



CPWR - The Center for Construction Research and Training
Fall Hazard Identification and Control Audit of the Mandarin Building

City Center Project

Las Vegas, Nevada

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Submitted by

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Introduction:

The fall hazard audit of the Mandarin building included evaluation of 8 of the buildings floors. The rationale for floor selection was to select a sample floor per each phase of construction identified by the auditor. For example, the lower level floors were more complete and were in the process of installing and finishing drywall, where higher level floors still had unprotected edges. See the attached Fall-Safe audit report to review the audit report by location.

The fall hazards identified during the audit included floor holes, ladder use, scissor lift use, stairways, and unprotected sides and edges 6' 09 TT9 Tw(o)-2(he bovhe e l)T0.0091 Tc 0.0059 Tw 200669 0 Tdower leves. Th(he were

- x 1 hole cover was not secured (4.17%, n=24).
- x 4 hole covers created tripping hazards. The trip hazard were created from protruding nails (13.79%, n=29)
- x All hole covers were free from obvious defects and secured, with the exception of one (3.45%, n=29)
- x There were 2 open holes audited with no contro

x 1 handrail audited was not capable of withstanding 200 pounds. (25%, n=4).

Conclusion

The fall hazards identified in the building audit, especially worker behavior created hazards, were starkly different than in the Aria building. Employee use of ladders on the Mandarin site was nearly perfect, and the hazards identified were not as serious. This site also had many more holes than the Aria building, yet the holes were more often properly protected. The exception being the 2 open holes with no protection.

The majority of the fall hazards identified that were not properly controlled in this audit were in the areas of guardrails and hole covers. The majority of the guardrails that required toeboards utilized the screens that meet the 200 pound strength requirement if anchored properly. In most cases, the screens had become loose and were not re-secured properly creating a falling object and falling hazard. Also, some of the wire rope guardrails were not properly flagged, although not as many deficiencies as the Aria site. The low frequency ladder deficiencies included not properly setting up the ladder and one instance of poor access egress. One drywall bucket being used as a ladder and was identified as having no safe intervention. Scissor lift hazards were higher on this site with fall hazards created by not closing the gate / chain, and by not standing firmly on the floor of the basket. Additionally two scissor lifts were identified as not being used properly.

Fall hazards that were well controlled were those that utilized personal fall arrest. Mandarin had 3 instances of personal fall arrest usage with all requirements being met. All stairways audited met the requirements with one exception of a handrail not meeting a 200 pound breaking strength.

This site utilized engineering controls (guardrails, hole covers) over personal fall arrest which is a preferred method. The recommendation would again be to implement an intensive fall hazard control maintenance program that ensured the security. Strength and required identifiers for all guardrails and hole covers. Personnel should be trained in the requirements of hole covers and guardrails as well as user training for all types of ladders and scissor lifts and aerial lifts.

The Site Summary Score of 82.33% would be considered an acceptable score if this contractor were part of the Fall-Safe program. On average the baseline audit scores of the Fall-Safe contractors were much lower than this score (approximately 70%). Although it could be argued that this audit would not be considered a baseline audit due to the recent efforts on site.

FallSafe

10	Adequate access/egress.	0
	Raw Score: 80.00%	Adjusted Score: 80.00%

Exposure: Unprotected sides and edges 6' or more above lower level.

Intervention:	<u>Guardrail System</u>	Possible:	100%
1	Top edge between 39" and 45" and at least 2"x4" construction.		1
2	Midrail centered and at least 1"x6" or 2"x4" construction.		1
3	Guardrail capable of withstanding 200 lb. force.		0
4	Midrails capable of withstanding 150 lb. force.		0
5	Toeboards installed and structurally sound.		0
6	Posts no more than 8' apart and at least 2"x4" construction.		0
7	Smooth and free from defects.		0
8	Being used properly and not being bypassed.		0
	Raw Score: 25.00%	Adjusted Score: 25.00%	

Intervention:	<u>Guardrail System</u>	Possible:	100%
1	Top edge between 39" and 45" and at least 1/4" diameter.		1
2	Wire rope does not deflect below 39" with 200 lbs. applied.		1
3	Flagged every 6'.		0
4	Midrail centered.		1
5	Toeboards		

