos show some areas of concern.

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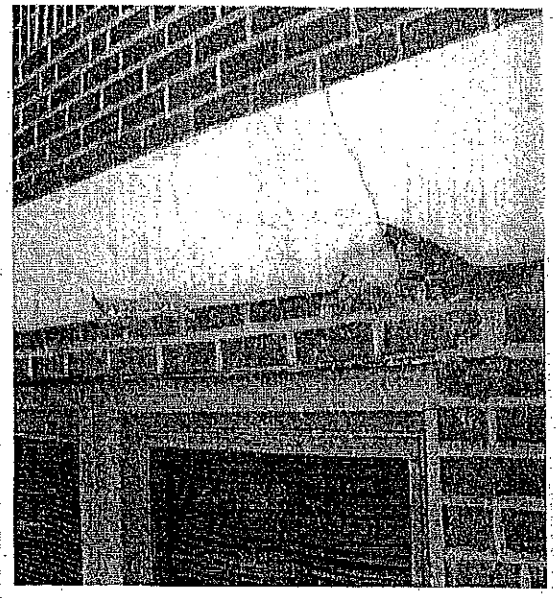
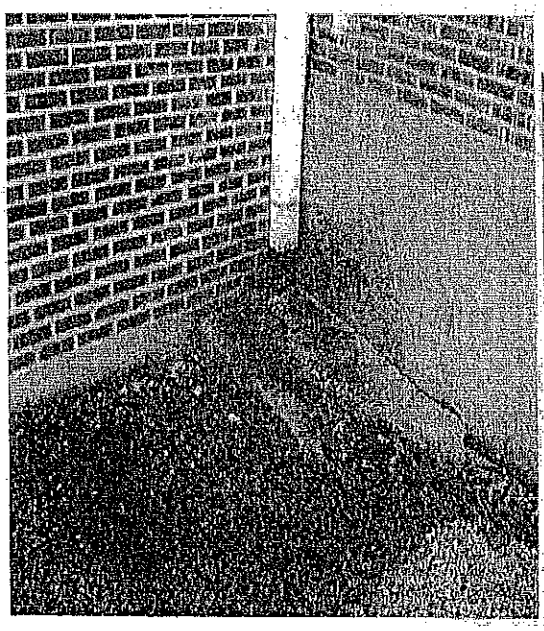


These photos show some cracks in the foundation walls. These are most likely caused from settlement, and appear to have occurred some time ago. The cause of this settlement might be attributed to drainage and runoff. The following photos show some downspout locations.



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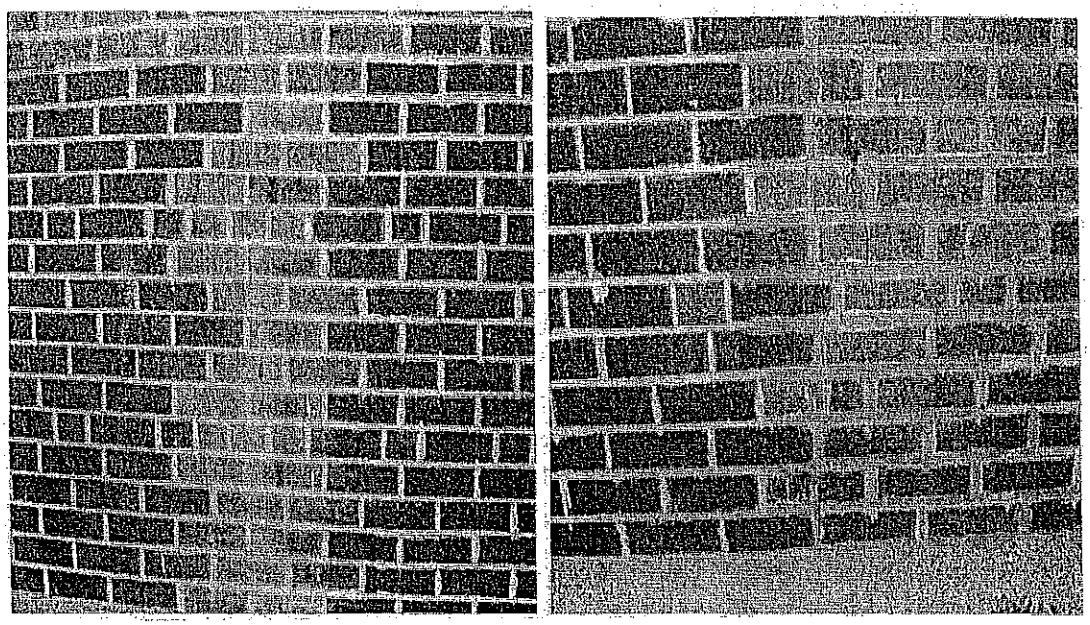
These downspouts do not allow water to properly drain away from the building. This accumulation of water can cause excessive moisture in the sub grade and subsequent settlement.

