Smithsonian

Smithsonian Design Standards

October 2021

VOLUME 3 – APPENDICES

SF PROJECT NUMBER: 1699622
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EWING COLE

VOLUME 1:

Design Guidelines & Technical Sections

Design Guidelines:

Technical Sections:

VOLUME 2:

Smithsonian Specifications:

APPENDIX A

Security Design Criteria Matrix

NOTE: The matrix in Appendix A categorizes the measures for each space and discipline into two categories; Existing Facilities/Spaces and New Facilities/Spaces. In some disciplines (i.e. Electronic Security) the measures are the same for both Existing Facilities/Spaces and New Facilities/Spaces. However, other disciplines (i.e. wall construction or location within the Architecture chapter) have different measures for the two categories.

This is intended not to overly burden projects with requirements that may be unreasonable based on their scope. However, project managers and planners should consider integrating facility requirements if it is found that security deficiencies must be mitigated in a future project. In all cases, major renovations and new construction must meet the requirements of this document.

APPENDIX A
Security Design Criteria Matrix

		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Ancillary																							
Building Common Support																							
Assembly																							
Conference room		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
General/mixed use		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Planetarium		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Screening Area		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Seating area, fixed		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Seating area, open		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Stage		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Support area		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Audio Visual																							
Projection room		3	3	1	1	2	2	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Coat Room																							
Coat room		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Exhibit																							
Barrier zone	Refer to: *SI Exhibit Security Design Criteria*	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	-	-
Flexible Hall		1	1	1	1	1	1	1	1	3	3			2	2	2	2	2,5,6	2,5,6	1,4	1,4	1	1
Live animal																							
Zoo Animal Buildings (Low Risk)	New space classification	1	1	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Zoo Animal Buildings (Medium Risk)	New space classification	1	1	1	1	1	1	1	1	5	5			3	3	2	2	5	5	1,4	1,4	1	1
Zoo Animal Buildings (High Risk)	New space classification	1	1	1	1	1	1	1	1	5	5			3	3	2	2	2,5	2,5	1,2,4	1,2,4	1	1
Live plants		1	1	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Object	Refer to: *SI Exhibit Security Design Criteria*																						
Viewing area		1	1	1	1	2	2	1	1	3	3			2	2	2	2	2	5	1,4	1,4	1	1
Exhibit, Outdoor																							
Barrier zone	Refer to: *SI Exhibit Security Design Criteria*	-	-	-	-	-	-	-	-	-	-			-	-	-	-	-	-	-	-	1	1
Flexible hall		1	1	1	1	1	1	1	1	3	3			2	2	2	2	2,5,6	2,5,6	1,4	1,4	1	1
Live animal																							
Zoo Animal Buildings (Low Risk)	New space classification	1	1	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Zoo Animal Buildings (Medium Risk)	New space classification	1	1	1	1	1	1	1	1	6	6			3	3	2	2	5	5	1,4	1,4	1	1
Zoo Animal Buildings (High Risk)	New space classification	1	1	1	1	1	1	1	1	6	6			3	3	2	2	2,5	2,5	1,2,4	1,2,4	1	1
Food services																							
Break room		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	1	0	1	1
Dining room		1	1	1	1	1	1	1	1	1	1			2	2	1	1	2,4	2,4	1,3	1,3	1	1
Dish room		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Food booth		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Food selection area		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Kitchen		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Kitchen, Animal Food		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Locker																							
Men's		1	1	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Unisex		1	1	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Women's		1	1	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Retail																							
Shop		1	1	1	1	2	2	1	1	5	5			3	3	2	2	2,4,6	2,4,6	1,3	1,3	1	1
Souvenir booth		1	1	1	1	2	2	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Ticket booth		1	1	1	1	2	2	1	1	3	3			2	2	2	2	4	4	1,3	1,3	1	1

Notes:
1. Refer to Section 1 for the explanation of "Existing" vs. "New".
2. The areas in red are new classifications created by OPS due to security requirements.

APPENDIX A
Security Design Criteria Matrix

		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Toilet																							
Children's		1	1	1	1	2	2	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Handicapped		1	1	1	1	2	2	1	1	-	-			2	2	1	1	1	1	-	-	1	1
Men's		1	1	1	1	2	2	1	1	-	-			2	2	1	1	1	1	-	-	1	1
Unisex		1	1	1	1	2	2	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Women's		1	1	1	1	2	2	1	1	-	-			2	2	1	1	1	1	-	-	1	1
Training/Education																							
Computer Lab		1	1	1	1	2	2	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Information booth		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Multi-use		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Visitor information		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Building Core & Service Areas																							
Circulation																							
Corridor		1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Lobby		1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Other		1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Tunnel		1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Control Room																							
Computer room		5	5	1	3	5	5	3	3	5	5			3	3	2	2	1	1	-	-	1	1
Security (Unit Control Room)		5	5	3	4	5	5	5,6	5,6	5	5			3	3	2	2	2	2	1	1	3	3
Security Equipment Room	New space classification	5	5	3	4	5	5	5	5	5	5			3	3	2	2	6	6	1	1	1	1
Utility		3	5	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
X-ray		6	6	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Laundry																							
Laundry Room		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Mechanical/Electric	Major Utility Areas (not Utility Closets)																						
Cooling		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Elevator Equipment		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Filter Room		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
General/mixed use		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Heating		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
High Voltage		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Steam tunnel		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Utility Tunnel		3,5,6	3,5,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Parking																							
Booth	Manned by non-security personnel	1	1	1	1	1	1	1	1	1	1			2	2	1	1	4	4	1,3	1,3	3	3
Shipping/Receiving																							
Crating Area		3	3	1	1	1	1	1	1	1	1			2	2	2	2	2,5,6	2,5,6	1,2,4	1,2,4	1	1
General/mixed use		3	3	1	1	1	1	1	1	1	1			2	2	2	2	2,5,6	2,5,6	1,2,4	1,2,4	1	1
Loading Dock		6	6	1	1	1	1	1	1	1	1			2	2	2	2	2,5,6	2,5,6	1,2,4	1,2,4	1	1

Notes:
1. Refer to Section 1 for the explanation of "Existing" vs. "New".
2. The areas in red are new classifications created by OPS due to security requirements.

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		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
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		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Storage																							
Equipment		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Freezer		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
General/mixed use		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Hazardous		3,5	3,6	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	3	3
Janitor's Closet		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Other		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Props/Display		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Refrigerated		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Subfreezing		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Workroom		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Utility Closet																							
ATM		3	3	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Data		3	3	3	3	5	5	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Electrical		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
General		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
General/mixed use		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
HVAC		3	3	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Plumbing		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Security		3	3	3	3	5	5	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Telephone (IT Frame Room)		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Waste Room																							
General		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Hazardous		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Refrigerated		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Workroom																							
Cabinet		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Crafts/Trade Shop		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Drying Room		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Electric/Lamping		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Fire Alarm		3	3	1	1	1	1	1	1	1	1			2	2	2	1	1	1	-	-	1	1
General/mixed Use		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Grounds		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
HVAC		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Lock Shop		3	3	1	1	1	1	1	1	5	5			3	3	2	2	1	1	-	-	1	1
Machine		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Mason		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Paint		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Plumbing		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Restoration		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Sheet Metal		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Spray Booth		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Transportation		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Welding		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Building Shared		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Exterior Walls	Refer to: "Building Perimeter"																						
Exterior Wall Cavity	Refer to: "Building Perimeter"																						
Floor Common Support		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	1	1	1	1

Notes:
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Security Design Criteria Matrix

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		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Floor Shared		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	1	1	1	1
Interior Parking																1	1	2,6	2,6	1,4	1,4	2,3	2,3
Parking																							
Enclosed Garage		3	3	1	1	1	1	1	1	3	3			2	2	1	1	2,6	2,6	1,4	1,4	2,3	2,3
Office																							
Animal Housing																							
Holding area																							
Zoo Animal Buildings (Low Risk)	New space classification	3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Zoo Animal Buildings (Medium Risk)	New space classification	3	3	1	1	1	1	1	1	6	6			3	3	2	2	5	5	1,4	1,4	1	1
Zoo Animal Buildings (High Risk)	New space classification	3	3	1	1	1	1	1	1	6	6			3	3	2	2	2,5	2,5	1,2,4	1,2,4	1	1
Transfer area		3	3	1	1	1	1	1	1	3	3			2	2	1	1	6	6	1,2	1,2	1	1
Assembly																							
Conference room		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
General/mixed use		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Seating area, fixed		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Seating area, open		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Support area		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Audio Visual																							
General/mixed use		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Imaging/photo studio		3	3	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Listening room		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Recording studio		3	3	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	1	1
Video conferencing		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Viewing room		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Circulation																							
Primary Corridor		1	1	1	1	1	1	1	1	-	-			1	1	1	1	6	6	-	-	1	1
Secondary Corridor		1	1	1	1	1	1	1	1	-	-			1	1	1	1	6	6	-	-	1	1
Coat Room																							
Coat room		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Day Care																							
General/mixed		3,4	3,4	1	1	1	1	1	1	5	5			3	3	1	1	2	2	1,3	1,3	1	1
Nap room		3,4	3,4	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Dwelling/Office Building	Refer to: "Building Perimeter"																						
Dormitory		3	3	1	1	1	1	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Multifamily		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Other		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Single family		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Trailer		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Food services																							
Break room		3	3	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Dining room		3	3	1	1	1	1	1	1	1	1			1	1	1	1	2,4	2,4	1,3	1,3	1	1
Vending Room		3	3	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Locker Room																							
Men's		3	3	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Unisex		3	3	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Women's		3	3	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1

Notes:
1. Refer to Section 1 for the explanation of "Existing" vs. "New".
2. The areas in red are new classifications created by OPS due to security requirements.

APPENDIX A
Security Design Criteria Matrix

		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Lounge																							
Men's		3	3	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Unisex		3	3	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Women's		3	3	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Medical Facility																							
Exam & Treatment		3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Office																							
Executive	New space classification	3	3	1	1	1	1	1	1	1	1			2	2	2	2	1	1	-	-	1	1
Private		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Reception area		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Shared(workstations)		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Publication																							
Production		3	3	1	1	1	1	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Recreation																							
Fitness Center		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
General/mixed use		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Recreation Center		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Security																							
Unit Security Office (Admin)	New space classification	2	2	1	1	2	2	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Badging		2	2	1	1	2	2	1	1	5	5			3	3	2	2	1	1	-	-	1	1
Booth	Manned by security personnel	1	1	1	1	1	1	1	1	3	3			2	2	2	2	1	1	-	-	3	3
Detention Area		3	3	3	3	6	6	3,6	3,6	3	3			2	2	1	1	1	1	-	-	1	1
Guardpost	Manned by security personnel	1	1	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	3	3
Key/Weapons Room		5	5	2	2	5	5	2	2	6	6			3	3	2	2	1	1	-	-	1	1
Shipping/Receiving																							
Mail Room	Refer to: *ISC Security Design Criteria*	6	6			2	2	1	1	5	5			3	3	2	2	1	1	-	-	1	1
Shower		3	3	1	1	2	2	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Men's		3	3	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Unisex		3	3	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Women's		3	3	1	1	2	2	1	1	5	5			3	3	1	1	1	1	-	-	1	1
Site																							
Animal Holding																							
Zoo Animal Buildings (Low Risk)	New space classification	3	3	1	1	1	1	3	3	3	3			2	2	1	1	1	1	-	-	1	1
Zoo Animal Buildings (Medium Risk)	New space classification	3	3	1	1	1	1	3	3	6	6			3	3	2	2	5	5	1,4	1,4	1	1
Zoo Animal Buildings (High Risk)	New space classification	3	3	1	1	1	1	3	3	6	6			3	3	2	2	2,5	2,5	1,2,4	1,2,4	1	1
Storage																							
Audio Visual		1	1	1	1	2	2	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Medical		1	1	1	1	2	2	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Props/Display		1	1	1	1	1	1	3	3	3	3			2	2	1	1	1	1	-	-	1	1
Records, Collections																							
Collections Storage (Low Risk)	New space classification	3	5	1	4	2	5	3	5	6	6			3	3	6	6	3,5	3,5	1,2,4	1,2,4	1	1
Collections Storage (Medium Risk)	New space classification	3	5	1	4	2	5	3	5	6	6			3	3	7	7	3,5	3,5	1,2,4	1,2,4	1	1
Collections Storage (High Risk)	New space classification	3	5	3	4	6	5	5	5	6	6			4	4	8	8	3,5,6	3,5,6	1,2,4	1,3,4	1	1
Records, General		1	1	1	1	1	1	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Retail Goods		1	1	1	1	1	1	3	3	5	5			3	3	2	2	3	3	1,2,4	1,2,4	1	1
Supply		1	1	1	1	1	1	3	3	1	1			2	2	1	1	1	1	1	1	1	1

Notes:
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APPENDIX A
Security Design Criteria Matrix

Space Name	Space Comments & Notes	Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
		Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Telemarketing																							
Telephone Room		3	3	1	1	1	1	1	1	3	3			2	2	1	1	1	1	-	-	1	1
Toilet																							
Children's		3	3	1	1	2	2	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Handicapped		1	1	1	1	2	2	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Men's		1	1	1	1	2	2	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Unisex		1	1	1	1	2	2	1	1	1	1			1	1	1	1	1	1	-	-	1	1
Women's		1	1	1	1	2	2	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Training/Education																							
Computer Lab		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Multi-use		3	3	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Veterinary Facility																							
Holding Enclosure		3	3	1	1	2	2	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Operating Room		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Pharmacy		3	3	1	3	2	5	3	3	5	5			3	3	2,4	2,4	2,5	2,5	1,3,4	1,3,4	1	1
Scrub Room		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Workroom																							
Administrative		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Animal Keeper		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Armature Shop		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Design		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Design Technology		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Frame Shop		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Graphics Studio		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Plaster		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Plastic		3	3	1	1	2	2	3	3	1	1			2	2	1	1	1	1	-	-	1	1
Other Tenant																							
Circulation																							
Corridor		1	1	1	1	1	1	1	1	-	-			1	1	1	1	6	6	-	-	1	1
Lobby		1	1	1	1	1	1	1	1	-	-			1	1	1	1	6	6	-	-	1	1
Other		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1

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		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Lab																							
Analytical Equipment		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Animal Analysis		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Audio Visual		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Chemical/Mechanical		3	3	1	1	2	2	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Clean Room		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Conservation		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Fluid		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
General/Mixed Use		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Histology		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Objects		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Observation		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Paper		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Photo-chemical		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Photo-darkroom		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Photo-research		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Radioactive		3	3	1	1	2	2	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Scientific		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Textile/Costume		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
Veterinary		3	3	1	1	2	2	3	3	1	1			2	2	2	2	1	1	-	-	1	1
X-ray		3	3	1	1	2	2	3	3	3	3			2	2	2	2	1	1	-	-	1	1
Library/archives																							
Collections Libraries (Low Risk)	New space classification	3	5	1	4	2	5	3	5	6	6			3	3	6	6	3,5	3,5	1,2,4	1,2,4	1	1
Collections Libraries (Medium Risk)	New space classification	3	5	1	4	2	5	3	5	6	6			3	3	7	7	3,5	3,5	1,2,4	1,2,4	1	1
Collections Libraries (High Risk)	New space classification	3	5	3	4	6	5	5	5	6	6			4	4	8	8	3,5,6	3,5,6	1,3,4	1,3,4	3	3
General/mixed use																							
Microfilm/fiche read																							
Microfilming																							
Reading Room			3	1	1	2	2	1	1	3	3			2	2	1	1	6	6	1,3	1,3	1	1
Slide Viewing																							
Slides																							
Stacks, Active																							
Stacks, Inactive																							
Technical, Reference																							
User Control Station																							
Process,Collections																							
Deacidification		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Demestid Chamber		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Environ Transition		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Fumigation		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Large Animal	See "Animal Holding"																						
Processing		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Receiving		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Sorting		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1
Shipping/Receiving																							
Collections (clean)		3	3	1	3	2	5	3	3	6	6			3	3	2,3	2,3	3,5	3,5	1,2,4	1,2,4	1	1

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		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Storage, Collections																							
Collections Storage (Low Risk)	New space classification	3	5	1	4	2	5	3	5	6	6			3	3	6	6	3,5	3,5	1,2,4	1,2,4	4	1
Collections Storage (Medium Risk)	New space classification	3	5	1	4	2	5	3	5	6	6			3	3	7	7	3,5	3,5	1,2,4	1,2,4	4	1
Collections Storage (High Risk)	New space classification	3	5	3	4	6	5	5	5	6	6			4	4	8	8	3,5,6	3,5,6	1,2,4	1,2,4	3,4	3
Collections Storage (Very High Risk)	New space classification	5	5	5	5	5	5	4	4	4,6	4,6			4,5	4,5	9	9	3,5,6	3,5,6	1,2,4	1,3,4	2,3,4	2,3
Archives	Refer to appropiate Risk Level above																						
Audio/Video/Film	Refer to appropiate Risk Level above																						
Clean Room	Refer to appropiate Risk Level above																						
Cold	Refer to appropiate Risk Level above																						
Compactor	Refer to appropiate Risk Level above																						
General Collections	Refer to appropiate Risk Level above																						
Hazardous	Refer to appropiate Risk Level above																						
Open	Refer to appropiate Risk Level above																						
Oversize	Refer to appropiate Risk Level above																						
Photographs	Refer to appropiate Risk Level above																						
Sliding Racks	Refer to appropiate Risk Level above																						
Study	Refer to appropiate Risk Level above																						
Wet Collections	Refer to appropiate Risk Level above																						
Primary Circulation																							
Circulation																							
Primary Corridor	Public Building Entrance	1	1	1	1	1	1	1	1	-	-			1	1	1	1	6	6	1	1	1	1
Lobby	Public Building Entrance	1	1	1	1	1	1	1	1	-	-			1	1	1	1	6	6	1	1	1	1
Other		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Secondary Circulation																							
Circulation																							
Secondary Corridor		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Lobby		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Other		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Special Purpose		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Store		1	1	1	1	2	2	1	1	1	1			3	3	2	2	2,4,6	2,4,6	1,3,4	1,3,4	1	1
Vertical Penetrations																				-	-		
Architectural Shaft		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Atrium		1	1	1	1	1	1	1	1	1	1			2	2	1	1	1	1	-	-	1	1
Circulation																							
Dumbwaiter		3	3	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Elevator, freight		3	3	1	1	1	1	1	1	-	-			2	2	1	1	6	6	1,3	1,3	1	1
Elevator, passenger																						1	
Public Elevator	New space classification	1	1	1	1	1	1	1	1	-	-			2	2	1	1	1	1	-	-	1	1
Staff Elevator	New space classification	3	3	1	1	1	1	1	1	-	-			3	3	1	1	1	1	-	-	1	1
Escalator		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Ramp		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Stairwell																							
Public Stairs	New space classification	1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Staff Stairs	New space classification	3	3	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Elevator Shaft		3	3	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1

Notes:
1. Refer to Section 1 for the explanation of "Existing" vs. "New".
2. The areas in red are new classifications created by OPS due to security requirements.

APPENDIX A
Security Design Criteria Matrix

		Architecture										Structural, Mechanical, Electrical, Fire Protection, & Elevators		Electronic Security								Intercom-munications	
		Location		Walls		Windows		Door Assembly		Door Hardware		Refer to respective sections		Access Control		Intrusion Detection		Surveilance & Assessment Video		Video Recording & Storage		Intercom-munications	
		4.3.1		4.3.2		4.3.3		4.3.4		4.3.5				10.3.1		10.3.2		10.3.3		10.3.5		11.3.1	
Space Name	**Space Comments & Notes**	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New
Site																							
Road		1	1	1	1	1	1	1	1	-	-			1	1	1	1	5,6	5,6	1,2,4	1,2,4	1	1
Stairs		1	1	1	1	1	1	1	1	-	-			1	1	1	1	5,6	5,6	1,2,4	1,2,4	1	1
Crosswalks		1	1	1	1	1	1	1	1	-	-			1	1	1	1	5,6	5,6	1,2,4	1,2,4	1	1
Stair		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Utility Shaft		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Workstation		1	1	1	1	1	1	1	1	-	-			1	1	1	1	1	1	-	-	1	1
Building Perimeters	Refer to paragraph 4.2.3 and 4.2.5.a																						
Museum / Collection Storage Facility	Refer to ISC for Anti-terrorism requirments	1	1	1	4	2	6	3,5	5	-	-			2	2	2,3	2,3	2,5,6	2,5,6	1,2,4	1,2,4	1	1
Office Building	Refer to ISC for Anti-terrorism requirments	1	1	1	1	2	2	3	3	-	-			2	2	2	2	1	1	-	-	1	1
Research Facility	Refer to ISC for Anti-terrorism requirments	1	1	1	1	2	2	3	3	-	-			2	2	2	2	1	1	-	-	1	1
Cash Rooms	New space classification	3	3	3	4	3	3	3	5	2,3	2,3			3	3	2,4,5	2,4,5	2,4,5	2,4,5	1,3,4	1,3,4	3	3
Public / Staff Seperation Portals	New space classification	3	3	1	1	2	2	3	3	3	3			3	3	1	1	1	2	1,2,4	1,2,4		

Notes:
1. Refer to Section 1 for the explanation of "Existing" vs. "New".
2. The areas in red are new classifications created by OPS due to security requirements.

APPENDIX B

Required Security Drawings

NOTE: Appendix B contains information and guidance on the type of drawings and other deliverables required by SI to adequately detail and document the Electronic Security System design. Also included is guidance about the drawings and other deliverables required for the various design submission throughout the typical design process.

APPENDIX B - REQUIRED SECURITY DRAWINGS

1. GENERAL INFORMATION

This appendix contains information and guidance on the type of drawings and other deliverables required by SI to adequately detail and document the Electronic Security System design. Also included is guidance about the drawings and other deliverables required for the various design submissions throughout the typical design process.

2. GENERAL DRAWINGS

2.1. COVERSHEET

The cover sheet bears general project information. The consultant is responsible for obtaining specific cover sheet lay out information from SI. The cover will shall, at a minimum, bear the following information:

- Project Name
- Project Address
- Project Code
- Submission Date
- Design Team/Firm Information
- Project Rendering/Illustration
- Project Site Map
- Project Area Map
- Title Block (Title block shall be on each sheet of the procurement package)
- Sheet Number
- Project Name
- Revision Number
- Design Firm Name
- Professional Engineer's Seal (Upon Request)

2.2. INDEX SHEET

The index sheet shall be used as a general reference for the procurement package. The index sheet shall convey limited project information in the form of "General Notes"; for more comprehensive understanding of the project and design intent the Consultant/Contractor shall reference the appropriate project specification. The Consultant/Contractor shall use the index sheet to display the various symbols and abbreviations used within the drawing set. The index sheet shall also bear a complete listing of the procurement package's contents, to include the numbers and material contained on each sheet.

2.3. SITE DRAWING

The site drawing shall depict the in scope area surrounding the project building. The Consultant/Contractor shall use site drawings to show utility routes, topology, and site level equipment.

2.4. FLOOR PLANS

Floor plans shall depict specific project areas. The drawings shall be to scale and will include rooms w/room names, partitions, elevators, equipment, conduit etc. The floor plans will be a depiction of current or future conditions.

2.5. RISER DIAGRAMS

Riser diagrams shall depict the vertical and lateral routing of conduit systems. A cross section of the specific building is typically used to show the approximate location of the conduit. Symbols for the project specific security equipment may be used to provide reference points. Each subsystem requires a separate riser diagram.

2.6. SYSTEM INTERCONNECT DRAWINGS

System interconnect drawings shall be used as an aide in connecting and terminating system equipment. Detailed representations of security equipment enclosures and circuit card assemblies shall be show. Graphical representations of the prescribed wire types shall be used to depict the point-to-point connections.

2.7. ONE-LINE DIAGRAMS (BLOCK DIAGRAMS)

One-line or block diagrams shall be used to provided a general overview of the interconnections of the electronic security system components. Each subsystem requires a separate one-line diagram.

2.8. EQUIPMENT SCHEDULE

Equipment Schedules are detailed lists of the electronic security system's components. The equipment schedule will include the following at a minimum:

- Component Name
- Manufacturer
- Part Number
- Quantity

2.9. WIRE SCHEDULE

Wire schedules are detailed lists of the wires and cables used to connect and terminate the electronic components security system. The wire schedule will include the following at a minimum:

- Wire Type
- Manufacturer
- Part Number
- Quantity
- Related Electronic Security System Component (a separate table may be used)

2.10. DOOR SCHEDULE

Door schedules are detailed lists of all doors that have special security requirements. The door schedule shall include door type (corresponding with door details), door number, room description, sheet referred, types of hardware used (door contact with description,

card reader with description, duress, sounder, locks types, intercom with description, camera reference), and hardware mounting type (recessed or surface). Any space that requires a door or access control measure above Measure 1 (no minimum requirement), shall be listed in the door schedule with each special security measure

Door schedules are detailed lists of all doors that have special security and/or fire rating requirements. The door schedule shall include door type (corresponding with door details), door number, room description, sheet referred, types of hardware used (door contact with description, card reader with description, duress, sounder, locks types, intercom with description, camera reference), and hardware mounting type (recessed or surface). Any space that requires a door or access control measure above Measure 1 (no minimum requirement), shall be listed in the door schedule with each special security measure identified.

3. STANDARD DETAILS

Standard details are used to show detailed representations of the electronic security system's components and the variations of component configurations.

3.1. DOOR DETAILS

Door details (or door elevations) shall depict the typical configuration of access control system (ACS) equipment, intrusion detection system (IDS) devices, and door hardware associated with a particular door. A separate door detail will be provided for each variation or special condition. The detail(s) shall include notes that outline typical mounting instructions, basic connection and termination instructions, supervision requirements, and other pertinent information not conveyed by the detail alone.

Door Details shall include, but are not limited to the following:

3.1.1. Double Door Elevation:

ACS Variation:

- Card Reader
- Door Contact(s)
- Request-To-Exit Device
- Electronic Lock/Magnetic Lock

IDS Variation:

- Door Contact(s) Only

Fire Door Package:

- Door Contact(s)
- Delayed Egress Device
- Alarm Annunciator

3.1.2. Single Door Elevation:

ACS Variation:

- Card Reader
- Door Contact(s)
- Request-To-Exit Device
- Electronic Lock/Magnetic Lock IDS only

IDS Variation:

- Door Contact(s) Only

Fire Door Package:

- Door Contact(s)
- Delayed Egress Device

- Alarm Annunciator

3.1.3. Overhead Door Elevation:

IDS Variation:

- Wide Gap Door Contacts

3.1.4. Roof Hatch Elevation

IDS Variation:

- Door Contact(s) Only

3.2. CLOSET ASSEMBLY DETAILS

Closet assembly details shall depict the electronic security system components relative to the electrical or telecoms closet they are mounted in. The detail(s) shall include notes that outline typical mounting instructions, basic connection and termination instructions, supervision requirements, and other pertinent information not conveyed by the detail alone.

A closet assembly detail shall include, but is not limited to the following:

- Field Panels
- Field Panel and Lock Power Supplies
- Camera Power Supplies
- Network Switches
- Fiber Optic Hubs
- Input Board Enclosures
- Relay Enclosures
- Cable Trays/Wire Ways
- Interconnecting Conduit

3.3. EQUIPMENT DETAILS

Equipment details shall depict detailed graphical representations of the electronic security system components. The detail(s) shall include notes that outline typical mounting instructions, basic connection and termination instructions, supervision requirements, and other pertinent information not conveyed by the detail alone.

3.3.1 A detail shall be provided for each major component to include, but not limited to:

- Camera
- VCR/DVR
- Video Matrix/Switcher
- Access Control Field Panel
- Card Reader
- Reader Module
- Request-to-Exit Device
- Door Contact

3.4. GALLERY DISPLAY DETAILS

Gallery display details shall provide a detailed graphical representation of the display area. The detail shall depict the security equipment to be used for securing the display.

3.5. SECURITY CONSOLE DETAILS

Security console details shall provide a detailed graphical representation of the security console. The detail(s) shall depict console configuration with measurements. The detail shall include notes on the configuration of the console and other pertinent information not conveyed by the detail alone.

3.5.1. Security Console Detail shall include, but is not limited to:

- Command Center Layout
- Security Console
- Workstation
- Free Standing Racks
- Rack Mounted Equipment

4. PROJECT DELIVERABLES

4.1. BASIS OF DESIGN

Prepare a section of the Basis of Design Narrative describing the physical and electronic security systems measures proposed for the project. Incorporate the security requirements provided in the body of this document and Appendix A and identifying exceptions to those requirements. In addition, make recommendations for deviations from the requirements.

4.2. SCHEMATIC DESIGN

The A/E shall prepare schematic design documents to illustrate the general scope of the project and the relationship between project components. Drawings shall be schematic in character, based on the programmatic and conceptual requirements developed in the Basis of Design phase, as directed by the COTR- A/E. The documents shall include outline specifications for the Intercom, IDS,

Access Control, and CCTV systems, as directed by the COTR-A/E. If alternative concept studies were produced, the subsequent advancement of the project to schematics shall rest upon the SI's decision to pursue a single concept for further development. The Schematic Design phase submission shall consist of drawings and sketches, a narrative report that addresses major site and all security related systems, gross and net area calculations (in both square meters and square feet), a massing model (as appropriate), and a cost estimate. Other specific requirements for submissions and presentations may be further defined in the SOW.

4.3. 35% DESIGN DOCUMENTS

At 35% SD the deliverable shall include the following:

- Coversheet with Project Title, Site and Vicinity Plan.
- Information Sheet containing general notes, abbreviations, symbols and conventions, index of sheets, and wire and cable schedule.
- Floor plans with area classifications and proposed ESS device placements
- Preliminary riser and one-line diagrams for ESS
- Provide product datasheets of all ESS equipment including the data transmission system
- Outline specifications – based on a customized version of the SI Construction Specifications for Electronic Security.
- Project narrative and description to be included with Outline specification above.

4.4. 65% DESIGN DEVELOPMENT DOCUMENTS

At 65% DD submission, the design shall include the following:

- Includes all documents identified in 35% submission documents
- Floor plans improved with reflected ceiling plans, system point numbering, and sized conduit routing shown. Confirm conduit scope with OPS.
- Power/UPS Sources Requirements
- Sensor Installation Details/Wiring Block Diagrams
- Mounting details for all ESS devices /Wiring Block Diagrams
- Door Details /Wiring Block Diagrams
- Riser and One-line diagrams with system points and required cabling types and counts
- Door Schedule
- Project Specifications– based on a customized version of the SI Construction Specifications for Electronic Security.

- System Point Loading Sheets (Istar/apC)

4.5. 95% CONSTRUCTION DOCUMENTS

At 95% CD submission, the design shall include the following:

- Includes all document identified in 35% and 65% submission documents
- Elevator Control Interface Plan Development
- Cutover Implementation Schedule
- Manufacturers Hardware and Software Data
- System Description and Analysis

4.6. 100% FINAL CONSTRUCTION DOCUMENTS

Includes all previous submission content. This submission shall only be minor corrections and changes by SI.

APPENDIX C

Standard Security Drawings

NOTE: When Security Drawings are required, as noted on Appendix B; these standard drawings should be used to meet the level of detail required by OPS.

Appendix C - STANDARD SECURITY DRAWINGS

1. INTRODUCTION

The drawings provided herein are standard drawings to demonstrate the level of detail required by OPS. The following drawings are included:

- Floor Plans
  - Partial First Floor Plan
- Risers
  - Access Control Riser Diagram
  - CCTV Riser Diagram
  - Intercom Riser Diagram
- System Interconnect Drawing
  - Reader Interconnect
- Door Details
  - Door Detail - Overhead Door - IDS Only
- Equipment Details
  - Balance Magnetic Switch Wiring & Mounting Detail
  - Camera Area of Coverage Detail - Cash Handling Location
  - Camera Power & DTS Enclosure
  - Detail Sheet
  - Multi-Sensor Circuit with Tamper
  - Power Supply Enclosure - ISTAR Pro
- Security Console Details
  - UCR Console
  - Unit Control Room & Equipment Room Floor-plan

In addition to the drawings listed above, all projects require a code analysis/summary and life safety plan. This information should be included, at a minimum, on a separate sheet in the project drawing set.

APPENDIX C

GENERAL NOTES:

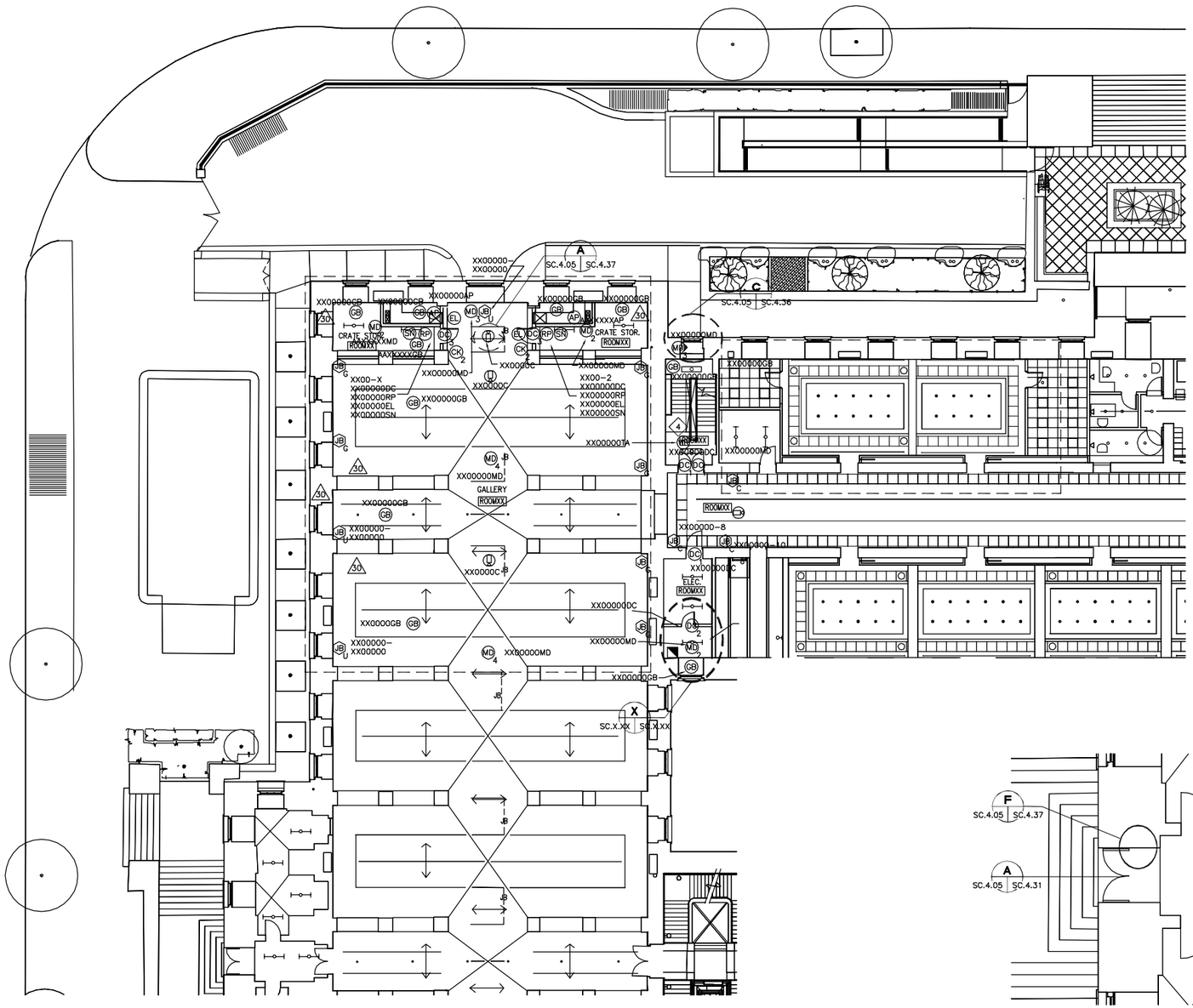
1. THE POSITIONING OF ALL MOTION DETECTORS MUST BE COORDINATED WITH ALL EQUIPMENT, FURNISHINGS, DUCTWORK AND SHELVING PLACED IN THE ROOM TO INSURE THEY ARE NOT BLOCKED.

2. PULL LINES SHALL BE PROVIDED IN CONDUIT FROM GALLERY JUNCTION BOXES TO COIL JUNCTION BOXES.

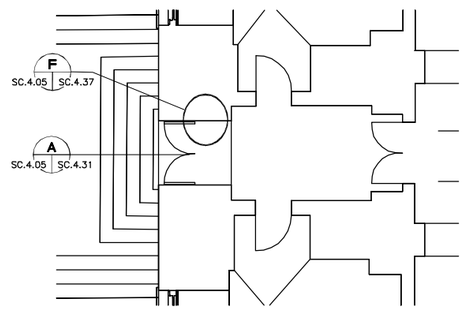
3. REFER TO DWG. SC.5.23 AND SC.5.24 FOR MOTION DETECTOR MASKING CONFIGURATION.

KEY NOTES:

1. MASK MOTION DETECTOR ZONES THAT WOULD EXTEND BEYOND THE WINDOW WELL TO PREVENT FALSE ALARMS.
2. PLACE WALL MOUNTED MOTION DETECTORS CLOSE TO THE EGRESS DOOR. MASK COVERAGE ZONES THAT WOULD RESULT IN FALSE ALARMS BY AUTHORIZED INTERIOR MOVEMENT.
3. CONFIGURE MOTION DETECTOR WITH PET AND RODENT IMMUNITY FEATURES ENABLED.
4. INSTALL WIRELESS REPEATER ABOVE EXIT DOOR ON STAIR SIDE, CENTERED IN MIDDLE OF PANEL DOOR OPENING. MOUNT 2133mm ABOVE FINISHED FLOOR.
5. RUN CONDUIT AS CLOSE TO WALL AS POSSIBLE.
6. CONDUIT SHALL BE INSTALLED IN FLOOR BELOW DOOR.
7. INSTALL WINDOW CONTACT FOR THIS OPERABLE WINDOW.



A PARTIAL FIRST FLOOR PLAN – NW
SC.1.02 SC.4.05 SCALE = 1:100



B ENLARGED PLAN
SC.4.05 SC.4.05 SCALE = 1:50

KEY PLAN

GRAPHIC SCALE
1:100
2000 0 2000 4000
GRAPHIC SCALE(S)

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Washington DC 20560

PARTIAL FIRST FLOOR PLAN
SECURITY SYSTEM

SHEET NO. SC X XX
OF

APPENDIX C

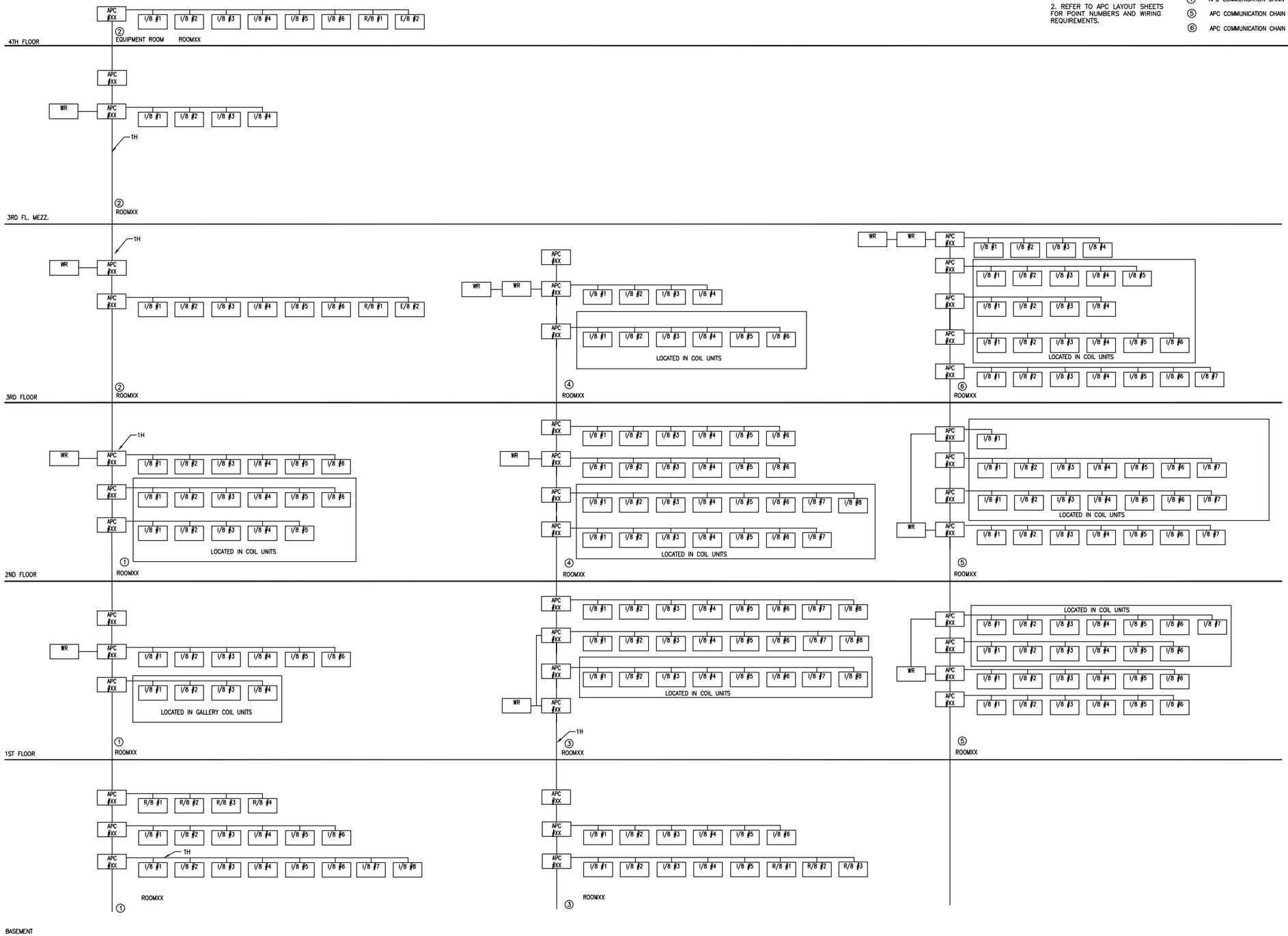
GENERAL NOTES:

1. RISER IS SCHEMATIC IN NATURE SHOWING EXAMPLES OF SYSTEM CONNECTIONS. DIAGRAM DOES NOT REFLECT ACTUAL DEVICE LOCATIONS. SEE FLOOR PLANS FOR ACTUAL LOCATIONS.

2. REFER TO APC LAYOUT SHEETS FOR POINT NUMBERS AND WIRING REQUIREMENTS.

KEY NOTES

1. APC COMMUNICATION CHAIN #1
2. APC COMMUNICATION CHAIN #2
3. APC COMMUNICATION CHAIN #3
4. APC COMMUNICATION CHAIN #4
5. APC COMMUNICATION CHAIN #5
6. APC COMMUNICATION CHAIN #6



A SC.X.XX SAMPLE ACCESS CONTROL RISER DIAGRAM

NTS

KEY PLAN

1:100 GRAPHIC SCALE 2000 0 2000 4000

GRAPHIC SCALE(S)

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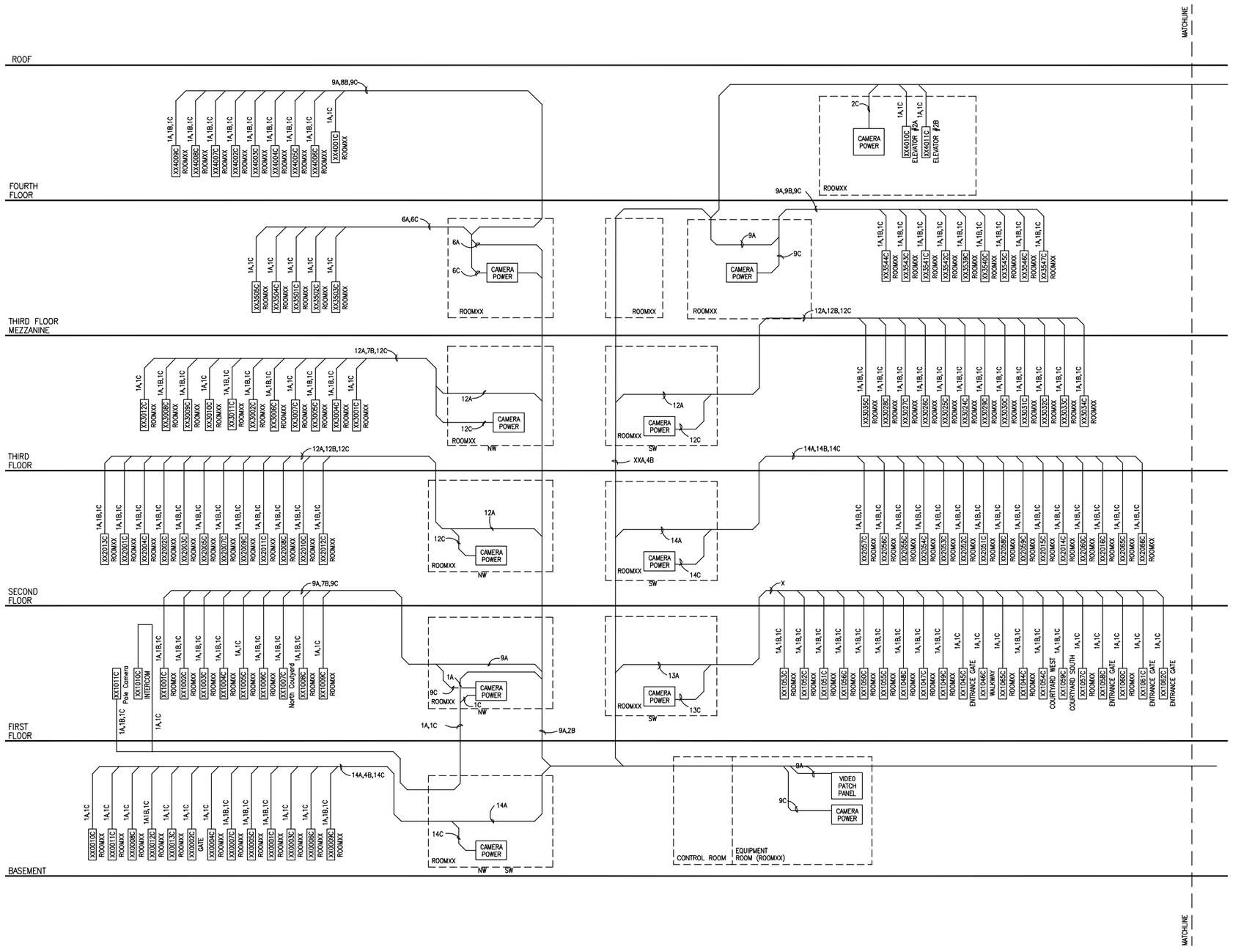
SAMPLE ACCESS CONTROL RISER DIAGRAM
SECURITY SYSTEM

SHEET NO.
OF

SC | X | XX

APPENDIX C



GENERAL NOTES:

1. RISER IS SCHEMATIC IN NATURE SHOWING EXAMPLES OF SYSTEM CONNECTIONS. CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL CABLE, FIBER, ELECTRONIC JUNCTION/OUTLET BOXES, CONNECTORS, FITTINGS, FASTENERS, HANGERS AND OTHER ACCESSORIES NECESSARY FOR A COMPLETE OPERATIONAL SYSTEM. RISER DIAGRAM DOES NOT REFLECT ACTUAL DEVICE LOCATIONS.

2. ALL WIRING TO BE PROVIDED IN ELECTRICAL METALLIC TUBING (EMT). WALL AND FLOOR PENETRATIONS SHALL BE SLEEVED, SEALED WITH AN INTUMESCENT FIRE RESISTIVE SEAL AND FIRESTOPPER. CONDUIT SHALL BE SIZED IN ACCORDANCE WITH NATIONAL CODE (NFPA 70) AND SHALL NOT BE LESS THAN 19mm TRADE SIZE.

KEY NOTES:

1. CAMERA NUMBERS SHOWN AS EXAMPLE. CAMERAS ARE TO BE NUMBERED AS FOLLOWS:

AA 0 006 C
- C — IDENTIFIES AS CAMERA
- 006 — NUMBER
- 0 — FLOOR
- AA — BUILDING (AMERICAN ART)

A SC.X.XX

SAMPLE CCTV RISER DIAGRAM

NTS

KEY PLAN

1:100 GRAPHIC SCALE 2000 0 2000 4000

GRAPHIC SCALE(S)

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SAMPLE CCTV RISER DIAGRAM
SECURITY SYSTEM

SHEET NO. OF

SC | X | XX

APPENDIX C

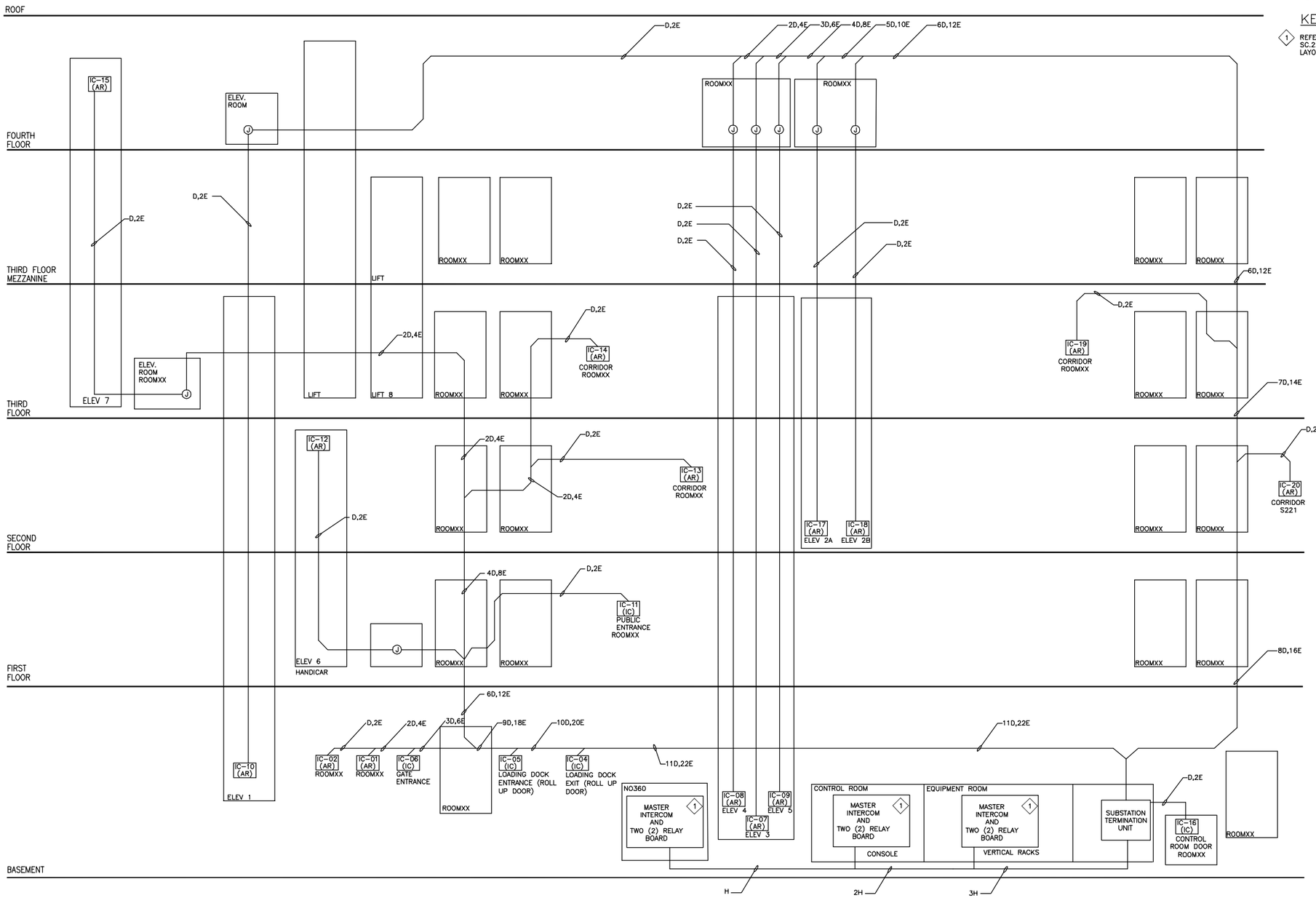
GENERAL NOTES:

1. RISER IS SCHEMATIC IN NATURE SHOWING EXAMPLES OF SYSTEM CONNECTIONS. DIAGRAM DOES NOT REFLECT ACTUAL DEVICE LOCATIONS. SEE FLOOR PLANS FOR ACTUAL LOCATIONS.

