

SECTION 075419.14 PVC RHINO BOND

PART 1 - GENERAL CONDITIONS

1.01 DESCRIPTION

A. Scope

To install: An attached 72 mil single-ply PVC roofing membrane utilizing Rhinobond attachment including flashings and other components, to comprise a roofing system for the structure of interest.

1. The existing Single Ply Roofing system is to be removed down to the existing insulation. Remove the existing single ply roof membrane including all curb/wall and penetration flashings, membrane screws and plates are to be removed.
2. Existing equipment curbs and walls are to be flashed with 72 mil PVC membrane. New equipment curbs are to receive 72 mil PVC fiberglass-reinforced flashing membrane.
3. 1/2" Dens-Deck roof board and insulation are to be mechanically fastened directly to the substrate using #15 Fasteners and Rhinobond plates in accordance with Section 3.05 of this specification.
4. A new 72 mil PVC, polyester-reinforced, PVC membrane is to be welded to the Rhinobond plate in accordance with Section 3.06 of this specification.
5. The color of the membrane is to be EnergySmart White, as selected by the Owner.
6. A 20 year UNLV Warranty shall be provided to the Owner upon completion as described in Section 1.0 of this specification.

B. Related Work

The work includes but is not limited to the installation of:

1. Substrate Preparation
2. Roof Drains
3. Wood Blocking
4. Insulation & Dens-Deck
5. Roof Membrane
6. Fasteners
7. Adhesive for Flashings
8. Roof Membrane Flashings
9. Walkways
10. Metal Flashings
11. Sealants

C. Upon successful completion of work the following warranties may be obtained:

1. 20 Year Systems Warranty - UNLV
2. 5 Year Roofing Applicator Warranty

1.02 QUALITY ASSURANCE

A. This roofing system shall be applied only by a Roofing Applicator authorized by approved PVC membrane manufacturer prior to bid.

B. Upon completion of the installation an inspection may be made by a Technical Service Representative of

PVC Membrane Manufacturer to determine that the visible elements of the roofing system have been installed in accordance with the project specification, details and approved changes wherever a System warranty has been specified.

- C. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the Owner, the Owner's Representative and PVC Manufacturer.
- D. Applicable code/insurance requirements shall be identified by the Owner or Owner's representative.
- E. Manufacturers warranty shall be "No Dollar Limit" for the replacement of defective materials and/or labor and shall not contain any exclusion's for ponding water. Membrane manufacturer to submit the consistency of formulation for the last fifteen (15) years as certified by the manufacturer.
- F. Manufacturer to be Responsible Care 140001 and ISO 140001 certified.
- G. Membrane manufacturer must have an established program for recycling membrane at the end of its useful life. Must provide 3 (three) instances in which they have done so.
- H. Membrane manufacturer to confirm in writing that they directly manufacture the roofing membrane (private labeled membranes are not acceptable and will not be reviewed).
- I. Membrane manufacturer shall not require the use of cut edge sealant at any location. This is a maintenance items that the owner does not accept.
- J. Membrane manufacturer must have an established program for recycling membrane at the end of its useful life. Must provide 3 (three) instances in which they have done so.

1.03 SUBMITTALS

- A. Copies of Specification.
- B. The Applicator shall submit written verification from PVC Membrane Manufacturer that they are an authorized Applicator.
- C. The Applicator shall verify that the specifications for the roofing project are in accordance with PVC Membrane Manufacturer.
- D. Sample copy of the Systems Warranty.
- E. Sample copy of Applicator's Warranty.
- F. Certification from the Applicator that the system specified meets code and insurance requirements.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.
- B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.
- C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.
- D. As a general rule all adhesives shall be stored at temperatures between 40 degree F and 80 degree F.

Read instructions contained on adhesive canister for specific storage instructions.

- E. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
- F. Any materials which the Owner's representative or PVC Membrane Manufacturer determine to be damaged are to be removed from the job site and replaced at no cost to the Owner.
- G. Material Safety Data Sheets (MSDS) shall be available at the job site at all times.