2 Wire rope doesnot deflect below 39" with 200lbs. applied.

1	Top edge between 39" and 45" and at least 1/4" diameter.	1
2	Wire rope does not deflect below 39" with 200 lbs. applied.	1
3	Flagged every 6'.	1
4	Midrail centered.	1
5	Toeboards installed and structurally sound.	0
6	Smooth and free from defects.	1
7	Being used properly and not being bypassed.	1

Raw

Intervention:

1	Designed to support 2 times the intended load.	1
2	Secured.	1
3	Color coded or labeled.	0
4	Installed so as to eliminate tripping hazards.	1
5	System free from obvious defects.	1
6	Being used properly and not being bypassed.	1
	Raw Score: 83.33%	Adjusted Score: 83.33%

Exposure: Floor Holes.

Intervention:	<u>Cover</u>	Possible:	100%
1	Designed to support 2 times the intended load.		1
2	Secured.		1
3	Color coded or labeled.		1
4	Installed so as to eliminate tripping hazards.		1
5	System free from obvious defects.		1
6	Being used properly and not being bypassed.		1
	Raw Score: 100.00%	Adjusted Score: 100.00%	
		Location Summary Score:	77.47%

Location: Floor 36

Number Exposed: 0

Exposure: Unprotected sides and edges 6' or more above lower level.

Intervention:	<u>Guardrail System</u>	Possible:	100%
1	Top edge between 39" and 45" and at least 1/4" diameter.		1
2	Wire rope does not deflect below 39" with 200 lbs. applied.		1
3	Flagged every 6'.		1
4	Midrail centered.		1
5	Toeboards installed and structurally sound.		0
6	Smooth and free from defects.		1
7	Being used properly and not being bypassed.		1

RawScore: 85.71%

AdjustedScore: 85.71%

Exposure: FloorHoles.

Intervention: Cover

Possible: 100%

- | | | |
|---|--|---|
| 1 | Designed to support 2 times the intended load. | 1 |
| 2 | Secured. | 1 |
| 3 | Color coded or labeled. | 1 |
| 4 | Installed so as to eliminate tripping hazards. | 1 |
| 5 | System free from obvious defects. | 1 |
| 6 | Being used properly and not being bypassed. | 1 |

RawScore: 100.00%

AdjustedScore: 100.00%

Intervention: GuardrailSystem

Possible: 100%

- | | | |
|---|---|---|
| 1 | Top edge between 39" and 45" and at least 1/4" diameter. | 1 |
| 2 | Wire rope does not deflect below 39" with 200 lbs. applied. | 1 |
| 3 | Flagged every 6'. | 1 |
| 4 | Midrail centered. | 1 |
| 5 | Toeboards installed and structurally sound. | 0 |
| 6 | Smooth and free from defects. | 1 |
| 7 | Being used properly and not being bypassed. | 1 |

RawScore: 85.71%

AdjustedScore: 85.71%

Exposure: Unprotected sides and edges 6' or more above lower level.

Intervention: GuardrailSystem

Possible: 100%

- | | | |
|---|---|---|
| 1 | Top edge between 39" and 45" and at least 1/4" diameter. | 1 |
| 2 | Wire rope does not deflect below 39" with 200 lbs. applied. | 1 |
| 3 | Flagged every 6'. | 1 |
| 4 | Midrail centered. | 1 |
| 5 | Toeboards installed and structurally sound. | 0 |
| 6 | Smooth and free from defects. | 0 |
| 7 | Being used properly and not being bypassed. | 1 |

RawScore: 71.43%

AdjustedScore: 71.43%

Exposure: FloorHoles.

Intervention: Cover

Possible: 100%

- | | | |
|---|--|---|
| 1 | Designed to support 2 times the intended load. | 1 |
| 2 | Secured. | 1 |
| 3 | Color coded or labeled. | 0 |
| 4 | Installed so as to eliminate tripping hazards. | 1 |
| 5 | System free from obvious defects. | 1 |
| 6 | Being used properly and not being bypassed. | 1 |

RawScore: 83.33%

AdjustedScore: 83.33%

Exposure: Unprotected sides and edges 6' or more above lower level.