2. HIGH FLEX CABLES SHALL BE USED FOR ELEVATOR INSTALLATIONS FROM INTERCOM TO JUNCTION BOX IN ELEVATOR MECHANICAL ROOM.

KEY NOTES:

(1) REFER TO DETAIL D OF SHEET SC.2.22 FOR ACTUAL EQUIPMENT LAYOUT AND INTERCONNECTIONS.



A SC.X.XX

SAMPLE INTERCOM RISER DIAGRAM

NTS

KEY PLAN

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1:100
2000 0 2000 4000

GRAPHIC SCALE(S)

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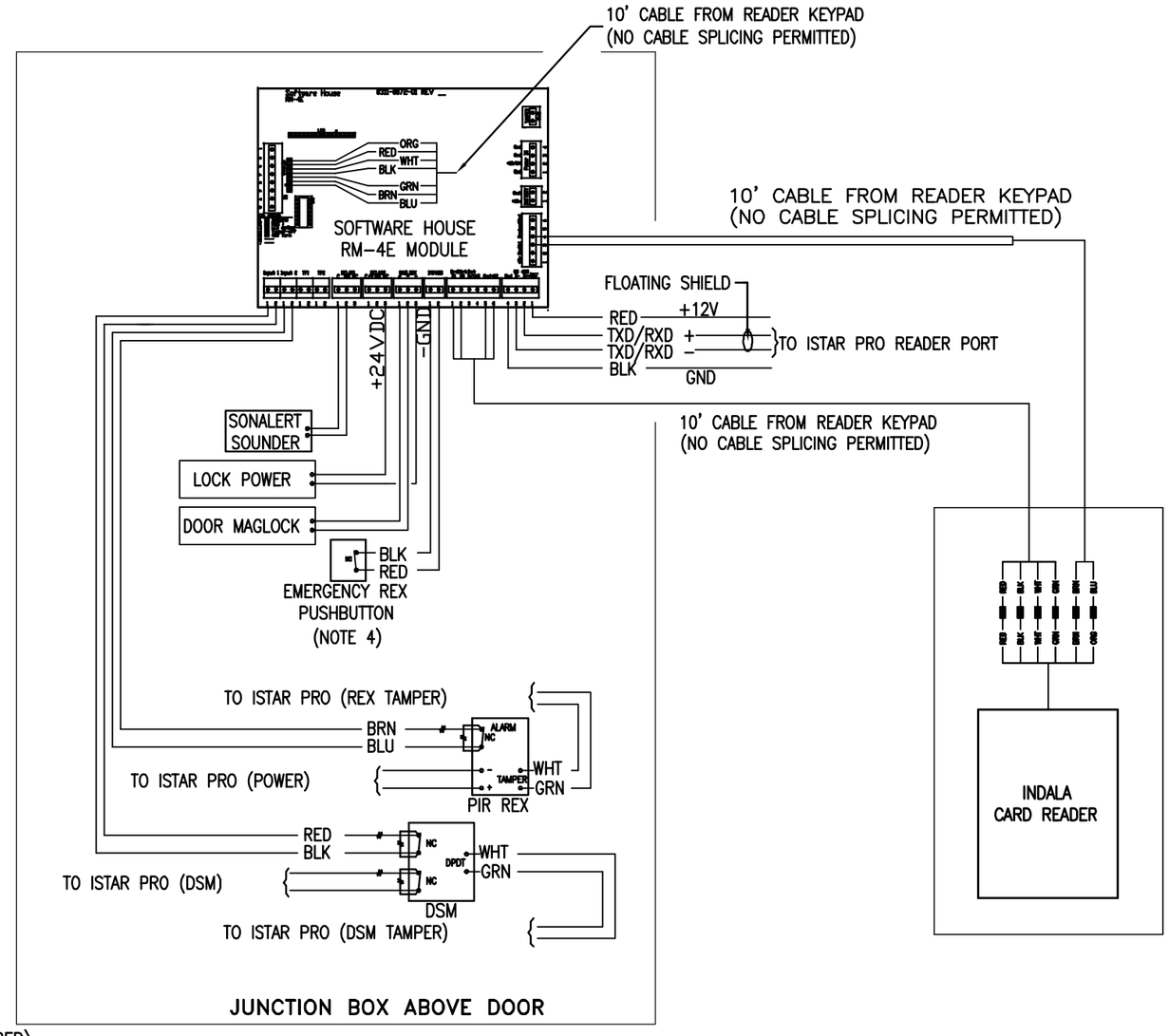
SAMPLE INTERCOM RISER DIAGRAM
SECURITY SYSTEM

SHEET NO. SC | X | XX
OF

APPENDIX C



JUNCTION BOX ABOVE DOOR

NOTES:

1. RESISTOR VALUES ARE 1K OHMS (BRN, BLK, RED).
2. PLACE RM4 AND ARM–1 BOARDS ON 1/2" STANDOFF INSULATORS TO PREVENT BOARD FROM SHORTING TO METAL BOX.
3. SURFACE OR RECESS MOUNTED. INSTALL WHERE REQUIRED. SEE DOOR MATRIX.
4. USED IN CONJUNCTION WITH MAGNETIC LOCKS.

KEY PLAN

GRAPHIC SCALE(S)

DATE:
SUBMISSION
REVISION
REVISION 1
REVISION 2
REVISION 3
REVISION 4
REVISION 5
REVISION 6

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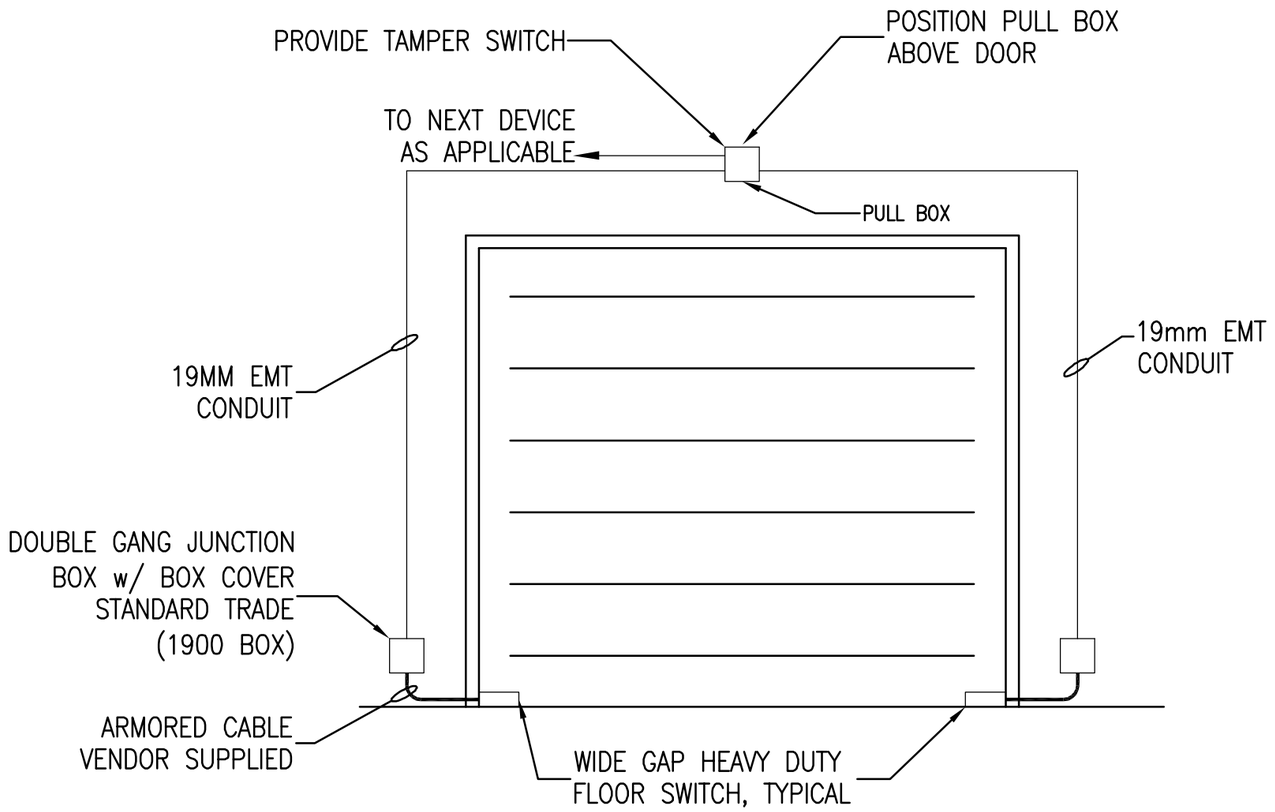
750 9th Street N.W. Suite 5200
Washington DC 20560-0908

BUILDING NAME
ADDRESS
PROJECT TITLE
OFEO PROJECT NUMBER
A/E PROJECT NUMBER
DRAWING TITLE
READER INTERCONNECT
DRAWING TYPE
WORKING STAFF
DESIGNED BY
DRAWN BY
CHECKED BY
SHEET NO.
OF #
DISCIPLINE
TYPE
SEQUENCE

APPENDIX C



NOTES:

1. ALL INTERIOR CONDUITS SHALL BE ELECTRIC METALLIC TUBING w/ STEEL COMPRESSION FITTINGS.
2. JUNCTION BOXES SHALL BE SECURED WITH APPORVED TAMPER RESISTANT FASTENERS.
3. REFER TO DETAIL A, SHEET XX–00 FOR DOOR SWITCH MOUNTING REQUIREMENTS.

KEY PLAN

GRAPHIC SCALE(S)

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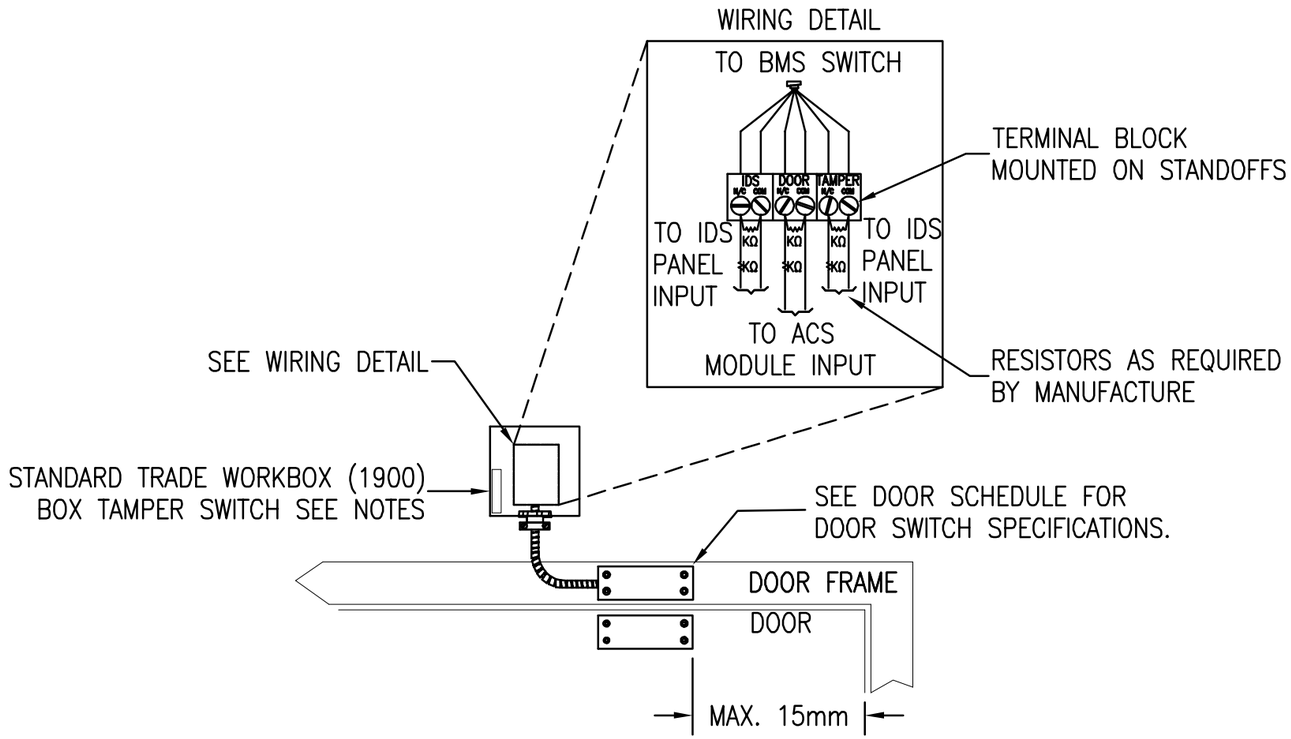
DOOR DETAIL - OVERHEAD DOOR IDS INLY

SHEET NO.
OF

SC | X | XX

APPENDIX C



NOTES:

1. CONTRACTOR TO CONFIRM RESISTOR NETWORK/VALUES PRIOR TO START OF WORK.

2. TAMPER CIRCUIT REQUIRES TIE IN TO BOX TAMPER SWITCH. CONTRACTOR TO PROVIDE CONSTRUCTION MOCK–UP FOR APPROVAL, PRIOR TO INSTALLATION.

3. REFER TO MANUFACTURERS INSTRUCTIONS FOR DOOR SWITCH MOUNTING REQUIREMENTS.

4. WORKBOX COVERPLATE SHALL BE SECURE WITH OWNER APPROVED TAMPER RESISTANT SCREWS.

KEY PLAN

GRAPHIC SCALE(S)

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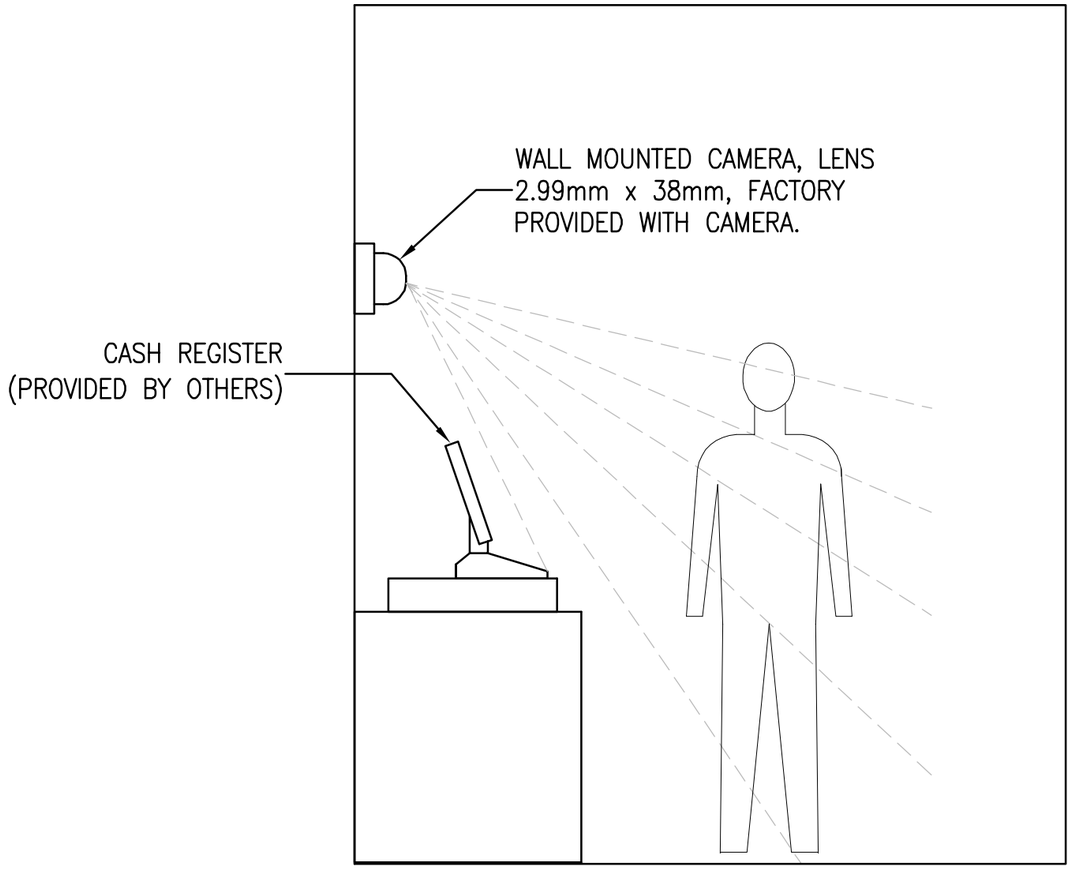
Washington DC 20560

BALANCE MAGNETIC SWITCH WIRING & MOUNTING DETAIL

SHEET NO.
OF

SC | X | XX

APPENDIX C



NOTES:

1. CAMERA SHALL BE POSITIONED AND SIZED TO MONITOR THE ENTIRE CASH HANDLING PROCESS.

2. AREA OF COVERAGE SHALL INCLUDE:
   - CASH REGISTER
   - CASHIER
   - MONEY TRANSACTION AREA

3. CAMERA SHALL BE INSTALL A MINIMUM OF 2.4m A.F.F.

KEY PLAN

GRAPHIC SCALE(S)

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Engineering and Operations
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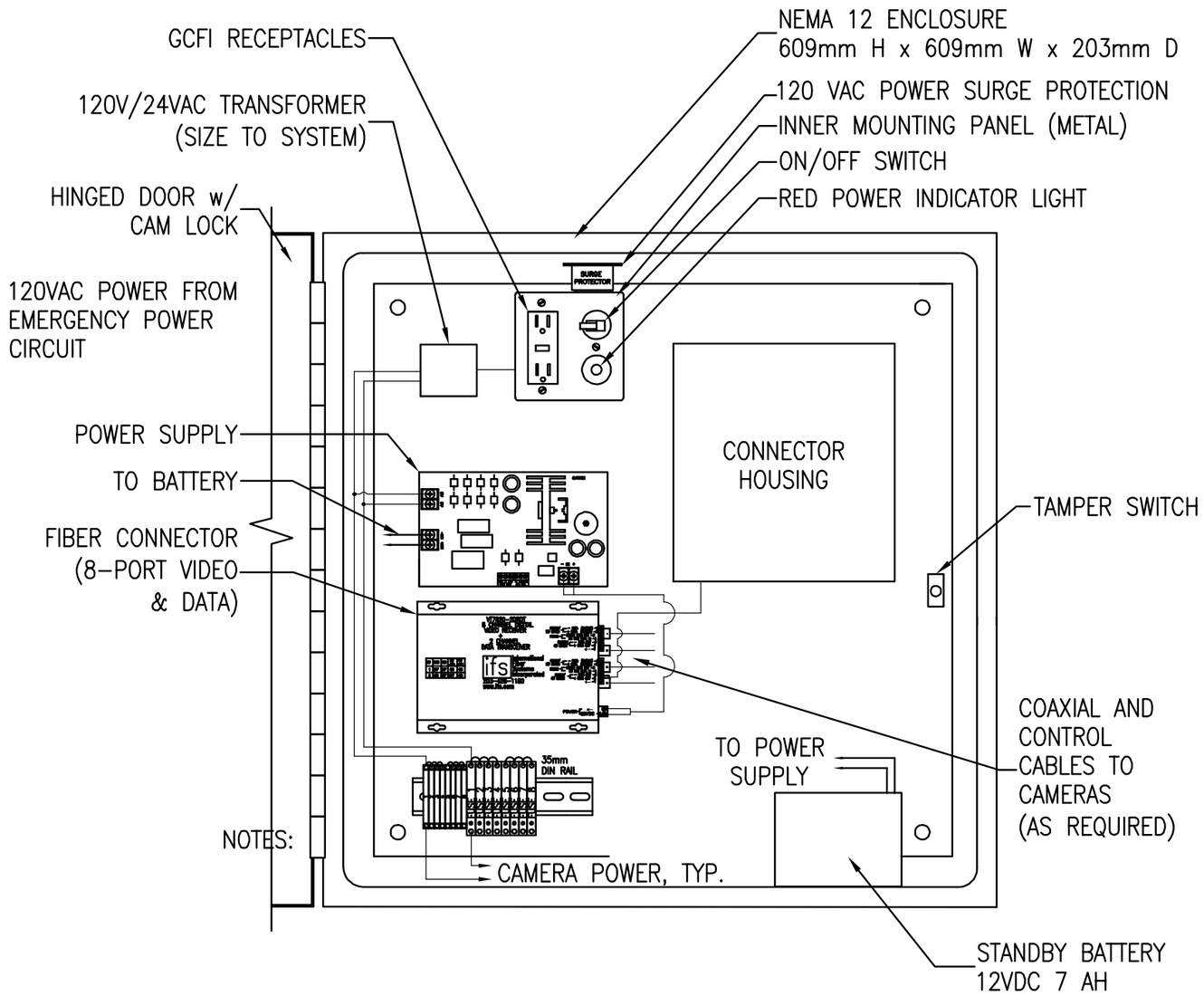
Washington, DC 20560

CAMERA AREA OF COVERAGE DETAIL - CASH HANDLING LOCATION

SHEET NO.
OF

SC | X | XX

APPENDIX C



KEY PLAN

GRAPHIC SCALE(S)

Smithsonian Institution

Office of Facilities, Engineering and Operations
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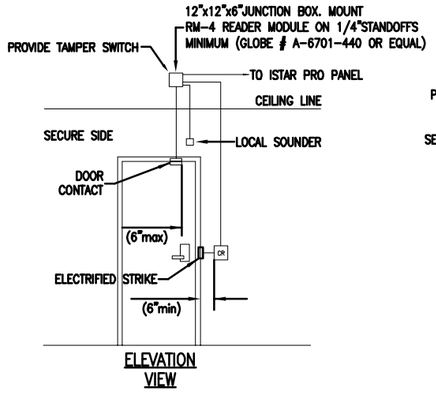
Washington DC 20560

CAMERA POER & DTS ENCLOSURE

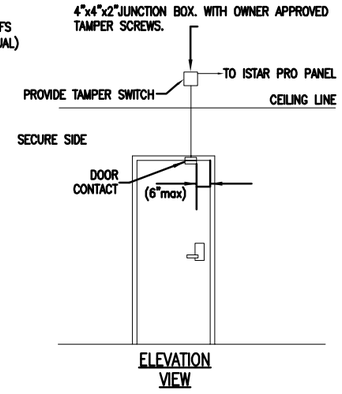
SHEET NO.
OF

SC | X | XX

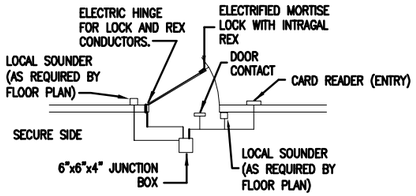
APPENDIX C



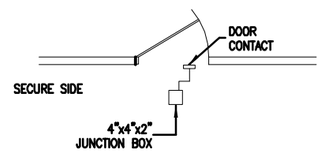
ELEVATION VIEW



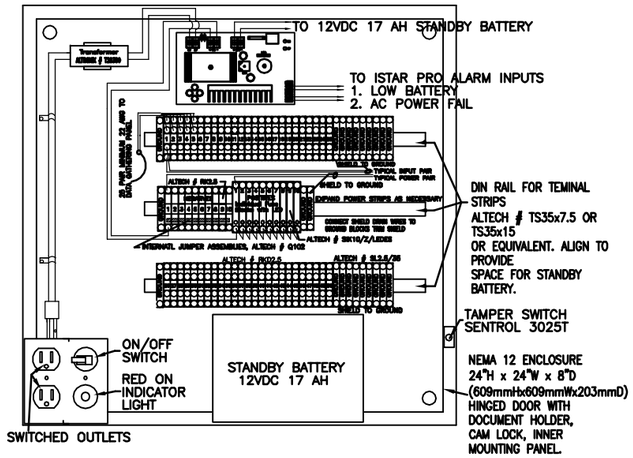
ELEVATION VIEW



PLAN VIEW



PLAN VIEW



NOTES:

1. USE JUMPER TO DISTRIBUTE THE POWER ACROSS THE POWER NEGATIVE AND POSITIVE TERMINALS.
2. POWER SUPPLY MUST BE RATED FOR 10 AMP CONTINUOUS DUTY.
3. USE 1.5 AMP FUSES FOR BRANCH CIRCUIT PROTECTION.
4. USE HEAVY DUTY STANDOFFS FOR MOUNTING CIRCUIT BOARDS.
5. SECURE ALL WIRING WITH SPIRAL WRAP AND NYLON WIRE TIES.
6. DIN RAILS SHOULD BE OF SUFFICIENT LENGTH TO ALLOW EXPANSION BY ADDING TERMINAL STRIPS.
7. POWER OUTLET MOUNTED IN 4"x4"x2-1/2" (100x100x62mm) J-BOX WITH CUT OFF WITCH AND RED POWER INDICATOR LIGHT.
8. VERIFY PART NUMBERS WITH MANUFACTURER. SUBMIT EQUIVALENTS FOR APPROVAL.

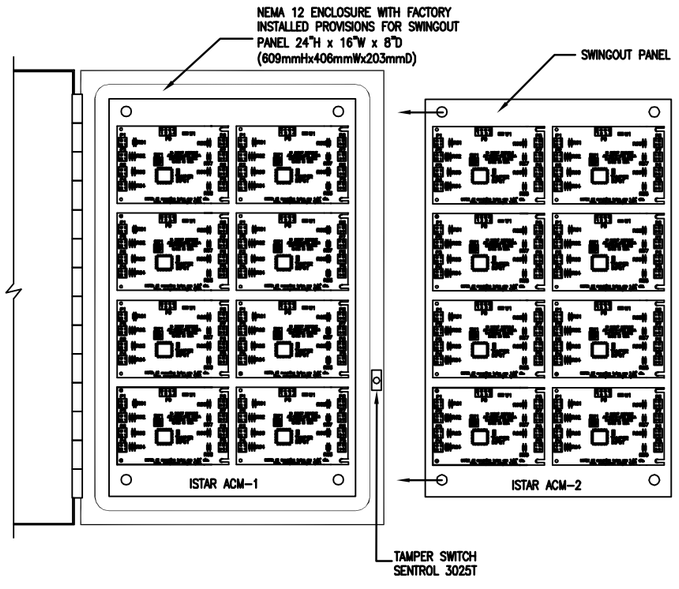
DOOR DETAIL NOTES:

1. JUNCTION BOXES AND PULL BOXES SHALL BE SIZED ACCORDINGLY WITH COVER PLATE PAINTED BLUE UNLESS OTHERWISE INDICATED. SECURE COVER PLATE WITH TAMPER RESIST SCREWS.
2. CONDUIT FROM DOOR DEVICE TO JUNCTION BOX ABOVE DOOR SHALL BE 20MM EMT UNLESS NOTED OTHERWISE.
3. POSITION JUNCTION BOX AS NOT TO INTERFERE WITH EXISTING CONDUIT OF OTHER EXISTING SYSTEMS.
4. WHERE NO FINISHED CEILING EXIST, JUNCTION BOXES OVER DOORS SHALL BE PLACED AT LEAST 9" (229mm) FROM BOTTOM OF BOX TO TOP OF DOOR AS SPACE PERMITS.
5. BALANCED MAGNETIC SWITCH (BMS) HAVE VENDOR SUPPLIED ARMOR CABLE WITH CONDUCTORS SUPPLIED. REFER TO DETAIL A SC502 FOR BMS MOUNTING AND WIRING REQUIREMENTS. ARMORED CORD IN LENGTHS OF 8" (203mm) OR MORE SHALL BE SECURED WITH APPROVED DEVICE.
6. DOOR TYPE DETAILS ARE SHOWN FOR EQUIPMENT LAYOUT AND WIRING REQUIRED. MAY NEED TO BE REVERSED TO FIT SPECIFIC DOOR APPLICATIONS.
7. DSM CONSIST OF BMS, SURFACE MOUNT OR RECESSED AS APPLICABLE.
8. DUAL DSM ON DOOR SHALL BE WIRED AS SINGLE ZONE WITH E.O.L. RESISTOR ONLY ON THE LAST DSM.
9. WIRING FOR ACCESS CONTROL AND IDS SHALL BE ROUTED IN WALLS WHERE POSSIBLE. CONDUIT SHALL BE INSTALLED ON SECURE SIDE OF WALL WHERE APPLICABLE.
10. UNLESS OTHERWISE NOTED, FOR CMU WALLS, SURFACE MOUNT EQUIPMENT AND CONDUIT. FOR HOLLOW WALLS, RUN CABLE IN CONDUIT IN INTERIOR. FOR ARMORED CABLE, PROVIDED AS PART OF BMS, PENETRATE WALL ABOVE BMS WITH A SINGLE GANG BOX AND MATCHING SINGLE HOLE COVER PLATE. RUN CABLE IN WALL TO ABOVE CEILING, THEN CONNECT TO ABOVE DOORJUNCTION BOX WITH SUPPLIED CONNECTORS.
11. CARD READERS HAVE A VENDOR SUPPLIED CABLE THAT WILL BE EXTENDED AND INCLUDED IN THE CONDUIT FROM THE JUNCTION BOX ABOVE DOOR TO CARDREADER. VENDOR CABLE NOT SHOWN IN TYPE DETAILS. CARD READER CABLE LENGTHS SHALL BE 10 FEET. ALLOW FOR UNSPLICED CONNECTION TO RM-4 MODULES.
12. USE INTERNAL JUMPERS TO DISTRIBUTE POSITIVE AND NEGATIVE POLARITY ALONG ADJACENT LIKE TERMINALS.
13. PROTECT REAR OF POWER SUPPLY PRINTED CIRCUIT BOARDS FROM SHORTING BY USING STANDOFFS. BOARDS MUST BE FASTENED WITH PERMANENT METHODS, NOT TAPED.
14. SECURE ALL WIRING WITH SPIRAL WRAP AND NYLON WIRE TIES. USE SCREWS OR RIVITS TO FASTEN. USE OF SELF-ADHESIVE BLOCKS PROHIBITED.
15. DIN MOUTING RAILS SHALL BE OF SUFFICENT LENGTH TO ALLOW EXPANSION BY ADDING TERMINAL BLOCKS.
16. LABEL EACH INPUT TERMINAL WITH ZONE NUMBER. LABEL POWER TERMINALS WITH VOLTAGE AND POLARITY.
17. CONNECT POWER OUTLET TO EMERGENCY GENERATOR CIRCUIT.
18. UPON COMPLETION, PANEL BOX WILL BE CLEAN OF WIRE CLIPPINGS, SOLDER SPILLS GENERAL DEBRIS.
19. RM-4 MODULE OR CARD READER BOX MUST BE TAMPERED.

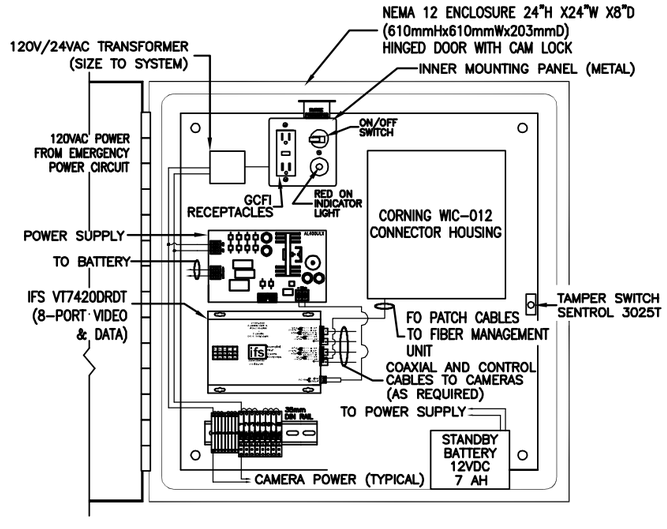
A SC5.01 **SINGLE DOOR, CARD READER** N.T.S.

B SC5.01 **SINGLE DOOR, BMS ONLY** N.T.S.

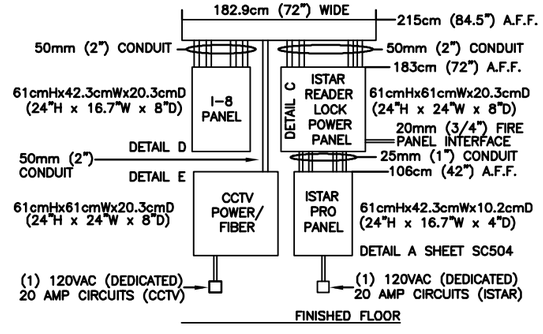
C SC5.01 **ISTAR POWER AND DITRIBUTION** N.T.S.



D SC5.01 **I-8 MODULE MOUNTING** N.T.S.



E SC5.01 **CCTV POWER & FO CONVERTORS** N.T.S.



F SC5.01 **ISTAR/CCTV CLOSET ASSEMBLY** N.T.S.

KEY PLAN

GRAPHIC SCALE(S)

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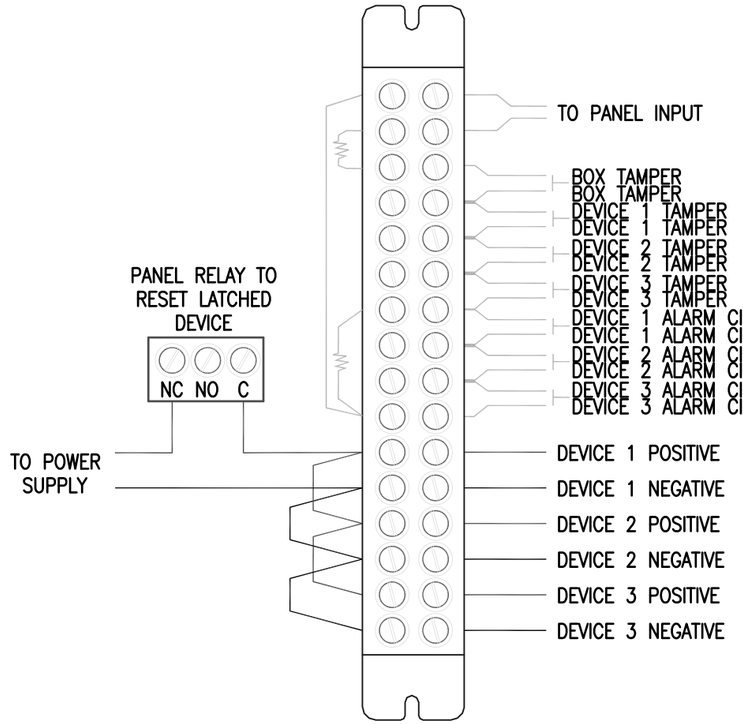
DETAIL SHEET

SHEET NO.
SHT OF 95

APPENDIX C

CIRCUIT VARATIONS
BOX OR DEVICE TAMPER: OPEN TROUBLE
DEVICE ALARM: 2K
ALL SECURE: 1K



NOTES:

DETAIL 1 — NOT TO SCALE — XX

WIRING DETAIL – MULTI SENSOR CIRCUIT WITH TAMPER IN SERIES WITH DEVICE ALARM CIRCUIT TO CREATE TROUBLE

KEY PLAN

GRAPHIC SCALE(S)

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MULTI SENSOR CIRCUIT WITH TAMPER

SHEET NO. OF

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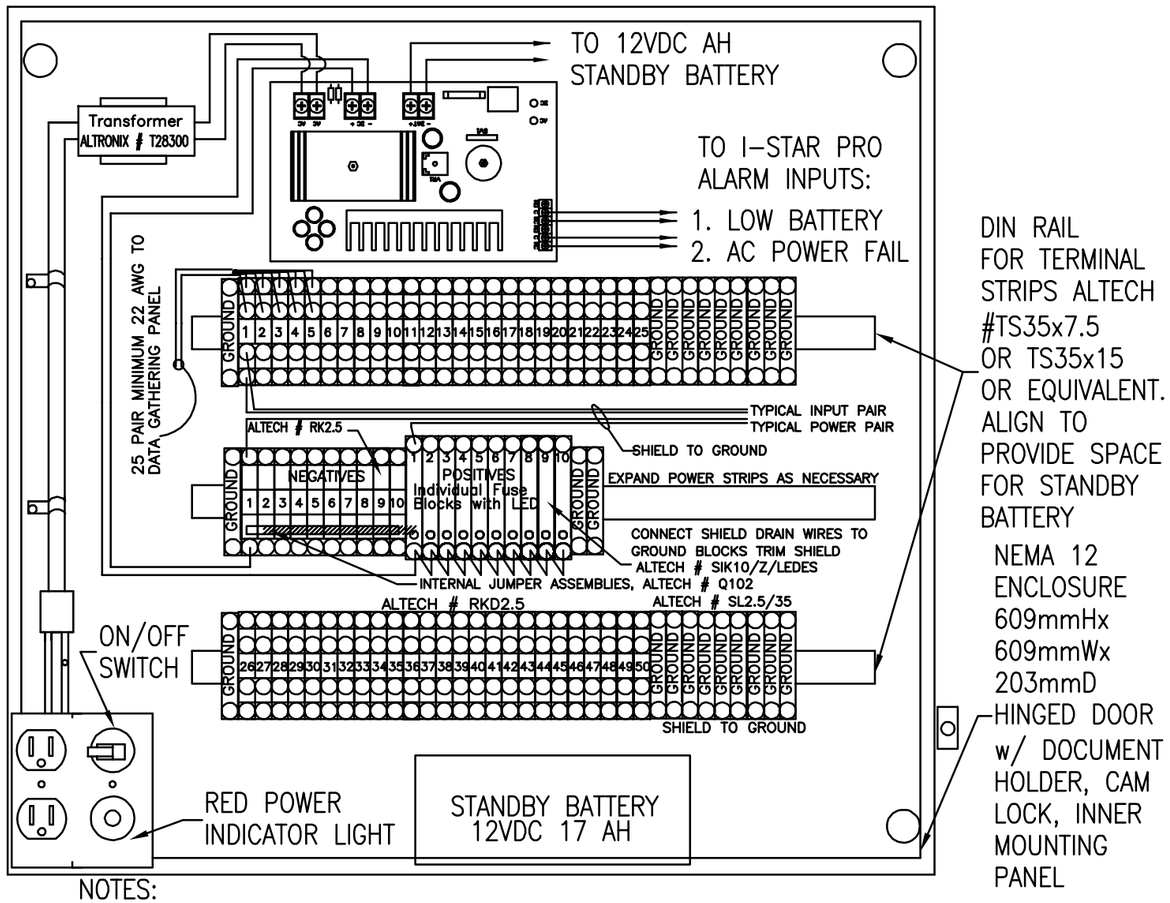
APPENDIX C



NOTES:

NOTES:

1. USE JUMPER TO DISTRIBUTE THE POWER ACROSS THE POWER NEGATIVE AND POSITIVE TERMINALS.
2. POWER SUPPLY MUST BE RATED FOR 10 AMP CONTINUOUS DUTY.
3. USE 1.5 AMP FUSES FOR BRANCH CIRCUIT PROTECTION.
4. USE HEAVY DUTY STANDOFFS FOR MOUNTING CIRCUIT BOARDS.
5. SECURE ALL WIRING WITH SPIRAL WRAP AND NYLON WIRE TIES.
6. DIN RAILS SHOULD BE OF SUFFICIENT LENGTH TO ALLOW EXPANSION BY ADDING TERMINAL STRIPS.
7. POWER OUTLET MOUNTED IN 100x100x62mm J-BOX w/ CUT OFF SWITCH AND RED POWER INDICATOR LIGHT
8. VERIFY PART NUMBERS WITH MANUFACTURER. SUBMIT EQUIVALENTS FOR APPROVAL.

KEY PLAN

GRAPHIC SCALE(S)

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POWER SUPPLY ENCLOSURE - ISTAR PRO

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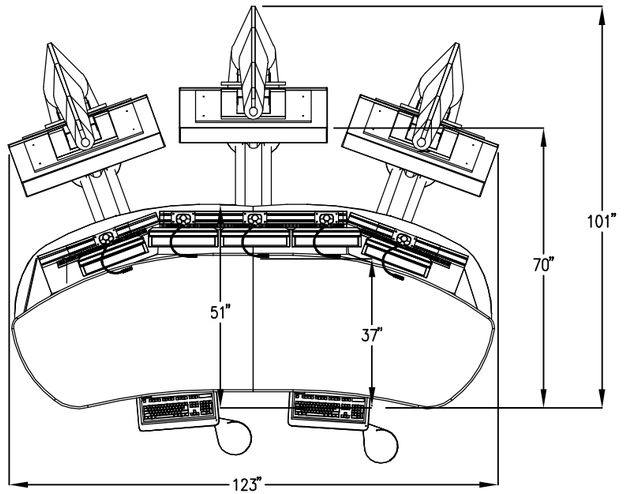

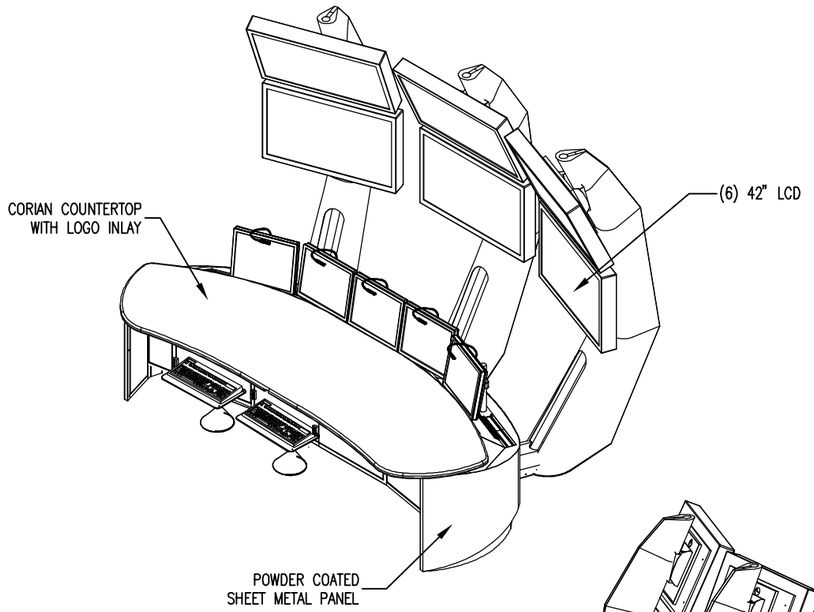

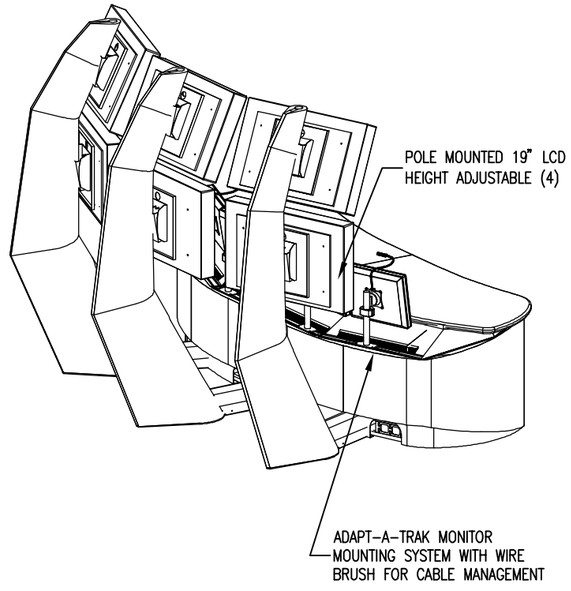

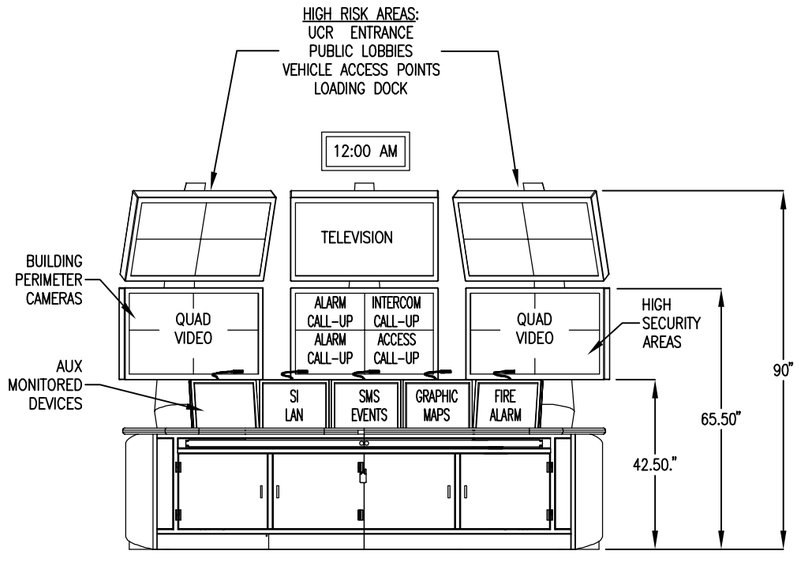

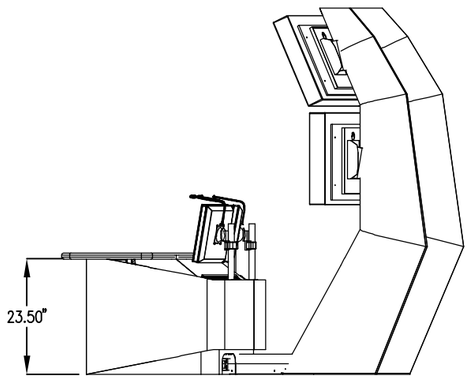

KEY PLAN

GRAPHIC SCALE(S)

DATE	?/??/??
SUBMISSION	???% SUBMISSION
REVISION 1	??/??/??
REVISION 2	??/??/??
REVISION 3	??/??/??
REVISION 4	??/??/??
REVISION 5	??/??/??
REVISION 6	??/??/??

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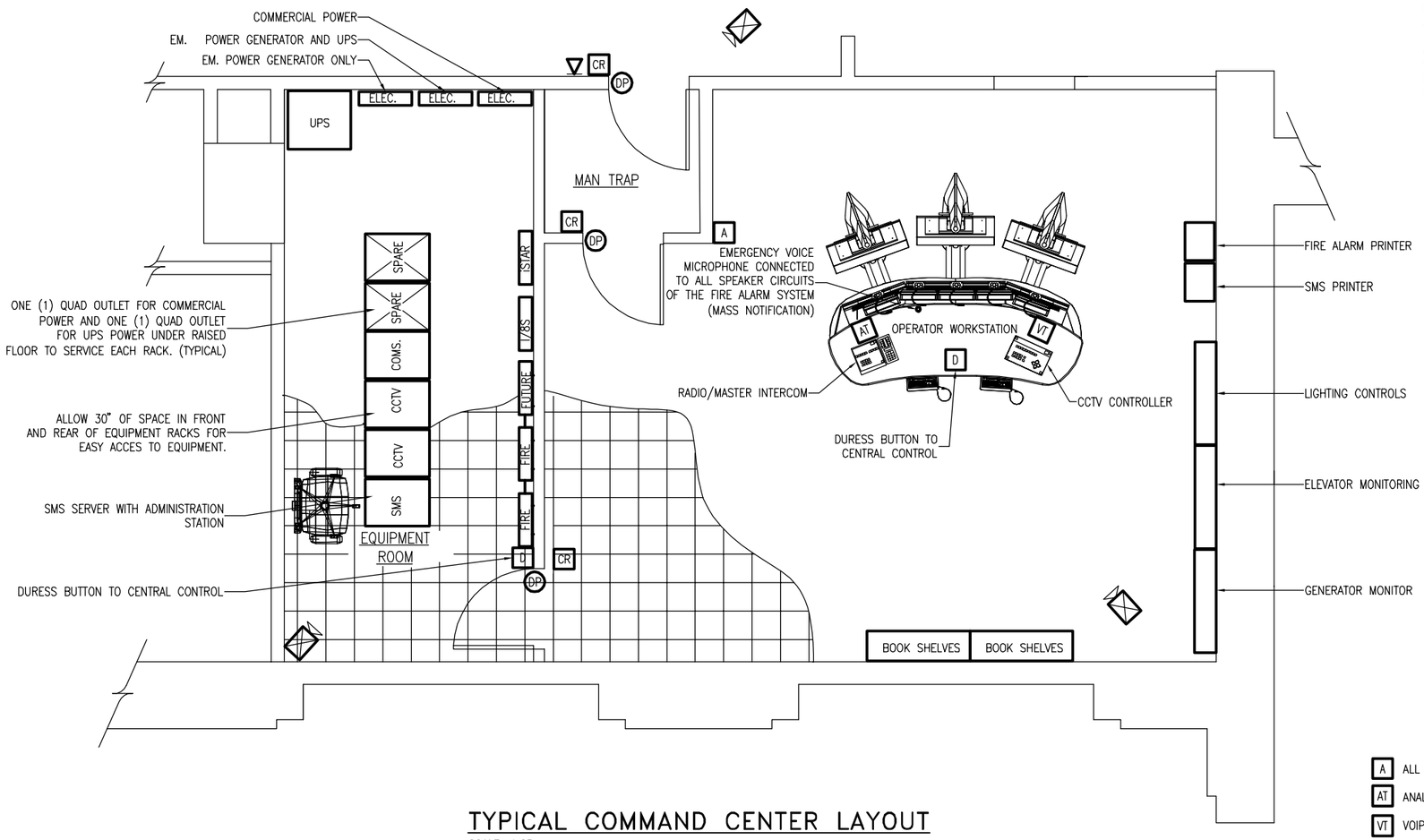
BUILDING NAME / ADDRESS	
PROJECT TITLE / SFEO PROJECT NUMBER / A/E PROJECT NUMBER	
DRAWING TITLE / DRAWING TYPE / WORKING STAFF	SECURITY CONSOLE DRAWING_TYPE ?? (DESIGNED BY) ?? (DRAWN BY) ?? (CHECKED BY)
SHEET NO.	SHT OF ??
DISCIPLINE / TYPE / SEQUENCE	SC / X / XX

APPENDIX C



TYPICAL COMMAND CENTER LAYOUT

SCALE: 1:25

NOTES

1. CONFIGURE MAN-TRAP ACCESS FOR ENTRANCE INTO UNIT CONTROL ROOM.
2. DESKTOP MOUNTED EQUIPMENT SHOWN IS TYPICAL. EQUIPMENT WILL VARY BASED UPON PROJECT SPECIFIC REQUIREMENTS.

POTENTIAL DESKTOP EQUIPMENT:

RADIO CONTROLLER
ZENITEL MASTER INTERCOM
TV CABLE CONTROLLER
ANALOG PHONE
VOIP PHONE
CCTV CONTROLLER
OTHER PROJECT SPECIFIC COMMUNICATION DEVICES

LEGEND

- A — ALL EVACUATION PULL STATION
- AT — ANALOG LINE TELEPHONE
- VT — VOIP TELEPHONE
- CR — CARD READER
- D — DURESS BUTTON
- DP — DOOR POSTION SWITCH
- INTERCOM STATION
- CAMERA

KEY PLAN

GRAPHIC SCALE(S)

?/??/??	??% SUBMISSION
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	??/??/??

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Washington DC 20560-0908

UNIT_CONTROL_& EQUIPMENT_ROOMS
TYPICAL_LAYOUT

??	??	??

SHEET NO. SHTOF

SC	X	XX
DISCIPLINE	TYPE	ORDINANCE

APPENDIX D

Collection Storage Risk Levels

APPENDIX D - COLLECTION STORAGE RISK LEVELS

1. INTRODUCTION

This information is offered to guide curatorial staff, OPS, and designers in establishing levels for Collection Storage spaces.

2. LEVELS OF RISK

The risk to any Smithsonian Institution collection item is the result of a combination of several factors. The perceived and/or actual value of a collection item can vary greatly from item to item and is one of those factors that must be identified by the Smithsonian Institution in order to establish the risk to any particular collection item. Value and the impact of loss or damage can be quantified by one or several factors including, but not limited to:

- Intrinsic value
- Cultural value
- Research value
- Reputation of the Smithsonian Institution or Federal Government
- Mission of the Smithsonian Institution or Federal Government

The mitigation measures appropriate for reducing risk for any particular collection item should also vary and be in proportion to the perceived or actual value the item. The physical and technical security measures identified in this section are divided into four risk categories, based on collection value, that would be established by the collection management staff, with guidance from OPS. In lieu of any such designation of risk/value, the default risk level assignment for any collection would be that of Medium Risk.