1.05 JOB CONDITIONS

- A. Materials may be installed under certain adverse weather conditions but only after consultation with PVC Membrane Manufacturer, as installation time and system integrity may be affected.
- B. Only as much of the new roofing as can be made weathertight each day, including all flashing and detail work, shall be installed. All seams shall be heat welded before leaving the job site that day.
- C. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.
- D. All surfaces to receive new insulation, Dens-Deck, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the necessary equipment to dry the surface prior to application.
- E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
- F. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.
- G. The Applicator is cautioned that certain PVC membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote and some preservative materials. Such materials shall not remain in contact with PVC membranes. The Applicator shall consult PVC Membrane Manufacturer regarding compatibility, precautions and recommendations.
- H. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.
- I. Prior to and during application, all dirt, debris and dust shall be removed from surfaces by vacuuming, sweeping, blowing with compressed air or similar methods.
- J. The Applicator shall follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.
- K. All new roofing waste material (i.e., scrap roof membrane, release paper, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.
- L. The Applicator shall take precautions that storage and application of materials and equipment does not overload the roof deck or building structure.

- M. Flammable adhesives and deck primers shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.
- N. All rooftop contamination that is anticipated or that is occurring shall be reported to PVC Membrane Manufacturer to determine the corrective steps to be taken.
- O. The Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing (letter copy to PVC Membrane Manufacturer) to the Owner's Representative for corrective action prior to the installation of the PVC roof system.
- P. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify Owner of such condition in writing.
- Q. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.
- R. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.
- S. The Applicator shall conduct fastener pullout tests in accordance with the latest version of the SPRI/ANSI Fastener Pullout Standard to help verify condition of the deck/substrate and to confirm expected pullout values.
- T. Precautions shall be taken when using flashing adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
- U. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.
- V. PVC membranes are slippery when wet or covered with snow, frost, or ice. Working on surfaces under these conditions is hazardous. Appropriate safety measures must be implemented prior to working on such surfaces. Always follow OSHA and other relevant fall protection standards when working on roofs.
- W. Aesthetics and Performance are equally important. The owner's representative will require that all flashings, details, and hand welding work shall be uniform and consistent throughout the entire project. Giving the appearance that one individual performed all of the work. Any sub-standard work will be immediately corrected to the satisfaction of the Owner's Representative.

1.06 WARRANTIES

- A. 20-year System Warranty (only products purchased from approved PVC Membrane Manufacturer are covered under the UNLV System Warranty)

Upon successful completion of the work to the owners satisfaction and receipt of final payment, the 20-Year System Warranty (70-mph wind speed) shall be issued.

- B. Applicator/Roofing Contractor 5-Year Warranty

Applicator shall supply Owner with a separate 5-Year workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within the Applicator warranty term, defective or otherwise not in accordance with Contract Documents, the Applicator shall repair that defect at no cost to Owner. Applicator's warranty obligation shall run directly to Owner and a copy shall be sent to the manufacturer.

C. Owner Responsibility

Owner shall notify both the manufacturer and the Applicator of any leaks as they occur during the time period when both warranties are in effect.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All components of mechanically attached 72 mil single-ply PVC roofing membrane utilizing Rhinobond-attached roof system shall be manufactured, supplied or accepted by the membrane manufacturer.
- B. Manufacturer to have a minimum of four years experience recycling their membranes at the end of their service life back into new membrane products. Provide a minimum of five reference projects.
- C. Condensation or moisture migration into the roof system must be controlled so that it does not compromise the performance of components of the assembly. Moisture vapor tends to migrate from warmer to cooler areas. Air/vapor retarders are used to inhibit or block the flow of warm moist air into the roof system. To determine if an air/vapor barrier is necessary, a design professional with experience with air handling and moisture control should be consulted.
- D. Membrane shall be certified by the PVC manufacturer to be with three (3) mils of the specified membrane thickness as stated in this section. ASTM minimum standards of +/- 10% will not be accepted.
- E. **Membrane shall have a minimum of thirty-four (34) mils of waterproofing polymers above the reinforcements as documented by a third party source.**