The following photos show some discoloration in the exterior brick in the areas between windows in the lower level. The following photos show this.



It appears that this brick had been repaired or replaced. It is difficult to determine what happened in these areas; however the repairs appear to have been adequate.

The interior structure was analyzed for suitability of occupancy.

The two occupancies that were considered are office, and classroom.

The following are the loading criteria for each.

Office:

Live Load: 100 P.S.F.
Dead Load: 20 P.S.F.

Classroom

Live Load: 40 P.S.F.
Dead Load: 20 P.S.F.

The framing plans that are shown in the following sheets are based on a non destructive investigation and are the engineers' best interpretation of what is there and may not be entirely accurate.

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In area A, this is the framing above the lower hallway. This framing was determined to be rough sawn 2x4 spaced 16" o.c. spanning 11'. These members are inadequate for either loading condition, and would have to be reinforced in order to accommodate the required loading.

In area B, the floor framing was determined to be 2x10's spaced 16" o.c. spanning 15'. These framing members are inadequate for either loading condition; however less work will be required to reinforce these to meet classroom loading.

In area C, The floor framing consists of 2x12's spaced 16" o.c. spanning 13'-11". These joists are capable of supporting the classroom loading but would need to be reinforced in order to facilitate the office loading. The beams that support these joists were inaccessible to inspect and determine their size so there might still need to be some modifications made.

For simplicity, all modifications to be made will accommodate the office loading of 100 P.S.F. live load.

Area A will require the addition of a 4x4x16 ga. C channels to each joist with bearing on each wall. This can be fastened to the existing wood joist with #8 wood screws 16" o.c. staggered.

Area B will require the addition of a 10x2x16ga. C channels on every other joist installed similar to area A.

Area C will require the addition of 12x2.5x16ga. C channels on every other joist installed similar to area A.
All supporting beams will require the addition of flitch plates on each side of the existing beams to accommodate this additional load.
The foundations that have settled may be underpinned and jacked to bring back to level. At a minimum, the downspouts will have to be reworked and some regarding will be necessary.

The roof structures have not been investigated as their loading will not change. However there may need to be some repair work required to meet current codes and or the addition of equipment.

This is a cursory structural evaluation of structural loading. This does not address any lateral loading analysis, upgrading of any of the plumbing, electrical, or H.V.A.C. systems, nor does it describe any work necessary to remediate unsuitable materials such as asbestos.

If you have any questions or need any additional information, please do not hesitate to contact me.

Sincerely,

Ronald Hamme, P.E.
Pinnacle Design Consultants, L.L.C.