Objects on loan may carry conditions that require a level of protection above that which the museum would normally establish, if the item were in their collections. These standards should be considered minimum standards and can be increased if loan requirements or risk justifies such.

All new or renovated collection storage areas or facilities should be planned in accordance with these minimum standards. Existing collection storage facilities should strive to meet these standards where and when possible. Temporary, short-term, or emergency collection storage may be exempt from some of these standards. However, all exceptions or waivers to these standards can only be

approved by the Director, Office of Protection Services, or his/her designee.

3. GENERAL COLLECTION STORAGE

This includes libraries, archives, and zoo (animal) collections.

3.1. LOW RISK

The majority of objects are of low to moderate monetary value, but predominately low value. Objects are not unique items or one-a-kind, and do not have significant scientific value. Few or no real artifacts; all or many models or casts; replaceable; low monetary value. Educational or informational panels associated with the exhibit. None, or few loaned objects. No loaner special security requirements. Objects are not of controversial nature; not identified with any political or religious attachment. Not easily portable or movable; due to size, weight, etc. The objects have low marketability, not easy to re-sell. Objects not identified as having known theft interest; Public interaction; permitted-touchable items (public curiosity); few exposed items (low risk of damage) little risk to miscellaneous exhibit support items (audio/visual, flat screens, decorate lighting, etc); non- accessible or in cases to prohibit theft.

3.2. MEDIUM RISK

The majority of objects are of moderate to high monetary value, but predominately of moderate value. Objects categorized as having some unique characteristics (limited in quantity, but not one-a-kind); having potential scientific value. Exhibit includes a majority of authentic items; few models or cast items. Several items in the exhibit are identified as loaned items: some special security requirements. Objects have been identified as having some notoriety or of controversial nature; limited political or controversial issues related to items. There are an increased number of smaller portable items of associated substantial value. There is a Marketability of object(s). There is an increased theft temptation: objects are “cool” or “good souvenirs” - unusual in appearance. There are few permitted-touchable items; increased concern, recognized danger as public interaction/touching could cause damage. Increased sophistication or cost of exhibit support items (audio/visual, flat screens, decorative lighting, etc); non- accessible or in locked cases to prohibit theft.

3.3. HIGH RISK

The majority of objects are of high to very high monetary value, but predominately of high value. Objects are considered rare, extremely limited numbers known to exist; items have significant scientific value. Majority of exhibit objects have been identified as authentic artifacts or relics; limited usage of models or cast items. Several items in the exhibit are identified as loaned items: requiring special security arrangements. Notoriety of objects have been identified to be associated with controversy, political, or religious issues, history of demonstration or other activities. There are an increased number of smaller highly portable items of associated substantial value. High marketability of object; increased theft interest (ex. Jewels) There are fragile items; inaccessibility to public interaction/touch. There are miscellaneous exhibit support items (audio/visual, flat screens); non-accessible or in locked cases to prohibit theft

3.4. VERY HIGH RISK

The majority of objects are of very high monetary value. One-of-a-kind, irreplaceable items; objects identified as having extremely high scientific value. Exhibit objects have been identified as authentic artifacts or relics. Special loaned items (national treasures); special security arrangements are required. Notoriety of objects has been identified to be associated with controversy, political, or religious issues; history of demonstration or other activities (high publicity). Easy to remove, highly portable smaller items of associated extreme value. The objects are extremely high marketability; increased theft interest; history of thefts of similar items; actual threats of theft (organized and professional). Extremely fragile items; inaccessibility to public interaction/touch.

APPENDIX E

Smithsonian Declaration on the Collections Preservation Environment

APPENDIX E- SMITHSONIAN DECLARATION ON THE COLLECTIONS PRESERVATION ENVIRONMENT

With this Declaration on the Collections Preservation Environment, the Smithsonian Institution clarifies values, shared by the diverse professional disciplines that directly and indirectly care for Smithsonian collections, related to the collections preservation environment and likewise presents a shared vision for implementing environmental policy based on these common values.[1]

Collections stewardship is a key component and core priority of the Smithsonian's Strategic Plan. Assembled over the course of 168 years, Smithsonian collections are fundamental to carrying out the Institution's mission, serving as the intellectual foundation for scholarship, discovery, exhibition, and education. Smithsonian collections represent a diverse range of materials and disciplines, including works of art, historical artifacts, natural and physical science specimens, living animals and plants, images, archives, library volumes, audio and visual media, digital art and time-based media, and their associated information. Together, these irreplaceable national icons, examples of everyday life, and scientific material preserve the past, increase our understanding of society and the natural world in which we live, and support the research that expands human knowledge in the arts, humanities, and sciences. The scope, depth, and unparalleled quality of these collections make it imperative to ensure that they are properly preserved and made accessible for current and future generations to enjoy and study.

Environment and environmental control are fundamental components of collections preservation; appropriate environmental conditions provide collections with chemical, biological, and mechanical stability to extend their life, making them available to future generations. As described in the American Institute for Conservation's Guidelines for Practice, assigning appropriate environmental conditions extends the life of cultural property.[2] The Smithsonian Institution aims to provide and actively manage optimized environments to promote collections preservation based on a balance of scientific research, engineering capability, collections management protocols, and environmental impact. The dynamic factors comprising the preservation environment,[3] and to which the common values and shared vision statements detailed below apply equally, are:

1. Humidity and acceptable ranges for relative humidity
2. Temperature and acceptable ranges for temperature
3. Air quality and ventilation

[1] Participants in the "Summit on the Museum Preservation Environment" held in Washington, D.C. in March 2013 affirmed the goals of this Declaration in a straw poll after discussion and review of presentations by experts in the fields of preservation, facilities management, and sustainability.

[2] Guidelines for Practice of the American Institute for Conservation of Historic & Artistic Works, Section 20,
"Preventive Conservation," http://www.conservation-us.org/about-us/core-documents/guidelines-for-practice (accessed 6/20/2014).

[3] Environmental factors such as Light and Integrated Pest Management, which have an interrelated role in the
preservation environment, will be specifically addressed in separate policy statements.

Common Values and Shared Vision Matrix

Core Area	Common Values	Shared Vision
Collaborating	The Smithsonian Institution believes that collaboration is the foundation for establishing environmental parameters. Achieving optimal preservation environments requires defining objectives and finding consensus among all stakeholders. Agreement on environmental parameters is inherently challenging because it requires consideration of a number of factors, such as evolving material-specific environmental guidelines, building fabric, which may be of historic significance and fragile itself, system capability, limitations on staff and resources, and the growing impetus to reduce energy costs and operate more sustainably.	The Smithsonian Institution supports a work force that collaborates across disciplines to establish, monitor, and maintain collections environments. Roles and responsibilities of all stakeholders across all core areas are clearly delineated. Responsibilities include how each stakeholder contributes to routine planned discussions. Architects, curators, conservators, collections specialists, energy managers, engineers, facility managers, scientists, industrial hygienists, IT specialists, administrators, exhibition specialists, and others are included in discussions of the establishment of collections environmental parameters. Decisions are made by sharing information, negotiating positions based on information, and developing consensus towards the expressed value of progress towards an optimized environment. Resources such as the National Collections Program and facility capital and maintenance planning are available to collaborators to foster the spirit and effect of collaboration.

Core Area	Common Values	Shared Vision
Monitoring	The Smithsonian Institution recognizes monitoring as an essential element of preservation environment activities. Monitoring and the data derived from monitoring are the basis of conversations between stakeholders; they provide meaningful information for attempting diverse preservation management actions, such as establishing seasonal adjustments or rehousing priorities, and aid in the establishment of priorities for long-term improvements.	The Smithsonian Institution has a standard way in which environmental monitoring data is collected, reported, and interpreted across the organization. All collections spaces are designed and built with monitoring plans and protocols established and defined at the outset of design discussions. All collections spaces are designed and built with mechanisms for monitoring environmental conditions for the space and air handling systems. Environmental monitoring data is readily accessible to all stakeholders. Environmental monitoring of collections and exhibition spaces is automated and integrated. Existing systems and spaces are studied for action and modeling, especially in historic or older spaces that may not be compatible with desired specifications. The purchase of room- and system-level environmental monitoring equipment and associated software is reliably supported.

Core Area	Common Values	Shared Vision
Training	Training provides the opportunity for understanding the evolution of theory and practice in the application of environmental parameters. The Smithsonian Institution believes that education and training of the Smithsonian workforce on the role of the environment in collections preservation, including promoting the understanding of the relationship between material damage in collections and the exposure to an improper environment, is fundamental to effective collaboration.	The Smithsonian Institution is committed to cultivating professional development and training the workforce on the essential role that a controlled and optimized environment has on collections preservation, as well as on the theory and practice of the preservation environment and the variety of means that ensure collections have optimal environments. Likewise, Smithsonian employees commit to keeping current with the theory and practice of the preservation environment. It is incumbent on staff to take training to understand why reappraisal of established environmental parameters is part of the ongoing professionalism of collections care.

Core Area	Common Values	Shared Vision
Guidelines and Best Practices	The Smithsonian Institution believes that standards, guidelines, and best practices for establishing, monitoring, and maintaining the collections environment form the basis for reasoned collections environment decisions, and therefore does not support a single specification for all collections. A broad range of choices may be made with respect to relative humidity, temperature, and air quality to provide optimal preservation environments and to meet operational and energy sustainability goals.[4] Smithsonian scientists are poised to play a role in the research that leads to establishing environmental parameters.	The Smithsonian Institution conducts research concerning the relationship between the environment and collections preservation in order to continue refining an understanding of the role of the preservation environment and the mechanisms for damage to collections. Standards are routinely reviewed and continuing research contributes to the refinement of existing guidelines and best practices. Standards and regulations regarding fire safety, health, building envelope, and HVAC are well-understood as part of the discussion of the preservation environment.

[4] Several guidelines and standards are especially valued for their helpfulness in formulating a rationale for the specification of relative humidity and temperature for collections:

- British Standards Institute, Publicly Available Specification (PAS) 198: 2012 "Specification for managing environmental conditions for cultural collections";
- American Society for Heating and Air-conditioning Engineers (ASHRAE) Handbook: HVAC Applications Chapter 23 "Museums, Galleries, Archives, and Libraries";
- Smithsonian Institution Facility Design Standards, http://www.ofeo.si.edu/ae_center/pdf/SI%20Standards_Jan2012.pdf (accessed 6/6/2014);
- American Institute for Conservation of Historic and Artistic Works, interim guidelines for loans, http://www.conservation-wiki.com/wiki/Environmental_Guidelines (accessed 6/19/2014);
- Smithsonian Directive 600, Collections Management, http://prism2.si.edu/SIOrganization/OCFO/OPMB/SD/SD600.pdf (accessed 3/19/2014)

Core Area	Common Values	Shared Vision
Risk Management	Some Smithsonian collections are tolerant of a wide range of environments because of their robust physical nature; other collections have specific requirements and special needs for long-term preservation. The Smithsonian recognizes that different approaches may be used to characterize the requirements of a particular collection or facility. Comprehensive risk management models used in collections management have an important role to play in establishing environmental parameters. Standards may be used in tandem with risk management models to develop reasoned collections environments.	Smithsonian Institution collections staff are trained to be knowledgeable about the profiles of the materials in their collections and apply modern approaches to categorizing collections' fragility and hardiness. Environmental requirements for a collection are thoroughly discussed with stakeholders and the methodologies used to make decisions, including the resulting decisions themselves, are well-documented. Historic structures are considered when performing risk management exercises and are evaluated for building performance.

Core Area	Common Values	Shared Vision
Sustainability	The Smithsonian Institution acknowledges that the preservation environment, operational sustainability, and environmental sustainability are interdependent. More sustainable preservation environments and operations also may extend the lifetime of collections. Sustainable preventive conservation methods have the potential to influence the type of preservation environment required for collections.	Improving the sustainability of collections preservation environments requires implementing strategies to conserve energy and water and to ensure the continued operations of preservation environment systems. The Smithsonian pursues these strategies while also fulfilling its responsibility to preserve, and to make accessible to present and future generations, the collections in its care. Energy and water conservation measures which may affect the preservation environment are developed in collaboration with all stakeholders. The process for selecting systems utilized in the preservation environment takes into account life-cycle costs impacting operational and financial sustainability.

Core Area	Common Values	Shared Vision
Customized Specifications	The Smithsonian Institution considers the preservation environment of each collections space to be one of the paramount mechanisms for ensuring the longevity of collections. Therefore, the preservation environment specifications of each collections space are actively defined to meet practical and sustainable parameters. Because of the wide variety of collections materials and collections spaces across the Smithsonian, and because conservation research has acknowledged the variety of approaches to establishing preservation environment parameters, there is not a default preservation environment specification. The space may be intentionally unconditioned or may be continually refined based on new data through a collaborative process among stakeholders, but tightly controlled 70° F and 50 percent RH is no longer considered an appropriate, practical, sustainable, or useful set-point for all collections.[5]	The Smithsonian captures the many data points of the preservation environment, allowing stakeholders to discuss it flexibly and openly, to adapt to changing information, and to account for differences of findings on environmental readings. At a minimum, all collections spaces receive pro-active specification of relative humidity and temperature allowances and seasonal adjustments. Several core areas from this document – monitoring, guidelines and best practices, risk management, and sustainability – are factors that contribute to the collaborative establishment of the optimal preservation environment for each collections space.

[5] In recent years, the Smithsonian Institution has actively pursued specifications that reflect seasonal adjustments, set-backs, and shutdowns calculated to avoid condensation in building envelopes. Research by the Smithsonian Institution Museum Conservation Institute demonstrated that a broad RH range can be tolerated by many objects. For exhibition spaces where the need for human comfort and protection of building structures is frequently cited, a guideline of 37-53 percent RH and 66-74°Fahrenheit has been developed. http://www.si.edu/mci/downloads/reports/mecklenburg-part1-RH.pdf (accessed 6/6/2014). Many spaces for collections at SI have adopted a "cooler and drier" methodology as well.

APPENDIX F

Exhibit Fabrication Guide

- Appendix F1 – Exhibit Fabrication Guide
- Appendix F2 – Fire and Life Safety Checklist for Exhibit Construction
- Appendix F3 – General Notes for Exhibit Design
- Appendix F4– Frequently Asked Questions about Exhibits Materials
- Appendix F5 – Approved/Prohibited Exhibit Materials [RESERVED]

APPENDIX F1- EXHIBIT FABRICATION GUIDE

1.1 GENERAL

A. This chapter sets forth the appropriate fire protection and safety requirements for organizations planning or engaging in exhibit construction, improvement and alteration projects.

B. The Smithsonian Institution shall ensure that the established fire protection and life safety requirements outlined in the Smithsonian Safety Manual and this Design Manual are carried out in the planning and design of all exhibit construction, improvement, and alteration projects.

1. This consists of the most current edition of the codes and standards cited in this Design Manual, including, but not limited to:

   i. IBC, *International Building Code*

   ii. IFC, *International Fire Code*

   iii. NFPA 101, *Life Safety Code*

   iv. NFPA 13, *Installation of Sprinkler Systems*

   v. NFPA 72, *National Fire Alarm and Signaling Code*

   vi. OSHA Standards Part 1910, *Occupational Safety and Health Standards for General Industry*

   vii. OSHA Standards Part 1926, *Safety and Health Regulations for Construction*

C. Because of the broad scope of concern, the Office of Safety, Health and Environmental Management (OSHEM) should be consulted in the earliest stages of planning, and development or design for all projects to ensure adequate consideration of all necessary requirements within the project time constraints.

1. The SI office responsible for organizing, planning, or engaging in any exhibit construction, improvement and alteration project is responsible for ensuring OSHEM is consulted in the earliest stages of the exhibit planning.

2. The Office of Safety, Health and Environmental Management (OSHEM) Director is responsible for directing and implementing fire protection, life safety, and occupational safety and health functions.

3. OSHEM will provide technical supervision, assistance, review, and approval during the design and construction process.

Commentary: Exhibits staff are encouraged to involve OSHEM directly in the initial stages of a design to ensure fire and life safety issues are identified and addressed early on.

D. A checklist to aide exhibit design and fabrication with respect to Smithsonian Institution fire and life safety requirements and standards is provided in Appendix A of this Design Manual.

E. Please refer to Appendix F, General Notes for Exhibit Design, and Appendix G, Frequently Asked Questions about Exhibits Materials, for additional information.

Commentary: These sections are new to this edition of the Manual and contain information regarding general notes that should be present in every drawing set, as well as questions and answers about exhibit materials that are frequently the subject of conversations between OSHEM and exhibit design personnel.

1.2 EXHIBIT DESIGN DRAWINGS

A. General

1. Exhibit design, construction plans and specifications shall be submitted for OSHEM for review and approval at all contract submission milestones.

2. Plans shall be approved by OSHEM prior to the start of any construction or alteration activities.

3. The general notes found in Appendix F of this Manual shall be included in each exhibit design drawing set.

B. Key Plan

1. A key plan shall be provided showing the location of the project area in relation to the building floor plan.

C. Floor Plans

1. Plans shall indicate all new and existing wall, floor, and ceiling construction.

2. Areas where work is to be accomplished shall be labeled and the occupancy of the areas in close proximity to the project site (e.g. gallery, office, corridor, exit stair, collection storage) identified.

3. All new, relocated, and existing fire safety equipment on both the demolition and new work plans must be shown and labeled appropriately.

i. This equipment includes but is not limited to: sprinkler heads, smoke detectors, heat detectors, pull stations, standpipes/hose cabinets, fire extinguishers, bells/horns/speakers, strobe lights, remote

indicator lights, exit signs, emergency lights, air supply and return ducts, fire-rated partitions, and fire doors.

4. Plans shall indicate exit details such as location, paths of access/egress, door swing, and width of passageways and doors.

   Commentary: The closure of a gallery for exhibit construction may impact egress from adjacent spaces. Where this occurs, plans should encompass the impacted areas.

   Indicating the exit paths to the nearest stairwell or building exit on the drawings facilitates the project's life safety review. This may require showing more of the building on the plans than just the area of work.

5. Plans shall indicate the hourly rating of new and existing fire doors and frames, and include details of new fire door assemblies, such as area of glazing, materials of construction, and types of hardware.

D. Existing Conditions

1. Show locations of all existing fire alarm devices. Indicate make and model number, and type of existing equipment. Ensure devices will not be obstructed by new work.

   Commentary: A common issue found (especially with cycling exhibit galleries) is that new walls will obstruct the view of notification devices. Care should be taken to relocate fire alarm speakers and strobes if necessary. Ceiling mounted strobes can be used in lieu of wall-mounted devices to avoid conflicts with exhibit construction.

2. Show locations of all existing automatic sprinkler heads. Indicate height above the floor (if it varies) and sprinkler type (pendent, upright, or sidewall).

   Commentary: In general, exhibitory should be kept to a height 18" or more below the level of sprinkler deflectors. This will avoid sprinkler coverage issues.

3. Show locations of all exit signage.

E. Special Operations and Hazardous Materials

1. Any special operations to be performed, or hazardous materials to be used, in the work area or nearby spaces shall be noted on the drawings. Examples include: electrical hazards, use of flammable or toxic materials, special cleaning operations.

F. Exhibited Objects

1. Drawings shall include adequate information about the objects on display to assess their impact on the level of fire protection and life

safety. Plans are to include the dimensions, exact location, and construction materials of large objects not enclosed within vitrines.

Commentary: Advance coordination with OSHEM of fabrication is critical to ensure fire protection and life safety requirements are met. The goal of this interaction is to ensure adequate life safety for visitors and staff, while minimizing impact to the exhibited objects.

2. Objects or exhibit construction shall provide necessary details to demonstrate that hazards such as sharp edges, tip-over, and moving parts are properly mitigated.

1.3 EXITS

A. Exit Details

1. All public galleries shall have a minimum of two exits, arranged to be remote from one another.

Commentary: Large galleries with capacities of more than 500 occupants, based on the criteria of NFPA 101, require three exits; galleries with capacities of more than 1000 occupants require four exits.

2. Ensure the clear width along all points on the primary egress path is a minimum of 5 feet (1524 mm).

Commentary: The wider path compensates for circuitous routes through an exhibit, and allows occupants room to turn around and head towards an exit in the event of a fire.

3. Ensure the clear width along all points on the secondary egress paths is a minimum of 44 inches (1117 mm). (In certain situations, NFPA 101 and OSHEM may require greater clear width.)

Commentary: Wider egress paths may be required to accommodate large exhibit spaces with higher occupant load capacities, per NFPA 101.

B. Exit Signs

1. Location

i. Exits shall be properly identified by exit signs. Exit signs shall be listed or approved, readily visible, and of a distinctive color which contrasts with the surrounding decor.

ii. No display, object or brightly illuminated signs shall be placed in the line of vision to distract attention from the exit signs.

2. Lettering

i. Each exit sign shall have the word, "EXIT" in plain, legible letters not less than 6 inches (150mm) high, with the principal stroke of letters

not less than 3/4 inches (19mm) wide.

ii. An arrow, indicating the direction of exit travel, shall be used when the direction is not readily apparent. Refer to NFPA 101 for other specific requirements.

3. Illumination

i. Exit signs shall be illuminated by either an integral light source or an external light source measuring not less than 5 foot-candles (54 lux) at the illuminated surface under both normal and emergency power.

ii. Internally illuminated signs shall be listed in accordance with ANSI/UL 924.

4. Power Supply

i. The power shall be supplied by continuous power source with secondary power from an emergency generator or integral battery.

C. Walking Surfaces

1. Changes in Elevation

Commentary: NFPA 101 recognizes the changes in elevation noted below as tripping hazards. Any change in excess of the below must be achieved by a ramp or stair.

i. Abrupt changes in elevation of walking surfaces shall not exceed 1/4 inch (0.63 cm).

ii. Changes in elevation exceeding 1/4 inch (0.63 cm), but not exceeding 1/2 inch (1.3 cm) shall be beveled with a slope of 1 in 2.

2. Headroom

i. Minimum headroom shall be 6 feet 8 inches (203 cm) at doors or stairwells.

3. Platforms

i. Platforms protruding into walk spaces present a "strike the ankle" type hazard. Special lighting, color contrast, padding, or full height guardrails are recommended.

D. Stairs and Steps

1. Fewer Than Three Risers

i. When fewer than three risers are used, measures shall be taken to create awareness of the elevation change. Examples include special lighting, color contrast, change in floor surface, or barriers.

2. Width and Height Requirements

   Commentary: The requirements below are taken verbatim from NFPA 101.

   i. Minimum width of stairs and steps shall be 44 inches (112 cm) and clear of all obstructions except handrails. Stair and landings shall not decrease in width along the direction of exit travel.

   ii. Treads shall not be less than 11 inches (27.9 cm).

   iii. Risers shall not be less than 4 inches (10.2 cm) nor more than 7 inches (17.8 cm).

   iv. Variations in width of adjacent treads and height of adjacent risers shall not exceed 3/16 inch (.5 cm). Variation between sizes of the largest and smallest risers or between the largest and smallest tread depths in a flight of stairs shall not exceed 3/8 inch (0.95 cm).

3. Landings

   i. Doors may not open immediately onto stairs without a landing of at least the width of the door, plus one tread dimension.

      Commentary: This configuration removes the risk of tripping or falling upon opening the door and is an NFPA 101 requirement.

4. Handrail Details

   Commentary: The requirements below are taken verbatim from NFPA 101.

   i. Stairs and ramps shall have handrails 34 to 38 inches (86 to 96 cm) high measured from the leading edge of the tread to the top of the rail.

   ii. Additional handrails that are lower or higher than the main rail are permitted. For areas where children are the primary users, it is recommended that an intermediate handrail be installed.

   iii. Handrails shall be installed to provide a clearance of at least 2-1/4 inches (56 mm) from the wall to which it is attached.

   iv. Handrails shall offer no obstruction to a smooth handhold surface along the top and both sides of the rail.

   v. Handrails shall have a circular cross section with an outside diameter of at least 1-1/4 inches (3.2 cm) and not greater than 2 inches (5 cm).

   vi. Handrails shall extend horizontally at least 12 inches (30.5 cm) beyond the top riser and continue to slope for a depth of one tread beyond the bottom riser.

   vii. Ends of handrails shall be turned into the supporting wall, floor

or shall terminate at newel posts.

5. Guardrails

Commentary: The requirements below are taken verbatim from NFPA 101.

i. Guardrails shall be provided at floor openings, open-sided floors, platforms (30 inches (76 cm) or more above the floor or ground level) and ramps. All open sides shall be guarded by railings, except where there is an entrance to a ramp or stairway.

ii. Guardrails shall have a vertical height of 42 inches (107 cm) measured from the upper surface of the top rail to the floor, platform, or runway.

iii. Guardrails shall be capable of withstanding a load of at least 200 pounds (90.7 kg) applied in any direction at any point at the top of the rail.

iv. Provide full-height (42") guardrails or barriers in lieu of cane rails.

Commentary: Experience with cane rails at SI has shown that they often present a significant tripping hazard.

1.4 FIRE-RATED CONSTRUCTION

A. Penetrations Through Fire-Rated Construction

1. Penetrations through fire-rated construction (i.e. walls, floors, etc.), not protected by fire dampers or combination fire/smoke dampers, shall be sealed with an approved penetration firestop material that maintains the fire rating.

Commentary: Most foaming insulation is not approved firestop material. This type of material will still burn in the presence of fire due to its chemical makeup.

2. All installations shall comply with the manufacturer's installation requirements.

1.5 MATERIALS OF CONSTRUCTION

A. General

1. All materials of construction shall be noncombustible or inherently fire retardant. These requirements typically do not apply to artifacts/collections to be exhibited, unless the object presents an appreciable fire risk as evaluated by OSHEM.

Commentary: Extreme care must be exercised in the selection of interior finish materials. Some veneers and synthetic J wall, ceiling and floor coverings are dangerously combustible. Flames spread rapidly

over them, generating large amounts of smoke and toxic products of combustion. The danger to collections and to the lives of visitors and staff from improperly selected interior finish materials cannot be overemphasized.

2. Readers are encouraged to reference Appendix F for common information required on exhibit design drawings.

3. When completed, readers are encouraged to reference Appendix G for approved materials for exhibit construction.

B. Testing

1. Fire tests for construction materials must be conducted by an independent, national testing laboratory, such as Underwriters Laboratories.

   Commentary: Such labs follow established test standards to rate the fire performance of construction materials, including how much fuel a material contributes to a fire, how quickly flame spreads over its surface, and how much smoke it generates.

   Standardized fire testing is a costly and lengthy process. OSHEM recommends using products that have been previously tested to the ASTM standards listed below.

2. Fire performance is to be measured using a standardized test, recognized by national codes, and appropriate for the material type and application. Flame spread shall be measured using test standard ASTM E-84, and critical radiant flux is to be measured using test standard ASTM E-648.

   Commentary: For ASTM E-84, the lower the flame spread the better its performance in the test. For ASTM E-648 the higher the critical radiant flux the better its performance in the test.

3. Test results of any materials may be requested by OSHEM for review prior to approval.

C. Wall and Ceiling Materials

1. Wall and ceiling materials that are used in exhibit spaces or the means of egress such as paneling or acoustical tiles; shall have a flame spread rating of 25 or less, and a smoke developed index of 450 or less, as measured in accordance with ASTM E-84, Surface Burning Characteristic of Building Materials.

   Commentary: The above numerical values equate to a Class A rating in accordance with ASTM E-84. Common wall materials that meet this

requirement are drywall, fire retardant MDF (e.g. Medite FR), and fire retardant plywood (e.g. Pyroguard).

The test results of ASTM E-84 are represented by a dimensionless number. For reference, mineral board has a flame spread of zero, and red oak has a flame spread of 100 per the test.

2. Materials not appropriate for testing with ASTM E84 shall pass NFPA 286.

   Commentary: Materials that are not appropriate for testing with E84 include materials that melt or drip. This includes most plastics and plastic foams, which are discouraged by this Manual. NFPA 286 is a more realistic fire test that utilizes a full-scale fire to approximate the contribution of a given material to a fire scenario in a compartment.

3. For exhibit spaces protected by an automatic sprinkler system, wall and ceiling materials shall have a flame spread rating of 75 or less.

   Commentary: Materials with a numerical flame spread rating from 26 up to and including 75 are considered to have a Class B rating, in accordance with ASTM E-84.

4. Wall mounted materials that have an aggregate surface area exceeding 10% of the wall area, and single pieces over 100 sq. ft. (9.3 sq. m) shall comply with the above requirements for wall and ceiling materials.

   Commentary: Wall mounted materials in this size or coverage begin to perform similarly to a wall finish. This size requirement includes backings for portraits and other wall-hung materials. Acrylic does not meet Class A or B ASTM E-84 requirements; therefore, the aggregate quantity of wall-mounted acrylic must have a surface area less than 10% of the wall area, and individual panels must have an area less than 100 sq. ft. Materials such as metal sign blank, fire retardant MDF, or glass are acceptable alternatives in this situation.

D. Wood

1. Wood used for walls, platforms, dioramas, blocking, furring, cases over 100 cubic feet (2.8 cubic m), light attics with electric lighting, and similar applications shall be fire retardant, pressure impregnated.

   i. Fire retardant coatings and intumescent paint are not acceptable in lieu of fire retardant pressure impregnation treatment.

      Commentary: Fire retardant coatings and intumescent paints are not absorbed/impregnated into the wood, as pressure impregnated fire retardant treatments are. While paints and similar coatings can reduce the flame spread across the surface of a material, they do not

alter the combustibility of the entire product. Additionally, such coatings can flake off or lose their effectiveness over time, leading to inadequate protection.

ii. This requirement shall not apply to cabinets, showcases or finish trim.

iii. Unenclosed spaces beneath table-style cases shall not contribute to overall case volume when considering the 100 cubic foot (2.8 cubic m) limit.

E. Carpeting

1. Flooring materials shall have a minimum critical radiant flux of 0.45 watts/cm², when tested in accordance with ASTM E-648, Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

   Commentary: The numerical value above corresponds to a Class I finish in accordance with ASTM E-648.

2. Carpeting shall also pass the Methanamine Pill Test, Federal Flammability Standard FF-1-70 (ASTM D-2859).

   Commentary: All carpeting imported, sold, or brought into commerce within the USA must meet the test above.

3. For installations specifying carpeting on walls the following criteria shall be used:

   i. The room shall be protected by an automatic sprinkler system.

   ii. Materials shall have a Class A rating (flame spread 25 or less and smoke development factor less than 450), as measured by ASTM E-84.

   Commentary: Materials perform differently in a fire when oriented vertically versus horizontally. Vertical surfaces tend to spread fire more rapidly than horizontal surfaces; therefore carpeting specified for wall installation must meet a Class A rating as tested per ASTM E-84 for wall finishes.

F. Draperies, Bunting or Decorative Textiles

1. All material intended for decorative purposes, such as draperies, scrim or bunting shall be certified flame resistant in accordance with the criteria contained in the current edition of NFPA 701, Methods of Fire Tests of Flame- Resistant Textiles and Films. Samples and fire test data shall be submitted to OSHEM for evaluation and approval.

   Commentary: Every effort should be made to obtain materials that are factory treated to meet NFPA 701. In the event that a fabric does not

come in a fire retardant variety, it may be treated post-manufacturing with a fire retardant. The requirements above for test data and samples still apply.

G. Plastics, fiberglass, exposed foamed plastics, materials containing foamed plastics

1. Plastics, exposed foamed plastics, and materials containing foamed plastics are prohibited from being used in the exhibit unless the specific criteria in the Life Safety Code and the IBC for Interior Finish and Furnishings, Decorations, and Scenery have been met.

   Commentary: Plastics are extremely flammable and produce toxic combustion products when burned. This type of material should not be selected for an exhibit when non-combustible or fire-retardant materials could be used.

   The documents above refer to ASTM E84 for most materials. However, plastics used as a wall finish (such as HDPE panels) must pass NFPA 286. Plastics used as trim (and similar auxiliary uses) must pass NFPA 289/UL 1975.

   However, the Codes do not adequately address items found in our galleries, such as fabricated models. Please see the model-making section below.

2. Samples and fire test data shall be submitted to OSHEM for evaluation and approval.

3. Vitrines materials with more than 100 sq. ft. (9.3 sq. m) of exposed vertical surface area shall comply with the interior finish requirements for walls and ceiling materials.

   Commentary: For vitrines, only the vertical (wall) surface area is tabulated, as flame spread over the vertical surfaces is of more concern than that of the horizontal ones. Acrylic use is limited to an aggregate exposed surface area of 100 sq. ft., since acrylic does not meet Class A or B ASTM E-84 requirements.

4. Fiberglass must use a fire-retardant resin and pass Class A or B interior finish requirements when tested in accordance with ASTM E-84 in the design thickness.

5. Aluminum Composite Materials (ACM) (e.g. di-bond) may be used for standalone signage and the backing of vitrines when the material does not exceed 100 sq. ft. in area. This material may not be used to construct casework. The material must pass ASTM E84 Class A.

   Commentary: OSHEM acknowledges that this material is preferred as a

graphics backing material in some instances. While this type of material passes ASTM E84, it still contains a significant amount of plastic, which melts, drips, and burns when exposed to heat and flame. Thus, its use is limited to the above.

6. Desiccant chambers within cases less than 100 ft^3 in size may be constructed of acrylic. ACM may be used in larger cases for this purpose. The ACM must pass ASTM E84 Class A.

   Commentary: The surfaces of desiccant chambers are required to be inert in terms of object conservation. Acrylic and ACM are two materials that have been approved by SI conservation staff. Barrier films (e.g. Marvelseal) are considered a last resort to accomplish separation between case materials and a specimen.
   Given the limited space that desiccant chambers occupy, the above-specified materials are permitted for this purpose.

H. Glass

1. Glass used in vitrines or displays that exceeds 48 inches (1219 mm) in any dimension shall be laminated safety glass.

   Commentary: The IBC requires safety glass for large panes of glass. The large number of cases and vitrines and high visitation in our public spaces, raises the risk of injury due to glass breakage. Thus, the IBC requirements for safety glass are applied in this situation.

I. Model-Making

1. It is not the intent of this Manual to prohibit the construction of models. However, models are often fabricated from plastic or foam. As stated in previous sections of this document, plastics and foam plastics are prohibited, unless meeting the specific requirements of IBC and the Life Safety Code.

   Commentary: Early collaboration with OSHEM on model design and fabrication is highly recommended.

2. Refer to Appendix G for guidelines on model fabrication.

1.6 FIRE ALARM AND DETECTION SYSTEMS

A. General

1. Smoke detection shall be installed in all areas and shall meet the requirements of the current edition of NFPA 72, the SI Fire Protection & Life Safety Design Manual, SI Standard Specifications, and the manufacturer's design specifications.

2. When a permanent gallery is closed to install a new exhibit, potential fire detection and alarm system upgrades must be evaluated and implemented. Ceiling-mounted notification appliances are preferred to provide maximum flexibility in exhibition design.

3. Smoke detectors and notification appliances shall not be field-painted.

   Commentary: Devices may be compromised if field-painted. Additionally, their listing/approval assigned by Underwriter's Laboratories (UL) or Factory Mutual (FM) will be invalidated. Field-painted devices can no longer be used as part of a listed/approved fire alarm system, and must be replaced.

4. Protective covers for fire detection and suppression devices shall be provided during dust-creating construction and painting operations. Protective covers shall be removed at the end of each workday. The SI Fire System Impairment Permit must be used each time detectors are covered or taken out of service by some other means.

   Commentary: Any work activity that will create dust can clog the sampling chamber of the smoke detectors and cause them to malfunction. If air sampling smoke detection (VESDA) is present in the gallery, the VESDA unit should be deactivated to preserve the filters. The system must be reactivated at the end of each workday, after dust has been cleared.

   It cannot be emphasized enough that the museums are most vulnerable to fire while undergoing construction. It is critical to have fire detection systems operational, except when dust-generating activities are ongoing.

B. Manual Fire Alarm Stations

   1. Manual fire alarm stations shall not be obstructed and shall remain accessible at all times.

C. Placement of Bells, Horns, and Speakers

   1. Audible devices shall be installed so that they are at least 15 dB louder than the maximum noise level that normally occurs in the area served.

D. Placement of wall and ceiling mounted strobes.

   1. Visual devices (strobes) shall be installed per NFPA 72, and not obstructed from view by exhibit construction.

E. Relocation or Extension of Existing Equipment

1. Determine final location of walls, barriers and ceilings before placing detection and alarm equipment.
2. New equipment shall be compatible with the existing system.

F. Testing of Devices

1. OSHEM must witness acceptance testing of new or relocated devices.

1.7 AUTOMATIC SPRINKLER SYSTEMS

A. General

1. Provide automatic sprinklers in all areas. Sprinkler installations shall meet the requirements of the current edition of NFPA 13, SI Fire Protection & Life Safety Design Manual, SI Standard Specifications, and the manufacturer's design specifications.

   Commentary: Care must be taken to ensure that new exhibitry does not obstruct fire sprinkler discharge. In general, floating ceilings/objects less than 4 feet in diameter and kept at least 18" below the sprinkler head will not require sprinkler protection. Mesh/grate-type ceilings less than 70% open will require a separate level of sprinkler protection. Obstructions may also comply with the cloud ceiling requirements of NFPA 13 where permitted.

2. When a permanent gallery is closed to install a new exhibit, potential fire protection system upgrades must be evaluated and implemented.

B. Relocation or Extension of Existing Equipment

1. Determine final location of walls, barriers and ceilings before considering changes to the sprinkler system.
2. If existing equipment must be extended or relocated, provide a layout showing location and size of existing and proposed piping.
3. Sprinkler system additions and modifications shall be per the latest edition of NFPA 13 and designed for Ordinary Hazard Group II Occupancies.

   Commentary: Providing Ordinary Hazard II sprinkler density allows for flexibility in future designs.

4. Pipe sizes shall be determined by hydraulic calculation.
5. Obstructions over four feet in width require sprinkler coverage underneath.

Commentary: This section does not apply to cases, tables, and similar construction.

C. Sprinkler heads and concealed sprinkler plates shall not be field painted. Any sprinkler heads or plates coated with paint in the field shall be replaced.

Commentary: When sprinkler heads or plates are painted, their ability to function is diminished. Care should be taken during painting stages to ensure that the heads do not need to be replaced. Please note that heads may not be "cleaned" to remove material if they have been painted; they must be replaced.

D. Enclosed dioramas/cases greater than 150 square feet in size shall have sprinkler coverage installed within unless it meets all of the following requirements and is approved by OSHEM:

1. The exhibitry is constructed of noncombustible materials. Fire retardant wood is also permitted.
2. Light attics are enclosed in metal and separated from the primary cavity of the case by glass.
3. All lighting is low voltage.
4. No other line-voltage electrics are present in the case.

Minimal diorama/scenery is present within. Anything in the exhibitry (other than specimens/objects) must be noncombustible or fire retardant.

Commentary: Sprinkler systems are designed to react to incipient fires and control them while they are small. Large unsprinklered casework and exhibitry can delay sprinkler operation, allowing a fire to grow unchecked. This represents a gap in the sprinkler protection strategy.

Very large objects/artworks will need to be evaluated by OSHEM on a case-by-case basis. That being said, large exhibits that visitors can enter or walk through are subject to this section due to the fire/life safety risk that results from a lack of sprinkler coverage.

1.8 EMERGENCY LIGHTING

A. Location

1. Emergency lighting for exhibits shall be provided for all occupiable spaces (public and staff) and means of egress, including stairs and ramps.
2. Facility emergency/maintenance/security lighting shall not be altered to accommodate exhibitry without approval from OSHEM. Ensure that relocated fixtures remain on an emergency circuit.

3. If exhibit lighting is utilized for emergency lighting purposes, alterations shall be reviewed by OSHEM to ensure sufficient lighting is provided.

   Commentary: Significant changes to lighting layout in this scenario may require lighting calculations to ensure that an average of 1 foot-candle is provided along egress routes.

B. Power

1. The power shall be supplied from a continuous fixed wiring power source with secondary power from either an emergency generator or battery pack.

C. Illumination

1. Lights shall be located to provide an average level of illumination of 1 foot- candle (10 lux), measured at the floor.

2. Where lighting dimming control systems are used one of the following conditions must be met:

   i. Separately controlled emergency egress lighting is provided.

   ii. Dimming control panel is connected to emergency power circuits and controlled lighting provides an average level of illumination of 1 foot-candle (10 lux) measured at the floor under both normal and emergency power.

D. Testing

1. Emergency lighting shall be tested prior to the beneficial occupancy of each new exhibit.

   Commentary: Wiring and lighting controls are often modified during exhibit construction, potentially affecting the performance of emergency lighting.

1.9 PORTABLE FIRE EXTINGUISHERS

A. Portable extinguisher coverage in exhibit spaces shall comply with the Standard for Portable Fire Extinguishers (NFPA 10), and the SI standard specifications for fire extinguishers.

B. Water-mist extinguishers shall be provided in all exhibit spaces.

Commentary: Of the various types of available portable extinguishing agents practical for exhibit spaces, water is generally considered the least detrimental to most collection materials. Water mist extinguishers use deionized water that is dispersed in droplet form with limited overspray. Dry chemical extinguishers, on the other hand, discharge a fine powder that can remain suspended in the air and migrate considerable distances, leaving a difficult to clean chemical residue on objects remote from the application site.

C. The minimum classification of water mist extinguishers is 2A-C.

D. The maximum travel distance to an extinguisher in an exhibit space is 75 feet (22.86 m).

E. Extinguishers may be mounted on hangers or brackets, on shelves, or in cabinets. Extinguishers shall be mounted so that the top is no more than 5 feet (152.4 cm) above the floor and the bottom is at least 4 inches (10.2 cm) from the floor.

F. Cabinets may be recessed to minimize the aesthetic impact. The door shall include a clear vertical viewing panel. The cabinet shall be labeled, “FIRE EXTINGUISHER" with minimum 1-inch (1.91 cm) letters and minimum 1/8-inch stroke width. At no time shall fire extinguisher cabinets be locked. Break-glass type cabinets are not permitted.

G. Extinguisher cabinets recessed in fire rated walls must be listed for such purpose.

H. Extinguishers shall be readily accessible and not hidden from view.

Commentary: Locations of extinguishers that are not readily apparent should have a sign installed above the cabinet to alert occupants as to the presence of an extinguisher.

1.10 ELECTRICAL REQUIREMENTS (OTHER THAN FIRE ALARM)

A. All new or altered electrical work shall be performed by qualified electricians and shall comply with the current edition of the NFPA 70, *National Electrical Code* as well as existing local electrical codes when specified.

B. All wiring shall be installed in rigid conduit, EMT or flexible conduit. Aluminum conduit shall not be imbedded in concrete.

Commentary: Wires placed in conduit are less susceptible to damage; damaged wires are a significant fire hazard.

Aluminum conduit reacts with concrete, which corrodes the aluminum and forms hydrogen gas. In the long term, the gas can expand and crack the concrete.

C. Fixed wiring methods shall be metal raceways, nonmetallic raceways encased in not less than two inches of concrete, mineral insulated metal-sheathed cable or Type MC cable. Type AC cable (commercial EX) shall not be permitted.

D. All new receptacles, switches and equipment shall be U.L. listed or equivalent. Where equivalent items are specified, pertinent features must be listed in the technical specifications and identified in the Specia1 Conditions of the Contract.

E. The number and placement of receptacles shall be adequate to support

the required electrical loads.

1.11 AUDIO VISUAL EQUIPMENT

A. Open Audio Visual Areas

1. Open Audio Visual Areas shall be defined as those areas constructed within exhibit areas or structures for the purpose of housing audio visual support equipment which are open to above and unobstructed in accordance with NFPA 101 and NFPA 72.
2. All shelves and mounts shall be constructed of noncombustible materials.
3. Clearance from audio-visual equipment to any combustible materia1s shall be at least one foot horizontally, and two feet (61 cm) vertically.

B. Enclosed Audio Visual Areas

1. Enclosed Audio Visual Areas shall be defined as those areas constructed within exhibit areas or structures for housing audio-visual support equipment that are NOT open to above or are obstructed.
2. Enclosures shall be constructed of fire resistant materials subject to the approval of OSHEM.
3. All shelves and mounts shall be constructed of noncombustible materials.
4. Each enclosure shall be provided with a smoke detector connected to the facility fire alarm system.
5. Sprinkler protection shall be provided, where applicable.
6. All enclosures housing projection equipment shall be ventilated mechanically to remove excess heat, unless the design proves that mechanical ventilation is not required.

C. Audio Visual Control Rooms

1. Audio Visual Control Rooms shall be defined as those rooms within the facility that house the control equipment for one or more gallery's audio visual exhibit components.
2. Rooms shall be constructed with 1-hour fire rated construction with 45-minute opening protectives.

   Commentary: While AV rooms do not contain all of the same equipment as an IT room, the basis for the fire rated construction is the same: loss of the equipment would result in a high replacement cost and an interruption of operations.
3. Rooms shall be provided with smoke detectors connected to the facility fire alarm system.

4. Sprinkler protection shall be provided, where applicable.

D. Audio Visual Equipment Shutdown

1. Upon general fire alarm evacuation, all audio-visual equipment (including interactive displays) shall be designed to cease operation. Where hard shutdown of audio visual equipment may damage the equipment, this requirement may be waived with OSHEM approval when at least one of the following conditions is met:

   Commentary: Recent gallery upgrades have relied upon heavy use of A/V equipment, television screens, interactive exhibits, and ambient audio. These items can distract occupants in the event of a fire or overpower the sound of the fire alarm speakers.

   i. Normal audio-visual operation can be demonstrated to not interfere with or obscure emergency notification systems.

   ii. Normal audio-visual operation can be replaced with an emergency message upon activation of emergency notification systems.

   iii. Normal audio-visual operation can be replaced with a black screen.

   iv. Other remediation approved by OSHEM.

2. Audio-visual shutdown is normally initiated via a fire alarm relay with a set of dry contacts (normally open and normally closed are typically both provided on the relay). The exhibit designer must confirm the location of existing fire alarm relays or include new relays in their design as necessary. The use of a shunt circuit breaker tripped by a fire alarm relay is an acceptable shutdown method, but should be discussed with the facility exhibit group since the breaker requires manual resetting.

   Commentary: If individual shutdown relays are provided in the gallery, they should be noted on the plans. If a central shutdown relay is provided in the building, then this should be indicated on the plans in a general note.

1.12 INSTALLATION OF EXHIBITS

A. Exit Access

1. Exhibit construction activities shall not block, remove, or otherwise inhibit exit access from nearby occupied galleries or spaces.

2. Exits shall be unobstructed and adequate in number and size.

3. Consideration shall be given to the orderly circulation of visitors and

avoiding cul-de-sacs or dead ends.

B. Exhibit Installation Barriers

1. Dust barriers shall be constructed of non-combustible or fire retardant materials that are classified as Class A or B per ASTM E-84, or shall pass NFPA 701, as applicable.

2. For exhibit installations where sprinkler system outages are required, or where hot work is needed, a 1-hr fire barrier separating the work area from the occupied space shall be provided.

3. Construction barriers shall be in accordance with the Standard for Safeguarding Construction, Alteration and Demolition Operations (NFPA 241).

C. Access to Equipment

1. Fire protection equipment shall not be obstructed or interfered with during exhibit installation.

1.13 FINAL ACCEPTANCE AND APPROVAL

A. Upon completion of each project, but prior to issuance of the beneficial occupancy permit, the COTR or person responsible for the exhibit construction shall contact OSHEM to conduct a final occupancy inspection/walkthrough of the space, noting any deficiencies or problems.

B. Prior to beneficial occupancy, any fire protection and life safety system changes included in the project must pass final acceptance testing by OSHEM. Final acceptance testing may include any or all of the following:

Commentary: In addition to the mandatory emergency lighting test, the following tests are required if the associated fire system/equipment has been modified or impacted during exhibit installation.

1. Hydrostatic Testing of Sprinkler Piping

2. Functional Fire Alarm Testing

3. Functional Fire Damper Testing

4. Exit Door Opening Force Test

C. A provisional occupancy certification may be issued where necessary for the installation of collection objects by SI staff.

APPENDIX F2- FIRE AND LIFE SAFETY CHECKLIST FOR EXHIBIT CONSTRUCTION

INTRODUCTION: This checklist is intended to assist exhibit designers and fabricators in approaching the design and construction of exhibits in SI facilities. It does not replace or exclude any of the requirements found in this Design Manual.