2.02 MEMBRANE

- A. A new 72 mil PVC S327, thermoplastic membrane with polyester reinforcement.
 - 1. Approved Manufacturers; Sika Sarnafil, Durolast or pre-approved Equal.
- B. Typical Physical Properties

| <u>Parameters</u> | <u>ASTM Test Method</u> | <u>Minimum Physical Properties</u> |
|---|-------------------------|------------------------------------|
| Reinforcing Material | - | Polyester |
| Overall Thickness, min., inches | D751 | 0.072 |
| Thickness Over Scrim, inches | D751 | 0.030 |
| Breaking Strength, min., lbf/in. | D751 | 315 |
| Elongation at Break, min. | D751 | |
| Machine Direction | | 28.5 |
| Cross Machine Direction | | 29.5 |
| Seam strength*, min. (% of breaking strength) | D751 | 85 |
| Retention of Properties After Heat Aging | D3045 | - |
| Tensile Strength, min., (% of original) | D751 | Pass |
| Elongation, min., (% of original) | D751 | Pass |
| Tearing Strength, min., lbf | D1004 | 48.5 |
| Low Temperature Bend, -40°F | D2136 | Pass |
| Accelerated Weathering Test (Florescent Light, UV exposure) | G154 | 10,000 Hours |

| | | |
|--|-------|------------|
| Cracking (7x magnification) | - | None |
| Discoloration (by observation) | - | Negligible |
| Crazing (7 x magnification) | - | None |
| Linear Dimensional Change | D1204 | -0.12 |
| Weight Change After Immersion in Water | D570 | 2 |
| Static Puncture Resistance, 33 lbf | D5602 | Pass |
| Dynamic Puncture Resistance, 14.7 ft-lbf | D5635 | Pass |
| Initial Solar Reflectance | E903 | 0.83 |
| Emissivity | 0.90 | |
| Solar Reflective Index (SRI) | E1980 | 104 |

2.03 FLASHING MATERIALS

Consult respective product data sheets for additional information.

- A. Wall/Curb Flashings
 - 1. PVC Membrane flashing
 - 2. PVC Clad laminated metal flashing
 - 3. PVC Flashing Membrane – asphalt resistant
- B. Perimeter Edge Flashings
 - 1. PVC clad
 - 2. Non-Typical Edge
- C. Miscellaneous Flashings
 - 1. Corners - Universal
Prefabricated outside/inside flashing corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or Sarnaclad base flashings.
 - 2. Stack
Prefabricated cones available in 5 sizes
 - 3. Multi-Purpose Sealant
A proprietary sealant used at flashing terminations.
 - 4. Flashing Adhesive
A solvent based reactivating-type adhesive used to attach membrane to flashing substrate.

2.04 INSULATION/BARRIER BOARD

Consult respective product data sheets for additional information.

- A. Polyisocyanurate Insulation – If required by owner
A closed-cell, tapered, polyisocyanurate (ISO) foam core insulation board. ISO insulation must have a minimum nominal density of 2.0 pcf per ASTM D 1622. Insulation shall have less than 1% water absorption per ASTM C209 and less than 2% linear change per ASTM S2126 testing for dimensional stability. Insulation is available in 3.1 inch x 4' x 8' boards.
- B. DensDeck – ½" minimum thickness
A siliconized gypsum, fire-tested hardboard with glass-mat facers. Available in 1/2 inch x 4' x 8' boards.

2.05 ATTACHMENT COMPONENTS

Consult respective product data sheets for additional information.

- A. RhinoBond Disc
A polymer coated 3 inch round plate used with various Sarnafasteners to attach the Insulation/Dens-Deck

board and as a substrate for induction welding the membrane.

- B. Fastener-XP
A #15, heavy-duty, corrosion-resistant fastener used with Sarnadisc RhinoBond to attach Insulation/Dens-Deck to steel or wood roof decks.