Intervention: Guardrail System

Possible: 100%

- | | | |
|---|---|---|
| 1 | Top edge between 39" and 45" and at least 1/4" diameter. | 1 |
| 2 | Wire rope does not deflect below 39" with 200 lbs. applied. | 1 |
| 3 | Flagged every 6'. | 1 |
| 4 | Midrail centered. | 1 |
| 5 | Toeboards installed and structurally sound. | 0 |
| 6 | Smooth and free from defects. | 1 |
| 7 | Being used properly and not being bypassed. | 1 |

RawScore: 85.71%

AdjustedScore: 85.71%

Exposure: FloorHoles.

Intervention: Cover

Possible: 100%

- | | | |
|---|--|---|
| 1 | Designed to support 2 times the intended load. | 1 |
| 2 | Secured. | 1 |
| 3 | Color coded or labeled. | 1 |
| 4 | Installed so as to eliminate tripping hazards. | 1 |
| 5 | System free from obvious defects. | 1 |
| 6 | Being used properly and not being bypassed. | 1 |

RawScore: 100.00%

AdjustedScore: 100.00%

Exposure: Unprotected sides and edges 6' or more above lower level.

Intervention: Guardrail System

Possible: 100%

- | | | |
|---|---|---|
| 1 | Top edge between 39" and 45" and at least 1/4" diameter. | 1 |
| 2 | Wire rope does not deflect below 39" with 200 lbs. applied. | 1 |
| 3 | Flagged every 6'. | 1 |
| 4 | Midrail centered. | 1 |
| 5 | Toeboards installed and structurally sound. | 0 |
| 6 | Smooth and free from defects. | 1 |
| 7 | Being used properly and not being bypassed. | 1 |

RawScore: 85.71%

AdjustedScore: 85.71%

Exposure: Floor Holes.

Intervention: Cover

RawScore: 83.33%

AdjustedScore: 83.33%

Exposure: FloorHoles.

Intervention: Cover

Possible: 100%

- | | | |
|---|--|---|
| 1 | Designedo support2 times the intendedload. | 1 |
| 2 | Secured. | 1 |
| 3 | | |

LocationSummaryScore: 85.71%

Location: Floor33

NumberExposed: 15

Exposure: Unprotectedsidesandedges6' or more abovelower level.

Intervention:	<u>GuardrailSystem</u>	Possible:	100%
1	Topedgebetween39" and45" andat least1/4" diameter.		1
2	Wire rope doesnot deflectbelow 39" with 200lbs. applied.		1
3	Flaggedevery6'.		1
4	Midrail centered.		1
5	Toeboardsinstalledandstructurallysound.		0
6	Smoothandfree from defects.		1
7	Beingusedproperlyandnot beingbypassed.		1
	RawScore: 85.71%	AdjustedScore:	85.71%

Intervention:	<u>PersonaFallArrest</u>	Possible:	85%
1	Anchorpoint proper andcapableof withstanding5000lbs. or 2 times the intendedload.		1
2	Freefall limited to 6' or less.		1
3	Sufficienttotal fall clearance.		1
4	Riggedto avoidswingfall.		1
5	Retractableattachmentpoint to worker in center of back.		1
6	Systemfree from obviousdefects.		1
7	Beingusedproperlyandnot beingbypassed.		1
	RawScore: 100.00%	AdjustedScore:	85.00%

Exposure: FloorHoles.

Intervention:		Possible:	0%
0			0
	RawScore: 0.00%	AdjustedScore:	0.00%

Intervention:	<u>Cover</u>	Possible:	100%
---------------	--------------	-----------	------

- | | | |
|---|---|---|
| 1 | Top edge between 39" and 45" and at least 1/4" diameter. | 1 |
| 2 | Wire rope does not deflect below 39" with 200 lbs. applied. | 1 |
| 3 | Flagged every 6'. | 1 |
| 4 | Midrail centered. | 1 |
| 5 | Toeboards installed and structurally sound. | 0 |
| 6 | Smooth and free from defects. | 1 |
| 7 | Being used properly and not being bypassed. | 1 |

Raw Score: 85.71%

Adjusted Score: 85.71%

Exposure: Floor Holes.