EXHIBIT CONSTRUCTION CHECKLIST			Project:	
Element		**Requirement**	**Section**	
Exhibit Design Drawings	**General**	Show project area in relation to building floor plan.	8.2.A.1	☐
		Show new, relocated, and existing equipment on demolition and new work plans.	8.2.C.3	☐
		Adequate Exhibited Object information included on drawings.	8.2.F.1	☐
Exits	**General**	Gallery has minimum two exits arranged to be remote from one another.	8.3.A.1	☐
		Clear width along primary egress path is minimum 60".	8.3.A.2	☐
		Clear width along secondary egress path is minimum 44".	8.3.A.3	☐
	Signs	Exits properly identified by exit signs.	8.3.B.1.i	☐
		No display, object, or bright illumination obstructs exit sign line of vision.	8.3.B.1.ii	☐
		Exit signs illuminated with integral light source or continuous external 5 foot-candle minimum.	8.3.B.3.i	☐
	Stairs and Steps	Elevation changes made obvious for stairs less than 3 risers.	8.3.C.1.i	☐
		Stairs minimum 44" wide and clear of obstructions.	8.3.D.2.i	☐
		Minimum headroom is 6'8" at doors and stairwells.	8.3.C.2.i	☐
		Stairs and ramps have handrails 34" to 38" above leading edge of tread.	8.3.D.4.i	☐
		Handrails offer no obstruction to smooth handhold surface.	8.3.D.4.iv	☐
		Handrails have a circular cross section with an outside diameter between 1-1/4" and 2".	8.3.D.4.v	☐
	Guard Rails	Guardrails are provided at floor openings, open-sided floors, platforms 30" or more above floor level, ramps, etc. on all open sides except entrances to ramps or stairways.	8.3.D.5.i	☐
		Guardrails have a vertical height of 42" measured from the upper surface.	8.3.D.5.ii	☐
		Guardrails are capable of withstanding 200 pounds applied in any direction at any point on the top rail.	8.3.D.5.iii	☐

Fire Rated Construction	**General**	Penetrations other than fire dampers through fire-rated construction are sealed with an approved firestop material.	8.4.A.1	☐
		Details provided of new fire door assemblies showing area of glass and construction material.	8.4.A.2	☐
Materials of Construction	**General**	All materials of construction are noncombustible or inherently fire retardant.	8.5.A.2	☐
		Proof of fire test performance for all materials of construction have been submitted to OSHEM and approved.	8.5.B.3	☐
	Wall and Ceiling Materials	Materials have a flame spread index less than 25 in unsprinklered exhibits or 75 in sprinklered exhibits.	8.5.C.1 & 3	☐
		Materials have a smoke developed index less than 450.	8.5.C.1	☐
		Wall mounted materials exceeding either 10% of wall area or single pieces greater than 100 ft^2 comply with above.	8.5.C.5	☐
	Wood	Wood used for walls, platforms, dioramas, blocking, furring, cases over 100 ft^3, and similar is Fire Retardant Pressure Impregnated (does not apply to cabinets, showcases, or finish trim).	8.5.D.1	☐
	Carpeting, Draperies, Bunting and Decorative Textiles	Carpeting has a minimum critical radiant heat flux of 0.45 watts/cm^2.	8.5.E.1	☐
		Carpeting has passed the Methanamine Pill Test.	8.5.E.2	☐
		Carpeting and textiles installed on walls have a Class A rating and is not installed in unsprinklered room.	8.5.E.3	☐
		All materials intended for decorative purposes have passed testing in accordance with NFPA 701.	8.5.F.1	☐
	Plastics	Plastics, exposed foam plastics, and materials containing foam plastics are not used in exhibits unless Life Safety Code and IBC Interior Finish requirements are met.	8.5.G.1	☐
		Vitrine materials other than glass do not exceed 100 ft^2 exposed vertical surface area.	8.5.G.3	☐
		Fiberglass uses a fire-retardant resin and complies with Class A or B interior finish tests in the design thickness.	8.5.G.4	☐
		Aluminum Composite Materials used only for standalone signage or vitrine backing. It must pass ASTM E84 Class A.	8.5.G.5	☐

		Desiccant chambers may be constructed of acrylic only in cases smaller than 100 ft^3. Aluminum composite material may be used in larger cases. ACM must pass ASTM E84 Class A.	8.5.G.6	☐
Fire Detection and Alarm Systems	**General**	Manual pull stations and fire alarm notification devices are not obstructed from view or access by exhibit construction.	8.6.B.1	☐
		Smoke, heat, and other detectors are not field painted.	8.6.A.3	☐
Automatic Sprinkler Systems	**General**	Sprinkler system has been hydraulically designed for Ordinary Hazard Group II occupancies.	8.7.B	☐
		Sprinkler heads are not field painted.	8.7.C	☐
		Cases over 150 sq. ft. in size are provided with sprinkler protection unless approved by OSHEM.	8.7.D	☐
Emergency Lighting	**General**	Emergency lighting provided in all main circulation and egress paths, corridors, and stairs.	8.8.A.1	☐
		Emergency lighting is supplied by a continuous fixed wiring power source with battery pack or generator backup.	8.8.B.1	☐
		Emergency lighting average illumination levels are a minimum 1 foot-candle measured at the floor.	8.8.C.1	☐
		Dimming control is connected to emergency power and cannot provide less than the required 1 foot-candle illumination.	8.8.C.2.ii	☐
Portable Fire Extinguishers	**General**	Water-mist extinguishers provided in all exhibit halls with exposed collections.	8.9.B	☐
		Maximum travel distance to an extinguisher is 75'.	8.9.D	☐
		Extinguishers mounted on hangers, brackets, shelves, or in cabinets so that the top is no more than 5' above the floor.	8.9.E	☐
		Cabinets recessed into walls are labeled "FIRE EXTINGUISHER" in appropriately sized lettering.	8.9.F	☐
		Extinguishers are readily accessible and not hidden from view.	8.9.H	☐
Audio Visual Equipment	**Open A/V Areas**	Shelves and mounts are constructed of non-combustible materials.	8.11.A.2	☐
		Clearance to any combustible materials is at least 1' horizontally and 2' vertically.	8.11.A.3	☐
	Enclosed A/V Areas	Enclosure is constructed of fire resistant materials approved by OSHEM.	8.11.B.2	☐
		Shelves and mounts are constructed of non-combustible materials.	8.11.B.3	☐
		Projection enclosures are provided with smoke detectors.	8.11.B.4	☐

		Projection enclosures are provided with mechanical ventilation.	8.11.B.5	☐
	A/V Control Rooms	A/V control rooms are of 1-hr rated construction.	8.11.C.2	☐
		A/V control rooms are provided with smoke detectors.	8.11.C.3	☐
	Equipment Shutdown	A/V equipment is provided with hard or soft shutdown designed to cease operation upon fire alarm activation.	8.11.D	☐

APPENDIX F3- GENERAL NOTES FOR EXHIBIT DESIGN

1. Penetrations through fire-rated construction (i.e. walls, floors, etc.), not protected by fire dampers or combination fire/smoke dampers, shall be sealed with an approved penetration firestop material that maintains the fire rating.
2. Wall and Ceiling Materials
   - A. Wall and ceiling materials that are used in exhibit spaces or the means of egress such as paneling or acoustical tiles; shall have a flame spread rating of 25 or less, and a smoke developed index of 450 or less, as measured in accordance with ASTM E-84, Surface Burning Characteristic of Building Materials.
   - B. For exhibit spaces protected by an automatic sprinkler system, these materials shall have a flame spread rating of 75 or less.
   - C. Materials that are not appropriate for testing to ASTM E84 (those that melt or drip) shall be tested to NFPA 286.
   - D. Wall mounted materials that have a surface area exceeding 10% of the wall area, and single pieces over 100 sq. ft. (9.3 sq. m) shall comply with the above requirements for wall and ceiling materials.
3. Wood
   - A. Wood used for walls, platforms, dioramas, blocking, furring, cases over 100 cubic feet (2.8 cubic m), light attics with electric lighting, and similar applications shall be fire retardant, pressure impregnated.
     - i. Fire retardant coatings of intumescent paint are not acceptable in lieu of fire retardant treatment.
     - ii. This requirement shall not apply to cabinets, showcases or finish trim.
     - iii. Unenclosed spaces beneath table-style cases shall not contribute to overall case volume when considering the 100 cubic foot (2.8 cubic m) limit.
4. Carpeting
   - A. Flooring materials shall have a minimum critical radiant flux of 0.45 watts/ cm^2, when tested in accordance with ASTM E-648, Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
   - B. Carpeting shall also pass the Methanamine Pill Test, Federal

Flammability Standard FF-1-70 (ASTM D-2859).

C. For installations specifying carpeting on walls:

i. The room shall be protected by an automatic sprinkler system.

ii. Materials shall have a Class A rating (flame spread 25 or less and smoke development factor less than 450), as measured by ASTM E-84.

5. Draperies, Bunting or Decorative Textiles

A. All material intended for decorative purposes, such as draperies, scrim or bunting shall be certified flame resistant in accordance with the criteria contained in the current edition of NFPA 701, Methods of Fire Tests of Flame- Resistant Textiles and Films. Samples and fire test data shall be submitted to OSHEM for evaluation and approval.

6. Plastics, fiberglass, exposed foamed plastics, materials containing foamed plastics

A. Plastics, exposed foamed plastics, and materials containing foamed plastics are prohibited from being used in the exhibit unless the specific criteria in the Life Safety Code and the IBC for Interior Finish and Furnishings, Decorations, and Scenery have been met.

B. Samples and fire test data shall be submitted to OSHEM for evaluation and approval.

C. Vitrines materials with more than 100 sq. ft. (9.3 sq. m) of exposed vertical surface area shall comply with the interior finish requirements for walls and ceiling materials.

D. Fiberglass must use a fire-retardant resin and pass Class A or B interior finish requirements when tested in accordance with ASTM E-84 in the design thickness.

E. Aluminum Composite Materials (ACM) (e.g. di-bond) may be used for standalone signage and the backing of cases when the material does not exceed 100 sq. ft. in area. This material may not be used to construct casework.

F. Desiccant chambers within cases less than 100 ft^3 in size may be constructed of acrylic. Aluminum Composite Material may be used in larger cases for this purpose.

7. Glass

A. Glass used in vitrines or displays that exceeds 48 inches (1219 mm) in any dimension shall be laminated safety glass.

APPENDIX F4- FREQUENTLY ASKED QUESTIONS ABOUT EXHIBITS MATERIALS

Revision 2018

09/27/18

The following questions have been generated from past conversations with exhibits staff and from previous projects that were approved after collaboration with OSHEM. They represent suggested paths forward for several types of exhibitry. Exhibits staff are encouraged to contact their OSHEM representative early when an exhibit will involve combustible materials of any type.

A. What are the various fire tests used to evaluate construction materials?

1. ASTM E84 – Steiner Tunnel Test
   - i. This is a test for wall and ceiling finishes. It evaluates how far flames spread across a surface material and how much smoke is produced when it is burned.
   - ii. Results are dimensionless numerical scores. Lower numbers are better for both flame spread and smoke development. The ratings are as follows:
     - (a) Class A – Flame Spread 0-25. Smoke Developed 0-450.
     - (b) Class B – Flame Spread 26-75. Smoke Developed 0-450.
     - (c) Class C – Flame Spread 76-200. Smoke Developed 0-450.
   - iii. Most materials for SI projects must meet Class A for unsprinklered spaces, and Class B for sprinklered spaces.
   - iv. Materials that melt and drip cannot be tested to ASTM E84.
2. NFPA 286 – Room Corner Test
   - i. This is a full-scale test for wall and ceiling finishes. It evaluates the contribution of a finish to fire growth.
   - ii. Materials tested to NFPA 286 (like some plastic panels) must pass the test to be used at SI.
3. ASTM E648 – Floor Covering Test
   - i. This is a test for floor covering systems such as carpeting and vinyl flooring.
   - ii. Results are based on how much radiant heat it takes to ignite a sample of the material. The ratings are as follows:
     - (a) Class I – Not less than 0.45 W/cm^2.

(b) Class II – Not less than 0.22 W/cm^2 but less than 0.45 W/cm^2.

iii. Flooring materials must meet Class I to be used at SI.

4. NFPA 701 – Textiles and Films

i. This is a test for textiles, fabrics, and films without a solid backing.

ii. Results are based on whether flame spreads across a fabric and whether flaming drips result from the test.

iii. Fabrics and textiles must pass this test to be used at SI.

B. What documentation do you need for materials of exhibit construction?

1. Product data sheets for the product in question

2. Results for all applicable fire tests. (See below for each type of material) What OSHEM requires is the fire test report from the independent testing lab used by manufacturer. A product data sheet stating "Passes ASTM E84 Class A" or "Fire Retardant" is not enough information to verify the fire performance of a material.

3. Samples must be provided to OSHEM upon request, in the configuration and thickness that will be used.

C. Is there a list of approved exhibit fabrication materials?

1. As of the writing of this version (1/29/2018), there is not. OSHEM is planning to develop such a list and will be polling the exhibits community on how to best document such information.

D. Can I use plaster/gypsum/sand/concrete?

1. No restrictions are placed on these types of material. While heavy, these materials are preferable since they are not combustible.

2. Newer, moldable versions of the above materials allow for construction of artificial environments. These are preferable to using a foam substrate to shape scenery.

E. Can I use metal?

1. There are no restrictions on metal. Metal framing for larger models is preferred over wood.

F. Can I use wood?

1. As stated elsewhere in this manual, casework over 100 ft^3 must be constructed of fire-retardant, pressure impregnated (FRPI) wood.

2. Similarly, wood used in models over 100 ft^3 must be fire retardant,

pressure impregnated. Steel or aluminum is preferred, however.

3. Fire retardant, pressure impregnated wood must pass ASTM E84 Class A.

G. Can I use a surface coating (intumescent paint) to make wood fire retardant?

1. No. Surface coatings do not get absorbed into the wood, and hence fade over time, can be chipped off, and do not offer the same level of fire performance as FRPI wood.

H. How is the volume of casework calculated?

1. To determine if a case exceeds the 100 ft^3 limit, the case length is multiplied by its width and height. Open space between the legs/supports is not counted in the volume. The vitrine is not counted in the volume.

I. Can I install a scrim ceiling as long as the fabric used passes NFPA 701?

1. No. Scrim ceilings will block the fire sprinklers above, which is not permitted.

J. How is the 100 ft^2 surface area limit calculated for restrictions on using acrylic for vitrines?

1. Only the walls of the vitrine are counted. The lid (top) does not count towards the 100 ft^2.

K. Can I use fiberglass?

1. Fiberglass is permitted so long as the resin component passes ASTM E84 with a Class A rating. Like wood, the fire retardant component must be mixed/impregnated into the resin. Surface coatings are not permitted. As they will not absorb into the material.

2. Some plastic resins allow the addition of fiberglass meshes/flakes. Adding this material provides additional strength to the material as well as some fire resistance. However, noncombustible materials are always preferred.

L. Can I use fabrics?

1. Yes. However, the fabric in question must be fire retardant from the factory and must pass NFPA 701. Fabrics coated in the field with a spray on fire retardant are generally not an acceptable substitute for long-term exhibits.

2. Spray-on additives are only acceptable in situations where it is not possible to obtain fabrics that come with the fire retardant from the factory. An example would be custom-fabricated artwork.

M. Can I use plastic resin?

1. Plastic resin is a very broad category, and different mixes/products perform different functions for fabricating artwork, dioramas, and casts. The majority of these resins do not pass ASTM E84, especially if they are clear. Even when they are marketed as being fire retardant (Class A), they produce a large amount of thick, black smoke when burned. Some varieties can be lit with a household lighter and sustain a fire afterwards. OSHEM has recently permitted a small number of Class A materials that classify as plastic resins, but perform more closely to plaster, in that they do not burn and do not produce much smoke.
2. OSHEM often has a number of questions regarding the use of plastic resins before proceeding:
    i. How large is the model in question?
    ii. Have other material options been exhausted? (See above.) The engineer will want to know any extenuating circumstances as to why plastic must be used.
    iii. Will the casted object/model in question be within an enclosed case? Smaller objects within a case present less of a fire risk.
    iv. Is the model touchable/interactive or otherwise accessible to visitors? An object out in the open represents an increased risk.
    v. Are there electrical sources in the case? The lack of ignition sources within the case goes a long way to reducing the fire risk.
3. Plastic resins proposed for exhibit installation require fire testing. A minimum of an ASTM E84 Fire Test Report with a passing score of Class A is required. E84 test results that indicate melting, dripping, or loss of structural integrity, are not acceptable, since they do not provide an accurate measurement of flame spread. Dripping, melting, and residual flaming at the bottom of the test apparatus is considered a fail, regardless of the test result. Untested plastics cannot be used.
4. For small cast objects (e.g. shark teeth, a skull) present within an enclosed case without internal lighting:
    i. Confirm with OSHEM before proceeding.
5. For a larger diorama within a case, or larger objects:
    i. Ensure that no ignition sources are present within the case.
    ii. Minimize the amount of plastic that will be used. Can the cast be hollow? Is the plastic being used as a thin topcoat?
    iii. Can fiberglass mesh or flakes be added to the model?

6. Larger models (e.g. skeletons)
    i. Plastic resin is not recommended, even as a topcoat.

N. Can I use plastic foam?

1. The answer to this question is, more often than not, no. Foam is extremely flammable, and burns more readily than resin due to the air in its structure. Any project considering the use of this material must be thoroughly vetted. It is not uncommon for detailed discussions to occur several times before a solution is reached.
2. Please see item B.2 above for information that will be required by OSHEM.
3. Foam is not permitted to be used as a wall or ceiling finish.
4. Foam use for models is only permitted in rare cases, where the scope of the project is such that no other materials can be used and an equivalent level of safety can be achieved. An example is the Right Whale present in the Oceans Hall of the National Museum of Natural History. For that model, the following methodology was used:
    i. The model was out of reach of the public.
    ii. Metal structure was used for stability.
    iii. The foam model was not solid. It was hollow to the maximum extent possible without compromising structural integrity. The extent of hollowing will depend on the shape and size of the model.
    iv. The foam passed ASTM E84, Class A. Having a material that passes NFPA 286 is preferable.
    v. Each piece of the model was encapsulated completely with an intumescent fire retardant barrier. The barrier was ignition-resistant for 15 minutes as described in NFPA 286.
    vi. The sprinkler system above was not compromised by the presence of the foam model.
    vii. The amount of foam present did not overwhelm the sprinkler system as installed.
    viii. Lighting was not placed directly above the model.

APPENDIX F5 - APPROVED/PROHIBITED EXHIBIT MATERIALS (RESERVED)

OSHEM is in the process of developing a database of approved exhibit materials. Information will be placed here when it is complete.

NOTE: Database of approved / prohibited materials is forthcoming.

APPENDIX G

Fire Protection Commissioning Standards [RESERVED]

APPENDIX G- FIRE PROTECTION COMMISSIONING STANDARDS

CLEAN AGENT EXTINGUISHING SYSTEMS EMERGENCY

POWER AND STANDBY SYSTEMS FIRE ALARM

SYSTEMS

FIRE AND SMOKE DAMPERS KITCHEN

SYSTEMS

SMOKE CONTROL SYTSEMS

NOTE: Appendix items listed above are forthcoming.

APPENDIX H

Summary of Enclosure Requirements for Common Use Areas

APPENDIX H- SUMMARY OF ENCLOSURE REQUIREMENTS FOR COMMON USE AREAS

Area	Minimum Fire Barrier	Commentary
Trash storage and recycling rooms	2-hour	IBC Table 509 requires 1-hr fire resistance rated separation or a smoke partition with sprinkler protection between rooms used to store combustible trash materials and the remainder of the building. SI requires 2-hr fire resistance rated separation for trash storage and recycling rooms within all occupancies due high density of trash within these rooms.
Laundry rooms over 100 sq ft	1-hour	IBC Table 509 requires that laundry and linen collection areas that are a higher hazard than the general building occupancy classification are separated from the building by fire resistance rated construction or have sprinkler protection. The 100 sq ft allowance accounts for the difference in fuel load between a smaller laundry room and a larger laundry room. The larger room has more combustible material and is therefore a higher hazard. Accordingly, SI requires that such laundry rooms are enclosed by 1-hr construction.

Incidental storage rooms over 100 sq ft	1-hour	IBC Table 509 requires that storage areas that serve industrial and ambulatory occupancies are separated from the building by fire resistance rated construction. The 100 sq ft allowance accounts for the difference in fuel load between a smaller storage room and a larger storage room. The larger room has more combustible material and is therefore a higher hazard. Accordingly, SI requires that such storage rooms are enclosed by 1-hr construction.
Collections storage rooms	2-hour rated fire/smoke barriers	NFPA 909 Section 9.12.23 requires that collections storage rooms are enclosed by a minimum of 1-hr fire resistance rating. Due to the value and vulnerability of the Smithsonian's stored collections, SI's collections storage rooms are required to be 2-hr fire resistance rated construction for protection from the remainder of the building. Additionally, the separation must be a smoke barrier to ensure that artifacts are not damaged by smoke infiltration if there is an incident outside of the storage room.

Area	Minimum Fire Barrier	Commentary
Collections processing areas	1-hour rated fire/smoke barriers	NFPA 909 Section 9.12.23 requires that collections storage rooms are enclosed by a minimum of 1-hr fire resistance rating. Processing areas have collections that remain in the space for less than 24 hours. Although these items are temporarily located within the room, these temporarily stored collections still require protection. These spaces typically have a lower collection density than storage spaces. Accordingly, SI requires 1-hr fire resistance rated construction for protection from the remainder of the building. Additionally, the separation must be a smoke barrier to ensure that artifacts are not damaged by smoke infiltration if there is an incident outside of the processing room.
Wet collections spaces < 500 sq ft	Per NFPA 30	NFPA 909 refers to NFPA 30 for the protection of wet collection storage. NFPA 30 Table 9.9.1 defines the fire resistance ratings for liquid storage rooms based on area of the room. In accordance with this table, wet collections spaces greater than 150 sq ft but less than 500 sq ft are required to have 2-hr fire resistance rated enclosure. Wet collections spaces less than 150 sq ft are required to have 1- hr fire resistance rated enclosure.

Wet collections space ≥ 500 sq ft	4-hour fire wall	In accordance with NFPA 30 Table 9.9.1, a liquid warehouse type storage area is required for wet collections spaces greater than 500 sq ft. A 4-hr fire wall separation from non-liquid storage areas is required for such warehouses. The intermediate floors are required to have a 4-hr fire rating. NFPA 30 references NFPA 221, *Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls* for firewall design. The design of a firewall is much more stringent than a fire barrier enclosure since firewalls are required to remain stable after collapse of the structure due to fire on either side of the wall [NFPA 221, Section 6.2].

Area	Minimum Fire Barrier	Commentary
Bulk alcohol storage for wet collections	3-hour	This requirement originated from the Recommended Fire Protection Practices for Distilled Spirits Beverage Facilities standard. Section 3-8.4 requires that storage areas used for draining and filling bulk amounts of alcohol exist within a 2- hour fire resistance rated room separated from the remainder of the building. SI staff perform similar drainage and filling operations to examine samples stored in alcohol. Often, drums of alcohol are stored to complete this operation. SI recognizes that these bulk alcohol storage rooms are a higher level of hazard than the general occupancy classification of SI assembly and business occupancies and therefore, bulk alcohol storage rooms are required to be separated with 3-hour fire resistance rated construction.
Electric closets	1-hour[3]	NFPA 70 is commonly referred to as The National Electrical Code (NEC). NEC Article 450.21 requires that indoor dry- type transformers exceeding 112½ kVA must be installed in a room of 1-hr fire-resistant construction. Electrical equipment, such as transformers, are often added post occupancy to electrical closets. To provide the most flexibility for use of these electrical closets by Smithsonian's maintenance staff once the

Mechanical and refrigerant machinery rooms	1-hour[3]	IBC Table 509 requires that furnaces and boilers with equipment over 15 psi and 10 hp must be installed in a room of 1-hr fire-resistant construction. IBC Table 509 also requires 1-hr construction or a smoke partition with sprinkler protection for refrigerant machinery rooms. Mechanical equipment, such as furnaces and boilers, are often added or replaced with larger versions post occupancy within the mechanical rooms. To provide the most flexibility for use of these rooms by Smithsonian's maintenance staff once the building is occupied, SI requires that all mechanical and refrigerant machinery rooms have a 1-hr fire resistance rating to ensure the critical equipment in these spaces is protected and remains operational for business continuity.

Area	Minimum Fire Barrier	Commentary
Communication closets (telephone and non-mission critical IT spaces)	1-hour[3]	NFPA 76, *Standard for the Fire Protection of Telecommunications Facilities*, Section 8.3 requires that telecommunications rooms are separated from the remainder of the building by 1-hr fire resistance rated construction. Communications closets are typically single rooms of dedicated space that are occupied by a telecommunications service company to provide voice calls and internet connectivity for the public while they are within Smithsonian buildings. NFPA 75 Section 5.1.3 requires that information technology (IT) equipment rooms are separated from the remainder of the building by fire resistance rated construction. Non-mission critical IT closets are those that are not vital to the operation of the Smithsonian and its ability to serve the public. Typically, these non-critical spaces are small closets distributed on several floors within the building.

IT spaces (mission critical)	2-hour	NFPA 75 Section 8.3 requires that telecommunications rooms are separated from the remainder of the building by fire resistance rated construction. Mission critical IT spaces are those that are not able to shut down without affecting the operations of the Smithsonian and its ability to serve the public. Mission critical IT spaces include rooms housing equipment, the loss of which
Maintenance shops	1-hour	IBC Table 509 requires that maintenance shops within institutional facilities are separated from the building by fire resistance rated construction. SI recognizes that these rooms are a higher level of hazard than the general occupancy classification of SI assembly and business occupancies and therefore, maintenance shops within all SI buildings are required to be separated with fire resistance rated construction.

Area	Minimum Fire Barrier	Commentary
Loading Docks	2-hour	NFPA 909 Section 11.4.11 requires that loading docks are separated from the remainder of the building by 2-hr fire rated construction. Loading docks can be used for unloading of any type of material and often contain an interior trash dumpster. NFPA 909 indicates that where sprinkler protection is provided, the loading dock can be separated from the rest of the building by 1-hr fire rated construction; however, SI requires 2-hr construction for all loading docks to further protect occupants and our collections.
Fire Pump Room	2-hour	IBC 913.2 requires fire resistance rated fire pump enclosures. High-rise buildings or buildings that are not fully sprinkler protected are required by IBC 913.2 to have a 2-hr fire resistance rating. Buildings that are not high-rise buildings and buildings that are not fully sprinkler protected are required by IBC 913.2 to have a 1-hr fire resistance rating; however, SI requires 2-hr fire resistance rated enclosures for fire pump rooms since this is a critical component of the fire suppression system.

Notes:

1. This table is not intended to be comprehensive. The Design Engineer/Architect is required to confirm these ratings and other special requirements based on the

applicable codes and standards.

2. The requirements listed here are for fire resistance ratings. Automatic sprinklers or other type of fire suppression system will be required in accordance with Chapters 5 and 7 of this Fire Protection and Life Safety Design Manual.
3. This assumes that these spaces are not located within a shaft connecting 4 or more stories.

APPENDIX I

Compact Storage Units (Mobile Shelving) Design Supplement

APPENDIX I- COMPACT STORAGE UNITS (MOBILE SHELVING) DESIGN SUPPLEMENT

This design supplement provides detailed requirements for the design and installation of compact shelving and automatic sprinkler systems. The information below identifies those designs which are appropriate for archival and collection storage.

1) *Enclosed shelving*. Provide fully enclosed metal cabinet-style compact shelving for all compactors. This effectively eliminates the hazard by compartmentalizing the large, continuous fuel load. Standard SI sprinkler system water density requirements are adequate. Clearance between compactors may be reduced to zero.
2) *Moderate-density sprinkler system with wide spacing*. Provide the following sprinkler system capability and shelving design
    a. Limitations.
        i. This arrangement is only suitable for books, files, and other similar archival paper-type storage.
        ii. Minimum clearance of 24" between top of shelving and ceiling (23" from sprinkler deflector to top of shelving).
    b. Sprinkler system
        i. Sprinkler density of 0.3 gpm/ft^2 over 1500ft^2.
        ii. Quick-response, 165°F sprinklers
        iii. Maximum 10 ft x 10 ft spacing.
        iv. Hose stream allowance of 250gpm
    c. Shelving system
        i. Steel construction, 18 ga. minimum
        ii. Longitudinal vertical divider (18 ga. steel, minimum) along entire length and height of each compactor. May be at the center of each compactor (preferred) or along one face, if the entire width of the shelf is needed for storage. This barrier will slow the progression of fire from one compactor to the next.
        iii. Transverse vertical divider (18 ga. steel, minimum), along the entire width of each compactor spaced at intervals no greater than 20 ft. If the length of the shelving unit is less than 20 ft, transverse dividers need not be provided. Similar to the longitudinal divider, this divider will slow the progression of fire within a compactor unit.
        iv. Solid metal canopy tops on each compactor (18 ga. steel, minimum).
        v. Minimum 4" spacing between compactors in the closed position. Permanent bumpers must be installed to maintain the spacing.
            1. As an alternative to permanent 4" spacing between compactor units (which usually leads to some loss in storage capacity), electric compactor units may be provided that are interfaced with the fire alarm system. When the fire alarm activates, a signal is sent to the electric compactor units which causes them to

automatically space themselves apart (to a minimum of 4"). Under normal conditions, the clearance between compactors may be zero.

3) *High-density sprinkler system with close spacing*. Provide the following sprinkler system capability and shelving design.
   a. Limitations.
      i. This arrangement is only suitable for books, files, and other similar archival paper-type storage.
      ii. No loose storage of paper is permitted (e.g. newspaper stacks)
      iii. Ceiling height 7 ft to 10.5 ft.
   b. Sprinkler system
      i. Sprinkler density of 0.7 gpm/ft^2 over the shelving area.
      ii. Sprinkler density of 0.3 gpm/ft^2 over 1500 ft^2 (over the aisle area adjacent to the shelving)
      iii. Shelving area must be separated from aisle area at ceiling by a draft curtain.
      iv. Quick-response, 165°F sprinklers
      v. Maximum 10 ft x10 ft spacing (with 18 in. of clearance, minimum)
         1. For areas of reduced clearance, quick response sidewall sprinklers may be used (clearance from top of shelving to ceiling greater than or equal to 7 in.).
            a. Distance of sprinkler deflector below ceiling is 4 inches.
            b. Maximum width of coverage is 15 ft.
            c. Sidewall sprinklers must be spaced at intervals of 8.5 ft along each side of the protected area. Positioning must be staggered from one side to another, such that sprinklers opposite each other do not line up (i.e. offset by 4.25 ft)
      vi. Hose stream allowance of 250gpm
   c. Shelving system
      i. Steel construction, 18 ga. minimum
      ii. Open cantilever-style shelving.
      iii. Longitudinal vertical divider (18 ga. steel, minimum) along entire length and height of each compactor. May be at the center of each compactor (preferred) or along one face, if the entire width of the shelf is needed for storage. This barrier will slow the progression of fire from one compactor to the next.
      iv. Transverse vertical divider (18 ga. steel, minimum), along the entire width of each compactor spaced at no greater than 15 ft intervals. If the length of the shelving unit is less than 15 ft, transverse dividers need not be provided. Similar to the longitudinal divider, this divider will slow the progression of fire within a compactor unit.
      v. No canopy tops on each compactor.

vi. Minimum 1" spacing between compactors in the closed position. Permanent bumpers must be installed to maintain the spacing.

4) *Ultra high-density sprinkler system with close spacing and no longitudinal or transverse dividers in compact shelving*.
   a. Limitation. This arrangement is only suitable for storage that is not considered as collections. This arrangement provides only life safety and possibly building protection. A fire could spread throughout the entire compact shelving array without longitudinal or transverse dividers in the storage system. This is unacceptable for collections.
   b. Sprinkler system
      i. Design sprinkler system according to Factory Mutual Data Sheet 8-9 for solid-pile storage of the appropriate type.
         1. The minimum design criteria shall be for Class 4 commodities.
         2. For ceilings less than 15 ft, the minimum design criteria shall be for cartoned, expanded plastic commodities.
      ii. Sprinkler densities will vary depending on conditions, but will be in the general range of 1 to 2 gpm/ft^2.
      iii. Quick-response, 165°F sprinklers
      iv. Maximum 10 ft x10 ft spacing.
      v. Minimum spacing of 8 ft x 8 ft spacing.
      vi. Hose stream allowance of 250gpm
   c. Shelving system
      i. Steel construction, 18 ga. minimum
      ii. No canopy tops on each compactor.
      iii. Shelving must be at least 50% open.
      iv. Minimum 1" spacing between compactors in the closed position. Permanent bumpers must be installed to maintain the spacing.

APPENDIX J

Facilities Design Standards: Smithsonian Enterprises Supplement

APPENDIX J - FACILITY DESIGN STANDARDS: SMITHSONIAN ENTERPRISES SUPPLEMENT

Notations related to size and locations are for general reference only and are subject to programming of the facility and business opportunity as agreed to by se senior management and facility director.

I. Retail Stores

A. Retail Back of House:

1. Stockrooms & Storage Spaces:

- Retail stores require properly sized stockrooms and storage areas for unloading, loading, and storage of merchandise and accessory equipment such as tobies, pallet jacks, dollys, carts, etc.
- Stockrooms and storage areas should be located with direct access to the retail store(s) and within close proximity to the building's loading dock(s) and freight elevator(s).
- Stockrooms and storage areas should be equipped with card readers for badge access by SE staff only.
- Fire retardant in-wall blocking is required in areas with wall-mounted merchandise storage.
- Doors shall be equipped with stainless steel kick plates, manually fastened.
- Specify heavy-duty, continuous hinges for doors.
- Corners shall have stainless steel corner guards, manually fastened and not adhered.
- Additional security requirements and hardware are required for these spaces and are dictated by the SI OPS Security Design Guidelines.
- HVAC design should account for human occupation including potential work stations.
- Sufficient lighting is required to provide adequate lighting at the bottom shelves of merchandise shelving units.
- Fire sprinkler head and lighting layouts should be coordinated with shelving unit layouts for adequate coverage.
- All pendant fire sprinkler heads should be equipped with a protective cage.

- Wireless (WAP) coverage is required throughout stockrooms and storage rooms to check in merchandise using RFID guns.
- Reference Division 10 for mobile storage & 105626 mobile storage shelving used in retail back of house applications.

2. Office Spaces:

- Number and size of offices are dependent on location.
- For each office space, there should be a large conference room/break area with sufficient electrical outlets for a microwave and small refrigerator. Depending on number of SE employees.
- Staff shall be supplied with metal lockers to secure their personal belongings.
- A data jack mounted roughly 52" AFF shall be supplied for a wall-mounted digital timeclock for clocking in and out.
- Each office computer workstation requires a minimum of (2) electrical outlets and (2) data jacks.
- Space for a small network rack is required for all locations outside of a Smithsonian building (leased spaces).
- Electrical and data outlets should be provided for at least (2) all-in-one printer/copier machines.
- Retail managers must have individual, lockable offices with a door and enclosed ceiling to conduct personnel discussions and store sensitive personnel documentation.

3. Cash rooms:

- All museum shops must have a dedicated OPS compliant cash room that can't be shared with any other business / operation.
- Minimum security requirements and hardware required for SE cashrooms is dictated by the SI OPS Security Design Guidelines depending on the estimated amount of cash handling by the business.
- In lieu of wire mesh reinforced walls, OPS has allowed SE to enclose our cash safes in wire mesh partitions, bolted to the floor and with the appropriate security hardware, sensors, and mag locks, etc.

- SE cashrooms are required to be equipped with card readers for badge access by SE staff only.
- A small table for cash counting near the cash safe is required.
- The main cash transaction door for the cash room should be a Dutch door with a countertop for transacting. Both leaves should have latch bolts and striker plates. The Dutch door bolt shall allow the locking of the both the bottom and top leaves.

B. Retail Front of House:

1. Accessibility and Visibility:

- The main retail shop in each museum facility may be located in close proximity to the main exit/entrance lobby. Retail stores perform best when located within a prominent and highly visible and visitor trafficked location within the museum.
- The location of the museum shop must be coordinated with the unit director.
- For multi-story retail locations, an escalator or public elevator should be incorporated to encourage patrons to access all levels.
- Minimum clear aisle width should be maintained at 42”.
- Consideration of the retail store amenity should be included in building wayfinding, maps, and visitor information.
- Signage in addition to complying with SI standards, must also comply with landlord design guidelines in leased spaces such as store at DCA (landlord is MWAA). Reference Division 10.
- Opportunities for seasonal pop-ups should be considered within the Museum in well lit, high traffic areas—dedicated power outlet and data drops or WAP for Wi-Fi needed.

2. Security:

- All retail stores should be equipped with a permanent security enclosure/system approved by SE and OPS. This may consist of overhead rolling gates, scissor gates, or other lockable enclosures.
- Security enclosures should be easy to maintain, operate, and account for physical limitations of retail staff.

- All retail overhead coiling doors / grilles must be in compliance with the requirements detailed in spec sections 083323 and 083326.

3. Point of Sale Units & Cash wraps:

- Point of Sale (POS) units must be on a dedicated, grounded, isolated circuit to maintain their warranty. Each point of sale (POS) unit draws roughly (8) amps. No more than (2) POS units can be run on the same dedicated circuit.
- POS units require a minimum of (2) hard-wired data jacks per unit.
- Per point of sale station, at a minimum there must be one VOIP phone per (2) POS units. VOIP phones require their own hard-wired data jacks.
- Typical POS units (as of November 2018) cut sheets have been added to this document for reference.
- Per retail location, there must be at least (1) ADA accessible point of sale station.
- Each POS station requires security camera coverage of each point of sale unit with clear view of the cash drawer & cash handling. This is in addition to any OPS general space coverage requirements.
- Each cash wrap requires an ergonomic floor mat, trash receptacle, recycling receptacle, folding/boxing counter, and hanger stacker.
- Cash wraps should be mobile, flexible, durable, and merchandisable. Consideration should be given of casters, modularity, seasonal expandability & shrinkability, integral storage space, and appropriate sizing for the equipment and footprint.

4. Retail Lighting:

- All retail lighting shall be LED 3500K color temperature, including integrated fixture lighting.
- Lighting should allow for the maximum amount of flexibility possible including a range of ambient wash, spotlights, and specialty fixtures to highlight merchandise.
- Lighting fixtures, accessories, and bulbs should be easily maintainable and repairable.

- Replacement components should be readily available from a local distributor or stock items.
- Mock-ups of lighting and integrated fixture lighting are required for any retail design.
- All lighting selections should be from a vendor with a U.S. sales division and through a local lighting distributor.

5. General Power & Data:

- Power & data receptacles may be required every (5) feet on walls—depending on merchandise programming and strategically located in floor boxes.
- Electrical panels should be in close proximity or within the retail space with sufficient capacity for the electrical design and for future expansion.
- SE runs their network off the SI backbone with a logic separation.
- Data should be strategically run for the shortest run lengths necessary from the closest available network closet.
- Network racks should contain sufficient capacity for the data requirements and future expansion.

6. General HVAC:

- HVAC design should be for retail/assembly occupancy requirements.
- If commissioning is not within the project scope, the space should at a minimum be tested and balanced to confirm compliance with minimum ASHRAE requirements.
- In best practice, retail space should be controllable/programmable in their own HVAC distribution zone or with their own VAV.
- Permanent Museum shop locations shall be on separate utility meters. Refer to Section 22113 Facility Water Distribution Piping and Section 262713 Electricity Metering for respective water and electric meter requirements.

7. Finishes:

- Ceiling, wall, and floor finishes should be selected for their maximum

durability, flexibility, and ease of maintenance.

- Finishes should comply with OSHEM minimum requirements for fire rating.
- Provide Level 5 finish for gypsum board for all walls schedule to have applied graphics.
- Acceptable flooring finishes include: epoxy terrazzo, carpet tile, porcelain ceramic tile, and metal.

8. Fixtures:

- Fixtures should be selected and/or fabricated for maximum durability, flexibility, mobility, and ease of maintenance.
- All free-standing fixtures should be equipped with heavy duty, lockable casters.
- Hardware and accessories for fixtures should be a standard finish/vendor so that they may be easily interchanged, replaced, etc.
- Fixtures should comply with OSHEM minimum requirements for fire rating. \Fire retardant in-wall blocking is required in walls with wall- mounted merchandise displays. Interiors of fixture cabinets shall be either black or white melamine.
- Fixtures shall incorporate in-fixture storage capacity in at least 50% of all wall-mounted and free-standing fixtures. Storage shall be lockable.
- Specialty fixturing for high value and high volume merchandise should be accounted for in the design.
- High value fixturing should be supplied with high security locks.
- High volume merchandise fixtures should be easily stockable/refillable.
- All retail fixtures should be keyed alike using SI standard Medeco, non- key retaining locks suitable to the application.
- If stock fixturing cannot accommodate specific merchandise needs/requirements, custom fixturing may be required.
- All retail millwork and/or custom fixturing should be in compliance with the requirements set forth in spec section 062023 Interior Finish Carpentry, 064113 Wood-Veneer Faced Cabinetry, 064116 Plastic Laminate, 064400

Architectural Woodwork, and other relevant spec sections in Division 6.

- Reference Division 10 for demountable partitions used in retail applications.

9. Queue Lines

- Queue lines should be designed for seasonal expandability/shrinkability in high-volume locations.
- If feasible, queue lines should incorporate in-queue fixture merchandising.
- Queue lines should be designed with consideration for customer flow and maximum throughput.

II. Theaters – IMAX & Planetarium

1. Seating:

- Provide a number of wheelchair locations in places of assembly with fixed seating. These locations shall be dispersed throughout the seating per the Smithsonian Guidelines for Accessible Design.
- For IMAX theaters, dispersed wheelchairs seating is not appropriate for accessibility given the varied view angles of dispersed seating. Seating may be in the same area provided that the viewing area has a preferential view angle compared to dispersed seating.
- Theater seating with raked flooring shall be cantilever mounted as opposed to floor mounted for raked seating to allow for efficient floor cleaning in between screenings.
- Theater seating with level flooring shall be floor mounted, but consideration should be given for efficient floor cleaning in between screenings.
- All fixed seating shall have the seat row letter and number identified on the seats to allow for assigned seating at events.
- Upholstered seating in theaters is preferred.
- Upholstered seating must comply with CAL T133
- Fabric should be durable with the highest number of rub counts possible
- Fabric color/pattern should be selected for least likely to show stains,

easily cleanable, and easily maintainable.

- Theater seating must be equipped with arm rest cup holders for concessions.

2. Special attention should be paid to the height of seatbacks. They should not be so high as to interfere with audio dispersion from the sound system to audience members (current IMAX seats are probably too high).

3. Doors:

- Theater and planetarium doors must be equipped with robust sound and light controls to prevent audible and visual light transmission during a performance.
- Theater and planetarium doors must have silent closers and hardware.
- Sample spec provided.
- Comply with spec section 083473 Sound Control Door Assemblies.
- Door finishes should be dark, matte as much as possible.
- Door sides facing the audiences must be clad with sound-absorptive materials if possible and acoustically recommended.

4. Wayfinding & Signage:

- Consideration of the theater or planetarium amenity should be included in building wayfinding, maps, and visitor information.
- Consideration of promotional signage (digital or static) and banners of upcoming programming should be included with every new design or retrofit.
- Exit signs and safety lighting must not emit light that in any way affects or distracts from the projected image and as allowable by NFPA / SI OSHEM.

5. Plumbing:

- Neither water nor sanitary waste piping is allowed to run over auditoriums.
- For theaters or planetariums that utilize 3D projection and 3D glasses, a plumbed glasses cleaning space is required adequately sized for the washer, hand sink, plumbing accessories, and glasses rack storage.

- Glasses washing machines require water softeners.
- Supplemental heating may be required if water supply piping cannot reach minimum equipment water inlet temperature.
- An emergency eyewash station on the hand sink required for theater support spaces that hold glasses cleaning machine & associated equipment.
- All plumbing equipment should be equipped with backflow preventers and local isolation valves for maintenance.
- Water pressure and volume meet minimum values needed for Kooptech glasses cleaning machines. Note that no hot water supply is needed for the Kooptech machines (they heat water themselves).

6. Fire Protection

- Theaters and planetariums should be equipped with a dry pre-action fire sprinkler system as opposed to a wet pipe system.
- Sprinkler piping in theaters should be painted black matte.
- Beam smoke detectors and other building appurtenances must not have visible status lights (especially blinking status lights) to avoid distracting the audience during shows and as allowable by NFPA / SI OSHEM

7. Lighting:

- Design of theaters & planetariums must address access to relamping light fixtures, adjusting audio visual equipment mounted above the stage and above the sloped floor seating area, and access to fire alarm devices. These tasks must be accomplished without the use of scaffolding and with the provision for necessary fall protection.
- Lighting consideration should include theatrical lighting, back of house lighting, and lighting appropriate for multi-functional uses such as lectures, etc.
- Remote lighting controls for the theater/planetarium and back of house spaces should be located within the projection booth / control console.
- For any major renovation or new construction of theaters/planetariums SE requires a lighting consultant specializing in high performance theaters & planetariums as part of the design team.

8. Finishes:

- Finishes should be selected for durability, maintainability, ease of cleaning, non-visually reflective, non-sound reflective, non-shiny, no light or sound infiltration from adjacent spaces, and dark in color to provide the darkest space with best acoustic performance possible.
- If acoustical ceiling tile is used, ACT should be black matte finish for both the tiles and suspended grid systems.
- Acceptable floor finishes include matte broadloom carpeting and acoustic resilient flooring.

9. Acoustics:

- An acoustical engineer shall review design drawings for a theater or planetarium in order to evaluate the acoustical properties of the proposed configuration and interior finishes
- Speakers and sound projection equipment should include vibration dampening when attached to structure.
- For any major renovation or new construction of theaters/planetariums SE requires an acoustical consultant specializing in high performance theaters & planetariums as part of the design team.
- The IMAX Theater and planetarium must be as silent as possible. Noise interference from MEP & HVAC equipment and attuperances must be avoided. Confirm maximum allowable limits with system vendor.

10. Projection Room Glass:

- Projection room glass shall be of grade and transmittance value appropriate for high definitions digital projection.
- Additional glass is required for the projectionist to monitor the performance / screen from the projection booth. This glass is not required to be as high of grade as the projection equipment glass.
- A sample specification has been provided.

11. Cash rooms:

- All museum theater operations must have a dedicated OPS compliant cash room that can't be shared with any other business / operation.
- Minimum security requirements and hardware required for SE cashrooms is dictated by the SI OPS Security Design Guidelines depending on the estimated amount of cash handling by the business.
- In lieu of wire mesh reinforced walls, OPS has allowed SE to enclose our cash safes in wire mesh partitions, bolted to the floor and with the appropriate security hardware, sensors, and mag locks, etc.
- SE cashrooms are required to be equipped with card readers for badge access by SE staff only.
- A small table for cash counting near the cash safe is required.
- The main cash transaction door for the cash room should be a Dutch door with a countertop for transacting. Both leaves should have latch bolts and striker plates. The Dutch door bolt shall allow the locking of the both the bottom and top leaves.

12. Ticketbooths & POS Stations:

- Each POS station requires security camera coverage of each point of sale unit with clear view of the cash drawer & cash handling. This is in addition to any OPS general space coverage requirements.
- Sufficient space consideration should be included in ticketbooth design to accommodate equipment anc concessions.
- in best practice, ticketbooths should incorporate fresh popcorn popping and affiliated exhaust.
- Flexibility in the layout and plan should allow for strategic placement of self-ticketing machines.
- Per ticketbooth location, there must be at least (1) ADA accessible point of sale station.

13. Queue Lines

- Queue lines should be designed for seasonal expandability/shrinkability in high-volume locations.
- If feasible, queue lines should incorporate in-queue fixture merchandising.
- Queue lines should be designed with consideration for customer flow and

maximum throughput.

III. Food & Concessions

A. General Requirements:

- All restaurants, operated by Smithsonian Enterprises (SE) and other vendors, shall be on separate utility meters. Refer to Section 22113 Facility Water Distribution Piping and Section 262713 Electricity Metering for respective water and electric meter requirements.
- All restaurants operated by Smithsonian Enterprises (SE) and other vendors are subject to the requirements of WASSA and DCRA regulations.

B. Food Service Back of House:

1. Location & Accessibility:

- Food service kitchens shall not be located above collection storage areas.
- Back of house spaces should be located with direct access to the food service and within close proximity to the building's loading dock(s) and freight elevator(s).
- Food service requires properly sized cold storage, dry storage, and food preparation areas for unloading, loading, and storage of food products, smallwares, and equipment such as rolling storage, pallet jacks, dollys, carts, etc.
- Cold storage & walk-in refrigeration units should be tied to the building's uninterrupted power supply (UPS) to prevent loss of inventory in the event of power outage.
- Back of house areas should be equipped with card readers for badge access by food service staff only. Back of house spaces must be fully compliant with the Health Department requirements of the Authority Having Jurisdictions.
- Wherever possible, provide a separate, dedicated loading dock for food service and a separate, dedicated loading dock for collections/exhibitions receiving.

- Provide locker area for food service employees.
- Provide ADA accessible restrooms for food service employees.
- Reference Division 10 for mobile storage & 105626 mobile storage shelving used in food service back of house applications.
- Consideration of the restaurant/cafe amenity should be included in building wayfinding, maps, and visitor information.
- Provide BOH space for recycling/composting operations. Required in LEED certified bldgs..

2. Finishes:

- Ceilings shall be scrubbable ACT with sufficient access to junction boxes, valves, access panels, clean-outs, etc.
- Walls shall be painted with a cleanable paint (high gloss?) or have GFRP paneling at a minimum of 48" AFF.
- Counters and horizontal food preparation surfaces shall be stainless steel with a backsplash and food-service grade sealant at joints, walls, material transitions, etc.
- All doors in food service areas shall be minimum 1067 mm (3 ft. 6 in.) in width to accommodate material handling and carts.
- Doors shall be equipped with stainless steel kick plates, manually fastened.
- Provide 1219 mm (4 ft.) high, minimum 16-gauge stainless steel corner guards at all outside corners of food service back-of-house areas and associated corridors, manually fastened, and not adhered.
- Walls behind food preparation areas or cook lines shall be stainless steel panels.
- Flooring in food preparatory areas & walk-in refrigeration/freezer boxes shall be highly durable quarry tile with epoxy grout.
- Quarry tile shall have high slip resistance rating, but also be easily cleanable and maintainable without specialty equipment.
- Epoxy flooring is appropriate for some applications such as ice machine rooms and dishwashing rooms provided that the flooring has a high slip

resistance.

- Specify mold-resistant gypsum board in all food service areas
- No stretched membrane ceiling systems in food service applications, front or back of house.
- Additional security requirements and hardware may be required for these spaces and are dictated by the SI OPS Security Design Guidelines. HVAC design should account for human occupation, cook line equipment loads, refrigeration equipment loads, etc.
- All backsplashes at food prep. Counters shall be sealed to vertical surface with approved silicone sealant.

3. Lighting:

- Sufficient lighting is required to provide adequate lighting at the bottom shelves of food/dry storage shelving units.
- Lighting covers should be easily cleanable.

4. Fire Protection & Ansul Systems:

- Fire sprinkler head and lighting layouts should be coordinated with layouts for adequate coverage.
- All pendant fire sprinkler heads should be equipped with a protective cage.
- Ansul systems are required at cook lines.
- Ansul systems shall be inter-locked with KEVS Hoods/fans as required by code.
- Fire extinguishers shall be wall-mounted and type for commercial cooking application.

5. Plumbing:

- Hot water supply should be tested in the space prior to any design work to determine whether existing supply will be able to maintain minimum hot water temperatures and flow rates required by the Health Department having jurisdiction.

- If minimum temperature and flow cannot be maintained additional intervention will be necessary such as on-demand water heating, flow valve adjustments, or booster pumps at fixtures.
- In addition to a hand sink, a 3-compartment sink is required for all food service applications. Bowl sizing shall be coordinated against sheet pan sizes of cooking equipment.
- 3-compartment sinks must be connected to a grease interceptor.
- If feasible, select food service equipment that can drain to a funnel drain or a floor sink rather than requiring empting of a condensate pan.
- Provide a filtration system for the water supply to all food service equipment that requires water service.
- Provide indirect waste drainage as required by DC Health Code. All 3-compartment sinks, dishmachines, pot washers, etc.
- Provide backflow preventers for the water supply to all food service equipment requiring water service.
- Provide locally located isolation valves for food service equipment requiring water service.
- Provide inter-lock disconnect on all gas fired cooking equipment, tied to Ansul systems.
- Refer to Section 221323 Sanitary Waste Interceptors and DC Health Code for requirements for grease interceptors in food preparation areas.

6. Warewashing:

- Warewashing types shall not be self venting and should have active exhaust.
- Warewashers require water softeners.
- Tray accumulator types are preferred in lieu of conveyer belt types.
- Ducts shall be welded stainless steel and pressure tested and pitched back to equipment.
- Warewashers shall tie into grease interceptors.
- Provide sensor alarms on stainless steel drip pans under mechanical

ductwork in areas of high humidity, such as dishwashing rooms.

7. Waste Management & Hauling:

- Plan waste hauling routes so that waste is never hauled in or through public spaces.
- Provide for on-site composting and recycling of waste including collection of oils for biofuels, bottle, can, paper, and plastic recycling.
- Provide signage to encourage recycling in dining areas. Avoid storing waste near any collections storage or collection receiving/staging spaces.
- Carefully plan composting and recycling areas to minimize attraction of rodents and other pests.
- Provide water and drainage at composting areas.
- For high volume food service locations, a separate dumpster area and trash compactor system with electric winch should be provided

8. HVAC:

- Refer to Division 23, HVAC, Part II, Section 2.03F for redundancy requirements for water-cooled food service equipment.

9. Grease Ducts & Exhaust Hoods:

- Must be installed and maintained in accordance with NFPA 96: Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- Coordinate requirements with current SOP's of Smithsonian Institution and OFMR.
- All access points must be clearly identified and maintained clear. Access point locations shall be in accordance with NFPA 96.
- TAB reports shall be recorded and reported to OFMR when any modifications are made to grease duct/hood systems.
- Existing grease ducts must be tested for leaks and NFPA 96 compliance as part of any major renovation of existing facilities.

10. Cash rooms:

- All museum restaurant operations must have a dedicated OPS compliant cash room that can't be shared with any other business / operation.
    - Minimum security requirements and hardware required for cashrooms is dictated by the SI OPS Security Design Guidelines depending on the estimated amount of cash handling by the business.
    - In lieu of wire mesh reinforced walls, OPS has allowed to enclose our cash safes in wire mesh partitions, bolted to the floor and with the appropriate security hardware, sensors, and mag locks, etc.
    - Cashrooms are required to be equipped with card readers for badge access by vendor staff only.
    - A small table for cash counting near the cash safe is required.
    - The main cash transaction door for the cash room should be a Dutch door with a countertop for transacting. Both leaves should have latch bolts and striker plates. The Dutch door bolt shall allow the locking of the both the bottom and top leaves.

C. Front of House

1. Chairs & Seating:
    - Non-upholstered seating is preferred over upholstered seating. If seating is upholstered, fabric should be durable with the highest number of rub counts possible, of a color/pattern least likely to show stains, easily cleanable, and easily maintainable.
    - Banquette seating should be off the finished floor to prevent pest infiltration.
    - Specify mold-resistant gypsum board in all food service areas
2. Finishes:
    - No carpet in the public dining areas. Flooring materials should be durable, cleanable, and non-staining.
    - Division 06116 Solid Surfacing Fabrications no light colored solid surface for food & beverage applications; must have appropriate finish- polished and sealed
    - No stretched membrane ceiling systems in food service applications.

- No cork flooring in food service applications.
- Flooring materials: epoxy terrazzo (section 096623), quarry tile, resilient flooring
- For fabric wrapped panels in food service applications, need to have a cleanable resilient coating applied 097723.
- Reference Division 10 for demountable partitions used in food service applications.

3. Point of Sale

- Each POS station requires security camera coverage of each point of sale unit with clear view of the cash drawer & cash handling. This is in addition to any OPS general space coverage requirements.
- Per POS location, there must be at least (1) ADA accessible point of sale station.