2.06 MISCELLANEOUS ACCESSORIES

- A. Multi-Purpose Tape
A high performance sealant tape used with metal flashings as a preventive measure against air and wind blown moisture entry.
- B. Walk-Tred (color: Light Gray)

A polyester reinforced, 0.096 inch (96 mil/2.4 mm), weldable membrane with surface embossment. Used as a protection layer from rooftop traffic. Tread is supplied in rolls of 39.3 inches (1.0 m) wide and 32.8
- C. RhinoBond Induction Welder
A 110 volt induction welding device that creates a radio frequency that allows the membrane to be welded to a specially coated plate.
- D. Solvent Cleaner
A high quality solvent cleaner used for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface. Sarnasolv is also used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if the membrane is not welded the same day it is unrolled.
- E. Perimeter Warning Tape

Designed for use on PVC membranes as a reflective, highly visible pressure sensitive tape used to draw attention to roof perimeters and potential hazardous areas. The tape is available in 2 inch wide rolls by 30 feet long and comes on a release liner for easy application. Perimeter Warning Tape exceeds reflectivity 3 requirements and Federal spec. L-S-300, Class 1.

2.07 SEALANTS

- A. Multi-Purpose Sealant (for termination details).
- B. Depending on substrates, the following sealants are options for temporary overnight tie-ins:
 1. Multiple layers of roofing cement and felt.
 2. Spray-applied, water-resistant urethane foam.
 3. Mechanical attachment with rigid bars and compressed sealant.

2.08 MISCELLANEOUS FASTENERS AND ANCHORS

- A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1-1/4 inch and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch and shall be approved for such use by the fastener manufacturer.

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION CONFERENCE

- A. The primary contractor shall conduct a pre-roofing conference before any work begins, so all parties involved in the roofing system construction, or who may work on or through the roofing system,

understand their obligations with respect to the roofing membrane.

3.02 SUBSTRATE CONDITION

- A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.
- B. Applicator shall verify that the work done under related sections meets the following conditions:
 - 1. Roof drains and scuppers have been reconditioned or replaced and installed properly.
 - 2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
 - 3. All surfaces are smooth and free of dirt, debris and incompatible materials.
 - 4. All roof surfaces shall be free of water.

3.03 SUBSTRATE INSPECTION

- A. A dry, clean and smooth substrate shall be prepared to receive PVC mechanically-attached roof system.
- B. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.
- C. All roof surfaces shall be free of water.
- D. PVC shall be applied over compatible and accepted substrates only.

3.04 SUBSTRATE PREPARATION

- A. If necessary, accumulations of bitumen or other irregularities shall be scratched and removed so as to produce a flat, smooth surface. Insulation and Dens-Deck boards shall lay flat from one board to another.
- B. All wet areas shall be removed and replaced.
- C. Surfaces on which the PVC membrane is to be applied shall be compatible, clean, smooth, free of sharp edges, loose and foreign material, oil, grease and bitumen.
- D. When possible, work shall begin at the high point of the roofing area and proceed to the lowest point.

3.05 INSULATION/DENS-DECK INSTALLATION

General Criteria:

- A. Insulation/Dens-Deck shall be installed according to manufacturer's instructions.
- B. Insulation/Dens-Deck shall be neatly cut to fit around penetrations and projections.
- C. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
- D. Do not install more Insulation/Dens-Deck board than can be covered with 72 mil single-ply PVC roofing membrane by the end of the day or the onset of inclement weather.
- E. Mechanical - Rhinobond Attachment
 - 1. Insulation/Dens-Deck shall be mechanically fastened to the structural deck with approved membrane fasteners and RhinoBond Disc according to the manufacturer's and PVC membrane manufacturer's recommendations for fastening rates and patterns. The quantity and locations of the fasteners and plates shall also cause the boards to rest evenly on the roof deck/substrate. Each board shall be installed tightly against the adjacent boards on all sides.

2. Fasten the Insulation/Dens-Deck so the RhinoBond disc and fastener XP in a 2 by 2 foot grid pattern according to PVC Membrane Manufacturer's and the wind design requirements. Fasteners must be tight enough that the membrane disc does not turn, but not so tight as to deform the disc.

3. Perimeter and Corner Areas

The perimeter and corner area will be determined by building height and width and other conditions according to ASCE 7 guidelines, PVC Membrane Manufacturer's Technical or FM LPDS 1-29 if insured by Factory Mutual. To meet the perimeter and corner uplift requirements, increase fastener density by decreasing the spacing between fastener points in one or both directions. The total tributary area to each fastener is no more than 60 percent for the perimeter and 40 percent for corners, based on the field of roof fastening density. See Detail Drawings.