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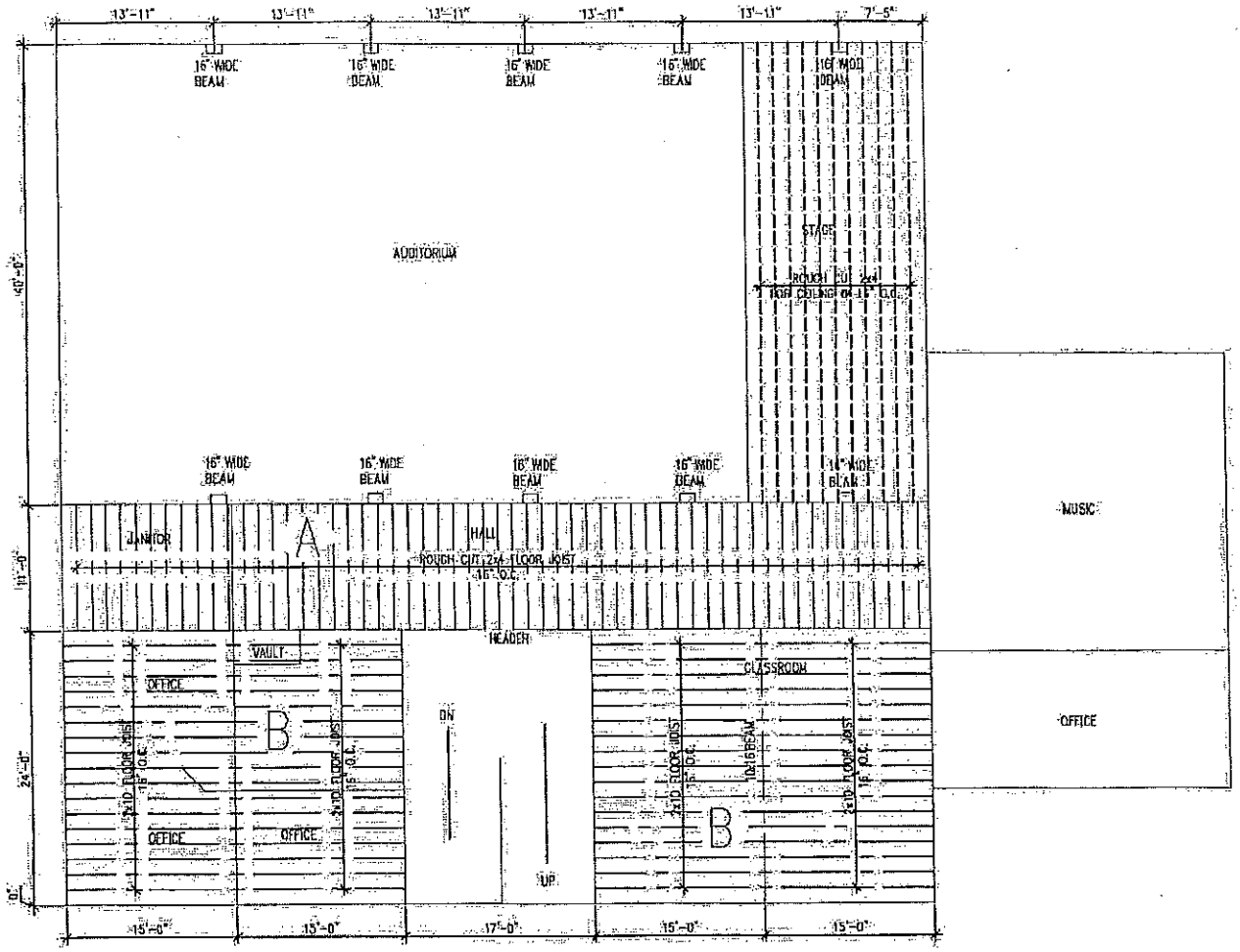