4. Queue Lines

- Queue lines should be designed for seasonal expandability/shrinkability in high-volume locations.
- If feasible, queue lines should incorporate in-queue fixture merchandising for impulse items.
- Queue lines should be designed with consideration for customer flow and maximum throughput.

D. Vegetation

- No vegetation in food service applications as they can harbor pests.

E. Outdoor Food Service

- Electrical service should be at a minimum 50amp service per location, with a weather-proof GFCI enclosure.
- Locations should have sufficient signal/access to process transactions using wireless internet.
- Locations must have water supply piping, waste piping, and sufficient drainage appropriate for the footprint of the service.

APPENDIX K

Smithsonian Enterprises Specialty Specifications

- 08 34 73 – Sound Control Door Assemblies
- 08 56 73 – Sound Control Windows
- 08 81 00 – Interior Glazing
- 10 22 13 – Wire Mesh Partitions
- 11 61 33 – Rigging, Curtain & Tracks
- 12 61 00 – Fixed Audience Seating Planetarium
- 12 61 23 – Fixed Auditorium Seats

SECTION 08 34 73
SOUND CONTROL DOOR ASSEMBLIES
January 31, 2018

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 UNITS OF MEASURE

A. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

1.3 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Acoustically rated swinging steel door and frame assemblies.
2. Acoustical hardware.
3. Accessories.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS for sustainable design requirements and procedures.

B. See Division 08 Section HOLLOW METAL DOORS AND FRAMES.

C. See Division 08 Section DOOR HARDWARE for hardware requirements, for hardware not specified in this Section.

D. See Division 09 Section PAINTING AND COATING for field applied finish.

1.5 ACTION SUBMITTALS

A. Product Data:
   1. Submit shop drawings of the door, frame, hardware and seals showing major operating dimensions and cross-sections of doors and seals.
   2. Submit manufacturer's specifications and installation instructions for each component and finish.
   3. Include catalog cuts for acoustically rated hardware and gaskets.

B. Shop Drawings - Door Schedule:
   1. Submit Shop Drawings for fabrication and installation of steel door and frame assemblies.
   2. Include locations, configuration, details, elevations, conditions at openings, STC rating and fire rating.
   3. Include hardware locations (including security hardware), mounting details and anchorage.

1.6 LEED SUBMITTALS

A. Comply with Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS.

B. MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials.
   1. For recycled content steel: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

1.7 INFORMATIONAL SUBMITTALS

A. Certifications:
   1. Where fire resistance classifications are indicated, certify that construction complies with requirements of NFPA 80.
   2. Written guarantee that the door is constructed in accordance with the laboratory tested door and free of defects in material and workmanship for a period of time not less than three years after installation.

B. Test Reports:
   1. Submit certified test reports indicating that the acoustical performance of the door meets the Sound Transmission Class (STC) performance specified in the door schedule. Test data shall be produced from an accredited independent acoustical laboratory that is a member of NVLAP (National Volunteer Laboratory Accreditation Program). Reports shall indicate that the test was performed on the doors and frames of the type to be supplied in conformance with the requirements of test method ASTM E 90-09 and have a certified Sound Transmission Class (STC) rating as determined according to ASTM E 413.

2. Test reports by an independent Acoustical Engineer certifying a Field Sound Transmission Class (FSTC) or Noise Isolation Class (NIC), in conformance with the requirements of test method ASTM E336-09, performance of no more than five points below the laboratory STC performance on similar installations. Results calculated according to ASTM E413
3. Show laboratory name, test report numbers and date of tests.

C. Inspection Reports: Submit copy of manufacturer's technical representative's field inspection report.

1.8 SYSTEM REQUIREMENTS

A. Fire Resistance Requirements:
1. Comply with label requirements of NFPA and applicable local codes.
2. Fabricate door and frame assemblies that comply with NFPA 80, are identical to door and frame assemblies tested per NFPA 252 and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
3. Provide UL plate labels permanently fastened on each door and frame within size limitations established by NFPA and UL for labeling.
4. Provide anchors for UL labeled frames required by authority having jurisdiction.

B. Acoustic Ratings:
1. Certified test reports indicating that the acoustical performance of the door meets the Sound Transmission Class (STC) performance specified in the door schedule. Test data shall be produced from an accredited independent acoustical laboratory that is a member of NVLAP (National Volunteer Laboratory Accreditation Program). Reports shall indicate that the test was performed on the doors and frames of the type to be supplied in conformance with the requirements of test method ASTM E 90 and have a certified Sound Transmission Class (STC) rating as determined according to ASTM E 413.
2. Test reports by an independent Acoustical Engineer certifying a Field Sound Transmission Class (FSTC) or Noise Isolation Class (NIC), in conformance with the requirements of test method ASTM E336, performance of no more than five points below the laboratory STC performance on similar installations. Results calculated according to ASTM E413.
3. Written guarantee that the door is constructed in accordance with the laboratory tested door and free of defects in material and workmanship for a period of time not less than three years after installation.

C. Interface With Other Systems:
1. Coordinate with Work of other trades affected by Work of this Section.

2. Provide items, such as anchors or supports, in a timely manner so as not to delay job progress.
3. Place items, such as anchors or supports, accurately in relation to final locations.
4. Use Contractor's bench marks.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project, licensed by the manufacturer.

B. Manufacturer Qualifications:
1. Company specializing in acoustically-rated steel doors and frames for fire rated openings, having minimum of 5 years successful, documented experience with work comparable to that required for this Project.
2. Company whose units are inspected, tested and listed by UL for single point hardware and astragal conditions for sizes and profiles indicated.

C. If a door or frame indicated with a fire resistance classification cannot qualify for appropriate labeling because of its design, hardware or other reason, notify COTR before beginning fabrication of that item.

D. Manufacturer's Inspections:
1. Provide inspections by manufacturer's technical representative at completion of installation.
2. Contractor shall be responsible for carrying out recommendations of manufacturer's representative.
3. Provide written reports of inspection.

E. Reference Standards: Comply with applicable provisions of Steel Door Institute.

1.10 DELIVERY, STORAGE AND HANDLING

A. Protect units from damage during transit, storage and installation.

B. Tool marks, rust, blemishes and any other damage on exposed surfaces will not be acceptable.

C. Store units in vertical position in dry location, off ground and in such manner as to prevent deterioration.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
1. Overly Manufacturing Company.
2. Krieger Specialty Products Co.
3. Security Acoustics.

2.2 MATERIALS

A. LEED, General: Recycled Content: Provide steel with minimum 25 percent post-consumer recycled content.

B. Hot-Rolled Sheet Steel: ASTM A1011 and A568, commercial quality carbon steel, pickled and oiled.

C. Cold-Rolled Sheet Steel: ASTM A1008 and A568, free from scale, pitting or other defects; E finish, stretcher leveled for doors.

D. Prime Paint: Rust-inhibitive enamel or paint, compatible with finish paints as specified in Division 09 Section PAINTING AND COATING.

2.3 SOUND CONTROL DOORS

A. Construction
1. Door thickness shall be as scheduled below, or as required to meet STC rating. Door leaf shall feature thick, flush design using cold-rolled steel construction not less than 1.6 mm (16 gauge) in thickness. The core shall be filled with sound-absorbing and damping elements that are acoustically non-coupling and non-combustible. Vision panels, where specified, shall comprise glazing systems that meet the acoustical performance of the tested product and shall be supplied by the door manufacturer.
2. Frames shall be formed to sizes and shapes indicated and shall have full welded unit-type construction at corners and other joints. Frames shall be of cold-rolled steel construction, not less than 2 mm (14 gauge) in thickness. All contact edges shall be closed tight. Welds on corners and exposed surfaces shall be pressed flush and smooth. Steel frame members shall be pre-straightened, free of wind or twist. Frame shall be factory-aligned to a diagonal tolerance of 1.6 mm (± 1/16 inch).
3. Continuously grout-fill frames when installed in masonry or concrete partition openings, or packed tightly with glass-fiber safing insulation and caulked with

acoustical sealant around the perimeter of both sides of the frame when applied to drywall and stud partition openings.

4. Doors and frames shall be factory mortised, reinforced and fitted for heavy-duty locksets, strikes and closers. The door manufacturer is responsible for supplying and installing all hardware. The door manufacturer is to notify the COTR if scheduled hardware is incompatible with the operation and performance of the acoustical door. Manufacturer shall submit for approval by the COTR alternate hardware as required. Refer to hardware schedule for models and types.
5. Manufacturer shall supply cam-lift hinges on all acoustical doors. Surface strap or butt hinges are unacceptable.
6. Where a transom panel is required, that panel shall provide acoustical performance at least as good as the door STC rating.
7. Door and frame shall be factory finished with a rust inhibiting primer.

B. Door Performance Schedule:

STC Rating	Thickness (inches)	Surface Weight (lb/ft^2)	Metal Gauge (ga.)	Transmission Loss Values in dB Octave Band Center Frequencies, Hz.						
				63	125	250	500	1000	2000	4000
43	1-3/4	8	14	16	21	40	41	43	44	50
49	2-1/2	7	16	22	27	41	46	50	52	54
51	2-1/2	9	14	22	32	45	51	49	55	54
53	2-1/2	11	14	23	30	47	52	54	52	57
54	3-1/2	16	14	23	32	52	53	53	52	62
61	3-1/2	16	14	24	41	53	60	60	62	69
64	5	18	14	26	44	58	62	65	66	68

C. Perimeter Treatment:

1. Clearance between frame and door shall not exceed 3 mm (1/8 inch). All sills shall be flush and of steel construction to ensure the integrity of the bottom seal. Raised thresholds will not be permitted.
2. Hinge, lock and head of the door shall close against positive neoprene compression and/or magnetic seals that are mounted in the frame and/or leaf. Combination neoprene-felt seals are not acceptable.
3. The door shall be supplied with a bottom neoprene seal covered in non-stick (Teflon or similar) material to prevent seal erosion. The seal shall be adjustable, to conform to job site sill conditions. Automatic drop bottoms are not

permitted. All screws shall be flush with the door leaf, no surface exposed screw heads or bolts are acceptable.

4. Where a double leaf door is specified, the astragal shall be rabbeted or bevelled and contain neoprene compression and/or magnetic seals for the full height of the door. There shall be no gaps in the seals at the head and sill of the door. There shall be continuous pressure applied to the astragal to compress the seals and prevent the leafs from bowing out and disengaging the astragal seals. Acoustic test data for double door configurations shall be submitted. Single leaf test data is not acceptable for double doors.

2.4 DOOR TYPES

A. Door Types:

1. General: Provide door assemblies complete with door frame, mortised cam-lift hinges, sound seals, retainers and covers, adjustable semi-mortised door bottoms, and cutouts and reinforcements for other hardware items scheduled in Division 08 Section DOOR HARDWARE.
2. Types:
   a. Type 1: Single swinging door.
   b. Type 2: Pair of swinging doors.
3. STC: As scheduled.
4. Thickness: As scheduled
5. Weight: 66.4 kg/m5(13.6 psf).
6. Fire ratings: See Door Schedule on Drawings.
7. Hardware:
   a. Hinges:
      1) Equivalent to MCL 500 cam-lift by Overly.
      2) Provide electrified hinges for 24 volt power transfer for doors with electric locks or exit devices.
   b. Head and jamb seals:
      1) Equivalent to Model H by Overly, or other type as recommended for the application.
      2) Provide magnetic sound seals in lieu of compression seals for doors with exit devices.
   c. Door bottom seals: Equivalent to Super H by Overly, or other type as recommended for the application.
   d. Other hardware: See Division 08 Section DOOR HARDWARE.
8. Acceptable product and manufacturer: Equivalent to Model 5189106 by Overly.

2.5 ACOUSTIC HARDWARE

A. See Division 08 Section DOOR HARDWARE.

B. General: Sound seals, specified below, shall be fitted to the hinge, lock and head; and an automatic door bottom shall be installed (either surface mounted, or mortised) at the bottom edge of the door leaf. All seals shall be continuous and must not be interrupted by other door hardware such as panic hardware, latches, automatic closers, etc. Conflicts between sound gasketing and other hardware must be brought to the immediate attention of the COTR.

C. Automatic Door Bottom:
   1. Automatic door bottom shall be surface-mounted, or mortised as called out on the drawings and schedules. The seal shall be actuated by an adjustable operating rod that cause the gasket to drop automatically when the door contacts the hinge jamb. The door bottom mechanism must drop first at the hinge edge of the door and then continue to drop towards the lock edge of the door as the door continues to swing shut. This will prevent excessive force being required to close door, excessive wear to seal and damage to mechanism. The seal must be self-centering to a flat-plate threshold to ensure a proper seal across the entire door width if the floor surface is not entirely even. Automatic door bottom mechanism shall have only one moving part and shall not utilize any plastic parts.
   2. Gasket material shall be a solid-extruded high-grade neoprene bulb. Door bottom shall utilize neoprene seals inside the mechanism to prevent sound from "flanking" through mechanism. Housing shall be constructed of extruded aluminum. Surface mounted housings shall have a minimum wall thickness of 2.4 mm (0.093 inch).
   3. The following are acceptable:
      a. Non-Fire-Rated: #367 (surface mounted) or #369 (mortised) from Zero International, Inc.
      b. Fire-Rated: #365 (surface mounted) or #366 (semi-mortised) from Zero International.
   4. Equivalent products by the following may also be acceptable:
      a. Reese Enterprises, Inc.
      b. National Guard Products

D. Tubular Neoprene Adjustable Door Stop

   1. Adjustable door stop shall be constructed of extruded aluminum housing with a minimum wall thickness of 2.4 mm (0.093inches). The dimensions of the door stop housing shall not exceed 38 mm (1-1/2 inches) in depth or 23.8 mm (15/16 inches) in width. Adjusting screws shall be located 305 mm (12-inches) on center and shall provide an adjustment range of 7.874 mm (0.310-inches). Adjusting screws shall be #8 x 38 mm (1-1/2 inches) stainless steel, shall have a special shoulder for a retaining clip, and shall be held in the assembly by said retaining clip. Adjusting screws shall engage a solid adjusting channel which has been drilled

and tapped to provide complete circumference engagement for the screw thread. No spring retainers, self-tapping adjusting screws, or channels without drilled and tapped holes for the adjusting screws will be allowed.

2. The seal shall be achieved using continuous tubular, solid neoprene. Install the gasket so that the neoprene engages the face of door for the full length of the seal. Adjust the seal so that the neoprene is compressed 0.8 mm (1/32 inches) when the door is closed. Solid neoprene shall fill the inside of the housing to prevent sound from "flanking" through the mechanism. The assembly must have a weight of at least 0.374 kg/m (0.825 lbs/ft) in order to ensure durability.
3. Fire rated gaskets usually require mounting to the stop of the door jamb. Because the gasket thickness adds to the stop dimension, lockset hardware with lever handles should be used. If knob locksets are required, a 81 mm (3-1/4") backset lock should be supplied.
4. The following are acceptable:
    a. Fire Rated: #770 (applied to stop) or #770SP (applied to frame) from Zero International, Inc.
    b. Non Fire Rated: #870 (applied to stop) or #7770 (applied to frame) from Zero International, Inc.
5. Equivalent products by the following may also be acceptable:
    a. Reese Enterprises, Inc.
    b. National Guard Products.

E. Meeting Stiles:
1. Meeting stiles for double-doors shall be of the adjustable and spring loaded mortised astragal type (surface applied for fire rated doors) with a neoprene seal at the door intersection. The seals should be continuous with no interference from door hardware such as closures, exit devices, etc. Install seals so they are compressed against each other by 1.6 mm (1/16 inches). The edge of the door requires a cutout to receive the mortised seal.
2. The following products by Zero International are acceptable:
    a. Single Active Door: #140, #322, or #383.
    b. Mortised-Both Doors Active: #557/#56.
    c. Surface Mounted-Both Doors Active: #555/ #55.
3. Equivalent products by the following may also be acceptable:
    a. Reese Enterprises, Inc.
    b. National Guard Products.

F. Rabbeted Saddle
1. Rabbeted type floor saddle shall be constructed of aluminum with a built-in tadpole-type neoprene seal. Width shall not to exceed 94 mm (3-3/4 inches) with a minimum 25 mm (1 inch) flat horizontal portion. Total clearance above finish floor shall not exceed 13 mm (1/2 inch) in order to make the saddle compliant with accessibility requirements.

2. Rabbeted saddles should not be used for spaces in which equipment such as pianos will be rolled in and out of the space.
3. The following are acceptable:
   a. #564 from Zero International, Inc.
   b. #S248DN from Reese Enterprises Inc.
   c. #8135N from National Guard Products.

G. Exit Devices for Acoustically Gasketed and STC Doors:

1. When using the above exit device, the door bottom must be surface mounted. Door closers shall be either mounted to the door leaf on the opposite side of the jamb and head gasket (pull side), or supplied with an offset pivot arm assembly to avoid interference with the perimeter gaskets.
2. Acceptable product and manufacturer: Equivalent to Von Duprin 99 series concealed rod type with the sound dampening feature.

2.6 ACCESSORIES

A. Supports and Anchors: Fabricated of not less than 1.3 mm (18 gage) galvanized sheet steel, unless otherwise indicated.

B. Inserts, Bolts and Fasteners: Manufacturer's standard units.

C. Jamb Anchors:
1. Anchor in masonry walls with adjustable anchors of stirrup-and-strap type, built into adjoining construction.
2. Fabricate anchors from 1.6 mm (16 gage) steel; minimum 50 mm wide x 250 mm long (2 inches wide x 10 inches long).
3. Provide 4 anchors per jamb up to 2235 mm (7 feet) high and 1 additional anchor for each 450 mm (18 inches) or fraction thereof over 2235 mm (7 feet) high.
4. At fire rated frames, comply with fire resistance requirements and provide UL rated anchors.

D. Floor Anchors:
1. Provide 2.8 mm (12 gauge) clip angles welded inside each jamb for attachment to structural substrate.
2. Where floor fill or setting beds occur, provide adjustable anchors.

E. Provide fasteners, clips, anchors, brackets, adhesives, inserts and other miscellaneous items as required for a complete installation.

2.7 FABRICATION

A. General Fabrication Requirements:
   1. Fabricate units rigid, neat, free from defects, warp or buckle.
   2. Reinforce units as required to prevent twisting or sagging.
   3. Shop fabricate units in largest units practicable. If frames require field splices due to shipping limitations, field weld such splices after installation.
   4. Assemble Work using all welded construction.
      a. Comply with applicable requirements off AWS D1-1.
      b. Grind, fill and dress welded joints smooth to provide smooth, seamless faces and edges.
   5. Form exposed surfaces with corners square, unless otherwise indicated. Form molded members straight and true, with joints coped or mitered.
   6. Conceal fastenings, unless otherwise indicated. Countersink exposed screws using flat, Phillips head screws.
   7. Provide assemblies complete with anchors, inserts, fasteners and other hardware and miscellaneous items as required for complete installations.

B. Doors:
   1. Provide doors of types and dimensions indicated.
   2. Face sheets:
      a. Minimum 1.6 mm (16 gage) steel face sheets.
   3. Construction:
      a. Provide welded seamless construction with no visible seams or joints on faces or vertical edges
      b. Join door faces at vertical edges by welding.
      c. Internal construction: Manufacturer's standard for the particular model and rating specified for each door type.
   4. Swinging doors:
      a. Provide flush closure at top and bottom of doors. Spot weld inverted 1.6 mm (16 gage) steel channels to both face sheets and an additional flush closing channel.
      b. Bevel lock and hinge edges of doors 3 mm in 50 mm (1/8 inch in 2 inches).
      c. Fabricate assemblies to provide following edge clearances:
         1) Between door and frame at head and jambs: 3 mm (1/8 inch).
         2) Between door and sill: Per manufacturer's standards.
         3) Between edges of pairs of doors: 3 mm (1/8 inch).
      d. If recommended by manufacturer, install door bottom seal at factory.

C. Frames:
   1. Provide frames of types, profiles and dimensions indicated.
   2. Fabricate from minimum 2 mm (14 gage) sheet steel.
   3. Construction:
      a. Fully welded construction with integral trim, with welded, mitered and reinforced corner joints. Knock-down frames are not acceptable.

b. Provide 1.6 mm (16 gage) steel channel spreaders at bottom of frames to prevent distortion during shipment.

D. Hardware:
1. Prepare assemblies to receive hardware. Coordinate with Hardware Schedule. Comply with ANSI A115 "Specifications for Door and Frame Preparation".
2. Mortise, reinforce, drill and tap units at factory to receive mortise type hardware.
3. Reinforce, drill and tap units to receive surface-applied hardware.
4. Security hardware:
   a. Prepare doors and frames to receive mortise and surface mounted Owner furnished security hardware.
   b. Door Schedule indicates doors to receive concealed contacts (position switches). Coordinate with Owner's security contractor.
   c. Include fabrication for doors and frames to receive concealed contacts and concealed associated wiring. Contacts and wiring will be provided by Owner's security contractor.
5. Provide metal mortar guards for mortise cut-outs and at openings for contacts.

2.8 SHOP FINISH

A. Shop Painting:
1. Clean, treat and paint surfaces of fabricated units. Remove grease and oil.
2. Chemically treat surfaces with phosphate compound.
3. Provide minimum 2 coats of primer to reinforcement and attachment steel in contact with concrete or masonry.
4. Apply primer with even consistency with a uniformly finished surface.
5. Provide minimum number of coats of dry film thickness recommended by paint manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
1. Install in accordance with final Shop Drawings and manufacturer's accepted installation procedures and instructions.

2. Door shall be installed by factory-trained or approved representatives or contractors. Door shall be installed per manufacturer's instructions to ensure a tight fit and proper seal at all joints and interfaces.
3. The door manufacturer shall provide factory trained supervision personnel during the initial frame installation, at regular periods during the acoustic door installation, and at final inspection. The manufacturer shall issue a letter of compliance certifying the completion of a successful installation.
4. All frames installed in masonry/concrete partitions shall be grouted solid. All frames installed in stud partitions shall be filled with high density glass-fiber insulation.

B. Frame Installation:
1. Set frames accurately in position, plumbed, aligned and braced securely.
2. Coordinate installation of built-in anchors for wall partition construction.
3. Terminate frames at indicated finished floor level. Where floor fill or setting beds occur, support frames with adjustable clip angles, anchored to structural substrate.
4. After wall construction is complete, remove temporary braces and spreaders.
5. Leave surfaces smooth and undamaged.
6. Installation tolerances for swinging door frames:
   a. Squareness: ±1.6 mm (±1/16 inch), measured on a line, 90 deg from one jamb, at upper corner of frame at other jamb.
   b. Alignment: ±1.6 mm (±1/16 inch), measured on jambs on horizontal line parallel to plane of wall.
   c. Twist: ±1.6 mm (±1/16 inch), measured at face corners of jambs on parallel lines perpendicular to plane of wall.
   d. Plumbness: ±1.6 mm (±1/16 inch), measured on jamb at floor.

C. Door Installation:
1. Install in accordance with final Shop Drawings, manufacturer's instructions and recommendations of manufacturer's representative.
2. Install labeled fire doors and frames to meet requirements of cited references and NFPA Standard No. 80.

D. Hardware Installation:
1. Install hardware in accordance with both acoustical door and hardware manufacturers' instructions and as specified in Division 08 Section DOOR HARDWARE.
2. Adjust installation to maintain door clearances specified under "Fabrication" above.
3. Install seals and gaskets, covers and retainers, and adjust to contact head, jambs and sill uniformly.

3.3 CLEANING AND ADJUSTING

A. Adjusting:
1. Before completion of Work, adjust hardware and seals until assemblies operate properly.
2. Test security devices with operation of security system in Owner's presence.
3. Replace defective, damaged, missing or stolen hardware.
4. Remove and replace defective Work.

B. Cleaning:
1. Clean doors and frames.
2. Sand smooth rusted or damaged areas of prime coat and touch-up with compatible air-drying primer.

3.4 FIELD QUALITY CONTROL

A. Provide the following services by acoustical door manufacturer's technical representative:
1. Inspect completed installation.
2. Put each door through at least 10 complete cycles of operation.
   a. Verify that each component is properly installed and operating.
   b. Make adjustments until assemblies operate properly.
3. Use a mechanic's stethoscope and cassette tape of laboratory-recorded noise furnished by door manufacturer to test sound seals. Coordinate with Contractor in adjusting sound seals for optimum efficiency.
4. Provide written report stating that Work has been installed in accordance with requirements of Contract Documents and final Shop Drawings.

B. Field Testing Verification:
1. If required, the Owner will retain the services of an independent acoustical consultant to conduct an acoustical test at any designated door locations where noise transmission is suspected of being below the set criteria. The test shall consist of a Field Sound Transmission Class (FSTC) or Noise Isolation Class (NIC) test per ASTM E336-09. If such results indicate non-conformance with the established FSTC or NIC requirements, it shall be the responsibility of the Contractor and Manufacturer to correct, at their expense, such deficiencies by methods that shall be approved by the Acoustical Consultant and Owner prior to incorporation. Acoustical tests shall be repeated at the manufacturer’s cost and corrective measures devised and incorporated until the set criteria and performance standards are met. If the Acoustical Consultant or COTR determines that the materials are not as specified herein, the door shall be replaced at no cost to the Owner.

3.5 DEMONSTRATION

A. Provide instruction in operation and maintenance of acoustical door systems to Owner's designated personnel.

3.6 PROTECTION

A. Protect units during construction so that they will be without any evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 08 56 73
SOUND CONTROL WINDOWS
January 31, 2018

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 UNITS OF MEASURE

A. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

1.3 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Aluminum-framed, shop-glazed acoustically-rated windows at IMAX, excluding windows used for projection.
2. Aluminum-framed, shop-glazed acoustically-rated window at Production Studio.
3. Glass and glazing.
4. Sealants and joint fillers.
5. Accessories.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 07 Section JOINT SEALANTS for perimeter joint fillers and sealants.

B. See Division 08 Section INTERIOR ALUMINUM WINDOWS for glazing at interior aluminum windows, including transaction windows and IMAX window port frames (IMAX projection window).

C. See Division 08 Section INTERIOR GLAZING for interior glazing requirements.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for

each component and finish.

B. Shop Drawings: Submit Shop Drawings for windows.
   1. Show plans, elevations and typical details of each condition for every member, joint, anchorage and glazing system.
   2. Include mounting details and anchorage.

C. Samples:
   1. Glass:
      a. Submit 305 mm (12 inch) square samples of each type of glass.
      b. Samples shall be typical production run quality and shall be complete with coatings.
   2. Aluminum:
      a. Submit 305 mm (12 inch) long samples of each type of aluminum framing, showing color and finish expected in completed Work.
      b. Prepare samples on specified alloy, temper and thickness of metal required for Work.

1.6 LEED SUBMITTALS

A. Comply with Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS.

B. MR Credit: Building Product Disclosure and Optimization – Environmental Product Declarations.
   1. For windows: Industry-wide or product-specific EPD.

C. MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials.
   1. For recycled content steel or aluminum in windows: Documentation indicating percentages by weight of pre-consumer and post-consumer recycled content. Include material cost value.

D. EQ Credit: Low-Emitting Materials.
   1. For interior wet-applied sealants and sealant primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1-2010 and VOC content in g/L.

1.7 INFORMATIONAL SUBMITTALS

A. Test Reports:
   1. General: Submit certified test reports performed by recognized testing laboratory verifying that windows have been previously tested and meet or exceed specified performance requirements.
   2. Translation Booth windows:
      a. General: Show laboratory names, test report numbers, and dates of tests.

b. Submit certified test reports performed by recognized testing laboratory showing that STC ratings for sound control window assembly have been previously tested and meet or exceed specified performance requirements.
c. Indicate whether additional treatment of window frame, by insertion of grout or acoustic insulation in cavity between window frame and adjoining partition, is necessary to comply with specified acoustic requirements. COTR shall be the judge of technical acceptability of such data.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data:
1. Submit maintenance procedures, materials and sources for maintaining and replacing glass, seals and gaskets.
2. Include copy of submittal in operation and maintenance manual.

1.9 SYSTEM REQUIREMENTS

A. Acoustic Performance Requirements:
1. Provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) specified in this Section, in accordance with ASTM E90 and E413.

B. Compatibility and Adhesion:
1. Provide gaskets, seals, and glazing accessories which are compatible with each other and with glass and glass framing members, and which will adhere to joint surfaces.
2. Provide airtight installation of glass.

C. Interface With Other Systems:
1. Coordinate with Work of other trades affected by Work of this Section.
2. Provide items, such as anchors or supports, in a timely manner so as not to delay job progress.
3. Place items, such as anchors or supports, accurately in relation to final locations.
4. Use Contractor's bench marks.

D. Visual Requirements:
1. Metal surfaces: Fabricate surfaces exposed to view from materials which are smooth and free of surface blemishes. Do not use materials which have stains and discolorations, including welds, exposed in completed Work.
2. Surface flatness and edges: Provide flat surfaces and cut edges by machine provide corners sharp and true to angle or curvature required.

1.10 QUALITY ASSURANCE

A. Sound control windows shall be installed by sound control window manufacturer, or by a firm licensed by the manufacturer.

B. Manufacturer Qualifications: Company specializing in sound control windows.

C. Reference Standards: Comply with applicable provisions and recommendations of the following.
1. AAMA/NWWDA 101/I.S.-2 "Voluntary Specifications for Aluminum, Vinyl (PVC)".
2. NAAMM "Metal Finishes Manual".

1.11 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site to review materials, installation procedures and coordination with other Work.

1.12 DELIVERY, STORAGE AND HANDLING

A. Protect units from damage during transit, storage and installation.

B. Tool marks, rust, blemishes and any other damage on exposed surfaces will not be acceptable.

C. Store units in vertical position in dry location, off ground and in such manner as to prevent deterioration.

1.13 PROJECT CONDITIONS

A. Verify dimensions of supporting structure at site by accurate field measurements so that Work will be accurately designed, fabricated and fitted to structure. Tolerances for supporting structure are specified in other Sections.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions:
1. Shapes and thicknesses as indicated in Contract Documents and as required to fulfill performance requirements.
2. Suitable alloy for extruding with adequate structural characteristics and

suitable for finishing as specified.

B. Glass Types:
1. Float glass:
a. ASTM C1036, Type I (transparent), Class 1 (clear), Quality q^3 (glazing select); thicknesses as specified below for each window type.
b. Provide low-iron float glass as specified.
2. Glass with anti-reflective coating:
a. Low-iron float glass with factory-applied anti-reflective coating, consisting of multiple-layer, metal oxide interference system.
b. Acceptable products and manufacturers: The following listed products are provided to establish the standard of quality consistent with the salient characteristics identified above.
1) Amiran; Schott Corp., Technical Glass Division.
2) Or approved equal.
3. Laminated glass:
a. Provide laminated glass complying with requirements of ASTM C1172, as specified below for each window type.
b. Adhesive laminating film:
1) Clear polyvinyl butyral plastic sheet.
2) 0.8 mm (0.03 inch) thick, or as required to comply with acoustic performance requirements.

2.2 SOUND CONTROL WINDOW

A. Description:
1. Fixed, double-glazed aluminum-framed window.
2. Fabricate with acoustically-absorptive material, consisting of glass-fiber held in place by perforated metal pan, placed between glazed lites.
3. Designation: Minimum acoustical laboratory rating of STC 48.
4. Finish: As selected by COTR from manufacturer's full range.

B. Glass – Type GL-25:
1. Outside and inside lite: Laminated glass, consisting of 3 mm (1/8 inch) low iron float glass; laminating film; 3 mm (1/8 inch) low iron float glass; total thickness of approximately 6 mm (1/4 inch).

C. Glazing System:
1. Separate outside lite and inside lite by minimum 113 mm (4-1/2 inch) wide air space, or as required to fulfill acoustic performance requirements.
2. Provide manufacturer's standard glazing system as required to fulfill acoustic performance requirements; shop-glaze units.
3. Provide units complete, including sound-deadening treatments, desiccants, and full perimeter seals and gaskets.

D. Acceptable Products and Manufacturers: The following listed products are provided to establish the standard of quality consistent with the salient characteristics identified above.
   1. Noise Control View Windows by Krieger Steel Products Company.
   2. Acoustical Vision Lights by Overly Manufacturing Co.
   3. Series 6002-6 by Peerless Products, Inc.
   4. Acoustical Windows by Wausau Metals.
   5. Series 75 by Window Technologies, Inc.
   6. Or approved equal.

2.3 ACCESSORIES

A. Perimeter Sealants and Joint Fillers: See Division 07 Section JOINT SEALANTS.

B. Fasteners:
   1. Provide fasteners for attachment of components to structural supports and for connecting components as recommended by component manufacturers and selected to prevent galvanic action with components fastened.
   2. For embedment in masonry or concrete, provide zinc plated fasteners, conforming to requirements of ASTM B633 for Class FE/ZN 8, service condition SC2 (moderate) with Type II finish meeting corrosion resistance requirements after 96 hour salt spray test, unless otherwise selected by manufacturer.
   3. For attachment of aluminum components, provide AISI 300 series stainless steel.
   4. Provide concealed fasteners, except where indicated on Contract Drawings or where shown and accepted on final Shop Drawings. Where exposed in finished surfaces, use oval-head countersunk Phillips heads with color to match adjacent surfaces.

C. Reinforcing and Joining Materials:
   1. Steel angles, plates, bars, rods and other steel accessories: ASTM A36 and ASTM 83, galvanized or if galvanizing is not compatible with alloy of component parts, shop painted with zinc chromate primer after cutting to size.
   2. Aluminum angles, plates, bars and other aluminum accessories: Alloys as recommended by manufacturer or fabricator to develop required strength of assembly.

2.4 FABRICATION

A. Fabricate in accordance with final Shop Drawings and component manufacturers' instructions. Field check masonry opening dimensions before proceeding with fabrication of windows.

B. Fit and assemble Work in shop.

C. Complete welding, cutting, drilling and fitting of joints prior to chemical treatment and application of finishes.

D. Welding:
1. Weld with electrodes and by methods recommended by aluminum manufacturer and in accordance with applicable recommendations of AWS.
2. Use only methods which will avoid distortion or discoloration of exposed faces.
3. Grind weld areas smooth and restore finish before proceeding with other treatment.

E. Reinforce members and joints with steel plates, bars, rods or angles as required for rigidity and strength and as needed to fulfill performance requirements.
1. Use concealed stainless steel fasteners for jointing which cannot be welded.
2. Where fasteners screw anchor into aluminum less than 3 mm (1/8 inch) thick, reinforce interior of section with aluminum or non-magnetic stainless steel to receive screw threads.

F. Conceal fasteners unless otherwise indicated on Contract Drawings or otherwise shown and accepted on final Shop Drawings.

G. Carefully fit and match Work with continuity of line and design, using rigidly secured joints with hairline contact that will not discolor finish. Miter or cope corners of frames, and mechanically stake and fasten.

H. Glazing:
1. Provide rabbets and removable stops required for glazing, and which are reglazable without dismantling of sash framing. Miter or kerf stops to provide hairline joints at corners of glass and panels.
2. Shop glaze windows.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Comply with final Shop Drawings and manufacturer's instructions and

recommendations for installation of Work.

B. Erection Tolerances:
   1. Variations from plumb: ± 3 mm (1/8 inch).
   2. Variations from level: ± 3 mm (1/8 inch).
   3. Offsets in end-to-end or edge-to-edge alignment of consecutive members: 1.6 mm (1/16 inch).

C. Set units level, plumb and true to line, with uniform joints. Support units on shims and anchor to supporting structure.

D. Apply sealants and backer rod around full perimeter of window framing on each side of framing, in accordance with requirements of Division 07 Section JOINT SEALANTS.

3.3 PROTECTION

A. Protect units during construction so that they will be without evidence of damage or use at time of acceptance.

END OF SECTION

SECTION 08 81 00
INTERIOR GLAZING
January 31, 2018

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 UNITS OF MEASURE

A. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

1.3 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
      a. Glass at revolving door
      b. Storefront framing.
      c. Railings
      d. Interior borrowed lites.
      e. Unframed mirrors.
      f. Glass smoke baffle system.
      g. Projection booth
   2. Glazing materials and accessories.

B. Interior Glazing Schedule: Schedule for interior glazing is attached at the end of this Section.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS for sustainable design requirements and procedures.

B. See Division 05 Section DECORATIVE METAL for ornamental metal framing systems and metal railings with glazing.

C. See Division 08 Section HOLLOW METAL DOORS AND FRAMES for hollow metal doors and hollow metal framing systems.

D. See Division 08 Section REVOLVING DOOR ENTRANCES for glazing system requirements for revolving doors.

E. See Division 08 Section INTERIOR ALUMINUM WINDOWS for glazing at interior aluminum windows, including transaction windows and IMAX window port frames (IMAX projection window).

F. See Division 08 Section SOUND CONTROL WINDOWS for sound control windows and glazing at IMAX windows (except for projection window) and at Production Studio.

G. See Division 08 Section EXTERIOR GLAZING for glazing at exterior conditions.

H. See Division 08 Section STRUCTURAL GLASS CURTAINWALL.

I. See Division 10 Section TOILET ACCESSORIES for glass and glazing in conjunction with framed mirrors and shower doors.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of glass required.

B. Samples:
1. Glass:
   a. Submit 305 mm (12 inch) square samples of each type of glass (except clear single lite glass and mirror glass).
   b. Samples shall be typical production run quality and, as applicable, shall be complete with fritted coatings and laminating films.
2. Fire Department label: Submit 305 mm (12 inch) square production run samples of required glass units finished with label.

1.6 LEED SUBMITTALS

A. Comply with Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS.

A. MR Credit: Building Product Disclosure and Optimization – Environmental

Product Declarations.
1. For glass: Industry-wide or product-specific EPD.

B. MR Credit: Building Product Disclosure and Optimization – Material Ingredients
1. For glass, if applicable: Material ingredient report.

C. EQ Credit: Low-Emitting Materials.
1. For interior wet-applied mastics, sealants and sealant primers: Documentation indicating compliance with California Department of Public Health (CDPH) Standard Method v1.1- 2010 and VOC content in g/L.

1.7 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Submit certificate from glass manufacturer stating that manufacturer has reviewed glazing details and each product provided is recommended for application indicated, and that materials are compatible and will adhere to specified finish.
2. Submit certificate from glass manufacturer stating that manufacturer has reviewed application of heat absorbing or reflective glass for effects of partial or full shading (including locations and types of indicated interior window treatment) under expected service temperature ranges and that resulting thermal stresses will not reduce "Glass Statistical Factor" below 2.5.
3. Submit certificate for glass materials at "Hazardous Locations" showing compliance with requirements of CPSC 16CFR, Part 1201.
4. Submit certificate stating that glass units can withstand design loads.
5. Submit certificate for security glass materials and bullet-resistant glass materials showing compliance with requirements of specified standards.

B. Qualification Data: Submit manufacturer and installer qualifications verifying years of experience; include list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data:
1. Submit cleaning and maintenance data for materials provided.
2. Include copy of submittal in Project information manual.

B. Warranties: Submit signed and dated warranties.

1.9 SYSTEM REQUIREMENTS

A. Design Requirements:
   1. Glass thicknesses when indicated (except for ornamental applications) are for convenience of detailing only and are to be determined by Contractor or glass manufacturer as required to fulfill performance requirements.
   2. Glazing channel dimensions indicated are intended to provide necessary minimum bite on glass, minimum edge clearances and adequate sealant and/or gasket thickness within required tolerances.
   3. Coordinate glazing systems with glazing channels to assure proper installation of systems.

B. Performance Requirements:
   1. Compatibility and adhesion: Provide glazing sealants, gaskets, and glazing accessories which are compatible with each other and with glass and glass framing members, and which will adhere to joint surfaces.
   2. Each installation must withstand specified performance requirements including normal temperature changes, wind loading and impact loading, without failure.

C. Fire-Protection-Rated Glazing Labeling:
   1. Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 232 deg C (450 deg F), and the fire-resistance rating in minutes.
   2. For fire-protection-rated glazing, provide products identical to those tested in accordance with the following, and labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Fire-resistant glazing products for door assemblies: NFPA 252.
      b. Fire-resistant glazing products for window assemblies: NFPA 257.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented successful experience in installation of work similar to Work of this Project, licensed or approved by glass manufacturer.

B. Single Source Responsibility:
   1. Provide glass and glazing materials from one source for each type of glass.
   2. Use same glazing material in each joint system unless material manufacturer recommends otherwise.

C. Manufacturer Qualifications:
   1. Not less than 5 years documented successful experience in production of work

similar to Work of this Project, with sufficient capacity to supply glass in a timely fashion.

D. Regulatory Requirements:
   1. Comply with applicable requirements of authorities having jurisdiction over Project.
   2. Safety glazing requirements:
      a. Provide glass and glazing at "Hazardous Locations" complying with requirements of CPSC 16CFR, Part 1201, Consumer Product Safety Commission Standard on Architectural Glazing Materials, including required tests and labeling.
      b. Permanently mark each lite of safety glazing material with certification label acceptable to authorities having jurisdiction.

E. Reference Standards: Unless otherwise required to comply with regulatory requirements or otherwise recommended by fabricator to fulfill performance requirements, comply with the following:
   1. AAMA "TIR-A Glazing Guidelines".
   2. GANA "Glazing Manual".

1.11 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, at Contractor's direction, meet at site and review installation procedures and coordination with other Work.

B. Attendees: Glass manufacturer's representative, glazier and fabricator of framing or other supporting structure receiving glass.

C. Agenda:
   1. Review glazing procedure and application of glazing materials.
   2. Review coordination with other Work.

1.12 DELIVERY, STORAGE AND HANDLING

A. Deliver glazing materials in manufacturer's unopened packaging.

B. Glass shall bear manufacturer's labels indicating type and quality. Labels shall be left on glass until final cleaning, unless otherwise directed by COTR.

C. Store in accordance with manufacturer's recommendations.

D. Provide cushions at glass edges to prevent damage during handling or storage.

1.13 PROJECT CONDITIONS

A. Environmental Conditions:
1. Ensure that conditions of temperature, humidity and precipitation are as recommended by glass manufacturer.
2. Do not proceed with glazing when ambient or substrate temperature conditions are below 4 deg C (40 deg F).
3. Install glazing sealants only when temperatures are in middle third of manufacturer's recommended installation temperature range.
4. Do not perform any glazing Work when framing members are wet or frosted.

1.14 WARRANTY

A. Provide written 10 year warranties, made out to Owner and signed by glass manufacturer agreeing to furnish replacements for the following:
1. In manufacturer's warranties, “initial purchaser” shall refer to Owner.
2. Laminated glass units which show evidence of delamination, deterioration of laminating films, loss of transparency or other forms of deterioration including edge separation due to defective materials or lamination, or breakage due to edge flaws (such as chips or gouges).
3. Coated or spandrel glass which show evidence of peeling, cracking or deterioration of coating or opacifier/scrim, or breakage due to edge flaws (such as chips or gouges).
4. Glass units with latent visual defects.
5. Mirrors which develop visible silver spoilage defects.

B. Manufacturer's Special Warranty for Laminated Polycarbonate: Manufacturer agrees to replace laminated polycarbonate that deteriorates within specified warranty period. Deterioration of laminated polycarbonate is defined as defects developed from normal use that are not attributed to maintaining and cleaning laminated polycarbonate contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glazing, blemishes exceeding those allowed by referenced standard, yellowing, and loss of light transmission.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS MATERIALS

A. Clear Float Glass:
1. ASTM C1036, Type I, Class 1, Quality q^3.
2. Minimum thickness: 6 mm (1/4 inch).
3. Low-iron glass:

a. Where indicated, provide ultra-clear (low-iron) glass, with minimum 91% visible light transmission and minimum solar heat gain coefficient of 0.87.
b. Acceptable products and manufacturers:
   1) Krystal Klear by AGC Flat Glass North America
   2) Optiwhite by Pilkington Building Products North America.
   3) Starphire by PPG Industries, Inc.
   4) Amiran Water White by Schott Corporation.

B. Heat-Treated Glass:

1. General:
   a. Fabrication process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   b. For uncoated glass, comply with requirements for Condition A.
   c. For coated vision glass, comply with requirements for Condition C (other coated glass).
   d. Adjust temperature settings of heat-treating ovens to suit specific glass coatings, so as to minimize distortion and discoloration of coatings.
2. Fully tempered glass:
   a. ASTM C1048, Kind FT, of color and type indicated.
   b. Provide fully tempered glass certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
   c. Heat soak glass to comply with the following:
      1) Heat-soak test fully tempered glass in compliance with DIN 18516-4, BS EN 14179 or another recognized international standard acceptable to glass fabricator to convert nickel sulfide inclusions from the alpha phase to the beta phase, so that the glass will fracture in the test.
      2) Each pane of heat soak tested tempered glass shall be traceable to individual heat soak test batches, in order that, in the event of failure, it shall be possible to identify and locate all panels from that heat soaked test batch.
      3) Statistical analysis of partial heat soaking is not acceptable.
      4) Warranties against nickel sulfide inclusions in lieu of heat soaking will not be accepted.
   d. Roller wave distortion: Limit roller wave distortion to .076 mm (0.003 inches) peak to valley.
   e. Wherever possible, locate tong marks along edge which will be concealed in glazing system.
   f. Permanently mark each unit of tempered glass with certification label acceptable to authorities having jurisdiction. Permanent marking is not required for tempered spandrel glass.

g. Locations: Provide as indicated and as required to comply with referenced standards.

3. Heat-strengthened glass:
   a. ASTM C1048, Kind HS, of color and type indicated.
   b. Locations: Provide as indicated, as required to comply with referenced standards and as required for conditions of glass application and intended use.

C. Tinted Float Glass:
1. ASTM C1036, Type I, Class 2, Quality q^3.
2. Color: Bronze.
   a. Thickness: 6 mm.
   b. Acceptable product and manufacturer: Equivalent to Glass Dynamics.

D. Fire-Rated Glazing:
1. Fire-protective glazing: Clear fire-rated and impact safety-rated laminated ceramic, 8 mm (5/16 inch) thick; tested to withstand thermal shock.
   a. Provide product certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
   b. Acceptable products and manufacturers:
      1) FireLite Plus by Technical Glass Products.
      2) Pyran Platinum L by Safti First, division of O'Keefe's.
      3) Laminated Pyran Crystal by Schott North America, Inc.
      4) SGG Keralite FR-L by Vetrotech Saint-Gobain.
2. Fire-resistive glazing: Clear fire-rated and impact safety-rated laminated glass units, consisting of multiple lites of clear float glass and transparent intumescent interlayer; assembled thickness as required to achieve specified fire rating
   a. Provide products complying with the following:
      1) Passed hose stream test portion of referenced fire resistance tests (withstands thermal shock).
      2) Complies with 232 deg C (450 deg F) temperature rise limitation.
      3) Product certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
   b. Fire rating and products: As indicated in Division 08 Section INTERIOR GLAZING SCHEDULE.

E. IMAX Projection Glazing: See Division 08 Section INTERIOR ALUMINUM WINDOWS.

F. Sound Control Glazing: See Division 08 Section SOUND CONTROL WINDOWS.

G. Mirror Glass:
1. ASTM C1503, Mirror Select Quality; with silvering, electro-plated copper coating, and protective organic coating.
2. Minimum thickness: 6 mm (1/4 inch).
3. For mirrors in Fitness Center (other than mirrors over countertops), shop-apply impact- resistant film adhered to entire back surface of mirrors.
   a. White polyester scrim-reinforced film, .1 mm (4 mil) thick, with pressure-sensitive acrylic adhesive, specifically designed as safety backing for mirrors. Application of film to mirrors shall provide compliance with CPSC 16CFR, Part 1201 for Category II materials.
   b. Provide in widths as required for a single sheet of film to cover full extent of each mirror.
   c. Provide with additional adhesives as recommended by film manufacturer.
   d. Acceptable product and manufacturer: Equivalent to No. 2MT, Category Two Mirror Safety Backing, by C.R. Laurence Company, Inc.

H. Laminated Glass Units (LGU):
1. Provide laminated glass units certified by SGCC or other recognized certification agency, acceptable to authorities having jurisdiction, as complying with requirements of CPSC 16CFR, Part 1201 for Category II materials.
2. Provide laminated glass complying with requirements of ASTM C1172.
3. Provide burglar-resistant glass complying with requirements of UL 752, Level 3.
4. Interlayer:
   a. Polyvinyl butyral plastic (PVB) sheet, unless otherwise required to produce a successful lamination.
      1) Thickness and color: As indicated in Division 08 Section INTERIOR GLAZING SCHEDULE.
   b. Ionomeric-extruded polymer.
      1) Thickness and color: As indicated in Division 08 Section INTERIOR GLAZING SCHEDULE.
      2) Physical properties:
         a) Young's Modulus, when tested in accordance with ASTM D5026: 43 kpsi.
         b) Tensile strength, when tested in accordance with ASTM D638: 5.0 kpsi.
         c) Elongation, when tested in accordance with ASTM D638: 400%.
         d) Flexural modulus, when tested in accordance with D790: 50 kpsi.
         e) Heat deflection temperature at 0.46 MPa (145 psi) when tested in accordance with D648: 43 deg C (110 deg F).
      3) Acceptable product and manufacturer: Equivalent to SentryGlas Plus by DuPont.
5. Fabrication:
   a. Laminate units at factory using manufacturer's standard heat-plus-pressure

process.
b. Exclude dirt and other foreign materials from lamination.
c. Eliminate voids and delaminated surfaces from Work.
d. Cut units to proper size at factory. Do not cut laminated glass at Project site.
e. Cut and treat edges in accordance with glass manufacturer's recommendations.
f. Arrange each course of laminate in order specified and label exterior (or interior) face of each completed unit.
g. For laminated glass units with exposed edges, fabricate so that each layer of glass, and each interlayer, is flush at unit edges.

2.2 PLASTIC MATERIALS

A. Polycarbonate Sheet:
1. Extruded polycarbonate sheet, meeting the requirements of ASTM C1349; thickness as indicated on Drawings, with flame spread of less than one inch when tested in accordance with ASTM D635.
2. Laminated Polycarbonate:
a. Polycarbonate sheets laminated with clear urethane interlayer that complies with ASTM C 1349, Appendix X2, and has a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
b. Provide laminated units that comply with requirements of ASTM C 1349 for maximum allowable laminating process blemishes and haze.
3. Thickness and color: Refer to Interior Glazing Schedule.
4. Locations:
a. Security booths.
b. Other locations indicated on Drawings.

2.3 GLAZING MATERIALS

A. General:
1. Comply with manufacturer's recommendation for selection of hardness, depending on location of application, conditions at time of installation and performance requirements indicated.
2. Provide materials, and variations or modifications that are compatible with surfaces contacted in installation.
3. Color: Provide colors selected by COTR from manufacturer's standard colors.

B. Emissions for interior wet-applied sealant: Comply with CDPH and VOC content not to exceed 250 g/L.

C. Structural Silicone Glazing Sealant:
1. Chemically curing silicone formulation complying with ASTM C1184, that is

compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural sealant manufacturer for use in assemblies indicated.

2. Color:
   a. To be selected by COTR from manufacturer's standard colors.
   b. Provide clear silicone sealant with butt glazing.
3. Acceptable products and manufacturers:
   a. 995 by Dow Corning Corp.
   b. Ultraglaze SSG 4000by Momentive Performance Materials, Inc.
   c. 895 by Pecora.
   d. Spectrem 2 by Tremco.

D. Glazing Sealant for Fire-Resistant Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

E. Acrylic-Emulsion Glazing Sealant: Emulsion of acrylic, with or without latex rubber modification; compounded specifically for glazing; nonhardening, nonstaining and nonbleeding.

F. Butyl Rubber Glazing Tape:
1. Partly-vulcanized, self-adhesive, non-staining, elastomeric tape, 100% solids; complying with AAMA 800.
2. Provide with or without spacer rod, as recommended by tape and glass manufacturers to suit applications indicated.

G. Molded Resilient Neoprene Gaskets: Continuous extruded neoprene gaskets complying with applicable ASTM standards for physical properties including durometer hardness and tensile strength recommended by framing manufacturer and tested to demonstrate conformance with Contract Documents.