Intervention: Cover

Possible: 100% = 2 d

1	Designedo support2 times the intendedload.	1
2	Secured.	1
3	Colorcodedor labeled.	0
4	Installedsoasto eliminatetripping hazards.	1
5	Systemfree from obviousdefects.	1
6	Beingusedproperlyandnot beingbypassed.	1
	RawScore: 83.33%	AdjustedScore: 83.33%

Exposure: FloorHoles.

Intervention:	<u>Cover</u>	Possible:	100%
1	Designedo support2 times the intendedload.	1	
2	Secured.	0	
3	Colorcodedor labeled.	0	
4	Installedsoasto eliminatetripping hazards.	1	
5	Systemfree from obviousdefects.	0	
6	Beingusedproperlyandnot beingbypassed.	0	
	RawScore: 33.33%	AdjustedScore: 33.33%	

Exposure: FloorHoles.

Intervention:	<u>Cover</u>	Possible:	100%
1	Designedo support2 times the intendedload.	1	
2	Secured.	1	
3	Colorcodedor labeled.	0	
4	Installedsoasto eliminatetripping hazards.	1	
5	Systemfree from obviousdefects.	1	
6	Beingusedproperlyandnot beingbypassed.	1	
	RawScore: 83.33%	AdjustedScore: 83.33%	

Exposure: FloorHoles.

Intervention:	<u>Cover</u>	Possible:	100%
1	Designedo support2 times the intendedload.	1	

RawScore: 83.33% AdjustedScore: 83.33%

Intervention: GuardrailSystem Possible: 100%

- 1 Top edge between 39" and 45" and at least 1/4" diameter. 1
- 2 Wire rope does not deflect below 39" with 200 lbs. applied. 1
- 3 Flagged every 6'. 0
- 4 Midrail centered. 1
- 5 Toeboards installed and structurally sound. 0
- 6 Smooth and free from defects. 0
- 7 Being used properly and not being bypassed. 0

RawScore: 42.86% AdjustedScore: 42.86%

Exposure: Unprotected sides and edges 6' or more above lower level.

Intervention: Personal Fall Arrest Possible: 85%

- 1 Anchor point proper and capable of withstanding 5000 lbs. or 2 times the intended load. 1
- 2 Freefall limited to 6' or less. 1
- 3 Sufficient total fall clearance. 1
- 4 Rigged to avoid swing fall. 1
- 5 Retractable attachment point to worker in center of back. 1
- 6 System free from obvious defects. 1
- 7 Being used properly and not being bypassed. 1

RawScore: 100.00% AdjustedScore: 85.00%

Exposure: Floor Holes.

Intervention: Cover Possible: 100%

- 1 Designed to support 2 times the intended load. 1
- 2 Secured. 1
- 3 Color coded or labeled. 1
- 4 Installed so as to eliminate tripping hazards. 1
- 5 System free from obvious defects. 1

6 Being used properly and not being bypassed. 1

Raw Score: 100.00%

Adjusted Score: 100.00%

Exposure: Floor Holes.

Intervention: Cover

Possible: 100%

1 Designed to support 2 times the intended load. 1

2 Secured. 1

3 Color coded or labeled. 0

4 Installed so as to eliminate slip, trip or fall hazards. 0

RawScore: 66.67%

AdjustedScore: 66.67%

Exposure: FloorHoles.

Intervention: Cover

Possible: 100%

- | | | |
|---|---|---|
| 1 | Designedo support2 times the intendedload. | 1 |
| 2 | Secured. | 1 |
| 3 | Colorcodedor labeled. | 0 |
| 4 | Installedso asto eliminatetripping hazards. | 0 |
| 5 | Systemfree from obviousdefects. | 1 |
| 6 | Beingusedproperlyand not beingbypassed. | 1 |

RawScore: 66.67%

AdjustedScore: 66.67%

Exposure: FloorHoles.