SECOND FLOOR

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FINE ARTS BUILDING

HOUSTON SCHOOL DISTRICT

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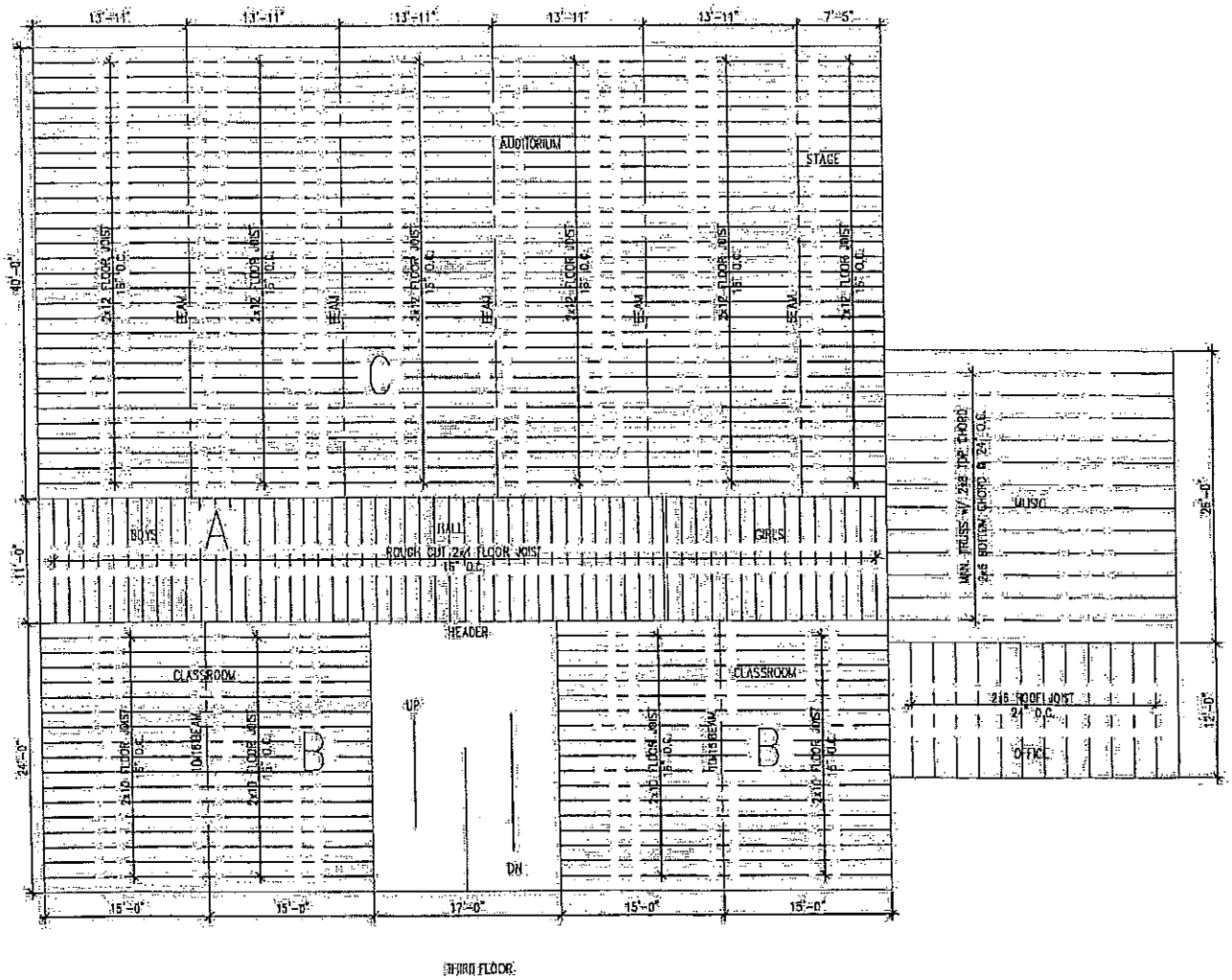
SHEET NO. 1 OF 2