Notes:

- a) Perimeter area is defined as the outer boundary of the roof. If the roof is broken into different levels, each roof area shall be treated as an individual roof with its outer boundary being treated as a perimeter. Typically, internal expansion joints and firewalls are not considered to be full perimeters. Refer to Factory Mutual's Data Sheet 1-28 for more information.
 - b) The ridge area is defined as the high point in the roof area formed by two intersecting planes. When the sum of the slopes is a minimum of 4 inches in 12 inches (30 degrees), each side of the ridge shall be treated as a perimeter area.
4. Fasteners are to be installed consistently in accordance with fastener manufacturer's recommendations. Fasteners are to have minimum penetration of 1 inch through the structural deck.
 5. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

3.06 INSTALLATION OF PVC MEMBRANE

The surface of the Dens-Deck shall be inspected prior to installation of the PVC roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged boards shall be removed and replaced. PVC membrane shall be attached with fasteners and RhinoBond disc according to PVC membrane manufacturer's and wind uplift requirements per ASCE 7 or Factory Mutual.

A. RhinoBond - Membrane Attachment to Structural Deck

1. General

- a) PVC full width rolls shall be placed over the installed boards. Membrane overlaps shall be shingled with the flow of water where possible. Seam overlaps may be placed over disc RhinoBond plate. Welding of the plate will not be affected.
- b) Tack welding of the membrane for purposes of temporary restraint during installation is not permitted and may result in voiding of warranty. Consult Technical Department for further information.

2. Field, Perimeter and Corner Areas

Over the properly prepared, installed and attached substrate surface following the 2 by 2 foot grid pattern, PVC full-width rolls are to be installed so as to properly shed water. See Detail Drawings for fastener layouts. Refer to FM LPDS 1-29 for their requirements for perimeter and corner enhancements.

3. Securement Around Rooftop Penetrations

- a) Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof

penetrations, fasteners and RhinoBond discs, discs or perimeter bars shall be installed according to perimeter rate of attachment. Fasteners shall be installed according to the manufacturer's instructions. Fasteners shall be installed using the fastener manufacturer's recommended torque-sensitive fastening tools with depth locators. If RhinoBond disc is not used, the fasteners shall clamp the PVC membrane tightly to the substrate.

- b) PVC membrane flashings shall extend 2-1/2 inches past disc and be hot-air welded to the PVC deck membrane.

3.07 RHINOBOND INDUCTION WELDING

B. General

1. Welding equipment shall be provided by or approved by PVC membrane manufacturer. All mechanics intending to use the equipment shall have successfully completed a training course provided by a Technical Service Representative prior to welding.

2. All membrane to be welded shall be clean and dry.

C. Induction Welding

1. Activate the weld between membrane and plate using approved portable induction device. The induction coil must be positioned over the center of the RhinoBond disc, +/- 1 inch. Portable induction device must elevate the temperature of the RhinoBond disc from ambient to 400 – 500 degree F. Cycle time will be affected by available power, use a heavy gauge power cord, at a minimum 12 gauge by 100 feet.

2. When the induction welding cycle is complete, immediately place a Cool & Clamp magnetic weight on the welded assembly. This device must be left in place for at least 60 seconds.

3.08 HOT-AIR WELDING OF SEAM OVERLAPS

A. General

1. All seams shall be hot-air welded. Seam overlaps should be 3 inches wide when automatic machine-welding and 4 inches wide when hand-welding, except for certain details.
2. Welding equipment shall be provided by or approved by PVC membrane manufacturer. All mechanics intending to use the equipment shall have successfully completed a training course provided by a PVC Manufacturer Technical Service Representative prior to welding.
3. All membrane to be welded shall be clean and dry.

B. Hand-Welding

Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.

1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
2. The nozzle shall be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow", the hand roller is positioned perpendicular to the nozzle and rolled lightly. For straight seams, the 1-1/2 inch wide nozzle is recommended for use. For corners and compound connections, the 3/4 inch wide nozzle shall be used.