Intervention: Cover

Possible: 100%

- | | | |
|---|---|---|
| 1 | Designedo support2 times the intendedload. | 1 |
| 2 | Secured. | 1 |
| 3 | Colorcodedor labeled. | 0 |
| 4 | Installedso asto eliminatetripping hazards. | 0 |
| 5 | Systemfree from obviousdefects. | 1 |
| 6 | Beingusedproperlyand not beingbypassedand | |

3 Entrancegate/chainin place.

0

4

Location: Floor15

NumberExposed: 11

Exposure: Ladder

Intervention:	<u>Ladder</u>	Possible:	100%
1	Correctsizefor the job.		1
2	Fullyopenedandspreaderbarslocked.		1
3	Firmfoundationfor ladderfeet.		1
4	Properclimbingproceduresbeingused.		1
5	Threepoint contactrule beingfollowed.		1
6	Freefrom obviousdefects.		1
7	Workernot standingon top 2 steps.		1
8	Beingused		

2	Landings at least 30" in the direction of travel.	1
3	Riser height and tread depth uniform with 1/4"	1
4	Swing of a door shall not reduce the platform to less than 20"	1
5	Free from hazardous projections, such as protruding nails.	1
6	No slippery conditions on stairs.	1
7	Metal pan landings and tread are secured in place.	1
8	Stairs with 4 or more risers or rising 30" has at least one handrail.	1
9	Stairs with 4 or more risers or rising 30" has a stairrail on unprotected sides.	1
10	Stairrail is not less than 36" in line with the face of riser.	1
11	Handrail and stairrail capable of withstanding a 200 lb. force.	1
12	Midrails are half way between stairrail and step.	1
13	Screen or mesh extends from the step to the top rail.	1
14	Vertical members are no more than 19" apart.	1
15	Being used properly and not being bypassed.	1

Raw Score: 100.00%

Adjusted Score: 100.00%

Exposure: Ladder

Intervention: Ladder

Possible: 100%

1 Correct size for the job.

Location: Floor10

NumberExposed: 14

Exposure: Ladder

Intervention:	<u>Ladder</u>	Possible:	100%
1	Correctsizefor the job.		1
2	Fullyopenedandspreaderbarslocked.		1
3	Firmfoundationfor ladderfeet.		1
4	Properclimbingproceduresbeingused.		1
5	Threepoint contactrule beingfollowed.		1
6	Freefrom obviousdefects.		1
7	Workernot standingon top 2 steps.		1
8	Beingusedproperlyand not beingbypassed.		1
9	Adequateaccess/egress.		1
	RawScore: 100.00%	AdjustedScore: 100.00%	

Exposure: Ladder

Intervention:	<u>Ladder</u>	Possible:	100%
1	Correctsizefor the job.		1
2	Fullyopenedandspreaderbarslocked.		1
3	Firmfoundationfor ladderfeet.		1
4	Properclimbingproceduresbeingused.		1
5			

- 1 Correctsizefor the job. 1
- 2 Fullyopenedandspreaderbarslocked. 1
- 3 Firmfoundationfor ladderfeet. 1
- 4 Properclimbingproceduresbeingused. 1
- 5 Threepoint contactrule beingfollowed. 1
- 6 Freefrom obviousdefects. 1
- 7 Workernot standingon top 2 steps. 1
- 8 Beingusedproperlyandnot beingbypassed. 1
- 9 Adequateaccess/egress. 1

RawScore: 100.00%

AdjustedScore: 100.00%

Exposure: Ladder

Intervention: Ladder

Possible: 100%

- 1 Correctsizefor the job. 1
- 2 Fullyopenedandspreaderbarslocked. 1
- 3 Firmfoundationfor ladderfeet. 1
- 4 Properclimbingproceduresbeingused. 1
- 5 Threepoint contactrule beingfollowed. 1
- 6 Freefrom obviousdefects. 1
- 7 Workernot standingon top 2 steps. 1
- 8 Beingusedproperlyandnot beingbypassed. 1
- 9 Adequateaccess/egress. 1

RawScore: 100.00%

AdjustedScore: 100.00%

LocationSummaryScore: 100.00%

Location:

Floor 5 of 064M, 1y4MP, y<8 (Rad)Tj /2(4d <2c9 379 344d Id [(Sc)7(ore:)]TJ /C2_0 1 T8a1 Tf 0.

2	Fully opened and spreader bars locked.	0
3	Firm foundation for ladder feet.	1
4	Proper climbing procedures being used.	1
5	Three point contact rule being followed.	1
6	Free from obvious defects.	1
7	Worker not standing on top 2 steps.	1
8	Being used properly and not being bypassed.	1
9	Adequate access/egress.	1

8 Stair with 4 or more risers or rising 30" has at