H. Glazing Felt: Treated wool felt, adhesive backed, non-wicking and non-staining.

I. Emissions for interior wet-applied mastic: Comply with CDPH and VOC content not to exceed 100 g/L.

J. Mirror Mastic:
1. Adhesive setting compound, produced specifically for setting mirrored glass by spot application, certified by both mirrored glass manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrored glass will be installed

2. Acceptable manufacturers:
   a. Royal Adhesives.
   b. Palmer Products Corp.

K. Glazing Accessories:
   1. Provide materials with proven record of compatibility with surfaces and other materials contacted in installation.
   2. Setting blocks: Neoprene or silicone, 70-90 Shore A durometer hardness.
   3. Spacers: Neoprene or silicone, 40-50 Shore A durometer hardness, adhesive backed one face only.
   4. Corner blocks: Closed cell neoprene wedge blocks designed to prevent lateral displacement of glass, as recommended by manufacturer and GANA Glazing Manual.
   5. Cleaners, primers, and sealers: As recommended by sealant or gasket manufacturer.

2.4 GLASS SMOKE BAFFLE SYSTEM

A. Glass Smoke Baffle System:
   1. Description: Provide tempered glass smoke baffle system to retain smoke in areas as shown on Drawings.
   2. Glazing: ½ inch tempered glass.
   3. Provide manufacturer's standard mechanically secured anchors and fasteners.
   4. Acceptable product and manufacturer: Equivalent to CRL Smoke Baffle System by CR Laurence.

2.5 ACCESSORIES

A. Mirror Edge Trim: Extruded aluminum J-channels formed with a return deep enough to produce a glazing channel to accommodate mirrored glass units of thickness indicated and in lengths required to cover bottom edge of each mirrored glass unit in a single piece; clear stain anodized finish.
   1. Bottom trim: J-channels formed with front leg and back leg not less than 10 and 21 mm (3/8 and 7/8 inch) in height, respectively, and a thickness of not less than 1.0 mm (0.04 inch)
   2. Top trim: J-channels formed with front leg and back leg not less than 16 and 25 mm (5/8 and 1 inch) in height, respectively, and a thickness of not less than 1.0 mm (0.04 inch).

2.6 FABRICATION

A. Cutting:
   1. Obtain sizes from Shop Drawings or by field measurement.

2. Cut glass to fit openings with minimum edge clearances and bite on glass recommended by glass manufacturer. Do not nip glass edges.
3. Factory cut heavy heat absorbing glass (over 10 mm / 0.4 inch) and heavy float glass (over 13 mm / 0.5 inch).
4. Edges:
   a. Concealed: Wheel cut or sawed and seamed.
   b. Exposed: Square edge; ground smooth and polished.
5. Mirrors:
   a. Seal edges after treatment to prevent chemical or atmospheric penetration of glass coating.
   b. Perform edge treatment and sealing in shop immediately after cutting to final sizes.
6. If glass will be cut in field, fabricate glass 50 mm (2 inches) larger than required.
7. Provide required openings in tempered or heat-strengthened glass before heat-treating. Do not cut, seam, nip or abrade such glass after heat-treating.
8. When glass is pre-cut to sizes obtained from Shop Drawings, take field measurements of openings before glazing to verify adequate bite of glass and minimum edge clearance.
9. If openings do not comply with tolerances for which pre-cut glass was sized, use new glass specially cut to fit such openings.

B. Fire Department Labels:
   1. Provide permanent labels as indicated on Drawings and as required to comply with requirements of authorities having jurisdiction over Work.
   2. Prior to tempering, etch or sandblast label on #2 surface of insulating unit, unless otherwise required to fulfill performance criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, including framing and glazing channels, and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.

B. Ensure that frame openings are plumb, level, true to line and otherwise properly installed.

C. Inspect each piece of glass immediately before installation, and discard pieces which evidence damage or deterioration including edge damage or face imperfections.

3.2 PREPARATION

A. Clean glazing channel and other framing members to receive glass immediately before glazing.

B. Remove coatings not firmly bonded to substrate. Remove lacquer from metal surfaces abutting elastomeric sealants.

C. Apply primer or sealer to joint surfaces where recommended by sealant manufacturer.

3.3 INSTALLATION

A. Comply with combined recommendations of referenced standards, glass manufacturer and manufacturer of sealants and other materials used in glazing, except where more stringent requirements are indicated or specified, and except where manufacturer's technical representatives direct otherwise.

B. Layout:
1. Unify appearance of each series of lites by setting each piece to match others as nearly as possible.
2. Inspect each piece and set with pattern, draw and bow oriented in same direction as other pieces.

C. Setting Blocks:
1. Install setting blocks at sill one-quarter in from each end of the glass, unless otherwise recommended by manufacturer.
2. Use blocks of proper size to support glass.

D. Spacers:
1. Provide spacers for glass sizes larger than 1270 mm (50 inches) united inches to separate glass from stops except where continuous glazing gaskets or felts are provided.
2. Locate spacers no farther than 610 mm (24 inches) apart and no closer than 305 mm (12 inches to corners.
3. Place) spacers opposite one another. Make bite of spacer on glass a nominal 6 mm (1/4 inch) or greater.

E. End Blocks: Provide end blocks to comply with requirements of referenced glazing standards except where otherwise required by glass manufacturer.

F. Backer Rods: Install compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers.

G. Sealant Glazing:

1. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
2. Use masking tape to limit coverage of glazing materials to surfaces intended for sealants.
3. Cure sealants for high early strength and durability.
4. Tool exposed surfaces of glazing materials to provide slight wash away from glass.

H. Gasket Glazing:
1. Vulcanize joints of glazing gaskets in accordance with manufacturer's instructions to provide continuous watertight and airtight seal at corners and other locations where joints are required.
2. Butt or lap ends of tape.
3. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage to ensure that gasket will not "walk" out when subjected to movement.
4. Anchor gasket to stop with matching ribs, or by proven adhesives, including embedment of gasket tail in cured heel bead. Set gaskets in silicone sealant at corners.
5. Install exposed tapes or gaskets with slight protrusion above stops in final compressed condition.

I. Structural Sealant Glazing:
1. Follow window manufacturer's recommended procedures strictly.
2. Clean and prepare components carefully.
3. Prime and mask elements that receive structural silicone sealant.
4. Fill joints completely before tooling.
5. Unless otherwise recommended, apply silicone to interior joints and allow to cure for 14 days before applying to exterior joints.

J. Butt Glazing:
1. Comply with sealant and glass manufacturer's recommendations for glazing.
2. Butt glazing of single thickness glass units:
   a. Tape polyethylene rod to one side of joint to act as back up for sealant.
   b. Install sealant to other side according to manufacturer's instructions.
3. Provide clear silicone sealant with butt glazing.

K. Fire-Resistant Glazing Products: Install in labeled fire doors, frames and windows to meet requirements of cited references and NFPA Standard No. 80.

L. Plastic Lites:
1. Install in accordance with manufacturer's recommendations.
2. Follow procedures for sealant glazing.

M. Mirror Adhesive Installation:
1. Paint back of mirror with additional coat of moisture-resistant paint of type

recommended by mirror manufacturer.

2. Support mirror on setting blocks or continuous glazing gasket.
3. Seal porous substrates as recommended by mastic manufacturer.
4. Apply mirror mastic in spots in accordance with mastic manufacturer's instructions, and to allow air circulation between back of mirror and face of mounting surface.

3.4 CLEANING

A. Clean excess sealant or compound from glass and framing members immediately after application.

B. After installation and until final acceptance, clean glass as frequently as required, but not less than once per month, to remove build-up of dirt, scum, and other substances. Comply with glass manufacturer's recommendations for cleaning.

C. Wash and polish glass on both faces not more than 4 days prior to final acceptance.

D. Comply with glass manufacturer's recommendations for final cleaning.

3.5 PROTECTION

A. Protect glass from breakage after installation. Do not apply markers to surfaces of glass.

B. Remove non-permanent labels.

C. Remove and replace glass which is broken, chipped, cracked, abraded or damaged.

3.6 INTERIOR GLAZING SCHEDULE

A. See Division 08 Section INTERIOR GLAZING SCHEDULE following this specification.

	DIVISION 08 INTERIOR GLAZING SCHEDULE	
GL-20	**Laminated Tempered** 6 mm (1/4") Tempered (Heat Soaked) Bronze - 0.060 clear PVB - 6 mm (1/4") Heat Strengthened Bronze	Existing Guardrail (Replacement of existing Concourse), Concorse Extensions, Missle Pit, Atrium Stair (#1 & #7)
GL-21	**Laminated Tempered** 6 mm (1/4") Tempered (Heat Soaked) Clear - 0.060 clear PVB - 6 mm (1/4") Heat Strengthened Clear	Stairs (#1, 2, 3, 5, 6, & 7; 3rd Floor), Launch Pad Stair, Launch Pad Escalator
GL-22	**NOT USED**	
GL-23	**Fire-Rated Glazing (TGP; Pilkington Pyrostop; BOD)** 2 1/8" (57 mm) Pyrostop	Glazed lite in doors at Stairs #1 ,2, 6, & 7; floor 3 only
GL-24	**Security Glazing** Glass-Clad Polycarbonate	Security Booth (P23)
GL-25	**Sound Control Laminated Glazing** 3 mm (1/8") Clear Low Iron - 0.080 clear PVB - 3 mm (1/8") Clear Low Iron	Control Studio (P18), IMAX Projection Booth (215A)
GL-26	**Laminated Tempered** 5 mm (3/16") Clear Tempered (Heat Soaked) - .060 clear PVB - 5 mm (3/16") Clear Tempered (Heat Soaked)	Non-Rated Door Glazed Panels & Sidelites, OFMR Reception (P06), Conference Room (P06B), Offices (P07D&E), Launch Pad Entrance Windows (PC03, PC04)
GL-27	**Tempered Sliding** 1/4" (6 mm) Clear Tempered (Heat Soaked)	Reception (P07A)
GL-28	**IMAX Projection Glazing (Billington; BOD)** 10 mm (3/8") OptiClear Anti-Reflective 2 sides, Water White	IMAX Projection Booth (215A)
GL-29	**Structural Glazed Partition** 1/2" (12mm) Optiwhite Heat Strengthened - 0.030 Ionoplast (Sentryglas) - 1/2" (12mm) Optiwhite Heat Strengthened	Gallery 206 & 210 Balconies

GL-30	**Structural Glazed Partition Fins** 1/2" (12mm) Optiwhite Heat Strengthened - 0.030 Ionoplast (Sentryglas) - 1/2" (12mm) Optiwhite Heat Strengthened - 0.030 Ionoplast (Sentryglas) - 1/2" (12mm) Optiwhite Heat Strengthened	Gallery 206 & 210 Balconies

END OF SECTION

SECTION 10 22 13 WIRE MESH PARTITIONS

March 1, 2018

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 UNITS OF MEASURE

A. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

1.3 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
1. Wire mesh partitions.
2. Gates (doors) and hardware.
3. Accessories.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS for sustainable design requirements and procedures.

B. See Division 08 Section DOOR HARDWARE for cylinders for locks for gates.

1.5 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each component and finish.

B. Shop Drawings:
1. Submit Shop Drawings for fabrication and erection of mesh partitions.
2. Include plans, elevations and large scale details.
3. Indicate anchorage and accessory items.

4. Provide location template drawings for items supported by, or anchored to, permanent construction.

C. Samples: Submit manufacturer's full standard color range samples for selection by COTR.

1.6 LEED SUBMITTALS

A. Comply with Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS.

B. MR Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials.
1. For partitions having recycled content: ~~Industry-wide or product-specific EPD~~*Documentation indicating percentages by weight of pre-consumer and post- consumer recycled content. Include material cost value.*

1.7 SYSTEM REQUIREMENTS

A. Interface with Other Systems:
1. Coordinate with Work of other trades affected by Work of this Section.
2. Provide items, such as anchors or supports, in a timely manner so as not to delay job progress.
3. Coordinate with electrical, plumbing and other fixtures or materials mounted within or adjacent to assemblies, or requiring access.
4. Provide cut-outs as required using manufacturer's templates or security templates, and field measurements to verify actual installed locations and dimensions.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Not less than 5 years documented, successful experience with work comparable to Work of this Project.

1.9 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site and review installation procedures and coordination with other Work.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products in accordance with manufacturer's instructions.

B. Store in protected and dry area in manufacturer's unopened protective shipping

packaging.

C. Support as required to prevent any damage to materials.

1.11 PROJECT CONDITIONS

A. Field verify dimensions of supporting structure and other adjoining elements before fabrication.

B. Provide for erection tolerances corresponding with specified tolerances for other Work where field measurements cannot be obtained.

C. Remedy unsatisfactory tolerances in adjoining Work.

PART 2 - PRODUCTS

2.1 LEED, GENERAL

A. Recycled content: Provide steel with at least 25 percent post-consumer recycled content.

2.2 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
1. Listed products establish standard of quality and are manufactured by Newark Wireworks.
2. Equivalent products by following are acceptable:
   a. Acorn Wire and Iron Works, Inc.
   b. Miller Wire Works, Inc.
   c. Standard Wire & Steel Works.
   d. Hartford Wire Works.
   e. Amico Security Products.

2.3 WIRE MESH PARTITION

A. General: Provide materials as specified, unless otherwise indicated on Drawings or required for proper installation of indicated configurations.

B. Fabric:
1. Provide 8 gauge, tight wire mesh with ½ inch openings to prevent rodents from entering.
2. Provide fine screen at inside of wire partition frame to prevent bugs from entering, as required.

C. Frames:
1. Joints: Mortised and tenoned joints.
2. Vertical members: 32 mm (1-1/4 inch) x 32 mm (1-1/4 inch) x 3 mm (1/8 inch) steel angle.
3. Horizontal members: 32 mm (1-1/4 inch) x 32 mm (1-1/4 inch) x 3 mm (1/8 inch) steel angle.
4. Center reinforcing bar: 25 mm (1 inch) x 13 mm (1/2 inch) x 2 mm (11 gage) cold rolled steel channel.
5. Top capping bar: Manufacturer's standard.
6. Corner posts: Manufacturer's standard.
7. Stiffener posts: 50 mm (2 inch) x 50 mm (2 inch) x 1.6 mm (14 gauge) steel tube.
8. Floor sockets: 64 mm (2-1/2 inches) high with set screw adjustment.

D. Hinged Gates (Doors):
1. Door frame: 32 mm (1-1/4 inch) x 32 mm (1-1/4 inch) x 3 mm (1/8 inch) steel angles, with 25 mm (1 inch) x 13 mm (1/2 inch) x 2 mm (11 gage) steel channel mid-rail.
2. Hinges: 38 mm (1-1/2 inch) pair butt hinges riveted or welded to door and frame.
3. Lock:
   a. Mortise type cylinder lock operated by key outside with recessed knob inside.
   b. Provide cylinders keyed to building system as specified.
4. Align bottom of door with bottom of adjacent panels.

E. Finish:
1. Provide manufacturer's standard powder coat finish.
2. Color: To be selected by COTR from manufacturer's full standard color range.

F. Acceptable Product and Manufacturer: Equivalent to ProGuard Series Wire Partitions by Newark Wire Works Inc.

2.4 ACCESSORIES

A. Provide bolts, hardware and accessories for complete installation.

B. Provide field bracing as necessary to install partitions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are

corrected.

3.2 INSTALLATION

A. Install in accordance with final Shop Drawings and manufacturer's instructions.

B. Install plumb, rigid, properly aligned and securely fastened to supporting substrates.

3.3 ADJUSTING AND REPAIR

A. Adjust moving components for smooth operation without binding.

B. Touch-up damaged finish after installation using field-applied paint to match color of shop-applied finish.

END OF SECTION

SECTION 11 61 33

RIGGING, CURTAIN & TRACKS

PART 1 – GENERAL

1.1 DEFINITIONS

A. The term "Contractor" shall mean the contracting entity, also referred to herein as Rigging Contractor, as a Manufacturer or Manufacturer's agent, responsible for the fabrication, assembly, installation, testing, instruction and completion of all stage rigging work as covered in these Specifications and related Drawings.

B. The terms "General Contractor" and "Electrical Contractor" are used herein to refer to organizations, individuals, and their representatives as typically defined for construction projects. These terms refer to parties other than the Rigging Contractor ("Contractor").

C. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

D. Technical terms unique to stage rigging and related work shall be construed in the following order, in accordance with:

1. Captions on related Drawings.

2. Relevant usage and definitions of handbooks, guidebooks, or trade group recommendations by manufacturers' associations or professional and engineering societies, such as ASTM, ASME, ASHRAE, etc.

3. Generally recognized theatrical usage.

1.2 SCOPE

All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

A. Preparation and submission of complete shop drawings and samples for review prior to fabrication.

B. Verification of dimensions and conditions at the job site.

C. Shipment of equipment to job site and the secured storage of all non-fixed equipment.

D. Installation and completion, in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.

E. The observation, demonstration, and necessary adjustment of the completed installation.

F. Preparation and submission of complete record drawings and operational and maintenance data and certificates.

The systems described by this Specification and related Drawings are not designed or intended for use in human “flying” effects or for suspension of people in any manner.

1.3 WORK INCLUDED

A. IMAX Theatre Door Masking Curtain and Track

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.4 WORK NOT INCLUDED

A. Principal structural steel work, except as herein indicated.

B. Electrical wiring, conduit, and connections.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.5 QUALIFICATIONS

A. All equipment and installation shall be the responsibility of a single contractor. The Contractor shall be responsible for the integration, operation, and performance of all elements of the systems described in this Section. This Contractor shall assume complete responsibility for the engineering, fabrication, transportation, and installation of the work in this Section, and shall hold the COTR, Architect, Theatre Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising therefrom. The Contractor shall provide all warranty work and equipment upgrades as called for in this Section.

B. Approved contractors may, at their option, arrange for sub-contract field and special shop work to be done by others. Bid submissions must identify such subcontractors and indicate the work they are to do.

C. The Contractor shall have at least 10 years' experience in the installation of similar equipment and systems of a similar scope for professional theatres. Contractor shall be a current Business member, accredited as a Dealer Retailer or Manufacturer, of the industry service organization, PLASA.

D. Contractor shall employ only experienced stage riggers to direct the installation of work of this Section. A competent supervisor shall be maintained on this Project during the entire installation. The supervisor shall be certified as a Theater Rigger by the Entertainment Technician Certification Program. A change of supervisor shall not be acceptable unless by written authorization of the COTR.

E. Subject to the above requirements, work performed under this Section may be by one of the following listed contractors:

1. Inter-America Stage, Sanford, Florida, 877-302-4274
2. I. Weiss, Fairview, New Jersey, 888-325-7192
3. Wenger / J. R. Clancy, Inc., Owatonna, Minnesota, 507-774-8863
4. Texas Scenic, San Antonio, Texas, 210-684-0091

as an integral part of their operation shall employ the services of a qualified and experienced Sewing Sub-contractor for the fabrication of stage curtains. Sewing Sub-contractor shall have at least 10 years' experience in the fabrication of curtains for professional theatres. If requested, the Rigging Contractor shall submit a representative list of professional theatre projects performed by the Sewing Sub- contractor during the above period. Subject to the above requirements, work performed under this Section may be by one of the following Sewing Sub- contractors:

1. Rose Brand, New York, New York
2. Stage Decoration and Supplies, Greensboro, North Carolina
3. Stagecraft Industries, Portland, Oregon
4. Syracuse Scenery and Stage Lighting, Liverpool, New York
5. Tiffin Scenic Studios, Inc., Tiffin, Ohio
6. I. Weiss & Sons, Long Island City, New York

G. Other contractors or sewing rooms may be considered with the prior review of the Theatre Consultant. Contractors seeking review must submit qualifications not later than 14 days prior to bid date.

1.7 SUBMITTALS

A. With bid.

1. Proof that the contractor meets the qualification requirements as outlined in this Section.
2. A list of at least three (3) professional theatre stage rigging and drapery installations by the bidder comparable to this project in scope and

completed in the past five (5) years.

3. A list of any proposed deviations or exceptions from the Specifications. Any deviations or exceptions from the Specification proposed after bid shall not be accepted.
4. A schedule for the anticipated completion of the following:
   a. Shop drawings.
   b. Delivery of all equipment.
   c. Installation of all systems.

B. Shop drawings. Within 60 days of contract award, the Contractor shall submit at least one set of drawings to the COTR for review prior to fabrication:

1. Floor plan, in scale equal to 1:20 (1/4" = 1'-0").
2. Elevation curtain set, showing floor, all blocks, , mounting and arrangement, curtain travel, and curtain storage.
3. Curtain schedule indicating fabric, finished size, fullness and special sewing requirements.
4. Dimensioned rear Elevation of every curtain to be provided for this project, showing hem construction and detailing of all edges and sewing requirements.
5. Complete, fully dimensioned shop drawings of all major components.
6. Requisite plans, sections, schematics, and details indicating assembly and installation of components.
7. Load ratings of all load bearing components including, but not limited to, bearings, blocks, trim chains, lift lines, and purchase lines.
8. Complete descriptions, including the manufacturer's catalog data sheets, of all components including, but not limited to, bearings, motors, transmissions, and items designated as “Deliver to COTR.”
9. Certification by a recognized independent testing laboratory that all steel cable and rope meets the ASTM standards referenced in this Section.
10. Coordination Drawing(s) illustrating requirements for blocking, provided by others, necessary to support rigging system components.
11. Quantities of each component and sub-assembly.
12. Indication by boxed caption of any and all variations from the contract Drawings and Specifications, whether or not these variations have been

formally or informally accepted by the COTR and Theatre Consultant.

13. Prepare all shop drawings under the supervision of professional electrical and structural engineers so licensed by the District of Columbia. All shop drawings shall be stamped and certified by those engineers. Structural Engineer's review shall include all elements provided under the work of this section including the methods of attachment of said elements to the building. In lieu of an Electrical Engineer's stamp, a letter from the installing Electrical Contractor, verifying that all conductors, conduits and terminations will be installed in accordance with all applicable local and national codes shall be acceptable.
14. Submittal Review:

    a. All shop drawing information shall be submitted at the same time; no partial submittals will be reviewed.
    b. Review and approval shall not relieve the Contractor of responsibility for meeting all functional, operational, and safety requirements of the project as set forth in this Specification and related Sections. Review does not relieve the Contractor of responsibility to verify field conditions; nor does it relieve the contractor of responsibility for errors, omissions, or deviations in submittals.

C. Samples. Within 60 days of contract award, the Contractor shall submit to the COTR for review prior to fabrication:

1. Color lines for all curtain fabrics, for color selection by COTR.
2. 910 mm (36-inch) long sample of each type of curtain track, complete with (if applicable) live end pulley, dead end pulley, operating line, one (1) single carrier, and one (1) master carrier.
3. Samples of any equipment component requested by the Theatre Consultant.

   Samples shall not be considered part of specified quantities but shall be returned.

D. Final submittal. Within 30 days of final tests, and as a condition for final review, the Contractor shall submit three (3) sets to the COTR and one (1) set on electronic media to the Theatre Consultant of the listed items. Format of sets shall be compliant with Division One of this Specification.

1. Receipts for delivery of all non-installed items, i.e., all items designated, "Deliver to COTR."

2. "As built and approved" drawings and wiring diagrams showing all systems and components as installed, including all field modifications. All field modifications shall be reviewed and stamped by professional engineers so licensed by the District of Columbia. The scope of this review shall be subject to the requirements noted above for Shop Drawing Submittals.
3. Operation and service manuals, schematics, and parts lists for each unit of equipment installed or provided.
4. Certificates of flame resistance.
5. Certificates of warranty, as set forth below.

1.8 TESTING AND INSTRUCTION

A. Upon completion of all installation work, the Contractor shall certify in writing to the COTR and Theatre Consultant that the work is complete and ready for final observation. Final observation shall be scheduled by the COTR, the Architect, and the Theatre Consultant to occur within 14 days following the Contractor's notice of completion.

B. Final observation shall be conducted by a knowledgeable representative of the Contractor, in the presence of the COTR, the Architect, and the Theatre Consultant, and shall include the following:

1. Operation of all components.
2. Visual examination of all components.

C. Necessary adjustments or modifications shall be made as required.

D. As a condition of final completion, Contractor’s representative shall instruct the COTR's staff or representatives, under the observation of the Architect and Theatre Consultant, in the operation and maintenance of the system including the storage and cleaning of all fabrics.

1. Initial Instruction: This instruction session shall be scheduled for a minimum duration of one (1) hour. While it may be possible to schedule this instruction session to coincide with the system checkout, such coincidence shall not be assumed. Instruction shall be scheduled by the COTR, the Architect, and the Theatre Consultant to occur within 14 days following the Contractor's written notice.

1.9 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work. Refer to Division One.

B. This work shall comply with local codes and applicable national codes and standards. All electrical components shall carry pertinent labels from Nationally Recognized Testing Laboratories.

C. All equipment shall be fully insured against loss or damage during shipment, job site storage, installation, and testing. The Contractor shall have and assume full responsibility for the safety of every unit of equipment, components and wiring during delivery, installation, and testing until acceptance by COTR. Certification of such coverage shall be furnished to the COTR within 30 days of award of contract.

D. Warranty

1. The Contractor shall unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least 12 months from the date of final acceptance of all work of this Section.
2. All repairs and service during the warranty period shall be performed at the job site; labor, materials, and transportation of replacement material and parts and service personnel to and from the job site shall be included hereunder at the Contractor's expense.
3. Appropriate additional equipment or draperies to replace equipment, devices, or draperies removed for repair, service, or cleaning shall be provided at the job site at no expense to the COTR to replace any and all equipment which must be removed for repair or service.
4. Warranty service shall be performed by personnel in the employ of the Contractor and shall not be sub-contracted or assigned to another company, service, or individual unless the COTR has approved such assignment in writing, in which event the Contractor shall nevertheless be responsible to the COTR for such work.

PART 2 – PRODUCTS

2.1 GENERAL

A. All components shall be new and of first quality.

B. Machinery and component parts shall comply with applicable trade practice, industry standards, and code requirements and bear appropriate labels of conformity and acceptability.

C. All components shall bear labels from a Nationally Recognized Testing Laboratory and labels identifying the manufacturer, model number, serial number, and date of flameproofing. All such labels shall be permanently attached in a conspicuous location.

D. Operating parts of all equipment shall be machine finished, and tolerances, finishes, fit, etc., where not specified, shall conform to good trade practices.

E. All items necessary for a complete, operational, and safe system shall be provided, including bolts, nuts, washers, fittings, anchors, supports, hinges, and all other items required for completeness and operational safety. Where not specified elsewhere in this Section, all bolts shall be Grade 5 or better.

F. Where not specifically called out in this Section, rope and wire rope shall be selected using a minimum safety factor of 8 to 1. All chain, shackles, and other hardware shall be selected using a minimum safety factor of 5 to 1.

G. Where specification allows for "approved equal," substitutions shall be proposed to the Theatre Consultant at least 10 days prior to bid date.

H. Equipment and hardware are specified on the basis of performance and minimum acceptable quality. Materials manufactured by any of the following companies that equal or surpass

1. Devices Company (ADC), Allentown, Pennsylvania
2. H & H Specialties, South El Monte, California
3. J. R. Clancy, Syracuse, New York
4. Tiffin Scenic Studios, Tiffin, Ohio
5. Texas Scenic, San Antonio, Texas

2.2 ENGINEERING RESPONSIBILITY

A. The engineering of all equipment, devices, machinery, and systems shall address the following considerations:

1. Safety to personnel during operation, use, and maintenance.
2. Adequate strength.
3. Proper coordination of all systems and elements, including electrical insulation levels, interrupting capacities, protective relays, impact strength, breaking strength, emergency stopping distances, acceleration and deceleration rates, and normal working stress capabilities of equipment and all components.
4. Reliability, with consideration for special or unusual requirements of the unit or installation.
5. Ease of operation and maintenance.
6. Quiet operation.

B. Provide all supplementary structural support necessary for safe and proper static and dynamic conditions of all systems and components required for the work of the Specification. Supplementary structural support required for access, support, enclosure, and service to all motors and motor control

cabinets shall be supplied and installed as part of the work of this Section. All attachments, anchorages, connections, and miscellaneous steel additions to accommodate pulleys, blocks, etc., shall be designed, supplied, and installed by the Contractor and reviewed by the COTR. All methods of connection and imposed loads resulting from the Contractor's work shall be submitted to the COTR prior to fabrication.

2.3 EQUIPMENT COMPONENTS

A. Single and Multiple Line Sheaves:

1. Supporting, load bearing, and idler sheaves shall be of materials indicated. Size and capacity shall be as required for safe and reliable operation under design loads, but in no instance shall bearing pressure of the wire rope on a sheave groove exceed:

    a. 100 PSI for nylon

    b. 250 PSI for Nylatron

    c. 250 PSI for cast iron

    d. 500 PSI for high tensile cast iron

    e. 750 PSI for cast steel

    f. 2,000 PSI for turned steel sheaves.

2. Tread diameter of sheaves for wire rope shall be at least 30 times the diameter of the wire rope employed, except minimum diameter of idler sheaves and mule blocks that divert the cable direction by less than 45 degrees may be 20 times cable diameter. Tread diameter of sheaves for textile rope shall be at least 15 times the diameter of the textile rope employed.

3. All castings shall be designed and detailed for required loads and cable diameters with safety factors of at least three (3).

4. Provide rigid and accurate shaft and bearing mounting. Shafts shall be seized to prevent rotation.

5. Cable grooves shall be properly sized for the cable used, with groove diameter clearances to fit cable closely and prevent cable from assuming oval or elliptical shape under load. Groove diameter clearance shall be 8% of cable diameter. Groove depth shall be equal to the cable diameter. Cast grooves on metallic sheaves are not acceptable. All grooves on the same casting or billet shall have the same pitch diameter. All groove sides shall be beveled for required fleet angle to eliminate rubbing. Fleet angles shall not exceed ± 1.5 degrees.

6. Fleeting, muling, idler, and spacer blocks shall be provided as necessary to guide, turn, support, and separate lift lines. Load bearing sheaves shall be of at least the same components and sizes as required for other sheaves in the set and provided with suitable swivel bases, slip-shafts, mounting brackets, platforms, and accessories to satisfy job requirements.

7. Spacers shall be located so as to both retain the cable in the sheave groove and to retain the sheave within the block in the event of shaft failure. Clearance between the spacer and the rope shall be not more than 40 percent of the rope diameter nor less than 20 percent of the rope diameter.

B. Bearings

1. Unless otherwise noted, all bearings shall be of the tapered roller type. Precision sealed ball bearings and oil impregnated bronze bushings, or similar, shall not be used except in specific applications identified in this Specification, and where guidance or diverting of wire rope self-weight are the only loads carried. In all cases, such bearings and bushings may be used only when specifically approved in advance by the COTR and Theatre Consultant.

2. Selection of bearings or bushings shall meet the following performance criteria:

   a. Silent operation at expected RPM

   b. Low maintenance and lubrication

   c. Ability to withstand long periods of static disuse under full design load without affecting performance

3. All bearings shall be pre-lubricated and sealed for life. For bearing types that cannot be sealed for life, easy means shall be provided for periodic lubrications via standard and common fittings. Such lubrication shall not require the disassembly of blocks or other extraordinary means. In all cases, such bearings may be used only when specifically approved in advance by the COTR and Theatre Consultant.

2.4 STRUCTURAL AND MISCELLANEOUS METAL WORK

A. Additional structural steel and other fittings required for installation, support, bracing, and/or operation of theatrical rigging in all areas of the Project are the responsibility of this Contractor and shall be in accordance with related Divisions of the Project Specifications. Excepted are supports which are erected behind finished surfaces. These supports shall be the responsibility of the General Contractor. The Rigging Contractor shall

coordinate these locations and requirements with the General Contractor.

B. Patented channel type structural steel shall accommodate the required load but shall equal Unistrut Series P1000 at minimum.

C. Flame Cutting: Flame cutting is not acceptable, except for fabrication of counterweight.

D. Miscellaneous steel shall be of suitable types and sizes. All straps, rods, anchors, clip anchors, clip angles and other hardware necessary for the attachment shall be supplied.

2.5 ROPE

A. Counterweight set purchase lines

1. Spun polyester:

a. "Multiline II" by New England Ropes, New Bedford, Massachusetts

b. “Pro-Master” by Samson Rope Technologies, Ferndale, Washington

c. Approved equal.

2. Rope shall be of domestic manufacture. Contractor shall submit certification of manufacture with bid.

3. Lines shall be attached to the top of each arbor with a bowline knot and to the bottom of each arbor with two (2) half hitches. The rope ends shall be secured back to the standing lines with two (2) nylon tension ties. Steel thimbles for fiber rope shall be employed at both top and bottom ties.

4. Color: white with orange or green tracers.

B. Electric cable snatch lines and special rigging lines

1. Braided polyester:

a. "Stage-Set X" by New England Ropes, New Bedford, Massachusetts

b. “Static Rope” by Samson Rope Technologies, Ferndale, Washington

c. Approved equal.

2. Lines shall be attached to the cable cradles with bowline knots and the rope ends secured back to the standing line with two (2) nylon tension ties.

3. Color: black.

C. All ends shall be heat sealed to prevent unraveling.

D. Sizes and quantities per Drawings and Schedules.

2.6 TRACKS

A. Channel Tracks

1. Tracks shall be of the heavy-duty channel type, approximately 80 mm x 80 mm (3-inch x 3-inch) 14-gauge galvanized steel, entirely enclosed except for slot in bottom.

a. Approved Manufacturers:

i. ADC 2800 series

ii. H & H Specialties 400 series.

iii. Approved equal.

2. Tracks shall be supported within 300 mm (12-inches) of the live and dead ends, at the center of the overlap, and no more than 2130 mm (7-feet) O.C. in between, as shown in the Drawings.

3. Carriers shall be constructed of steel bodies with a "hollow center" design to contain operating line, with nylon tired ball bearing wheels and 150 mm (6- inch) trim chains on plated swivels.

a. Approved Carriers:

i. ADC 2851 (single) and 2852 (master).

ii. H & H 416 (single) and 417 (master).

iii. Approved equal.

4. Operating line shall be 13 mm (1/2-inch) braided cotton with a fiberglass center.

5. Live and dead end pulleys shall contain 200 mm (8-inch) diameter sheaves on ball bearings. For travelers mounted in rigging systems using lineset spacing of 230 mm (9-inches) or less, mount 200 mm (8-inch) dead-end pulleys at a 45-degree angle, with a total projection not greater than 150 mm (6-inch) from lineset center line.

a. Approved Pulleys:

i. ADC 2863-A (live) and 2864-A (dead),

ii. H & H 423 (Live) and 424 (dead)

iii. Approved equal.

6. Floor pulleys for fixed traveler tracks shall contain 200 mm (8-inch) inch diameter sheaves on ball bearings. Side plates shall be slotted

to allow a minimum 200 mm (8-inch) vertical adjustment.

a. ADC 2866-A

b. H&H 422

c. Approved equal.

B. I-Beam Tracks

1. Tracks shall be of the heavy duty I-beam type, approximately 60 mm x 25 mm (2-1/2 inch x 1 inch) 11-gauge extruded aluminum.

a. ADC 1400

b. H&H 316 Series

c. Approved equal.

2. Carriers shall be constructed of steel bodies with nylon tired ball bearing wheels and six (6) inch trim chains on plated swivels. Each carrier shall include nylon strips inside either side to minimize friction and noise from the track edges. Each carrier shall be cushioned from the adjacent carrier by neoprene bumpers.

a. Approved Carriers:

i. ADC 4201

ii. H&H 316 (Single) and 317 (Master)

iii. Approved equal.

3. Tracks shall be supported at both ends and no more than 1220 mm (48- inches) O.C. in between.

C. Finishes

1. All Steel Components shall be painted or powder coated flat black.

2. All Aluminum components shall be anodized flat black.

3. All plastic or nylon components shall be inherently colored black.

4. All operating line and tow ropes shall be black.

D. Every track segment shall be one (1) continuous piece of maximum catalog length, except where splicing clamps are required. Splicing clamps shall provide a flush, positive alignment of track sections.

E. Provide and install tow ropes for each end of each walk-draw curtain panel. Tow ropes shall be 10 mm (3/8 inch) braided cotton rope with 50 mm (2-inch) diameter wood balls on the operating end, than 1220 mm (48-inches) above stage level. Ropes and handles shall be black.

F. Quantities, sizes, and locations as per Drawings.

2.7 CURTAINS

A. Fabrics

1. All fabrics not inherently flameproof shall be fully mill flameproofed by the immersion process to meet or exceed the minimum requirements set forth by NFPA "Small Scale 701." The Contractor shall submit certificates so stating.

2. All fabrics shall be produced from one (1) dye lot per color. Color quality shall be consistent throughout, with no visible streaking, striping, or spotting.

3. All curtain color selections shall be submitted to the Theatre Consultant following selection by COTR. Final color approval by the Theatre Consultant is required prior to ordering fabric.

4. Inherently Flame-Retardant Masking Curtains: 100 percent carded Inherently Flame Retardant velour, 1,370 mm (54-inches) wide, weighing 550 gsm (25 ounces per linear yard). "Charisma" as manufactured by KM Fabrics, Inc., Greenville, South Carolina, or approved equal by J. L. DeBall Fabrics or J. B. Martin Fabrics. Color: as shown on the Drawings.

B. Fabrication

1. General

a. Unless otherwise noted, all pile fabrics shall have pile running up.

b. All seams shall be vertical, unless otherwise specifically indicated. All fabric widths shall run full height, with no vertical piecing. All hems shall be sewn for the complete length of the hem.

c. Thread shall match face fabric in color and material.

d. The center of every curtain shall be indicated by a 13 mm (½-inch) wide fabric strip sewn to the back of the webbing. In addition, the center grommet of each border, backdrop, cyclorama and scrim shall be provided with a tie line in a color that is obviously different than the rest of the tielines.

e. All grommets shall be black in finish.

f. Every curtain shall contain permanent labels sewn to all off-stage ends of each curtain. Labels shall be located at the top webbing for all curtains. For any curtain taller than 3050 mm (10- feet), labels shall also be provided at 1220 mm (48

inches) above the bottom hem. Stitches shall not penetrate the front face fabric of the curtain. Labels shall indicate fabric, color, finished size, and method and date of flame-retardant treatment, if applicable.

g. Immediately below every curtain's lowest label shall be sewn, on one edge, one (1) 100 mm (4-inch) wide x 460 mm (18-inch) long swatch of cloth provided from the same bolt(s) and having undergone the same flame-retardant treatment as the curtain itself. The swatch shall be sewn to the curtain along the length of the swatch. Each swatch will carry the following label:

"THIS SWATCH IS A FLAME TEST SAMPLE FOR CURTAIN XXX.

IT IS TAKEN FROM THE SAME FABRIC BOLT(S) AND HAS RECEIVED IDENTICAL FLAME TREATMENT ON DATE XXX"

Contractor shall complete items shown as XXX above.

h. Sizes and quantities per Drawings.

2. Travelers

a. Top hem shall be single turned and reinforced with continuous 90 mm (3-1/2 inch) webbing. Fullness shall be sewn into the curtain by means of box pleats 300 mm (12 inches) O.C. Two (2) No. 3 brass grommets shall be provided at each top corner of each finished panel and one (1) grommet shall be provided at the center of each box pleat along the top hem. One heavy duty snap hook, Zoron Steel Bit Snap #421 or approved equal, shall be provided for each grommet for attachment to track.

b. Bottom hem shall be 150 mm (6-inches) double turned and contain a continuous No. 6 plated jack chain held in a separate muslin pocket 100 mm (4-inches) above bottom of curtain and tacked at each vertical seam to prevent bunching.

c. All vertical hems shall be faced back with 1/2 width of face fabric. The hem shall be continuously sewn to the selvage edge of the previous panel seam.

PART 3 – EXECUTION

3.1 FABRICATION

A. This Contractor is responsible for becoming familiar with and verifying all pertinent dimensions and conditions, both in the Drawings and in the field, before proceeding with any work.

B. Coordinate the design, planning, and scheduling of the work of this Section with the work of all other trades. Notify the COTR of any difficulties in coordinating work with other contractors. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive the work of this Section.

C. All electrical components shall be fully assembled and internally wired, with terminals of the proper rating and clearly labeled, provided for external feeder and control wiring.

D. All metal fabricated items shall be given at least one (1) coat of primer and one (1) coat of finish paint. Color: flat black.

E. Where not specifically called out in the Drawings and Specifications, tracks and fittings shall be painted or anodized black.

F. Verify curtain height dimensions after track installation is complete, prior to fabricating curtains.

G. All curtain color selections shall be submitted to the Theatre Consultant following selection by COTR. Final color approval by the Theatre Consultant is required prior to ordering fabric.

H. All equipment shall be fabricated and installed to facilitate maintenance and future replacement.

3.2 INSTALLATION

A. Contractor shall employ only experienced stage riggers for the installation of work of this Section. A competent supervisor shall be maintained on this Project during the entire installation. A change of supervisor shall not be acceptable unless by written authorization of the COTR.

B. Coordinate installation with all other trades doing adjoining work.

C. Examine all existing conditions at the jobsite prior to beginning installation. Report to COTR any conditions that vary from the Drawings that could prevent the correct installation of the specified system, including, but not limited to, out-of-plumb, out- of-square, out-of-true and out-of-level conditions. Failure to do so shall constitute acceptance of construction as suitable in all ways to receive the work of this Section.

D. Blow all accumulated dust from gridiron, using compressed air, prior to installation of new system.

E. Provide protection for all stage flooring, regardless of whether flooring has been stained or sealed. Flooring shall be protected from both structural damage and cosmetic damage.

F. Provide and install all supplementary structural support as required for the installation and safe operation of equipment and materials

supplied under this Section.

G. Do all required cutting, drilling, tapping, and welding necessary for proper installation. Cut no structural members unless specifically shown in the Drawings or indicated in the Contractor's shop drawings, or unless written approval is obtained from the COTR.

H. Install all items in conformity with standard trade practices and manufacturers' recommendations. Position all items accurately and true to plumb line and level. Maintain maximum headroom and clearances at all locations.

I. Ropes and cables shall enter rigging blocks and drums at a fleet angle not exceeding ±1.5 degrees.

J. All turnbuckles and screw-pin shackles shall be seized in place with either wire or standard 23 kg (50-lb capacity) black nylon (UV stabilized) cable ties after final adjustment. Loose ends of seizing material shall be trimmed to be no longer than 6 mm (¼-inch) in length.

K. Number all line sets at the Loading Gallery, at the top of the kick plate, and at the gridiron, at the top flange of the centerline loft well, so as to facilitate the identification of sets at these locations. Use white enamel paint and stencils for all numbering. Numerals shall be at least 25 mm (1-inch) high.

L. Install all traveler tracks with 910 mm (36-inch) overlap at center.

M. No curtains shall be installed until construction and painting are complete and the building has been cleaned. Any curtains delivered to the job site prior to their installation shall be stored in a clean area in dustproof bags.

END OF SECTION

SECTION 12 61 00

**FIXED AUDIENCE SEATING -
PLANETARIUM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. *ANSI/BIFMA e3 Future Sustainability Standard.*

1.2 UNITS OF MEASURE

A. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

1.3 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Fixed, floor mounted upholstered seating units at Planetarium to match existing.
   2. Refurbishment and installation of salvaged existing seating units from Planetarium.
   3. All seating will be mounted on new standards.
   4. Removable floor-mounted upholstered seating units to allow wheelchair seating. Additional new seating as required to match existing seating.
   5. Accessories.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. See Division 01 Section SUSTAINABLE DESIGN REQUIREMENTS for sustainable design requirements and procedures.

B. See DIVISION 26 for aisle lighting electrical connections.

1.5 ACTION SUBMITTALS

A. Product Data:
   1. Submit manufacturer's specifications and installation instructions for each type of theater seating required.
   2. Include photographic catalog cuts for manufacturer's standard components as specified.

B. Shop Drawings:
   1. Submit plans, elevations and details
      a. Indicate layouts of units coordinated with field measurements.
      b. Include seat dimensions and clearances, row spacing, overall dimensions in closed and open positions, connections and relationships to adjoining Work, accessories, materials and finishes.
   2. Include seating lettering and numbering layout.
   3. Include electrical wiring diagrams for aisle lighting.

C. Samples:
   1. Submit minimum 305 mm (12 inch) square samples for the following items, showing color and texture to be expected in finished Work.
      a. Powder on steel.
      b. Plastic laminate.
      c. Plastic.
   2. Submit full-size sample for arm rest, showing color and texture to be expected in finished Work.
   3. Fabric: Submit full width production run samples for fabric; length as required to show full texture and pattern variation; minimum 450 mm (18 inches) long.

1.6 INFORMATIONAL SUBMITTALS

A. Certificate: Submit seating manufacturer's certification that products comply with specified requirements, including certified test reports performed by a recognized independent testing laboratory showing that fabric and padding have been previously tested and meet or exceed specified fire performance requirements.

B. Qualification Data: Submit installer qualifications verifying years of experience; include manufacturer's approval of installer and list of completed projects having similar scope of work identified by name, location, date, reference names and phone numbers.

C. Location Drawings: Submit Drawings of existing Auditorium seating, indicating number for each seat to correspond to identification number given each seat bottom and each seat back, applied on an unexposed surface of each seat bottom and seat back.

1.7 LEED SUBMITTALS

A. MR Credit: Building Product Disclosure and Optimization – Material Ingredients.
   1. For upholstery fabric and/or seating, if applicable: Material Ingredient Report.

B. EQ Credit: Low-Emitting Materials.
   1. For composite wood: Documentation indicating compliance with California Air Resources Board (CARB) Airborne Toxic Control Measures (ATCM) for ultra-low- emitting formaldehyde (ULEF) resins or no added formaldehyde resins.
   2. For furniture evaluations: Documentation indicating compliance with ANSI.BIFMA M7.1-2011 testing protocols and ANSI/BIFMA e3-2011 Future Sustainability Standard, Sections 7.6.1 and 7.6.2.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data:
   1. Submit manufacturer's cleaning and maintenance instructions, including information needed for removal of common stains from each type of fabric, padding and material.
   2. Include list of replacement parts and sources.
   3. Include copy of submittal in Project information manual.

B. Warranty: Submit signed and dated warranty.

1.9 SYSTEM REQUIREMENTS

A. Seating Layout:
   1. Provide seating layout with seats varied in width to optimize sightlines, and to maintain minimum aisle width indicated on Drawings.

B. Fire Performance Requirements:
   1. Provide seating which complies with the following, unless otherwise required by authorities having jurisdiction.
      a. Finished seating complies with California Technical Bulletin 133.

b. Seat fabric and padding complies with California Technical Bulletin 117.

C. Electric Wiring:
1. Wiring and electrical interconnections shall comply with governing codes.
2. Insulated wiring shall have flame retardant and moisture proof outer covering, and shall be run in conduit, tubing or electrical wireways.

D. Fabric Durability: Fabric must be sturdy enough to withstand 100,000 double rubs.

E. Visual Requirements: Manufacturer's nameplates, or stamped or printed markings, shall not be exposed on any item provided for this Work.

F. Interface With Other Systems:
1. Coordinate seating Work with Work of other trades and provide items to be placed during installation of other Work at proper time so as to avoid delays in overall Work.
2. Place such items, including inserts and anchors, accurately in relation to final locations of seating components.
3. Use Contractor's bench marks.

1.10 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain seating from single manufacturer including accessories, mounting and other installation components.

B. Installer Qualifications:
1. Either seating manufacturer or a licensee of manufacturer, who has not less than 5 years successful documented experience with installation of similar seating units.
2. The same firm shall be responsible for removal of seating components and for reinstallation of seating components.

C. Regulatory Requirements:
1. Conform to applicable requirements of authorities having jurisdiction over Project, including fire resistance classification requirements.
2. Except as may be modified by governing authorities, comply with applicable requirements and provisions of the following:
a. ANSI A117.1 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People".

b. Americans with Disabilities Act.

1.11 PRE-INSTALLATION CONFERENCE

A. Prior to commencing Work, meet at site and review installation procedures and coordination with other Work.

1.12 DELIVERY AND STORAGE

A. Deliver seating to building after wetwork, including painting, in areas has been completed and is dry, work on and above ceilings have been completed, when areas are ready to receive Work, and only after temperature and humidity have been stabilized in installation areas at approximate level which will prevail in building when occupied.

B. Deliver, store and install seating with factory applied protective coverings in place.

C. Protect seating against damage during handling, transit and storage.

D. Store in dry, clean, well ventilated place, protected from dampness, moisture and weather.

1.13 SEQUENCING AND SCHEDULING

A. Do not reinstall seating components until:
1. Wet work in Auditorium spaces is complete and dry, and work above ceilings is complete.
2. Permanent HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period
3. Carpeting installation in Auditorium has been completed.

1.14 WARRANTY

A. Submit written five year warranty signed by Contractor, manufacturer and installer, agreeing to replace units or unit components which develop material, workmanship or installation failures.

1.15 EXTRA STOCK

A. Deliver one unopened roll of upholstery for each 100 rolls (or fraction thereof) installed for each type, pattern and color.

B. Extra stock shall be supplied from same production runs as installed material.

C. Store at Project site where directed. Ensure rolls are identified by manufacturer, product, pattern and color.

PART 2 - PRODUCTS

2.1 *LEED, GENERAL*

A. *Composite wood: Comply with the California Air Resources Board (CARB) Airborne Toxic Control Measure (ATCM) for formaldehyde emissions for ultra-low-emitting formaldehyde (ULEF) resins or containing no added formaldehyde resins.*

B. *Emissions for Seating: Comply with the testing procedure requirements of ANSI/BIFMA M7.1- 2011 testing protocols and comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2 using either the concentration modeling approach or the emissions factor approach*

2.2 PRODUCTS AND MANUFACTURERS

A. Acceptable Products and Manufacturers:
1. Listed products establish standard of quality and are manufactured by Irwin Seating.
2. Equivalent products by other manufacturers may be acceptable, provided they comply with requirements of Contract Documents.

2.3 MATERIALS

A. Steel:
1. Plates, shapes and bars: ASTM A36.
2. Steel tubing: Cold formed, ASTM A1008, grade selected by fabricator to suit Project conditions.
3. Steel sheet and strip: Hot rolled, ASTM A1011.

B. Panel Materials:
1. Concealed plywood: Hardwood plywood complying with HPVA HP-1, as standard with the manufacturer.
2. Medium density fiberboard: Comply with ANSI A208.2.
3. Mat-formed wood particleboard: 720 kg/cu. m (45 pcf) density, complying with ANSI A208.1.

C. Plastic Laminate:
1. High pressure laminates, complying with NEMA LD3, General Purpose Grade,

minimum nominal 0.762 mm (0.030 inch) thick.
2. Adhesive: Clear drying type recommended by laminate manufacturer.
3. Colors and products: To match COTR's sample.

D. Padding:
1. Molded polyurethane foam, of density and grade recommended by manufacturer for seat construction; suitable for specified fabric.
2. Padding shall be resistant to acids, alkalais, oils, graese, soaps, detergents, moisture, mildew, abrasion and tearing.
3. Comply with the following:
   a. ASTM D3453, for dynamic fatigue performance Grade AD (heavy duty use) for seats and Grade BD (normal duty use) for backs.

E. Fabric: To match COTR's sample.
1. Fire-retardant treat fabric to comply with specified fire performance requirements.
2. Treat fabric for stain resistance with manufacturer's recommended treatment.

2.4 SEATING UNITS

A. Description:
1. Floor mounted units on standards, with upholstered back and seat cushions in molded plastic shells, with arm rests.
2. Seat widths: As indicated on Drawings.
3. Acceptable product and manufacturer:Equivalent to Planetarium Signature Model 71.12.90.4 by Irwin.

B. Standards:
1. Manufacturer's standard steel tube standards welded to steel bar floor-mounted bases.
2. Weld seat, back and arm rest connections to standard.
3. Number and letter plates: Manufacturer's standard finish with black letters and numerals.
4. Finish: Manufacturer's standard powder coat or baked enamel paint finish.

C. Aisle Panel: MDF panel with plastic laminate facing.

D. Arm Rests:
1. One-piece, high-density plastic or self-skinning urethane on manufacturer's standard metal support, to secure arm rest to standard.
2. Color: To match COTR's sample.
3. Provide arm rest at aisle side of end seats, and between each seat, for mounting to standard.

E. Aisle Lights:
1. Manufacturer's standard UL-approved aisle lighting fixtures, installed in ends of

beams at each end of each aisle.
2. Provide each fixture with bulb.
3. Acceptable product and manufacturer: Equivalent to Focal LED Aisle Light by Irwin.