C. Machine Welding

1. Machine welded seams are achieved by the use of PVC membrane automatic welding equipment. When using this equipment, PVC manufacturer instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a

- dedicated portable generator is recommended. No other equipment shall be operated simultaneously off the generator.
2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

D. Quality Control of Welded Seams

1. The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark grey material from the underside of the top membrane. On-site evaluation of welded seams shall be made daily by the Applicator at locations as directed by the Owner's Representative or PVC membrane representative. One inch wide cross-section samples of welded seams shall be taken at least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the Owner.

3.09 MEMBRANE FLASHINGS

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and PVC manufacturer. Approval shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

A. Adhesive for Membrane Flashings

1. Over the properly installed and prepared flashing substrate, flashing adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.

B. PVC manufacturer's requirements and recommendations and the specifications shall be followed. All material submittals shall have been accepted by PVC Manufacturer prior to installation.

C. All flashings shall extend a minimum of 8 inches above roofing level unless otherwise accepted in writing by the Owner's Representative and PVC Membrane Manufacturer Technical Department. All curb flashings will picture frame the penetration; the corners of adjacent sheets will form one corner where the base flashings meet on the plane of the roof membrane. All flashing will be uniformly installed at all locations. Failure to picture frame the penetrations will result in the contractor removing the flashing and redoing the penetration to the satisfaction of the owners representative at no additional cost to the owner.

D. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot-air welded into place. No bitumen shall be in contact with the PVC membrane.

E. All flashing membranes shall be mechanically fastened along the counter-flashed top edge with peel stop at 6-8 inches on center.

F. PVC flashings shall be terminated according to PVC membrane recommended details.

G. All adhered flashings that exceed 30 inches in height or that of the perimeter Sarnabar spacings shall receive additional securement. Consult Technical Department for securement methods.

H. All mechanically-attached flashings that exceed 18 inches in height shall receive additional securement.

Consult approved PVC Manufacturer Technical Department for securement methods.

3.10 PVC CLAD METAL BASE FLASHINGS/EDGE METAL

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and PVC Manufacturer. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Applicator's expense.

- A. PVC clad metal flashings shall be formed and installed per the Detail Drawings.
 - 1. All metal flashings shall be fastened into solid wood nailers with two rows of post galvanized flat head annular ring nails, 4 inches on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch.
 - 2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
- B. Adjacent sheets of clad shall be spaced 1/4 inch apart. The joint shall be covered with 2 inch wide aluminum tape. A 4 inch minimum wide strip of PVC flashing membrane shall be hot-air welded over the joint. Exercise caution at perimeter of roof. Workers shall follow OSHA safety procedures.

3.11 WALKWAY INSTALLATION

- A. Tread Walkway

Roofing membrane to receive tread Walkway shall be clean and dry. Place chalk lines on deck sheet to indicate location of Walkway. Apply a continuous coat of approved adhesive to the deck sheet and the back of Walkway in accordance with technical requirements and press Walkway into place with a water-filled, foam-covered lawn roller. Clean the deck membrane in areas to be welded. Hot-air weld the entire perimeter of the Walkway to the PVC deck sheet. Check all welds with a rounded screwdriver. Re-weld any inconsistencies. **Important:** Check all existing deck membrane seams that are to be covered by Walkway with rounded screwdriver and reweld any inconsistencies before Walkway installation. Do not run Walkway over bars. Tread Walkway shall be installed two (2) courses wide around all roof top mechanical equipment and at all access and egress locations.

3.12 TEMPORARY CUT-OFF

All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the work progresses. All temporary waterstops shall be constructed to provide a 100 percent watertight seal. The stagger of the board joints shall be made even by installing partial panels of Insulation/Dens-Deck. The new membrane shall be carried into the waterstop. Waterstop shall be sealed to the deck and substrate so that water will not be allowed to travel under the new or existing roofing. The edge of the membrane shall be sealed in a continuous heavy application of sealant as described in Section 2.07. When work resumes, the contaminated membrane shall be cut out. All sealant, contaminated membrane, insulation fillers, etc. shall be removed from the work area and properly disposed of off site. None of these materials shall be used in the new work.

If inclement weather occurs while a temporary waterstop is in place, the Applicator shall provide the labor necessary to monitor the situation to maintain a watertight condition.