DATE 08/07/08

PROJ. NO. 989-06



THIRD FLOOR

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SHEET NO. 2 OF 2

DATE 08/07/08

PROJ. NO. 989-06

TABLE 4-1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS

Occupancy or Use	Uniform psf (kN/m²)	Conc. lb (kN)
Apartments (see *Residential*)		
Access floor systems		
Office use	50 (2.4)	2,000 (8.9)
Computer use	100 (4.79)	2,000 (8.9)
Armories and drill rooms	150 (7.18)	
Assembly areas and theaters		
Fixed seats (fastened to floor)	60 (2.87)	
Lobbies	100 (4.79)	
Movable seats	100 (4.79)	
Platforms (assembly)	100 (4.79)	
Stage floors	150 (7.18)	
Balconies (exterior)	100 (4.79)	
On one- and two-family residences only, and not exceeding 100 ft² (9.3 m²)	60 (2.87)	
Bowling alleys, poolrooms, and similar recreational areas	75 (3.59)	
Catwalks for maintenance access	40 (1.92)	300 (1.33)
Corridors		
First floor	100 (4.79)	
Other floors, same as occupancy served except as indicated		
Dance halls and ballrooms	100 (4.79)	
Decks (patio and roof)		
Same as area served, or for the type of occupancy accommodated		
Dining rooms and restaurants	100 (4.79)	
Dwellings (see *Residential*)		
Elevator machine room grating (on area of 4 in.² [2,580 mm²])		300 (1.33)
Finish light floor plate construction (on area of 1 in.² [645 mm²])		200 (0.89)
Fire escapes	100 (4.79)	
On single-family dwellings only	40 (1.92)	
Fixed ladders	See Section 4.4	
Garages (passenger vehicles only)	40 (1.92)[a,b]	
Trucks and buses		
Grandstands (see *Stadiums and arenas, Bleachers*)		
Gymnasiums—main floors and balconies	100 (4.79)	
Handrails, guardrails, and grab bars	See Section 4.4	
Hospitals		
Operating rooms, laboratories	60 (2.87)	1,000 (4.45)
Patient rooms	40 (1.92)	1,000 (4.45)
Corridors above first floor	80 (3.83)	1,000 (4.45)
Hotels (see *Residential*)		
Libraries		
Reading rooms	60 (2.87)	1,000 (4.45)
Stack rooms	150 (7.18)[c]	1,000 (4.45)
Corridors above first floor	80 (3.83)	1,000 (4.45)
Manufacturing		
Light	125 (6.00)	2,000 (8.90)
Heavy	250 (11.97)	3,000 (13.40)
Marquees	75 (3.59)	
Office Buildings		
File and computer rooms shall be designed for heavier loads based on anticipated occupancy		
Lobbies and first floor corridors	100 (4.79)	2,000 (8.90)
Offices	50 (2.40)	2,000 (8.90)
Corridors above first floor	80 (3.83)	2,000 (8.90)
Penal Institutions		
Cell blocks	40 (1.92)	
Corridors	100 (4.79)	
Residential		
Dwellings (one- and two-family)		
Uninhabitable attics without storage	10 (0.48)	
Uninhabitable attics with storage	20 (0.96)	
Habitable attics and sleeping areas	30 (1.44)	
All other areas except stairs and balconies	40 (1.92)	
Hotels and multifamily houses		
Private rooms and corridors serving them	40 (1.92)	
Public rooms and corridors serving them	100 (4.79)	
Reviewing stands, grandstands, and bleachers	100 (4.79)[d]	

TABLE 4-1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS (continued)