2.5 ACCESSORIES

A. Gaskets and Spacers: Provide as required for installation and as recommended by manufacturer for each use.

B. Fastenings:
1. Non-corrosive metal which will not cause galvanic action or rusting, standard commercial items suitable for intended purpose.
2. Provide drilled-in expansion anchors, machine bolts, mechanical fasteners for adjoining table tops, and other fastenings and fittings of type and size as selected by manufacturer to suit substrates and installation conditions.
3. Finish exposed fastenings to match adjacent finishes.

C. Provide other materials or accessories as required for complete installation.

2.6 FABRICATION

A. Provide exposed surfaces free from dents, mold or tool marks, warpage, buckle and open joints, and without pits, holes, cracks, scars and flaws.

B. Accurately fit joints and corners.
1. Provide concealed fastenings unless shown and accepted on Shop Drawings.
2. Smoothly round corners, edges and exposed fasteners to present least possible snagging and pinching hazards.

C. Provide reinforcing as required to ensure rigid and secure assemblies.

2.7 SHOP FINISHING

Ferrous Metal:
1. Surface preparation: Clean surfaces of dirt, grease and other contaminants.
2. Pretreatment: Apply conversion coating compatible with finish.
3. Finish:
   a. Immediately after cleaning and pretreatment, apply manufacturer's standard baked enamel finish; minimum 0.053 mm (2.1 mils) dry film thickness.
   b. Color: To match COTR's sample.
   c. Provide finish uniform in color, sheen and texture, and free from sags, runs, skips, scratches and abrasions

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and adjoining construction, and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected.

3.2 REMOVAL OF EXISTING SEATING COMPONENTS

A. Prior to removal of seating components, apply a unique number to unexposed surface of each seat bottom and each seat back, corresponding to the number assigned to each seating unit on Drawings of existing Auditorium seating.

B. Remove seat bottoms and seat backs from seating units. Seat standards shall remain in place; only seat bottoms and backs are to be removed.
   1. Retain removed fasteners and other accessories, for use in reinstallation of seating components.
   2. Wrap removed seat bottoms and seat backs in protective covering as required to protect components from damage during storage and handling.

C. Store components in conditioned space in building, as specified in Part 1 above.

3.3 INSTALLATION

A. General: Install units as shown and in accordance with final Shop Drawings and manufacturer's instructions and recommendations.

B. Standards/Floor Bases:
   1. Install bases in locations conforming to seating layouts.
   2. Anchor to floor with not less than 2 anchoring devices, to provide installation free from rocking or instability under conditions of actual use.
   3. Leveling:
      a. Level assemblies using concealed, adjustable, permanently attached shims that cannot become dislodged.
      b. Exposed shims are not acceptable.
   4. Coordinate electric wiring for aisle lights with layout of standards.

C. Seats:
   1. Secure seats and accessories to standards using manufacturer's recommended hardware and fasteners.
   2. Verify that mechanisms operate smoothly and quietly.

D. Take care in handling of seating units to avoid their being scratched or otherwise defaced during installation.

E. Do not install units which have members that are warped, bowed, deformed or otherwise damaged. Remove and replace such units as directed.

3.4 REFURBISHING EXISTING SEATS

A. Clean existing seats gently so as not to damage any finishes, in accordance with manufacturer's recommendations.

B. Remove existing fabric, and reupholster seats.

3.5 REINSTALLATION

A. Reinstall salvaged and refurbished seat bottoms and seat backs to new standards.

B. Adjust mechanisms to operate smoothly and quietly.

C. Take care in handling of seating components to avoid their being scratched or otherwise defaced during installation.

D. Repair or replace components which have been damaged or lost.

3.6 ADJUSTING AND CLEANING

A. Adjust self-rising seat mechanisms so that seats in each row are aligned when in upright position.

B. Remove protective coverings only when construction is complete in seating areas and when acceptable to COTR.

C. Clean fabric and exposed finishes as recommended by manufacturer, using care to avoid abrasion of finishes.

D. Repair:
   1. Touch-up minor abrasions and imperfections in painted finishes with coating which matches factory-applied finish.
   2. Replace damaged units which cannot be satisfactorily field repaired, as directed by COTR.

3.7 PROTECTION

A. Protect Work during construction so that it will be without any evidence of damage or use at time of acceptance.

SECTION 12 61 23

FIXED AUDITORIUM SEATING - IMAX

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 UNITS OF MEASURE

A. Contractor to Note: Per SI direction units of measure have been listed in both Metric and Imperial Units, with the metric unit listed first. The metric units are nominal and may not be in agreement with dimensioning on drawings. In cases of conflict the Imperial unit of measure shall
govern. Contractor to note that for purposes of the work Imperial refers to United States Customary Units.

1.3 DEFINITIONS

A. Technical terms unique to theatre seating and related work shall be construed in the following order, in accordance with:

1. Captions on related Drawings.
2. Relevant usage and definitions of handbooks, guidebooks, or trade group recommendations by manufacturers' associations or professional societies.
3. Generally recognized theatrical usage.

1.4 SCOPE

A. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

1. Preparation and submission of complete shop drawings and samples for review prior to fabrication.
2. Verification of dimensions and conditions at the job site.
3. Shipment of equipment to job site and the secured storage of all non-fixed equipment.
4. Installation and completion, in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade

criteria, and all applicable code requirements.

5. The inspection, demonstration, and necessary adjustment of the completed installation by the Contractor's engineering personnel.
6. Preparation and submission of complete record drawings and operational and maintenance data and certificates.
7. Seating specified in this Section is long lead. Manufacturer shall communicate with the General Contractor sufficiently in advance to ensure no delays in project completion.

B. WORK INCLUDED

1. Furnish and install fixed seating as indicated on the drawings and as specified herein, in the following location(s):
   a. IMAX Theatre Auditorium
2. Furnish Maintenance Materials
3. Coordination of Work
   a. Coordinate installation of electrical wiring and transformer quantities and locations with seating layout. Ensure that junction boxes for aisle lights are located inboard of aisle light standards as shown in Drawings.
   b. Coordinate seating layout as required with under-floor air distribution grille locations.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

C. WORK NOT INCLUDED

1. Electrical wiring, conduit, and connections.
2. Concrete or other flooring finishes.
3. Handrails.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.5 QUALIFICATIONS

A. All equipment and installation shall be the responsibility of a single manufacturer who shall own and operate a full-time, staffed shop for the fabrication and assembly of fixed theatre seating. This Manufacturer shall assume complete responsibility for the design, fabrication, transportation, and installation of the work in this Section, and shall hold the Owner, COTR, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising therefrom.

B. Approved manufacturers may, at their option, arrange for sub-contract field and special shop work to be done by others. Bid submissions must identify such subcontractors and indicate the work they are to do.

C. Manufacturer shall engage a manufacturer-approved, locally based, experienced installer who regularly installs and services auditorium and theatre seating similar in kind, quality, and extent to that indicated for Project. A competent supervisor shall be maintained on this Project during the entire installation. A change of supervisor shall not be acceptable unless by written authorization of the COTR.

D. The Manufacturer and Installer shall have at least 10 years' experience in the installation of similar equipment and scope for secondary school theatres. If requested, the Manufacturer shall submit a representative list of comparable installations during the above period.

E. Subject to the above requirements, work performed under this Section may be by one of the following listed manufacturers:

1. Irwin Seating, Grand Rapids, Michigan
2. Wenger Corporation, Owatonna, Minnesota

Other manufacturers may be considered with the prior review of the COTR. Manufacturers seeking review must contact the COTR not later than 14 days prior to bid date.

1.6 SUBMITTALS

A. General: Submit in accordance with the General Conditions as described in the Project Manual.

B. Submit Following with bid:

1. Proof that the firm has been continuously engaged in the fabrication and installation of fixed theatre seating during the past 10 consecutive years.
2. A list of at least three (3) installations by the bidder comparable to this project in scope including the same installation supervisor.
3. A list of any proposed deviations or exceptions from the Specifications. Any deviations or exceptions from the Specification proposed after bid shall not be accepted.
4. A schedule for the anticipated completion of the following:
   a. Shop drawings
   b. Delivery of all equipment
   c. Installation of all systems
5. Samples:

a. Manufacturer's color charts or samples of actual materials showing full range of standard colors, finishes, patterns, and textures available for each exposed material.
b. Single fixed seating unit of each type that meets the basic requirements of the specification.

C. Shop drawings: Within 60 days of receipt of order, the Manufacturer shall submit at least one set of reproducible shop drawings and equipment data sheets to the COTR for distribution for review and action prior to fabrication:

1. Plan and section in scale equal to 1/4" = 1'-0".
2. Complete, fully dimensioned shop drawings of all major components.
3. Requisite plans, sections, schematics, and details indicating assembly and installation of components.
4. Complete counts of every seat feature, including but not limited to:
   a. End Standards
   b. Aisle Lights
   c. Transfer Arms for Designated Aisle Access Seats
   d. Row ID
   e. Chair ID
   f. Cup Holders
5. Quantities of each component and sub-assembly.
6. Indication by boxed caption of any and all variations from the contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by the COTR.
7. Product certificates signed by manufacturers certifying that their products comply with specified fire safety requirements as outlined in this Section.
8. Product certificates signed by manufacturers certifying that their products comply with specified LEED requirements as outlined in Division One.

1. Finish and fabric samples for COTR selection.
2. Two (2) 76 cm (30-inch) square "quality" sample of seating fabric for approval by COTR.
3. A sample chair the same as to be supplied in the contract except for finishes and fabrics.
4. Samples of any equipment component requested.
5. Samples shall not be considered part of specified quantities but shall be returned.

6. Provide acoustical testing data to the COTR. In addition, submit samples of cushion materials and fabrics used in the tests to the COTR.

D. PROTOTYPES

1. Prior to fabrication of seating, provide for review by Owner and COTR a prototype as described below:
   a. Prototype shall be self-supporting, using support brackets that are proposed for permanent installation. Prototype base shall be provided to allow seats to be used for comfort testing.
   b. Prototype shall be a two (2) seat unit incorporating the narrowest and widest seats shown in the layout drawings.
   c. Prototype shall incorporate one (1) standard end panel and one (1) ADA transfer arm.
   d. Prototype shall incorporate all finishes as directed by COTR.
2. Deliver prototype to location as directed by COTR.
3. Obtain Owner and COTR written acceptance of prototypes before beginning production of seating for Project.
4. Prototype shall be retained at the site during construction in undisturbed condition as a standard for evaluating completed seating.
   a. When directed, remove prototype from Project Site.

E. Final submittal. Within 30 days of final tests, and as a condition for final review, the Contractor shall submit to the COTR:

1. Receipts for delivery of all non-installed items, i.e., all items designated, "Deliver to Owner."
2. Three (3) sets to the COTR. Format of sets shall be compliant with Division One of this Specification.
   a. "As built and approved" drawings and wiring diagrams showing all systems and components as installed, including all field modifications.
   b. Operation and service manuals, schematics, and parts lists for each unit of equipment installed or provided.
   c. Certification that all components and assemblies comply with specified fire safety requirements as outlined in this Section.
   d. Certification that all components and assemblies comply with specified LEED requirements as outlined in Division One.
   e. Certificates of warranty, as set forth below.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of the relevant sections of the General Conditions in the Project Manual.

B. Deliver seating in manufacturer's unopened cartons clearly labeled with manufacturer's name and contents.

C. Inspect deliveries upon arrival to verify no items are damaged. Immediately order replacement of damaged materials at no cost to Owner.

D. Store seating in dry location protected from damage and soiling under environmental conditions acceptable to manufacturer.

E. Handle seating in a manner to prevent damage.

1.8 TESTING AND INSTRUCTION

A. Upon completion of all installation work, the Manufacturer shall certify in writing to the COTR that the work is complete and ready for final observation. Final observation shall be scheduled by the COTR to occur within 14 days following the Contractor's notice of completion. Costs of additional or repeat tests due to delay or negligence on the part of the Seating Manufacturer shall be borne by the Seating Manufacturer. These costs include the COTR at their current hourly rates and the direct expenses resulting from this delay or negligence.

B. Final observation shall be conducted by a knowledgeable representative of the Manufacturer, in the presence of the Owner and the COTR and shall include the following:

1. Operation of all components.
2. Visual examination of all components.
3. Necessary adjustments or modifications shall be made as required.

C. Manufacturer's representative shall instruct Owner's designated staff or representatives in the safe operation, maintenance and replacement of all components, including the storage and cleaning of all fabrics. This instruction session shall be scheduled to last a minimum of two (2) hours. While it may be possible to schedule this instruction session to coincide with the system checkout, such coincidence shall not be assumed.

1.9 MAINTENANCE MATERIALS

A. Furnish extra materials described below matching products installed, packaged with protective covering for storage and identified with labels clearly describing contents. Provide sufficient material to provide two (2) percent, but not less than one of each component type and size for each seat back, pan, standard, fastener, aisle light and cushion.

B. Upholstery fabric in size and quantity required to reupholster two (2) percent

of each size of installed seats and backs.

1.10 WARRANTY

A. The Manufacturer shall unconditionally warrant all components and installation provided under this Section to be free from defects in materials and workmanship for a period of at least 60 months from the date of final acceptance of all work of this Section.

B. Appropriate additional equipment to replace equipment removed for service shall be provided at the job site at no expense to the Owner to replace any and all equipment which must be removed for service.

C. All warranty service shall be performed by technicians certified by the manufacturer for the installed equipment.

PART 2 - PRODUCTS

2.1 GENERAL

A. Seats shall use materials which are carefully selected to be free of defects, objectionable projections, or irregularities. Ease all corners and edges, and select exposed fasteners to prevent snagging and pinching hazards.

2.2 ACOUSTICAL REQUIREMENTS

A. The acoustical testing shall demonstrate that the following sound absorption values are not exceeded:

1. Maximum Sound Absorption Values (Sabins/Seat):

	Octave Band Center Frequency (Hz)					
	125	250	500	1000	2000	4000
Occupied	4.0	4.5	6.5	7.2	7.2	7.2
Unoccupie	2.5	3.0	3.7	3.7	3.7	3.5

B. Action of self-rising seat shall not produce an excessive amount of noise (squeaking or impact noise). All springs shall be damped at all metal contact points. Hardware shall be permanently lubricated; stops shall be cushioned. The sound level of self-rising seats shall not exceed 30 dB-A when measured 1 meter (3 feet) from the seat using a precision sound level meter on the fast response.

C. The COTR shall assess degree of noise produced.

2.3 PERFORMANCE CHARACTERISTICS

A. Chairs provided under this specification shall be compliant with all applicable codes. It shall be the Manufacturer's responsibility to provide documentation of compliance.

B. Testing and Compliance

1. The seats shall be certified to withstand a 273 kilogram (600 pound) static load, laterally distributed 7.5 cm (three inches) from the leading edge of the seat.
2. The seat shall also be certified to pass seat cycle oscillation testing, ASTM F851-87 and sandbag testing.

C. Fire

1. Such requirements shall include but may not be limited to the following standards:
   a. Federal Motor Vehicle Safety Standard No. 302.
   b. Class 1 requirements of U.S. Department of Commerce, CS 191-52.
   c. California Technical Bulletin CA 133.

2.4 BASIS OF DESIGN

A. "Marquee" by Irwin Seating

2.5 MATERIALS

A. Fabrics:

1. Fabric TBD, provide allowance for $30 per yard.

B. Steel: Provide with smooth surfaces and be of sufficient gauge thickness and designed to withstand strains of normal use and abuse. ASTM A 36

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, commercial and drawing quality, Coating Class C, chemically treated for baked-enamel finish and not less than .1 cm (0.0396 inch) thick.

D. Padding Material: Seat and back padding material shall be of cold molded closed cell polyurethane foam.

E. Wood

1. Exposed plywood shall be hot press laminated using high frequency process. Interior plies shall be Class 3 or better. Exposed exterior plies shall be Class 1.
2. Concealed plywood shall be hot press laminated using high frequency process. All plies shall be Class 3 or better.
3. Exposed solid wood shall be grain matched hardwood, kiln dried, free from knots

and blemishes. Species and appearance shall be consistent within each seat and from seat to seat.

4. Surface applied wood veneers shall be Class 1.

F. Plastics

1. Plastic Seat backs shall be made of high-density polyethylene. Seat backs shall be one-piece injection molded shapes. *Color: Maroon*

2.6 FINISHES

A. Metal Parts: All ferrous metal parts, both exposed and non-exposed, shall be electrostatic powder coated. All coatings shall be consistent in appearance. All metal coatings shall have a dry film thickness of at least two millimeters and shall pass the 2H pencil hardness test.

B. Wood Parts: All exposed surfaces shall be stained to color selected and finished with a clear plastic sealant of sufficient film depth to afford wear resistance of institutional quality.

C. Hardware: All assembly hardware shall be rust resistant, black plated.

2.7 STANDARDS

A. The standards shall be manufacturer's standard riser-mount design made from steel or cast iron.

B. A reinforced bracket for seat pan attachment shall be integrated into the standard.

C. The seat pan shall be anchored to the standard by bolts.

D. A support for attachment of the back shall be provided.

E. The top of the column shall provide for armrest attachment.

F. The standard shall be designed to fasten to the mounting plate.

G. Standards in row 'M' shall be manufacturer standard floor-mount type but shall otherwise meet the requirements of the specification.

H. Standards shall be manufactured to conform to floor and riser conditions as shown in Drawings while maintaining seat and back dimensional and angular relationships throughout.

2.8 MOUNTING PLATE

A. Mounting Pate shall be fabricated from steel of minimum thickness required to meet strength requirements for seat mounting.

B. Mounting Plate shall be designed to fasten to existing riser-mount seat anchors and provide a secure surface for mounting the new seats.

C. Mounting Plate shall be designed to allow the new riser-mount-standards to fasten to the plate securely to maintain strength requirements.

D. Mounting Plate shall be finished to match the surrounding concrete surface, subject to COTR approval.

2.9 END PANELS

A. Provide end panels, as selected by COTR from Manufacturer's catalog, securely attached to aisle standards with concealed fasteners.

B. Exposed face shall be wood veneer, stain color as selected by COTR.

C. Edges shall be finished with hardwood matching veneer edge banding.

2.10 SEAT ASSEMBLIES

A. Two-part seat assembly of arch-spring construction indicated below with upper part removable for reupholstering without removing pan from chair.

B. Cushion shall be molded polyurethane foam padding tapered from 7.5 cm (3 inches) thick at the leading edge to 4 cm (1-1/2 inches) thick at the rear, over not less than five serpentine springs attached to reinforced steel frame; with weight-distributing and abrasion resisting sheeting separating padding from springs; upholstered with fabric sewn into box construction without welts and securely attached to frame to produce surfaces free of creases, stretch lines, or wrinkles. Fabric shall be removable without damaging any component.

C. Seat pan shall be a single piece, sheet steel pan or molded polypropylene. Pan shall be reinforced at stress points and shall completely enclose the hinges and self-rising seat mechanisms.

D. The seat shall rotate on two (2) hinge rods. Hinge rods shall be securely engaged in seat standard pivots. Bearing surfaces shall be low friction and permanently lubricated, requiring no maintenance. Seat-lift shall be accomplished by compression springs and self-lubricating plastic cams. All hinge operation elements shall be shielded and inaccessible to the seated patron. Seat shall automatically return to a 3/4 fold position. It shall be possible to rotate the seat to full-fold position with slight additional rearward pressure.

2.11 SEAT BACK ASSEMBLIES

A. Backs shall be of plywood construction with an upholstered front, and shall consist of two (2) parts; an upholstered panel and an exposed plastic rear panel.

B. Cushion shall be high density closed cell cold cured sculpted non-skinning molded foam: density 56 kg/cubic meter (3.5 pounds/cubic foot), padding measuring not more than 5cm (2 inches) thick.

C. Plywood base shall be a minimum of 1.7cm (5/8-inch thick). The cushion shall be securely cemented to plywood base with no voids occurring between the base and the foam.

D. The exposed back panel shall be plastic, formed on the same radius as the upholstered panels. The exposed back panel shall not be less than 66 cm (26 inches) long and shall protect seat in raised position. Color shall be selected by COTR from manufacturer's standard colors.

E. Exposed back panel shall be securely connected to the upholstery panel.

F. Backs shall be designed and installed so as to achieve an even and consistent gap between seat back panels within each row except at aisle locations.

G. Seat Back Assembly shall utilize steel back wings for connection to standards. Wings shall have provision for 12 degree, 16 degree and 20 degree pitch.

2.12 ARMRESTS

A. Armrests shall be provided at each aisle and between seats.

B. Armrests shall be designed for concealed mounting to standards with all edges well rounded.

C. Armrests shall be removable for repair or replacement.

D. Armrests shall be at least 6 cm (2-3/8 inches) in width.

E. Armrests shall be solid plastic subject to the requirements noted above.

F. Each interior armrest shall contain a cup holder.

2.13 ACCESSORIES

A. Moveable Bases:

1. Manufacturer's standard steel bases to provide for mobility of seats in multiple quantities as shown on Drawings.

2. All components of the bases shall have rounded edges. Ends of components shall be ground smooth and finished to match.

3. No part of the base assembly shall extend beyond the footprint of the seat when the pan is in the lowered position.

B. Designated Aisle Access Standards: Manufacturer's ADA compliant tilt-up arm aisle standard in locations as shown on the Drawings. Standard shall include aisle light where indicated.

C. Seat and Row Identification System:

1. System shall utilize satin finish brass plates with etched characters.

2. Seat identification plates:
   a. Mount into vandal-resistant recess at front edge of seat pan, clearly viewable from above when seat pan is in folded position and secure with two rivets.
   b. Rectangular with black characters not less than 1 cm (3/8-inch) in height.
   c. Attachment hardware finish shall match plate faces.
3. Row identification plate
   a. Mount at center of end panel in routed recess for flush, non-snagging, finish. Locate plate to ensure that the aisle lighting system illuminates the plate.
   b. Round, 5 cm (2 inch) diameter, with black letters. Letters shall be at least 2.5 cm (1 inch) in height.
   c. Attachment hardware finish shall match plate faces.

2.14 SPARE PARTS

A. Provide a quantity of seat and back component parts equal to two percent but not less than one each of each component in each size of the total amount installed. All spare components are to be labeled for size, venue and component type.

B. Provide all fixed and removable seating units noted including removable seating units designed to fill all wheelchair locations.

C. Provide 20 yards of upholstery fabric from the same dye lot as the installed seats. Extra fabric shall be wrapped, labeled and turned over to owner at completion.

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Environmental Requirements: Do not install seating until space is enclosed and weatherproof, wet- work in space is complete and nominally dry, installation of finishes including painting is complete, other units of Work adjacent or overhead are complete, and ambient temperature and humidity conditions will be continuously maintained at values near those indicated for final occupancy.

3.2 EXAMINATION

A. Examine conditions and proceed with work when substrates are ready.

B. Examine substrates and conditions, with installer present, for compliance with requirements for construction tolerances, material properties as they affect anchors and fasteners, and location of junction boxes. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

Manufacturer shall engage a manufacturer-approved, locally based, experienced installer who regularly installs and services auditorium and theatre seating similar in kind, quality, and extent to that indicated for Project. A competent supervisor shall be maintained on this Project during the entire installation. A change of supervisor shall not be acceptable unless by written authorization of the COTR.

A. Seating Layout: Install seating to conform with Project Documentation in a manner that produces seating layouts with standards spaced laterally in each row so that end standards are in alignment from first to last row, regardless of whether aisles converge or are of constant width, and with backs and seats varied in width so that sightlines are optimized.

B. General: Comply with Manufacturer's printed installation instructions applicable to products and application indicated.

C. Locate all seats in locations indicated on approved shop drawings, with designed and required clearances, elevations, sight lines, aisles and aisle accessways.

D. Install standards in locations conforming to seating layout, with each standard attached to substrate by not less than two (2) anchoring devices of size and type required to produce chairs free from rock or instability under conditions of actual use.

E. Install chairs by mounting components to standards, or brackets mounted on standards, using manufacturer's recommended hardware and fasteners. Ensure that chairs in curved rows are installed at the specified radius, and verify that moving components operate smoothly and quietly.

F. Installation review for compliance will include, but shall not be limited to the following:

1. All end standards shall be plumb and shall be installed at a constant dimension from the aisle edge $\pm$.5 cm (1/4-inch) variation allowed within a seating section with no more than .25 cm (1/8-inch) variation allowed between adjacent rows.
2. All seat backs shall be aligned with a consistent back pitch angle. Allowable variation of not more than 0.25 degrees between adjacent seats and not more than 0.75 degrees across the length of a row.
3. Gaps between seat backs shall be constant with no more than 3.75 cm (1-1/2-inch) variation between adjacent seats and no more than 1 cm (1/2-inch) variation between the largest gap and smallest gap within a seating section.
4. Seat stagger shall be as shown in the drawings. Deviation will not be accepted without prior approval of the COTR and .
5. Seat pans shall all automatically rise to a consistent position without noise as outlined in Paragraph 2.2 of this Specification. Position variation of no more than .25 cm (1/8-inch) between adjacent seats and not more than .5 cm

(1/4-inch) within a row shall be allowed. Dimension shall be measured from the most projective portion of the seat pan to the front edge of the armrest.

6. Coordination with in-floor electrical and mechanical devices shall be as shown in Drawings. Deviation shall require prior approval from the COTR. Unless noted otherwise, all in-floor air grilles shall be centered between seat standards and shall not project past the edge of the seat pan in its stored position.
7. Seat and Row Identification plates shall be securely attached and free from scratches and blemishes. Design, location, font, and alignment shall be consistent throughout the project.
8. Unless otherwise notified in writing by the General Contractor, responsibility for the condition of the seat fabric and all other seat finishes shall be the responsibility of the seating manufacturer until substantial completion or review of the seating installation, whichever is later. Fabric and all other finishes shall be smooth, clean and unblemished.
9. All surfaces and edges shall be smooth to the touch and free of protrusions that will cause injury or damage to clothing.
10. Packaging and protective coverings shall be removed from the site and disposed of in accordance with jobsite protocol and mandated requirements.

3.4 ADJUSTING

A. Adjust self-rising seat mechanisms as required to ensure that seats in each row are aligned when in upright position.

B. Touch-up minor abrasions and imperfections in painted finishes with coating which matches factory-applied finish.

C. Replace upholstery which has been damaged in installation.

END OF SECTION

APPENDIX L

OCIO Appendices

- Appendix L1 – Cable Specifications
- Appendix L2 – Wire Closet Specifications

APPENDIX L1

Cable Specification– Copper

Project Type	Specification for Copper Cable	Connectors & Conduit
New Construction and Renovation (Major & Minor)	• *ANSI/EIA/TIA-568* standard for testing, length, plenum rating, bend radius • Cat 6 or 6A IEEE 802.3ab standard determined on a case by case basis	• Connectors for Cat6 cable will be EIA approved RJ-45 connectors. • No inline RJ-45 extenders will be used. • In the wire closet, all worksite cable running from the workstation to the closet will be terminated on EIA Cat6A approved patch panels –equipped with a lockable front panel, if deemed necessary by OCIO. • All non-plenum rated cable will be placed in conduit, or installed to local code and OFEO design specifications.

Mode	Applicable Specification for Fiber Cable		Connectors & Conduit
	New Construction	Renovation	
Multimode	*ANSI/EIA!TIA-568-B* standard for testing, length, plenum rating, bend radius 50/125 micron OM3	*ANSI/EIA!TIA-568-B* standard for testing, length, plenum rating, bend radius 50/125 micron OM3 Multimode fiber	• Unless otherwise specified it is recommended that SC type connectors be used for terminations and fiber distribution boxes and panels. Connectors should be unicam or polish type connectors. • All new fiber installation between distribution and access switches should be 50/125 micron OM3 • All termination and cross connect panels will be EIA approved. • All panels will be secured and lockable. • All fiber cable will be armored jacketed or installed in metal conduit, and all elbows and boxes will meet the ANSI/TIA569 standards for bend radius for the particular cable that is being installed. • All non-plenum rated cable will be placed in conduit, or installed to local code and OFEO design specifications.
Single mode	*ANSIJEIA!TIA 568-8* standard for testing, length, plenum rating, bend radius 8.3/125 micron OS1/0S2	*ANSI/EIA!TIA 568-B* standard for testing, length, plenum rating, bend radius 8.3/125 micron OS1/0S2 Singlemode fiber	

Cable Type	Specification		Connectors & Conduit
	New Construction	Renovation	
New multi purpose antenna systems for wireless	Cable specifications arn determined by the design.	Cable specifications are determined by the design.	Cable specifications are determined by the design.
Armored cable (outdoor or hazardous installations)	Shielded CAT6 or 6A*	Shielded CAT6 or 6A*	Shielded CAT6 or 6A*
Wireless Access Points - ISO/IEC TR 24704 Information Technology Customer Premises Cabling	Standard CAT 6 or 6A*	Standard CAT 6 or 6A*	Standard CAT6 or 6A*

* Determined on a case by case basis

APPENDIX L2: WIRE CLOSET SPECIFICATIONS

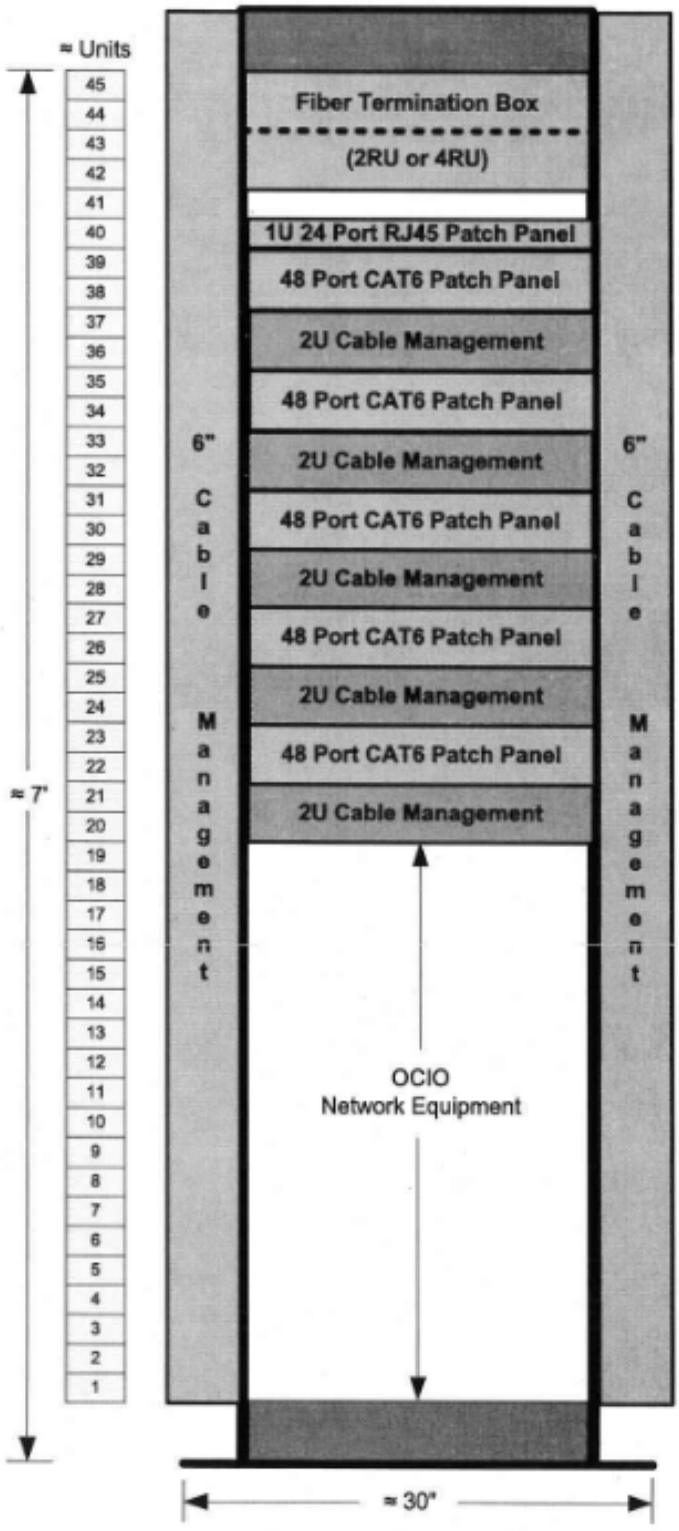
Closet	Requirements
Physical	• Minimum floor space of 10 feet by 8 feet. • Room/closet shall be secured with either a badge reader access (preferred) or key access. • The door to the room/closet should swing out to maximize usable space. • Walls shall be slab to slab with a 1 Hour fire rating or a 2 Hour fire rating if considered "Mission Critical." • Floors shall be anti-static or static dissipative tile. • No drop ceiling shall be installed. Minimum clear height without obstructions shall be 2.4m (8ft). • Sprinkler mains, plumbing pipes, and hvac ducts not servicing the Telecom Rooms shall not transit the Telecom Rooms.
Backer Board	• Must have wall mounted fire-rated plywood backer board. • Two walls should have 21mm (0.75 in.) A-C plywood 2.4m (8 ft.) high. Plywood shall be mounted 6" AFF and painted with 2 coats of fire retardant paint. Leave plywood fire stamps unpainted.
Environmental	• IT spaces must have environmental controls with no HVAC units in or above these spaces. • Telecom Room and Equipment Room shall follow ASHRAE Thermal Guidelines for Data Processing Environments. • Provide 20,000 BTU/hr cooling per rack. • Positive ventilation and air conditioning is required to remove the heat load generated by the equipment. • HVAC requirements to maintain temperature the same as adjacent office area. A positive pressure shall be maintained with a minimum of one air change per hour or per code. • Overhead HVAC units are not to be used in the IT closets. The preferred method is that these spaces have their own thermostat and be served by external HVAC units. • Lighting shall be a minimum of 500 lx (50 foot candles) and mounted 2.6m (8.5 ft.) above floor. • Standard work place lighting is required.

Closet	Requirements
	• One or more code-approved ground busbar(s) in each Telecom Room is required
Electrical	• Dedicated grounded electrical feeds. • Minimum of two dedicated 20 Amp, non-switched, duplex electrical outlet receptacles (5-20P); two dedicated 20 Amp, non-switched electrical outlets (L6-20); and one dedicated 30 Amp, non-switched, electrical outlet (L6-30); each on separate branch circuits. • Additional convenience duplex outlets placed at 1.8m (6 ft.) intervals around perimeter, 150mm (6 in.) above floor. • The manufacturer's installation site requirements guide for each device should be used to determine the NEMA outlet specification, and the voltage and current requirements. • When equipment has redundant power supplies, the electrical outlets/supplies for each power supply in the device should be on a separate dedicated electrical line. • Unless otherwise specified, electrical receptacles should not be installed on or above the IT racks. • The receptacles for IT equipment should be tied to emergency backup power systems.
Uninterruptible Supply (UPS)	• The UPS should be sized to support each piece of Power equipment located in the wire closet at full load for 30 minutes. • One UPS is used per electrical supply line. • When equipment has redundant power supplies, one power supply is connected directly to a dedicated electrical outlet and the other is connected to a UPS on a different dedicated electrical outlet.
Enclosures (e.g., cabinet)	• All equipment properly grounded according to code. • The upper part of any wall mounted equipment, racks, or box, cabinets shall not exceed 6' in height from the floor so that they can be safely managed without the use of ladders or other means necessary for elevated access. • All enclosures for cable terminations will comply with the applicable EIA standard for the type of cable being installed.

Closet	Requirements
	• All enclosures for communication equipment will meet EIA standards, as well as the device site requirements specified by the equipment manufacturer. • Enclosures will be attached to a ground bus bar in the closet. • If deemed necessary by OCIO, all communication fiber optic patch panels will be lockable and use the recommended Master Lock product # 15200 combination lock. The combination of the lock will be managed, changed, and maintained by OCIO. • 7 ft, 2-post open frame 19inch racks are the standard for mounting patch panels, fiber enclosures, and equipment. • In the MDF, provide 4-Post open frame racks for the mounting of equipment. • Rack elevations should follow the guidelines below: o Fiber enclosures should be situated at the top of the rack (2U to 4U depending on fiber quantities). o 2U RJ45 48-port patch panels should be installed below the fiber enclosure(s), beginning from the upper part of the rack and working down. o A single 1URJ45 24-port patch panel should be installed immediately above the first 2U RJ45 panel for the termination of a 25 pair cable for analog lines. o 2U horizontal cable managers should be installed below the fiber enclosure, between each RJ45 panel, and one below the last panel. o Each side rail should be equipped with vertical cable managers (6" wide mini" 1um). Adjacent racks can share a single vertical wire manager. • See Appendix C, Standard Rack Guideline Diagram, for more information.

Closet	Requirements
Labelling of copper ports & fiber links	• All copper pairs will be labeled with the wireclosetroom#-room#-[a-z]. • All fiber links will be labeled with wireclosetroom#-[01-99)-wireclosetroom#-[01-99]

Figure 2 - Wire Closet Rack Configuration



APPENDIX M

CPTED Narratives

NOTE: This appendix contains excerpts from OPS's Security Design Criteria document relating to Crime Prevention Through Environmental Design (CPTED) concepts. The security planning concepts described herein should be considered early in the design process.

2. CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

The Smithsonian Institution advocates the integration of Crime Prevention Through Environmental Design (CPTED) principals and strategies in their site planning and facility designs. CPTED principals and techniques seek to create a physical and operational environment which discourages criminal or other wrongdoer activity by incorporating territorial cues, natural access controls, and natural surveillance.

2.1. CRIME PREVENTION MODEL

The model for crime prevention through environmental design is based on the theory that action must be taken to counter crime or wrongdoer activity before it occurs. The critical element in this model is the environmental-engineering component. It provides both direct and indirect controls against criminal activity by reducing the opportunity for crime through science and technology and the use of various urban planning and design techniques. The model explains what environmental engineering is and how it supports crime or wrongdoer prevention. With this information, the design team may be in a better position to understand and respond to questions and discussions on how site and facility planning can have an impact on criminal or other wrongdoer elements.

2.2. THE ENVIRONMENTAL INFLUENCE ON CRIMINAL BEHAVIOR

The basic theory that supports crime prevention through environmental design is that urban environments can influence criminal behavior in two ways. First, the physical surroundings in which people live have an effect on each individual. These physical characteristics include noise, pollution, overcrowding, and the existence and unmonitored spreading of refuse and other unsightly waste. The second element which must be dealt with in the environmental-engineering formula concerns the social characteristics of the site that provide individuals with social relationships to which they must respond. Characteristics such as alienation, loneliness, anxiety, and dehumanization are seen as keys to criminal behavior.

In terms of these environmental characteristics, buildings are all too often constructed to be dangerous, with corridors and passageways hidden from public view. Elevators, basements, storage, coat rooms and janitor closets are also laden with danger due to their design.

With regard to altering the social characteristics of the area (museum, offices, or multi-tenant facilities) and the relationship to wrongdoer behavior, it should be recognized that behavior is future-oriented, not

past-oriented. A person steals so that they can have a car or money in the future, not because in the past he experienced psychic trauma, a broken home, poverty, or delinquent associates. Criminal behavior can be explained directly in terms of the consequences of behavior and in terms of non-criminal variables such as poverty, race, or social class. Criminal behavior is viewed as a problem to be dealt with and not a symptom of other problems (such as poverty, mental conflict, class conflict, unemployment, or under education). To change criminal behavior, it must be dealt with directly by removing the environmental reinforcement which maintains the behavior. The approach advocated is to change the environment to which the individual responds.

2.3. TERRITORIALITY

Historically, a building on its own piece of land and somewhat isolated from its neighboring buildings (but often by as little as a few feet) has been considered to be the building's territory. The building sits on a piece of land buffered from neighbors and the public street by intervening grounds. At times, symbolic shrubs or fences reinforce a boundary. The positioning of lights to look out on the grounds and good natural surveillance act to reinforce the territorial claim.

A number of concepts have been identified which may be used in new construction or renovation projects. These mechanisms encourage the building staff and other tenants to identify more with the ground or area around their immediate site and to assume responsibility for its protection.

2.4. NATURAL SURVEILLANCE

Experience has shown the ability to observe criminal or other wrongdoer activity may not be adequate to stimulate an observer to respond with assistance to the person or property being victimized. The decision to act depends on the presence of motivational conditions, including:

- The degree to which the observer has developed a sense of personal and property (ownership like) rights which may or will be violated by the criminal act.
- The degree to which the observer feels the event is within their area of influence.
- The observer's ability to clearly identify whether the act is unusual for the particular area.

- The observer's identification with either the victim or the property being vandalized.
- The degree to which the observer believes he/she can effectively alter the course of events they are observing.

2.5. DEFENSIBLE SPACE

Defensible space is a term for a range of combined security measures which brings an environment more under the control of its owners, operators, staff and/or residents. A defensible space is a building environment which can be used by inhabitants for the enhancement of their lives while providing security for themselves, coworkers, and visitors. The physical concepts suggested to create safety and improve upkeep (as part of the defensible-space concept) are self-help tools wherein design catalyzes the natural impulses of staff rather than forcing them to surrender their shared social responsibilities to any formal authority.

2.6. ACTION PLANNING FOR CRIME PREVENTION THROUGH PHYSICAL PLANNING

Many organization's security and police activities have become involved in the physical-planning process and have achieved notable results from their work. This involvement includes evaluating the accessibility of buildings and locations of security patrols and posts; pedestrian and vehicle traffic flow; and off-street parking provisions; and the layout and adjacencies of access roads, garden areas, utility areas (e.g., generators, transformers, communications hubs, boilers and chillers), childcare facilities, playgrounds, common greens, fences, and entrances. There are a number of concerns to SI's Office of Protection Services that should be carefully examined from a security perspective. Some examples of specific concerns:

- Building setbacks (front, side, and rear). Includes reduction or elimination of crevasses around building, interior spaces, and landscaping.
- Wall construction, interior and exterior (industrial, commercial, and residential).
- Door construction, building setback and security (industrial, commercial, and residential) including carports, garages, and sliding-glass doors.
- Windows and skylights, building setback, window height (from ground), show-window displays, and the type of frame or pane.
- Stairs (stairwells and staircases).
- Utility boxes.

- Fences, walls, hedges, screens, building setback, building height, and louvers.
- Parking (public and private).
- Lighting (industrial, commercial, and residential) for walkways, entrances, and streets.
- Streets, sidewalks, and walkways (locations, slopes, curvature, grades, and the length of a block). When practical eliminate crevasses or hiding areas by smoothing curves and slopes away from walkways.
- Alleys and access ways (well lighted and clear of obstacles).
- Visibility of valuables (people, safes, vehicles, cash registers, and personal property).
- Signs (street signs and signals, no trespassing signs, traffic signs and signals, and advertising signs).
- Accessibility; approach, entrance, and exit (pedestrian, vehicular, services, residential, commercial, and industrial).
- Public utilities and easements (gas, water, telephone, and electrical).
- Public areas and facilities (public restrooms, parks, bus stops and shelters, playgrounds, recreation halls, and so forth).
- Trees and shrubbery along the boulevard (types, heights, and locations).

2.7. DESIGN TEAM GUIDANCE

The Smithsonian Institution encourages design teams to explore these CPTED concepts and principles in their projects. To encourage a multi-disciplinary approach to CPTED, 'discipline specific strategies' are introduced in the following chapters to assist designers in addressing security concerns. These strategies help prepare the design team in understanding CPTED and support its benefits in SI facility designs.

3. SITE LAYOUT

This section discusses site-level considerations for development. The intent of this guidance is to provide concepts for integrating land use planning, landscape architecture (vegetation, landforms, and water), site planning, and other strategies to mitigate the design basis threats as identified by OPS via the risk assessment. Integrating security requirements into a larger, more comprehensive

approach necessitates achieving a balance among many objectives such as reducing risk; facilitating proper building function; aesthetics and matching architecture; hardening of physical structures beyond required building codes and standards; and maximizing the use of non-structural systems.

The design team must work closely with building owners and operators to ensure the optimal balance of all the above considerations is achieved; thus, coordination within the design team is critical. Many asset protection objectives can be achieved during the early stages of the design process when mitigation is the least costly and most easily implemented. Planners, architects, and landscape designers play an important role in identifying and implementing crucial asset protection measures while considering land use; site selection; the orientation of buildings on the site; and the integration of vehicle access control points, physical barriers, landscaping, parking, and the protection of utilities to mitigate threats.

This chapter is broken into three (3) basic sections which are *Best Practices*, *General Criteria*, and *Space Specific Criteria*. Best Practices are encouraged design considerations, but some or all considerations may be impractical for the project. General Criteria and Space Specific Criteria are SI requirements which must be met in the project design.

3.1. PRINCIPAL BEST PRACTICES

The design team is encouraged to utilize the following best practices when determining the appropriate and cost-effective measures for incorporation into the building and site design.

- Site Design

  Because the economics of development dictate recovering the largest possible portion of square footage within most urban and rural sites, security concerns should be evaluated carefully. Conflicts sometimes arise between security site design and conventional site design. To maximize safety, security, and sustainability; designers should implement a holistic approach to site design which integrates form and function to achieve a balance among the various design elements and objectives. Even if resources are limited, significant value can be added to a project by integrating security considerations into the more traditional design tasks in such a way that they complement, rather than compete with, the other elements.

The overall layout of a site (e.g. the placement and form of its buildings,

infrastructures, and amenities) is the starting point for this integration. Choices made during this stage of the design process will steer decision-making for the other elements of the site. A number of aspects of site layout and building type present security considerations and are discussed below.

a. Building Placement

The ideal building placement from a security standpoint incorporates the three basic CPTED principles of Territorial Reinforcement, Natural Surveillance and Defensible Space. Some general guidelines for incorporating each element are discussed below.

i. Territorial Reinforcement

a) Site Design

If the grounds around a set of buildings can be directly identified with a particular building where building occupants play a role in protecting it, then strangers are usually recognized and their activities come under observation and immediate questioning. Even in public areas like museums, strangers with wrongdoer intent are noticed, questioned, and placed under surveillance (either by staff or by security personnel).

The placement of the building should provide territorial reinforcement of the ownership by creating a distinction between the public domain and that of the building. This can be accomplished through the use of clear space to separate the two entities. Additional strategies for site design may be found in the U.S. General Services Administration, Public Buildings Service, *The Site Security Design Guide*.

b) Street Design

Research has shown that the placement, enclosure, or routing of roadways and traffic can change the nature of a particular area and reduce wrongdoer activity. For example, a particular portion of a street might be closed to vehicular traffic, and streetscape equipment (seats, lighting, planters, etc.) may be added. This same approached is observed in the *National Capital Planning Commission (NCPC), The National Capital Urban Design & Security Plan*.

In a number of areas where this technique has been utilized, it has been found that most people know or at least recognize other people up and down the block and suspicious activity on the street is identified. Similar approaches which involve rerouting traffic, using one-way streets, or blocking off streets has reduced wrongdoer activity.

c) Symbolic Barriers

The types of barriers that planners may use when laying out an area include open gateways, light standards, low walls, and plantings. Both physical and symbolic barriers serve the same purpose—to inform an individual that he/she is passing from a public to private space. Symbolic barriers identified by people as boundary lines serve as defining areas of comparative safety. Many places warrant the use of symbolic barriers, including transition points between a public street and the semi-public grounds of a building; an area between a building's lobby and its corridors; or hallways on particular floors of a building.

ii. Natural Surveillance

That same clear space aides the natural surveillance, increasing the risk to individuals desiring surreptitious entry to the facility. The building should be oriented in order to eliminate or at least minimize areas which cannot be seen by a casual observer.

iii. Defensible Space

The clear zone also provides defensible space by providing the opportunity to have several layers of security before entering the building. For instance, defining the site through territorial reinforcement is one layer, the natural surveillance is a second layer, and the building façade is yet another layer. The clear space also provides standoff distance which will be discussed further.

Research has revealed investigative techniques that may be used to modify existing building areas to make them more secure. The following methods may require alteration or adaptation to the particular situation on your design project:

- Widening major pathways and using colored decorative paving.

- Differentiating small private areas (gardens, lawns) outside each building from the public path with low, symbolic walls.
- Adding public-seating areas in the center of public paths. Seating would need to be far enough from buildings to eliminate conflicts of use but close enough to be easily seen from building windows or security personnel.
- Designing play areas as an integral part of open space.
- Adding new and decorative lighting to highlight various paths and recreation areas at night and extending the occupants' surveillance potential and feeling of security.
- Adding seats and path networks to recreational facilities where large, central court areas exist. This increases the interest and usability of the areas.
- Redesigning parking and play areas around buildings to create the illusion the buildings are grouped where natural surveillance opportunities exist.

b. Building Orientation

The orientation of a building can have a significant impact on its performance, not only in terms of energy efficiency, but also in the ability to protect occupants. For this document, the term "orientation" refers only to the building's spatial relationship to the site. A structure's orientation relative to its surroundings defines its relationship to that area. The physical positioning of a building relative to its surroundings may seem subtle, but can be a greater determinant of this intangible quality than exterior aesthetics.

For example, the proximity of a vulnerable façade to a parking area, street, adjacent site, or other area which is accessible to vehicles and/or difficult to observe can greatly contribute to its vulnerability. A strong, blank wall with no glazing will help to protect the people, property, and operations within from a blast, but the lack of windows limits the opportunities for natural surveillance of activities outside. Designers should consider such trade-offs early in the design process, in an effort to determine an acceptable level of risk.

- <u>Standoff Distance</u>

Standoff distance is the distance between an asset and a threat.

Blast energy decreases as the inverse of the cube of the distance from the position of the explosion, therefore every additional increment of distance provides increasingly more protection. There is no ideal standoff distance; it is determined by the type of threat, the type of construction, and the desired level of protection.

The primary design strategy is to keep threats away from inhabited buildings. Although sufficient standoff distance is not always possible in conventional construction, maximizing the distance may be the most cost- effective solution. Maximizing standoff distance also ensures there is opportunity in the future to upgrade buildings to meet increased threats or to accommodate higher levels of protection. Stand-off distance must be coupled with appropriate building hardening to provide the necessary level of protection to assets.

One method to attain the appropriate level of protection and ensure stand- off distance between assets and potential threats is with the creation of controlled access zones. These zones attempt to limit access to the area immediately surrounding a building. Although a controlled access zone is one of the best methods of providing standoff, such issues as site limitations, building placement, and property line restrictions do not always allow this zone to be created.

The standoff distance can be separated into two distinct zones known as the exclusive zone and the nonexclusive zone. The standoff distance for each zone should be determined based upon the guidance in the *ISC Security Design Criteria* for the specific building and the design basis threats as identified by OPS.

- Circulation

The movement of people and materials into, through, and out of a facility is determined by the design of its circulation system. This system should be designed to maximize efficiency while minimizing conflicts between vehicles and pedestrians. Designers should begin with an understanding of the site's transportation requirements based on an analysis of how the facility will be utilized. This includes the parking volume necessary, pedestrian patterns and the modes of transportation they will use, and the number and types of access points required. Several aspects of transportation planning can impact security and are discussed below.

a. Parking

There are three primary types of parking facilities, all of which present security trade-offs. Surface lots can be designed to keep vehicles away from buildings, but they consume large amounts of land. They can also be hazardous for pedestrians if dedicated pedestrian pathways are not provided. In contrast, on-street parking is often convenient for users but this type of parking may provide little or no setback. Finally, garage structures can provide revenue and be convenient for users, but they may require structural measures to ensure blast resistance as well as crime prevention measures to prevent street crime. Although the cost of land suggests the construction of a garage below a building may be the most economically viable approach for many developments, they can be highly vulnerable to vehicle-borne weapons, endangering the building above. If garages must be used, additional security measures will be necessary to ensure safety.

Parking restrictions can help keep potential threats away from a building. In urban settings, however, curbside or underground parking is often necessary and sometimes difficult to control. Mitigating the risks associated with parking requires creative design measures, including parking restrictions, perimeter buffer zones, barriers, structural hardening, and other architectural and engineering solutions. Operational measures may also be necessary to inspect or screen vehicles entering parking garages. Reference the OPS provided risk assessment to determine if vehicle delivered bombs are a concern for the facility under design. If so, users must reference the *ISC Security Design Criteria* for guidance and requirements for parking, circulation, and other site access considerations.

b. Where operable bollards are used a speed bump at the top of the bollard base is preferable. Signage

Way finding is an important function of design which illustrates the importance of coordination among practitioners and community planning, public works, transportation, law enforcement, and fire-rescue organizations. The ability of users to navigate an unfamiliar environment is important for its success on a day-to-day basis, but will become critical in an emergency situation. In addition to overt prompts such as landmarks, architectural elements, and clear, consistent signage and maps, users will subconsciously rely on cues from their surroundings to help them select a path to safety. Similarly, emergency responders will depend in part on these design elements

in order to navigate the scene.