If any water is allowed to enter under the newly-completed roofing, the affected area shall be removed and replaced at the Applicator's expense.

3.13 COMPLETION

Prior to demobilization from the site, the work shall be reviewed by the Owner's Representative and the Applicator. All defects noted and non-compliances with the Specifications or the recommendations of PVC roofing membrane manufacturer shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the Owner's Representative and PVC roofing membrane manufacturer prior to demobilization.

All Warranties referenced in this Specification shall have been submitted and have been accepted at time of contract award.

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 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware for:
 - a. Swinging doors.
 - b. Sliding doors.
 - c. Gates.
2. Electronic access control system components, including:
 - a. Electronic access control locksets and electric strikes.
3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
4. Lead-lining door hardware items required for radiation protection at door openings.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
3. Division 09 sections for touchup finishing or refinishing of existing openings modified by this section.
4. Division 13 Section "Radiation Protection" for requirements for lead-lining for door hardware at openings indicated to receive radiation protection.
5. Division 26 sections for connections to electrical power system and for low-voltage wiring.
6. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES

- A. Fire/Life Safety

1. NFPA - National Fire Protection Association
 - a. NFPA 70 – National Electric Code
 - b. NFPA 80 - Standard for Fire Doors and Fire Windows
 - c. NFPA 101 - Life Safety Code
 - d. NFPA 105 - Smoke and Draft Control Door Assemblies
 2. State Fire Safety Code.
- B. UL - Underwriters Laboratories
1. UL 10B - Fire Test of Door Assemblies
 2. UL 10C - Positive Pressure Test of Fire Door Assemblies
 3. UL 1784 - Air Leakage Tests of Door Assemblies
 4. UL 305 - Panic Hardware
- C. Accessibility
1. ADA - Americans with Disabilities Act.
 2. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- D. DHI - Door and Hardware Institute
1. Sequence and Format for the Hardware Schedule
 2. Recommended Locations for Builders Hardware
 3. Key Systems and Nomenclature
- E. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.4 SUBMITTALS

- A. General:
1. Submit in accordance with Conditions of Contract and Division 01 requirements.
 2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
 3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
- B. Action Submittals:
1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
 2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.

- 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
- a. Samples will be returned to supplier in like-new condition. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:
- a. Door Index; include door number, heading number, and Architects hardware set number.
 - b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
 - c. Type, style, function, size, and finish of each hardware item.
 - d. Name and manufacturer of each item.
 - e. Fastenings and other pertinent information.
 - f. Location of each hardware set cross-referenced to indications on Drawings.
 - g. Explanation of all abbreviations, symbols, and codes contained in schedule.
 - h. Mounting locations for hardware.
 - i. Door and frame sizes and materials.
 - j. Name and phone number for local manufacturer's representative for each product.
 - k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.
- 1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
5. Key Schedule:
- a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
 - b. Use ANSI A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
 - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

C. Informational Submittals:

1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Product Certificates for electrified door hardware, signed by manufacturer:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
3. Certificates of Compliance:
 - a. Certificates of compliance for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
 - b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
 - c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:

1. Operations and Maintenance Data : Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.
 - c. Name, address, and phone number of local representative for each manufacturer.
 - d. Parts list for each product.
 - e. Final approved hardware schedule, edited to reflect conditions as-installed.
 - f. Final keying schedule
 - g. Copies of floor plans with keying nomenclature
 - h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
 - i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE

- A. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.
 1. Where specific manufacturer's product is named and accompanied by "No Substitute," including make or model number or other designation, provide product specified. (Note: Certain products have been selected for their unique characteristics and particular project suitability.)
 - a. Where no additional products or manufacturers are listed in product category, requirements for "No Substitute" govern product selection.

2. Where products indicate “acceptable substitute” or “acceptable manufacturer”, provide product from specified manufacturers, subject to compliance with specified requirements and “Single Source Responsibility” requirements stated herein.
- B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
1. Warehousing Facilities: In Project's vicinity.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
 4. Coordination Responsibility: Coordinate installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.
- D. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
 2. Can provide installation and technical data to Architect and other related subcontractors.
 3. Can inspect and verify components are in working order upon completion of installation.
 4. Capable of producing wiring diagrams.
 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
 2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
- G. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
- H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- I. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
- J. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
 2. Maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.
- K. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01.
1. Attendees: Owner, Contractor, Architect, Installer, and Supplier's Architectural Hardware Consultant.
 2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.
- L. Pre-installation Conference: Conduct conference at Project site
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.
- M. Coordination Conferences:
1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
 - a. Attendees: Door hardware supplier, door hardware installer, Contractor.