Occupancy or Use	Uniform psf (kN/m^2)	Conc. lb (kN)
Roofs		
Ordinary flat, pitched, and curved roofs	20 (0.96)[b]	
Roofs used for promenade purposes	60 (2.87)	
Roofs used for roof gardens or assembly purposes	100 (4.79)	
Roofs used for other special purposes	[i]	[i]
Awnings and canopies		
Fabric construction supported by a lightweight rigid skeleton structure	5 (0.24) nonreduceable	
All other construction	20 (0.96)	
Primary roof members, exposed to a work floor		
Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages		2,000 (8.9)
All other occupancies		300 (1.33)
All roof surfaces subject to maintenance workers		300 (1.33)
Schools		
Classrooms	40 (1.92)	1,000 (4.45)
Corridors above first floor	80 (3.83)	1,000 (4.45)
First-floor corridors	100 (4.79)	1,000 (4.45)
Scuttles, skylight ribs, and accessible ceilings		200 (0.89)
Sidewalks, vehicular driveways, and yards subject to trucking	250 (11.97)[e]	8,000 (35.60)[f]
Stadiums and arenas		
Bleachers	100 (4.79)[d]	
Fixed seats (fastened to floor)	60 (2.87)[d]	
Stairs and exit ways	100 (4.79)	[g]
One- and two-family residences only	40 (1.92)	
Storage areas above ceilings	20 (0.96)	
Storage warehouses (shall be designed for heavier loads if required for anticipated storage)		
Light	125 (6.00)	
Heavy	250 (11.97)	
Stores		
Retail		
First floor	100 (4.79)	1,000 (4.45)
Upper floors	75 (3.59)	1,000 (4.45)
Wholesale, all floors	125 (6.00)	1,000 (4.45)
Vehicle barriers	See Section 4.4	
Walkways and elevated platforms (other than exit ways)	60 (2.87)	
Yards and terraces, pedestrian	100 (4.79)	

[a] Floors in garages or portions of a building used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of Table 4-1 or the following concentrated load: (1) for garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 lb (13.35 kN) acting on an area of 4.5 in. by 4.5 in. (114 mm by 114 mm) footprint of a jack; and (2) for mechanical parking structures without slab or deck that are used for storing passenger car only, 2,250 lb (10 kN) per wheel.

[b] Garages accommodating trucks and buses shall be designed in accordance with an approved method, which contains provisions for truck and bus loadings.

[c] The loading applies to stack room floors that support nonmobile, double-faced library book stacks subject to the following limitations: (1) The nominal book stack unit height shall not exceed 90 in. (2290 mm); (2) the nominal shelf depth shall not exceed 12 in. (305 mm) for each face; and (3) parallel rows of double-faced book stacks shall be separated by aisles not less than 36 in. (914 mm) wide.

[d] In addition to the vertical live loads, the design shall include horizontal swaying forces applied to each row of the seats as follows: 24 lb per linear ft of seat applied in a direction parallel to each row of seats and 10 lb per linear ft of seat applied in a direction perpendicular to each row of seats. The parallel and perpendicular horizontal swaying forces need not be applied simultaneously.

[e] Other uniform loads in accordance with an approved method, which contains provisions for truck loadings, shall also be considered where appropriate.

[f] The concentrated wheel load shall be applied on an area of 4.5 in. by 4.5 in. (114 mm by 114 mm) footprint of a jack.

[g] Minimum concentrated load on stair treads (on area of 4 in.^{2} [2,580 mm^2]) is 300 lb (1.33 kN).

[h] Where uniform roof live loads are reduced to less than 20 lb/ft^2 (0.96 kN/m^2) in accordance with Section 4.9.1 and are applied to the design of structural members arranged so as to create continuity, the reduced roof live load shall be applied to adjacent spans or to alternate spans, whichever produces the greatest unfavorable effect.

[i] Roofs used for other special purposes shall be designed for appropriate loads as approved by the authority having jurisdiction.

TABLE 4-2 LIVE LOAD ELEMENT FACTOR, K_{LL}

Element	K_{LL}[a]
Interior columns	4
Exterior columns without cantilever slabs	4
Edge columns with cantilever slabs	3
Corner columns with cantilever slabs	2
Edge beams without cantilever slabs	2
Interior beams	2
All other members not identified including:	1
Edge beams with cantilever slabs	
Cantilever beams	
One-way slabs	
Two-way slabs	
Members without provisions for continuous shear transfer normal to their span	

[a] In lieu of the preceding values, K_{LL} is permitted to be calculated.