Signs are an important element of security. Confusion over site circulation, parking, and entrance locations can contribute to a loss of site security. Signs should be provided off site and at entrances. There should be on-site directional, parking, and cautionary signs for visitors, employees, service vehicles, and pedestrians. Unless required, signs should not identify sensitive areas.

- Lighting

a. General

Lighting shall provide for safety and security without compromising the quality of the site, the environment (including neighboring properties), or the architectural character of the buildings. The following are the basic lighting design criteria.

i. Aesthetic: The site lighting shall provide desired illumination and enhancement of trees, landscaping, and buildings without providing dark shadowy areas compromising safety and security.

ii. Pathways: Pedestrian and bicycle pathways and walks, including bike racks, gates, and other features shall be illuminated in support of video and visual surveillance while providing for safety without objectionable spill onto adjacent areas on and off site.

- Infrastructures and Lifelines

Providing power, gas, water, wastewater, and communications services is one of the most basic requirements of any development. At the site scale, all critical lifelines should have at least one layer of redundancy, or backup. By eliminating single-point vulnerabilities, designers reduce the chance that service will be interrupted either intentionally or unintentionally. It is important to note that collocating a backup lifeline with its primary lifeline does not eliminate single-point vulnerability; only physical separation can substantially increase the likelihood of continuity of service. Designers should be aware that this could create the need for each type of infrastructure lifeline to cross the site perimeter at multiple locations, potentially complicating the process of managing utility easements and rights- of-way. Additionally, all controls, interconnections, exposed lines, and other vulnerable elements of infrastructure systems should be protected from access and

exploitation by surveillance and/or physical countermeasures.

To minimize the possibility of such hazards, apply the following measures:

- Where possible, provide underground, concealed, and protected utilities.
- Provide redundant utility systems to support site security, life safety, and rescue functions.
- Prepare vulnerability assessments for all utility services to the site, including all utility lines, storm sewers, gas transmission lines, electricity transmission lines, and other utilities which may cross the site perimeter.
- Locate petroleum, oil, and lubricant storage tanks and operations buildings at lower elevations from all other buildings. Locate fuel storage tanks at least 30.5 m (100 ft) from buildings.
- Locate the main fuel storage away from loading docks, entrances, and parking. Access should be restricted and protected (e.g., locks on caps and seals).
- Provide utility systems with redundant or loop service, particularly in the case of electrical systems. Where more than one source or service is not currently available, provisions should be made for future connections. In the interim, consider "quick connects" at the building for portable backup systems.
- Place trash receptacles as far away from the building as possible; trash receptacles should not be placed within 9 m (30 ft) of a building.
- Locate utility systems at least 15.25 m (50 ft) from loading docks, front entrances, and parking areas.
- Manhole covers 25.4 cm (10 in) or more in diameter must be secured to prevent unauthorized opening. They may be secured with locks and hasps, by welding them shut, or by bolting them to their frame. Ensure hasps, locks, and bolts are made of materials that resist corrosion. Keyed bolts (which make removal by unauthorized personnel more difficult) are also available.

- Landscape and Urban Design

For the purposes of this document, these two domains are virtually

overlapping and will therefore be addressed together.

a. Landscape Design.

The implications of security for landscape design affect everything from plant species and building material selection to landform construction and way finding. Elements such as landforms, water features, and vegetation are among the building blocks of attractive and welcoming spaces, and they can also be powerful tools for enhancing security. These features can be used not only to define or designate a space, but also to deter or prevent hostile surveillance and unauthorized access. However, landscaping can also have detrimental impacts for safety and security, and practitioners should consider the unique requirements of the project to ensure the landscape design elements they choose will be appropriate and effective.

With careful selection, placement, and maintenance, landscape elements can provide visual screening which protects sensitive operations, gathering areas, and other activities from surveillance without creating concealment for covert activity. However, dense vegetation in close proximity to a building can screen illicit activity and should be avoided. In clear zones, vegetation should be selected and maintained with eliminating concealment opportunities in mind. Similarly, measures to screen visually detractive components such as transformers, trash compactors, and condensing units should be designed to minimize concealment opportunities for people and weapons. When developing landscape designs, ensure the long-term growth plan is evaluated to ensure vegetation will not interfere with natural surveillance, create hiding spots, or interfere with CCTV cameras and lighting.

b. Urban Design

Through urban design, practitioners seek to create vibrant, inviting, and functional places for people to live, work, and play. To protect people, property, and operations, and to reduce liability, security should be considered a necessary aspect of these characteristics. If people do not feel safe, they will not use a place and, if a place is not used as intended, it will fail to fulfill its purpose. This failure can, in turn, result in a net loss to the community in terms of social, economic, and environmental sustainability.

Numerous urban design elements present opportunities to provide security. The scale of the streetscape should be appropriate to its primary users, and it can be manipulated to increase the comfort level of desired users while creating a less inviting atmosphere for users with malicious intent. However, even at the pedestrian scale, certain operational requirements must be accommodated. For example, although efficient pedestrian and vehicle circulation systems are important for day-to-day living, they are also critical for emergency response, evacuation, and egress. Furthermore, despite an emphasis on downsizing the scale of the streetscape, it is critical to maintain the maximum stand-off distance possible between vehicles and structures.

At the site perimeter, walls and fences used for space definition may be hardened to resist the impact of an explosive-laden truck; however, planters, bollards, or decorative boulders could accomplish the same objective in a much more aesthetically pleasing manner. Such an approach also creates permeability, which would allow pedestrians and cyclists to move more easily through the space.

Similarly, street furniture (e.g., mailboxes, bus stop shelters, light poles, works of art, street trees, planters, bicycle racks, seating, newspaper boxes, kiosks, and trash receptacles) can be used to enhance security. For example, bus stop shelters can be designed to allow for easy surveillance and detection of suspicious activity and objects. Hardened versions of everyday items, such as light poles, planters, benches, street trees (of appropriate size and type), and even water fountains can serve as vehicle barriers. These items maintain stand-off while creating a line of protection that is virtually transparent and highly permeable at the pedestrian scale. Note that in-ground installation of bollards, fences, and any other anti-ram measures should be preceded by an assessment of soil conditions and underground utilities in the immediate vicinity.

A main challenge for the design community is to reach the desired level of protection without turning the building or facility into a bunker or fortress. In other words, they are required to incorporate subtle and aesthetically pleasing security measures when involved in urban design projects. Below are some rules of thumb which should be taken into consideration when designing an urban landscape with a security component:

- Security measures must not impede access to public entrances or pedestrian flow on adjacent sidewalks.
- Landscape elements in the form of grassed plinths, trees, plantings, fountains, and pools are appropriate, but must be designed as integral parts of a building and its setting as much as possible.
- Miscellaneous decorative elements such as flag poles, fountains, pools, gardens, and similar features may be located within an access path to slow movement or restrict access.
- Trees planted along the inside edge of a public sidewalk and adjacent to pedestrian and vehicular paths can serve dual aesthetic and barrier purposes.
- The design of bollards, fences, light posts, and other streetscape and landscape elements should form an urban ensemble which helps to create a sense of unity and character.
- Security devices must be designed and located to establish consistent, rhythmic patterns along the street, particularly where a number of elements are used in combination to reduce visual street clutter.

3.2. GENERAL CRITERIA (MINIMUM REQUIREMENTS)

- Existing Facilities

  None

- New Construction / Major Modernization

  Site Layout requirements are based on the *ISC Security Design Criteria* and the OPS project specific risk assessment.

3.3. SPACE SPECIFIC CRITERIA (MINIMUM REQUIREMENTS SEE APPENDIX A)

None.

4. ARCHITECTURE

A great deal can be done architecturally to mitigate security risks to a facility or site. These measures often cost nothing or very little if implemented early in

the design process. Architectural considerations include building layout and configuration, space design, and building detailing.

This chapter is broken into three (3) basic sections which are *Best Practices*, *General Criteria*, and *Space Specific Criteria*. Best Practices are encouraged design considerations, but some or all considerations may be impractical for the project. General Criteria and Space Specific Criteria are SI requirements which must be met in the project design.

4.1. PRINCIPAL BEST PRACTICES

The design team is encouraged to utilize the following best practices when determining the appropriate and cost-effective measures for incorporation into the building design.

- CPTED - Territoriality

a. Interior Design

Although economics and operational issues may sometimes alter this practice, a building's interior spaces may be designed for specific groupings of security layers to discourage wrongdoer activity and keep wrongdoers from vital areas. These factors may cause the occupants to develop a concern for the space immediately adjacent to their office or area. For example, on each floor of a museum, two or three offices or collection areas may share a common corridor area. The office doors would be grouped around that common corridor, and access to elevators or stairs might be screened by a glazed partition. The net effect would be the floor's occupants would adopt the corridor as a collective extension of their office (select staff only space) and therefore take an increased interest in the activities taking place there, particularly when accessed by a stranger.

b. Facilities and Amenities

The location of particular facilities (such as employee lounge, employee courtyards, daycare, playgrounds, and sitting areas) will tend to give an area a high intensity of use and support the idea of territoriality. The presence of staff involved in various activities allows for casual surveillance by concerned staff and screens out possible intruders.

- CPTED – Natural Surveillance

A number of concepts have been identified which can be used to design the grounds and internal areas around offices, museums, and other areas to facilitate natural monitoring of activities taking place. By providing opportunities for surveillance through the positioning of windows in relation to stairs, corridors, or outside areas, continual natural observation will be maintained and crime will be deterred. If such steps are taken, the security of observed areas will be understood by the potential wrongdoer, making them reluctant to commit a crime at that location.

The first of these natural surveillance concepts involves the positioning of service areas and access paths leading to buildings to facilitate surveillance by staff and security. For example, buildings might be designed so their entries face and are within 15.25 m (50 ft) of a street, so well-lit paths lead to the front door or lobby, and the lobby is arranged to afford good visibility from the street. Other related steps focus on the strategic placement of windows, fire stairwells, lobby lights, trash receptacles, and mailboxes so they can be easily viewed from the street. Elevator waiting areas on each floor can also be designed so they can be seen from the street level. If steps such as these are taken, building occupants will be more likely to become involved with protecting the facility.

A second technique which may be used to increase surveillance is to design facilities so people within them will naturally view commonly used paths, entries, and play and seating areas during their normal activities. This concept also focuses on the strategic placement of windows, desks, lighting, and open areas so natural surveillance by building occupants is improved.

Another concept involves the subdivision of building areas into small, recognizable, and identifiable groupings which improve visual surveillance possibilities. Research has shown that in office areas where the surveillance of a neighbor's office activities was possible, occupants were found to be very familiar with everyone's comings and goings. The overall effect was to cement collective identity and responsibility through social pressure.

- <u>Space Planning & Design</u>

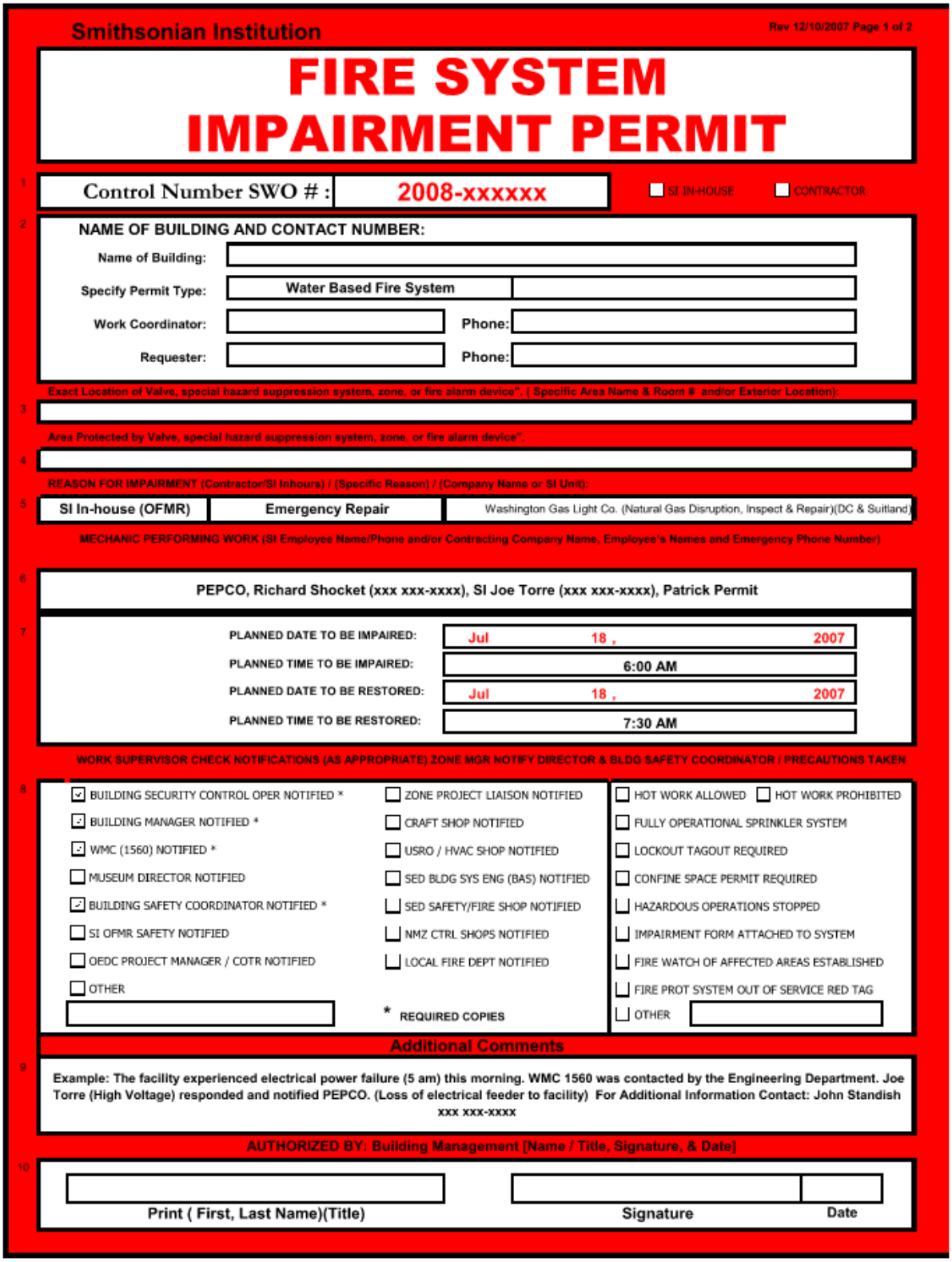
  a. The protection of the building interior can be divided into two categories: functional layout and structural layout. In terms of

functional layout, public areas such as the lobby, loading dock, mail room, garage, and retail areas need to be separated from the more secured areas of the facility. This can be done by creating internal “hard lines” or buffer zones, using secondary stairwells, elevator

APPENDIX N

Fire System Impairment Permit

APPENDIX N- FIRE SYSTEM IMPAIRMENT PERMIT



Smithsonian Institution

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FIRE SYSTEM IMPAIRMENT PERMIT

1 Control Number SWO # : 2008-xxxxxx ☐ SI IN-HOUSE ☐ CONTRACTOR

2 NAME OF BUILDING AND CONTACT NUMBER:

Name of Building:

Specify Permit Type: Water Based Fire System

Work Coordinator: Phone:

Requester: Phone:

3 Exact Location of Valve, special hazard suppression system, zone, or fire alarm device". (Specific Area Name & Room # and/or Exterior Location):

4 Area Protected by Valve, special hazard suppression system, zone, or fire alarm device".

5 REASON FOR IMPAIRMENT (Contractor/SI Inhours) / (Specific Reason) / (Company Name or SI Unit):

SI In-house (OFMR) | Emergency Repair | Washington Gas Light Co. (Natural Gas Disruption, Inspect & Repair)(DC & Suitland)

6 MECHANIC PERFORMING WORK (SI Employee Name/Phone and/or Contracting Company Name, Employee's Names and Emergency Phone Number)

PEPCO, Richard Shocket (xxx xxx-xxxx), SI Joe Torre (xxx xxx-xxxx), Patrick Permit

7

PLANNED DATE TO BE IMPAIRED:	Jul 18 , 2007
PLANNED TIME TO BE IMPAIRED:	6:00 AM
PLANNED DATE TO BE RESTORED:	Jul 18 , 2007
PLANNED TIME TO BE RESTORED:	7:30 AM

8 WORK SUPERVISOR CHECK NOTIFICATIONS (AS APPROPRIATE) ZONE MGR NOTIFY DIRECTOR & BLDG SAFETY COORDINATOR / PRECAUTIONS TAKEN

☑ BUILDING SECURITY CONTROL OPER NOTIFIED *	☐ ZONE PROJECT LIAISON NOTIFIED	☐ HOT WORK ALLOWED ☐ HOT WORK PROHIBITED
☑ BUILDING MANAGER NOTIFIED *	☐ CRAFT SHOP NOTIFIED	☐ FULLY OPERATIONAL SPRINKLER SYSTEM
☑ WMC (1560) NOTIFIED *	☐ USRO / HVAC SHOP NOTIFIED	☐ LOCKOUT TAGOUT REQUIRED
☐ MUSEUM DIRECTOR NOTIFIED	☐ SED BLDG SYS ENG (BAS) NOTIFIED	☐ CONFINE SPACE PERMIT REQUIRED
☑ BUILDING SAFETY COORDINATOR NOTIFIED *	☐ SED SAFETY/FIRE SHOP NOTIFIED	☐ HAZARDOUS OPERATIONS STOPPED
☐ SI OFMR SAFETY NOTIFIED	☐ NMZ CTRL SHOPS NOTIFIED	☐ IMPAIRMENT FORM ATTACHED TO SYSTEM
☐ OEDC PROJECT MANAGER / COTR NOTIFIED	☐ LOCAL FIRE DEPT NOTIFIED	☐ FIRE WATCH OF AFFECTED AREAS ESTABLISHED
☐ OTHER		☐ FIRE PROT SYSTEM OUT OF SERVICE RED TAG
	* REQUIRED COPIES	☐ OTHER

Additional Comments

9 Example: The facility experienced electrical power failure (5 am) this morning. WMC 1560 was contacted by the Engineering Department. Joe Torre (High Voltage) responded and notified PEPCO. (Loss of electrical feeder to facility) For Additional Information Contact: John Standish xxx xxx-xxxx

AUTHORIZED BY: Building Management [Name / Title, Signature, & Date]

10 Print (First, Last Name)(Title) | Signature | Date

FIRE SYSTEM IMPAIRMENT PERMIT FORM

GENERAL INSTRUCTION

Summary:
The Fire System Impairment Permit Form is to be used whenever maintenance, repairs, modifications or upgrades cause fire detection / alarm systems, life safety systems, or fire suppression systems within the SI Facilities to be out of service. All work must be authorized and approved through the Building Manager. Using this form should help prevent miss communication and assure continuity of work among various shops and departments within the Office of Facility Engineering and Operation (OFEO). The Work Supervisor / Leader are responsible for ensuring all codes and regulations are followed during fire/life safety system repairs.

The Building Manager shall inspect the work area prior to granting a permit. The Building Manager will verify and sign off on the permit. The permit is void unless copies of the fire system impairment permit have been posted and properly distributed to the "Fire System Impairment" Outlook user group (including Building Management, and Work Management Center (WMC)) by the Building Manager. Upon notification, the security office is to immediately notify the building control room operator. The Work Supervisor will return the original copy of the permit back to the Building Manager. The Building Management Office shall retain the original permit for official record.

Should fire system impairment directly impact the ability of the local fire department to perform tactical fire fighting operations, the Building Manager shall notify the fire department of the impairment. Incidents requiring fire department notification may include impairment of water storage tanks serving hydrants, closure of main sprinkler control valves, shut down of mains feeding yard hydrants or entire buildings.

Instructions:

1. Tracking Control # / Control Number SWO# – Select the appropriate control number and enter the tracking number. The Office of Facility Maintenance & Reliability (OFMR) group will use an SWO for the tracking number. The tracking number will be used for a reference to work which allows us to pull historical records for labor and material cost. All individuals in OFMR working on this permit should use the same number.

SI In-House and Contractor – check either or both if work involves in-house and outside contract work.

2. Name of Building – select from the drop down list the location of work or type in the building name.

- Specify Type of Permit – use the drop down to select.
- Work Coordinator & Phone # – specify the individual who will be responsible for coordinating work. Provide a phone number xxx xxx-xxxx. The Work Co-Coordinator will ensure that this permit is posted and copies are sent to appropriate shops and/or departments.
- Requester & Phone # – use this block for the requester's name. Example: Work request may come from Building Management, Safety Office and / or the Office of Engineering, Design and Construction.

3. Exact Location of the Valve/Zone – enter the valve location and identification number. Copy of this permit will be posted at the valve location at a visible site.

4. Area Protected by Valve - provide some detail of the zones and/or areas affected by this work.

5. Reason for Impairment – select from the drop down list the proper reason for impairment.

6. Mechanic Performing Work (SI Employee Name/Phone and/or Contract Company Name, Employee's Names and Emergency Phone #)

7. Planned Dates and Time (Impaired & Restored) – use the drop downs to select the dates and times.

8. Notification - Precautions Taken (check as appropriate) – use the list and check those that are appropriate. The Work Supervisor / Leader will provide notification to the Building Security Control Operator, Building Management, and Work Management Center (WMC) by providing a copy of the permit prior to any work other than extreme emergencies.

9. Additional Comments – use this block to provide more specific information.

10. Authorized By – The Permit Authorized Individual (PAI) shall provide last, first name (print), sign and date.

Reference Attachments B-2 and B-5 to Ch. 36 (Fire Protection) of the OSHEM Safety Manual, which provide specific procedures to be followed when impairing water based and fire alarm/special hazard systems.

APPENDIX O

Laboratory Design Standards

APPENDIX O- LABORATORY DESIGN STANDARDS

1. Regulations, Standards and References

   a. Regulations:
      i. Virginia Code of Regulations, Ventilation requirements for laboratory type hood operations
      ii. Virginia Code of Regulations, Carcinogens
      iii. Maryland Code of Regulations, Ventilation requirements for laboratory type hood operations
      iv. Maryland Code of Regulations, Carcinogens
      v. New York Code of Regulations Ventilation requirements for laboratory type hood operations
      vi. New York Code of Regulations, Carcinogens
      vii. CCR Title 8 Section 5154.1(e)(7)
      viii. SCCo Toxic Gas Ordinance No. NS-517.44
      ix. Code of Federal Regulations (CFR) 10, Parts 20 and 35
      x. Code of Federal Regulations (CFR) 1910.106 page 144,
      xi. OSHA 2206, Nov 7, 1987 (OSHA, 1987)
      xii. National Fire Protection Association ("NFPA") Handbook 45
      xiii. Standard on Fire Protection for Laboratories Using Chemicals
      xiv. National Fire Protection Association ("NFPA") 56C
      xv. Standard for laboratories in health-related institutions, Chapter 3-3.5: Fume Hoods
      xvi. National Fire Protection Association (NFPA) Handbook 99
      xvii. Standard for Health Care Facilities
      xviii. 29 CFR 1910.1450 "Occupational Exposures to Hazardous Chemicals in Laboratories"

   b. Consensus Standards and References:
      i. "ANSI/ISEA Z358.1-2014. American National Standard for Emergency Eyewash and Shower Equipment"
      ii. "ANSI/AIHA/ASSP Z9.5-2012 Laboratory Ventilation"
      iii. American National Standard for Thermal Environmental Conditions for human Occupancy (ANSI/ASHRAE 55-2004)
      iv. American Society of Heating and Refrigeration Engineers – ASHRAE Handbook, Chapter 13
      v. American Society of Heating and Refrigeration Engineers – ASHRAE Applications: Chapter 14, Laboratories: Part VIII; Laboratory Fume Hoods
      vi. Virginia Disabled Accessibility Guidebook
      vii. Maryland Disabled Accessibility Guidebook
      viii. New York Disabled Accessibility Guidebook
      ix. "CRC Handbook of Laboratory Safety, 5th ED. CRC Press 2000"
      x. Guidelines for Construction and Equipment of Hospital and Medical

Facilities – U.S. Department of Health and Human Services; Chapter
xi. 7.29 Mechanical Standards – Sections D(1)(n): Laboratory Hood Special Standards
xii. SAMA Fume Hood Standards – LF-10, latest edition
xiii. USDA: Science and Educational Administration Manual for laboratory Chemical Fume hoods – Standards – United States Department of Agriculture
xiv. ACGIH Industrial Ventilation Handbook (22nd edition)
xv. "Industrial Ventilation: A Manual of Recommended Practice for Design, 30th Edition"
xvi. University of California EH&S Lab Safety Design Guide
xvii. Prudent Practices in the Laboratory 8.C, 8.D
xviii. Design and Construction of Inside Storage Rooms, General Industry Standard 29
xix. CDC-NIH Biosafety in Microbiological and Biomedical Laboratories
xx. NIH Design Policy and Guidelines, Research Laboratory, 1996, D7.7
xxi. NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals, 2019 Edition.
xxii. "Industrial Ventilation: A Manual of Recommended Practice for Operation and Maintenance, 2nd Edition"
xxiii. "ANSI/ASHRAE 110-2016 Methods of Testing Performance Of Laboratory Fume Hoods"
xxiv. "SEFA 1.2-1996 Laboratory Fume Hoods, Recommended Practices"
xxv. "NSF/ANSI 49-2019 Biosafety Cabinetry: Design, Construction, Performance, And Field Certification"
xxvi. ASHRAE 62.1-2019 Ventilation for Acceptable Indoor Air Quality

2. General Ventilation Considerations

a. The room shall have mechanical generated supply air and exhaust air. All lab rooms shall use 100% outside air and exhaust to the outside. There shall be no return of fume hood and laboratory exhaust back into the building. The air balance of the room cannot be adjusted unless the provision of mechanically generated supply and exhaust is made.

b. Mechanical climate control shall be individually provided for each laboratory.

c. Cabinetry or other structures or equipment must not block or reduce effectiveness of the supply or exhaust air.

d. Ventilation calculation shall be in accordance with ACGIH Industrial Ventilation Manual.

e. General laboratories shall have a minimum of 6 air changes per hour or 1 cfm/sf of exhaust, whichever provides the more stringent ventilation requirement.

During unoccupied hours, laboratory exhaust rates can be reduced to a minimum of 4 air changes per hour.

f. Laboratories must be maintained under negative pressure in relation to the corridor or other less hazardous areas. Clean rooms requiring positive pressure shall have entry vestibules provided with door-closing mechanisms and interlocks so that both doors are not open at the same time. Consult with the local State Fire Marshal for additional design requirements.

g. The air velocity volume in each duct shall be sufficient to prevent condensation or liquid or condensable solids on the walls of the ducts in compliance with ACGIH Industrial ventilation handbook and ASHRAE Laboratory Design Guide.

h. Fume hoods shall not be the sole means of the room air exhaust. General room exhaust outlets shall be provided where necessary to maintain minimum air change rates and temperature control.

i. Operable windows are prohibited in new lab buildings and shall not be used on modifications to existing buildings.

j. Local exhaust ventilation (e.g. “snorkels”), other than fume hoods shall be designed to adequately control exposures to hazardous chemicals. An exhausted manifold or manifolds with connections to local exhaust may be provided as needed to collect potentially hazardous exhausts from gas chromatographs, vacuum pumps, excimer lasers, or other equipment which can produce potentially hazardous air pollutants. The contaminant source needs to be enclosed as much as possible, consistent with operational needs to maximize control effectiveness and to minimize air handling challenges and cost. The development of enclosures to minimize the volume of airflow required to attain the desired degree of containment control will effectively reduce fan size, motor horsepower, make up air volume, and make up air conditioning costs.

k. Hoods shall be labeled to show which fan or ventilation system they are connected to.

l. No laboratory ventilation system ductwork shall be internally insulated. Sound baffles or external acoustical insulation at the source shall be used for noise abatement.

m. Air exhausted from laboratory work areas shall not pass un-ducted through other areas.

n. Biological safety cabinets shall be designed and installed with exhaust systems or associated exhaust systems as specified by CDC NIOSH BMBL Appendix A and ANSI/AIHA Z9.5.

3. Negative Pressurization

a. Airflow shall be from low hazard to high hazard zones. Anterooms may be necessary for certain applications, such as clean rooms or tissue culture rooms. Potentially harmful aerosols can escape from the containment of the laboratory room unless the room air pressure is negative to the adjacent non-laboratory areas. It is recommended that laboratories contain a fully integrated laboratory control system to control the temperature, ventilation rate and room pressurization. The control system shall constantly monitor the amount of supply and exhaust air for the laboratory rooms and regulate the flow to maintain a net negative pressurization.

b. Provide an adequate supply of makeup air to the laboratory to maintain target pressurization.

c. An air lock or vestibule may be necessary in certain high-hazard laboratories to minimize the volume of supply air required for negative pressurization control. These doors shall be provided with interlocks so that both doors cannot open at the same time.

d. Corridors shall not be used as plenums.

4. Supply Air Arrangements

a. Room air currents at the fume hood shall not exceed 20% of the average face velocity to ensure fume hood containment.

b. Make up air shall be introduced to the opposite end of the laboratory room from the fume hood (s) and the flow paths for the room HVAC system shall be kept away from the hood locations. Where supply diffusers are located in the vicinity of fume hoods or biological safety cabinets, laminar flow type diffusers shall be utilized.

c. Make up air shall be introduced such that negative pressurization is maintained in all laboratory spaces and does not create a disruptive air pattern

d. Cabinetry or other structures or equipment shall not block or reduce effectiveness of the supply or exhaust air.

e. Supply system air shall meet the technical requirements of the laboratory work and the requirements of the latest version of ASHRAE, Standard 62.1, Ventilation for Acceptable Indoor Air Quality

5. Fume Hood Location

a. Fume hoods shall be located away from activities or facilities which produce air currents or turbulence. Locate away from high traffic areas, air supply diffusers, doors, and operable windows.

b. Fume hoods shall not be located adjacent to a single means of access to an exit. Recommend that hoods be located more than 3 m (10 ft) from any door or doorway.

c. Fume hood openings shall not be located opposite workstations where personnel will spend much of their working day (i.e. desks or microscope benches).

d. An emergency, ADA eyewash/shower station shall be within16 meters (55 feet) or 10 seconds of each fume hood.

6. Approved Equipment and Submittals

a. All fume hoods shall meet the requirements of:

i. State Code of Regulations specific to project site, including:

1) Virginia Code of Regulations
2) Maryland Code of Regulations
3) New York Code of Regulations
4) Florida Code of Regulations
5) Arizona Code of Regulations
6) Hawaii Code of Regulations
7) Massachusetts Code of Regulations

ii. NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals

b. The following chemical fume hood manufacturers are currently approved for installation within the Smithsonian Institution facilities:

i. Fisher/Hamilton
ii. Kewaunee

iii. Jamestown
iv. Mott Manufacturing
v. LabConco
vi. H.H. Hawkins, Ltd.

c. Only those fume hoods on the Smithsonian Institution's approved list may be used. Fume hood submittals must be reviewed and approved by the Smithsonian Institution OSHEM prior to selection

d. Fume hoods not on the Smithsonian Institution's approved list may be added to the approved list only after the Smithsonian Institution OSHEM review and approval of the manufacturer's specifications.

e. Manufacturer's product literature and data sheets are required

f. Plastic laminate for color selection shall be provided.

g. Submit specifications for size of fume hood, showing dimensions, required clearances, and finishes; and where necessary, size (especially height above the floor), and capacity and location of all mechanical and electrical services required

7. Fume Hood and Local Exhaust Ventilation Selection/Types

a. General laboratory design shall be based upon the following factors:

i. Room volume (length x width x height)
ii. Number of room air changes
iii. Laboratory Heat Load
iv. Types of material used
v. Linear meter (feet) of hood needed based on
    a. Number of users/hood
    b. Frequency of use
    c. % of time working at the hood
    d. Size of apparatus to be used in the hood, etc
    e. Sash Position

b. A facility designed for intensive chemical use shall have at least 0.8 linear meters (2.5 linear feet) of hood space per user.

c. An extensive laboratory calculation that evaluates all laboratory equipment against heat load, recommended air change rates, minimal cooling requirements for the laboratory, variable volume venturi valve laboratory design or constant volume venturi valve laboratory design shall be provided to Smithsonian

Institution for review of laboratory development.

d. Fume hoods are to be operated 24 hours a day. No user controlled shut-off switch is allowed unless necessary to the operation and approved by OSHEM.

e. Constant Volume Fume Hoods

   i. Constant Volume fume hoods permit a stable air balance between the ventilation systems and exhaust by incorporating a full bypass feature within the hood. If the bypass is 100%, this allows a constant volume of air to be exhausted through the hood regardless of the sash position. Full by-pass hoods must be used for constant volume applications.

f. Variable Volume (VAV) Fume Hoods

   i. Variable Volume fume hoods (partial bypass) maintain constant face velocities by varying exhaust volumes in response to changes in sash position. Because only the amount of air needed to maintain the specified face velocity is pulled from the room, significant energy savings are possible when the sash is closed.

g. Supply or Auxiliary Air Hoods

   i. This type of hood is not permitted by the Smithsonian Institution, unless an exception is granted by Smithsonian Institution OSHEM.

h. Ductless Fume Hoods

   i. Portable, non-ducted fume hoods are not permitted by the Smithsonian Institution, unless an exception is granted by Smithsonian Institution OSEHM. Portable hoods do not typically meet the regulatory airflow requirements.

i. Perchloric / Hot Acid Hoods

   i. Heated perchloric acid shall only be used in a laboratory hood specifically designed for its use and identified as “For Perchloric Acid Operations”. Perchloric acid and other hot acid digestion hoods must be on a dedicated system and have an automatic wash down system. High use solvent extraction and solvent use hoods (ether, other flammable solvents, etc.) must be on a dedicated system.

   ii. Perchloric acid hoods and exhaust duct work shall be constructed of

materials that are acid resistant, nonreactive, and imperious to perchloric acid.

iii. The exhaust fan shall be acid resistant. The exhaust fan motor shall not be located within the duct work. Drive belts shall not be located within the ductwork.

iv. Ductwork for perchloric acid hoods and exhaust systems shall take the shortest and straightest path to the outside of the building and shall not be manifolded with other exhaust systems. Horizontal runs shall be as short as possible, with no sharp turns or bends. The ductwork shall provide a positive drainage slope back into the hood. Duct shall consist of sealed sections. Flexible connectors shall not be used.

v. Sealants, gaskets, and lubricants used with perchloric acid hoods, ductwork, and exhaust systems shall be acid resistant and nonreactive with perchloric acid.

vi. A water spray system shall be provided for washing down the hood interior behind the baffle and the entire exhaust system. The hood work surface shall be watertight with a minimum depression of 15 mm (1/2") at the front and the sides. An integral trough shall be provided at the rear of the hood to collect wash-down water. The work surface shall have a raised lip on all four sides and be constructed of materials compatible with usage. Union between work surface and counter shall be coved at a 20 mm (3/4") radius and sealed watertight.

vii. Spray wash-down nozzles shall be installed in the ducts not more than 1.5 m (5 ft) apart. The ductwork shall provide a positive drainage slope back into the hood. Ductwork shall consist of sealed sections and no flexible connectors shall be used.

viii. The hood surface shall have an all-welded construction and have accessible rounded corners for cleaning ease.

ix. The hood baffle shall be removable for inspection and cleaning.

x. Each perchloric acid hood must have an individually designated duct and exhaust system.

j. American with Disabilities Act (ADA) Hoods

i. The designer shall consult with the Smithsonian Institution's ADA Compliance Office regarding the number of laboratory hoods that are required under each project design. These hoods must provide the appropriate work surface heights, knee clearances, reach to controls, etc for individuals requiring use in wheelchairs. Hood and lab design shall comply with the Accessibility regulations established by the State of installation.

k. Glove Boxes

i. Glove boxes (positive and negative) must meet the type, design, and construction requirements of ANSI/AIHA Z9.5.

l. Walk-In Fume Hoods

i. Walk-In fume hoods must meet the type, design, and construction requirements of ANSI/AIHA Z9.5.

8. Fume Hood Construction, Installation and Performance

a. New hoods can be mounted above a chemical storage cabinet, provided that the cabinet meets the Uniform Fire Code requirements for construction. It is recommended that solvent storage not be located under the laboratory fume hoods as this is where fires are most likely to occur in laboratories.

b. All chemical fume hoods must meet the Smithsonian Institution's review for approval.

c. All fume hoods must be tested using the most current American National Standards Institute (ANSI)/ASHRAE 110 method.

d. Type 316 stainless steel shall be used for all parts of the fume hood systems ventilation duct as long as compatibility is maintained.

e. Fume hood interior surfaces shall be constructed of corrosion resistant, non-porous, non-combustible materials such as type 316 stainless steel, and shall be smooth and impermeable, with round corners. These materials shall have a flame spread index of 25 or less when tested in accordance with NFPA method 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.

f. Laboratory hoods shall be provided with a means of containing minor spills.

g. There must be a horizontal bottom airfoil inlet at the front of the hood.

h. Operator adjustable baffles are not permitted. Removable fixed slot or perforated baffles only are acceptable. Slots are to be continuous across the back of the fume hood.

i. Before a new fume hood can be placed into operation, an adequate supply of makeup air must be provided to the lab.

j. Face Velocity

   i. Laboratory fume hoods shall be designed to provide a minimum average effective face velocity of 0.5 m/s (100 feet per minute (fpm)) with a minimum of 0.4 m/s (70 fpm) at any point, unless an exception is approved by OSHEM.

   OSHEM is to be consulted on all face velocity/exhaust rate design parameters for laboratory hood systems.

k. Where the required velocity can be obtained by partly closing the sash, the sash and/or jamb shall be marked to show the maximum opening at which the hood face velocity will meet the requirements.

l. An airflow indicator shall be provided and located so that it is visible from the front of the fume hood. The hood shall be prepared at the factory to receive the specified alarm/monitor. As a minimum, the alarm shall accommodate the following:

   i. The Safety Monitor/Alarm System shall monitor face velocity and provide audible and visual alarm if face velocity drops below or rises above a range set by SI and is to have a flexible range capable of alarms from 0.35 m/s (70 fpm) to 0.76 m/s (150 fpm). Audible alarm shall pulse at 80 dBA

   ii. The monitor shall be UL listed with all alarm circuit electric component, external tubing, restrictors and manifolds furnished complete. Monitor shall have light emitting diode display, which provides clear indication of airflow conditions. Safety monitor shall be tamperproof.

   iii. Alarm Signal. Audible pulsating signal and a visual, large flashing red light emitting diode.

   iv. Silence push button, which temporarily overrides the audible alarm for a period of no longer than 5 minutes, shall be accessible on the front of the Safety Monitor.

v. During temporary silence of the audible alarm, the visual alarm shall remain activated until the alarm condition is corrected.

vi. After the alarm condition is corrected and the face velocity and volume is returned to the specified levels, the safety monitor shall automatically reset and begin routine monitoring.

vii. Test circuit shall be provided to verify proper safety monitor operations

viii. Electrical Rating: Maximum 15 VDC and maximum current rating of 200 MA.

ix. An air monitor or alarm, comparable to ALNOR Airguard 335, or equal is acceptable

x. Connect between the fume hood and the filter or damper

xi. Flow tube device (floating indicators) or ribbons hanging in the air stream are not acceptable airflow indicators.

m. For variable volume fume hoods, provide a sash height monitor and exhaust air valve to permit variable flow operation through the Laboratory Airflow Control system. Exhaust air valve shall be paired with a supply air valve to permit constant pressurization in a tracking arrangement.

n. Include a zone presence sensor for all variable volume hoods to alarm when sash height is not in optimal position when hood is not in use.

o. Exterior construction

i. Chemical Resistant finish

ii. End panels fastened to frame with screws

iii. Unused holes (interior or exterior) shall be plugged or blanked

p. Air Foil that provides an air sweep across the work surface with the sash in the fully lowered position. Air foils installed over the work surface edge, allowing for air flow under the air foil are preferred.

q. Interior end panels require an access panel with gas tight gasket.

r. Baffles shall be constructed so that they may not be adjusted to restrict the volume of air exhausted through the laboratory hood.

s. Fans shall run continuously without local control from the fume hood location and independently of any time clocks.

t. For new installations or modifications of existing installations, controls for laboratory hood services (e.g., gas, air, and water), shall be located external to the hood and within easy reach.

u. Shutoff valves for services, including gas, air, vacuum, and electricity shall be outside of the hood enclosure in a location where they will be readily accessible in the event of fire in the hood. The location of such a shut-off shall be legibly lettered in a related location on the exterior of the hood.

v. Laboratory hoods shall not have an on/off switch located in the laboratory unless necessary to the operation and approved by OSHEM. Exhaust fans shall run continuously without direct local control from laboratories.

w. Drying ovens shall not be placed under fume hoods.

9. Power and Electrical

a. Receptacles per National Electrical Manufacturers Association (NEMA) 5-15R: 20A – 125V AC three-wire duplex polarized receptacles. Receptacles shall be GFI. Receptacles: Harvey Hubble-Inc.'s No. 5252, Arrow Hart, Leviton, or equal.

b. Plate Covers: Meet usage, Bell or equal

c. Switch for lighting: Hubbel #1221 or equal.

d. Flexible Conduit: 15 mm (½") complete with wiring as required

e. Light Fixture: Heavy duty fluorescent strip light with 430 Ma rapid start lamps and 120-volt HPF ballasts. Provide three-foot length for four-foot hoods and four-foot length for six-foot hoods. Light Fixture: Garcy #RN 9942 – 36H, Columbia Lighting Inc; Smoot-Holman Company; Benjamin Products of Thomas Industries, Inc; or equal.

f. Chemical fume hood exhaust fans shall be connected to an emergency power system in the event of a power failure.

g. Emergency power circuits shall be available for fan service so that fans will automatically restart upon restoration after a power outage.

h. Momentary or extended losses of power shall not change or affect any of the control system's set points, calibration settings, or emergency status. After the power returns, the system shall continue operation without the need for any manual intervention. Alarms shall require manual reset; shall they indicate a potentially hazardous condition.

i. Fume hood ventilating controls shall be arranged so that shutting off the ventilation of one fume hood will not reduce the exhaust capacity or create an imbalance between exhaust and supply for any other hood connected to the same system.

j. In installations where services and controls are within the hood, additional electrical disconnects shall be located within 15m (50 ft) of the hood and shall be accessible and clearly marked. (Exception: If the electrical receptacles are located external to the hood, no additional electrical disconnect shall be required).

k. Hood lighting shall be provided by UL listed fixtures external to the hood or if located within the hood interior, the fixtures shall meet the requirements of NFPA 70, (National Electrical Code).

l. Light fixtures shall be of the fluorescent type and replaceable from outside the hood. Light fixtures must be displaced or covered by a transparent impact resistant vapor tight shield to prevent vapor contact.

m. The valves, electrical outlets and switches for utilities serving the hoods shall be placed at readily accessible locations outside the hood. All shutoff valves shall be clearly labeled. Plumbing (e.g., vacuum lines) shall exit the sides of the fume hood and not the bench top.

10. Sashes

a. Hoods shall have transparent movable sashes constructed of shatter-resistance flame resistant material and be capable of closing the entire front face.

b. Vertical rising sashes are preferred. Consult with the Smithsonian Institution OSHEM regarding the use of horizontal sashes. If permitted, sash panels (horizontal sliding) must be 310 to 360 mm (12 to 14 inches) in width.

c. Vertical type: 6 mm (¼") thick laminated safety glass complete with 6 mm (¼") deep stainless-steel metal channels on sides, top and bottom; or frameless.

d. Mechanical stops shall ensure that sash work opening is 450 mm (18") as measured from the top of the fume hood work surface to the bottom of the sash.

e. A manual override shall be provided to allow the vertical sash to be raised above the maximum opening to allow lab apparatus to be installed or removed.

f. Operating face velocity at 450 mm (18") shall be set between 0.5-1 m/s (100 – 120 fpm).

g. A force of 2.2 kilograms (5 pounds) shall be sufficient to move vertically and/or horizontally moving doors and sashes.

11. Ducting

a. Fume hood exhaust shall be manifolded together except for the following:

i. Perchloric/hot acid hood applications
ii. Fume hoods with wash down equipment
iii. Fume hoods that could deposit highly hazardous residues on the ductwork
iv. Exhaust requiring HEPA filtration or other special air cleaning
v. Situations where the mixing of exhaust materials many result in a fire, explosion, or chemical reaction hazard in the duct system
vi. "Exhaust streams containing radioactive materials shall not be manifolded unless authorized by the Smithsonian Facilities - Office of Safety Health and Environmental Management (OSHEM)"

b. Manifolded fume hood exhaust ducts shall be joined inside a fire rated shaft or mechanical room, or outside of the building at the roofline.

c. Airflow control devices shall be installed on each hood when configured in a manifolded arrangement. Provide proper coating to meet requirements of the exhaust air stream.

d. Horizontal ducts must slope at least 25 mm per 3 m (1" per 10 ft) downward in the direction of airflow to a suitable drain or sump.

e. Ducts exhausting air from fume hoods shall be constructed entirely of

noncombustible material. Gaskets shall be resistant to degradation by the chemicals involved. Gaskets shall be fire resistant.

f. Automatic fire dampers shall not be used in laboratory hood exhaust systems. Fire detection and alarm systems shall not be interlocked to automatically shut down laboratory hood exhaust fans.

12. Exhaust

a. New exhaust fans shall be oriented in an up-blast orientation.

b. Hood exhaust stacks shall be coordinated and developed with a wind tunnel analysis specialist. Refer to section 15.0 Wind Engineering for additional requirements.

c. Hood exhaust shall be located on the roof as far away from the outside air intakes as possible to prevent re-circulation of laboratory hood emissions within a building. For toxic gas applications, the separation distance shall be a minimum of 23 m (75 ft) from any outside air intake.

d. A minimum 3 meter (10 foot) vertical separation must be established between the stack discharge and the adjacent roof lines and/or air intakes.

e. Discharge from exhaust stacks must have a velocity of at least 15 m/s (3,000 fpm). Achieving this velocity shall not be done by the installation of a cone type reducer. The duct may be reduced, but the duct beyond the reduction shall be of sufficient length to allow the air movement to return to a linear pattern. High plume, induced dilution type exhaust fans may be used to address exhaust velocity requirements.

f. Rain caps that divert the exhaust toward the roof are prohibited.

g. Fume hood exhaust may be required to be treated as determined by local codes and planned operations within the hood.

h. Laboratory ventilation exhaust fans shall be spark-proof and constructed of materials or coated with corrosion resistant materials for the chemical being transported. V-belts drives shall be conductive.

i. Vibration isolator shall be used to mount fans. Provide all laboratory exhaust fans with vibration monitors. Flexible connection sections to ductwork, such as chemically resistant coated glass fiber cloth, shall be used between the fan and

its intake duct when such material is compatible with hood chemical use.

j. Each exhaust fan assembly shall be individually matched (cfm, static pressures, brake horsepower, etc.) to each laboratory ventilation system.

k. Exhaust fans shall be located outside the building at the point of final discharge. Each fan shall be the last element of the system so that the ductwork through the building is under negative pressure. For multiple risers through a rated shaft, manifolding ducts to a common plenum through which exhaust fans draw the laboratory exhaust can be incorporated into the design. Design must be approved by Smithsonian Institution OSHEM prior to development and construction.

l. Fans shall be installed so they are readily accessible for maintenance and inspections without entering the plenum.

13. Plumbing

a. Cup Sink shall be flush with the work surface and shall conform to the usage requirements, complete with stainless steel tailpiece as required.

b. Make provisions for cold water only for each hood, in accordance with utility service symbols. Provide vacuum breaker required at each fume hood outlet, in addition to the main backflow preventer.

c. Run internal electric wiring in conduit. Do not run conduit through hood interior or across the hood.

d. Utilities controls shall be located outside of hood interior for convenient access and use.

e. Fixtures shall be Water Saver Faucet Company, Chicago Faucet, T & S, or equal. The following specifications refer to the Water Saver Faucet Company to establish quality, utility, and appearances.

i. Gas, air, water, steam, and vacuum fixtures shall be made up of remote control valves L-3185 (15 mm (1/2”) IPS pipe thread, 10 mm (3/8”) NNPT outlet pipe threads) with guide bushing “B” with 4-arm handle and color plastic for index disc, and for service

ii. For gas, air, and vacuum, the remote-control valve shall be connected to a Water Saver L-14 (or equal) serrated nozzle with 10 mm (3/8”) male threads,

10 serrations, and of dimensions as shown on the drawing. Valve shall have stainless steel seat and stainless steel renewable floating cone unit.

iii. For water, the remote-control valve shall be connected to a Water Saver L171-WSA with vacuum breaker (or equal) serrated nozzle with a ½ inch pipe and elbow. Valves shall have "Water Saver: standardized renewable operating unit".

iv. Access panel to service the utilities shall be gasketed with approved gasket material.

v. Plumbing shall not be run through hood interior or across front of hood.

vi. Water faucets shall have a vacuum breaker.

vii. Pre-plumb all utilities

14. Wind Engineering

a. A wind tunnel evaluation is required for all new construction. Any new construction project that produces emissions of a hazardous, noxious, odoriferous, or otherwise nuisance character and that poses a health and safety risk is to be evaluated using the best available technology for wind tunnel studies. Common emission sources can include laboratory exhaust, cooling towers, generators, incinerators, kitchen exhaust, and vent stacks.

b. A wind tunnel evaluation may be required for remodeling projects if new exhausts are being added that may impact sensitive receptors, when the total volume of the exhaust is being substantially increased, or when the project may be affected by nearby existing building. Sensitive receptors can include air intakes, courtyards, operable windows, or sensitive animal populations that are either part of the facility being remodeled or that exist nearby.

c. Wind tunnel engineering evaluations shall be conducted for all wind directions striking all walls of a building where fume hood exhaust is likely to have significant ground level impact or is likely to affect air intakes for buildings located nearby.

d. Required Dilution: The required dilution is based on the chemical makeup of the exhaust and the type of receptors that are affected. Target dilution factors are 1/1,000 at minimum, as measured from the top of the exhaust fan to the receptor in question. For highly toxic emissions where a 1/1000 dilution factor

is inadequate, the appropriate dilution level shall be calculated for the specific application.

e. Chemical Parameters: Chemical parameters to be evaluated include but are not limited to worst case spill releases and modeling with chemicals possessing highest toxicities, greater volatility and lowest threshold limit values (TLV).

f. Wind tunnel study parameters chosen shall use the best available technology and the current industry testing standards. The ASHRAE Handbook of Fundamentals or the Environmental Protection Agency (EPA) Guideline for Fluid Modeling of Atmospheric Diffusion, EPA – 600/8-81-009 shall be consulted. At a minimum, the wind tunnel study shall take into account probable evaporation times based on ventilation rates, exhaust stack height and diameter, exit velocity, exhaust location, wind speed, and direction, building features and any nearby features that could influence emission dispersion.

g. Emergency generator exhaust shall be considered in the wind tunnel engineering study.

15. Noise

a. System design must provide for the control of all exhaust system noise (combination of fan generated noise and air generated noise) in the laboratory. Systems must be designed to achieve an acceptable Sound Pressure Level (SPL) frequency spectrum (room criterion) as described in the ASHRAE Handbook– HVAC Applications.

16. Lab Hood Commissioning

a. Balance, test, and certify each fume hood in accordance with the latest edition of ASHRAE 110 Testing Requirements. Fume hood field tests shall be performed by a qualified independent testing company on each hood to determine face velocity, containment, and airflow patterns. Proper operation of fume hoods must be demonstrated by the contractor installing the fume hood prior to project closeout.

b. Fume hood face velocity to be maintained between 0.5 – 0.6 m/s (100 – 120 fpm) at all times during normal operation.

c. As installed, under the ASHRAE 110 test method, fume hoods must meet the testing criteria 4.0AI0.05 as specified in the Industrial Ventilation Handbook (4.0 liters/minute release rate of tracer gas, as installed, less than 0.05 ppm of

tracer gas detected).

d. There shall be no visible smoke flow out of the fume hood during the flow visualization test.

e. Balance, test, and certify each glove box, biosafety cabinet and laminar flow hood in accordance with the latest edition of ANSI/NSF 49 Testing Requirements. Each hood test shall be performed by a qualified independent accredited Biological Cabinet Field Certifier to determine proper containment and certify the effectiveness of internal filtration.