- b. After meeting, provide letter of compliance to Architect, indicating when meeting was held and who was in attendance.
- 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
 - a. Attendees: Owner's access control company – Vegas Valley Locking Systems, electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, Owner, Architect and Contractor.
 - b. After meeting, provide letter of compliance to Architect, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
 - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
 - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
 - 2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
 - 1. Promptly replace products damaged during shipping.
 - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
 - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- F. Deliver keys and permanent cores to: JJ Hall, Lead Locksmith, UNLV Lock Shop by registered mail or overnight package service.

1.7 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.
- F. Direct shipments not permitted, unless approved by Contractor.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Years from date of Substantial Completion, for durations indicated.
 - a. Closers:
 - 1) Mechanical: 30 years for LCN 4000
 - 2) Electrified: 2 years.
 - b. Automatic Operators: 1 year
 - c. Exit Devices:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - d. Locksets:
 - 1) Mechanical: 3 years.
 - 2) Electrified: 1 year.
 - e. Continuous Hinges: Lifetime warranty
 - f. Key Blanks: Lifetime
 - 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

1.9 MAINTENANCE

- A. Extra Materials:
 - 1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - a. Door Hardware: Coordinate with UNLV Lock Shop
 - b. Electrical Parts: Coordinate with UNLV Lock Shop
- B. Maintenance Tools:
 - 1. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers other than those listed shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated as "Acceptable Manufacturer" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

| Item | Scheduled Manufacturer | Acceptable Manufacturer |
|--|----------------------------|-------------------------|
| Hinges | Ives (IVE) | Hager, Stanley |
| Continuous Hinges | Ives (IVE) | Markar, Stanley |
| Electric Power Transfer | Von Duprin (VON) | ABH, |
| Flush Bolt | Ives (IVE) | Hager, Rockwood |
| Surface Bolts | Ives (IVE) | Hager, Rockwood |
| Coordinators | Ives (IVE) | Hager, Rockwood |
| Locksets & Deadlocks | Schlage (SCH) | No Substitute |
| Aluminum Door Locks – Narrow Style | Adams Rite (ADA) | No Substitute |
| Sliding Door Locks | Adams Rite (ADA) | As pre-approved |
| Pocket Door Locks | Accurate (ACC) | As pre-approved |
| Exit Devices & Mullions | Accurate (ACC) | As pre-approved |
| Electronic Access Control – Hardwired | Von Duprin (VON) | No Substitute |
| Access Control Readers | Millennium Access Control | No Substitute |
| Access Control Credentials | Schlage – Electronic (SCE) | No Substitute |
| Electric Strikes | Schlage – Electronic (SCE) | No Substitute |
| Magnetic Locks - Surface Type | HES (HES) | No Substitute |
| Magnetic Locks - Shear Type | Schlage Electronics (SCE) | Securitron |
| Roller Latches | Schlage Electronics (SCE) | Securitron |
| Cylinders & Keying | Medeco Keymark (MED) | No Substitute |
| Door Closers | LCN (LCN) | No Substitute |
| Closer/Holder Unit | LCN (LCN) | No Substitute, |
| Electro-Mechanical Automatic Operators | Stanley (STN) | No Substitute |
| Protection Plates | Ives (IVE) | Hager, Rockwood |
| Overhead Stops | Ives (IVE) | Hager, Rockwood |
| Thresholds & Weatherstrip | Zero (ZER) | Pemko,NGP |
| Silencers | Ives (IVE) | Pemko, Zero |
| Magnetic Holders | LCN (LCN) | Hager, Rockwood |

| | | |
|-----------------------|------------|-----------------|
| Latch Protector | Ives (IVE) | Hager, Rockwood |
| Sliding Door Hardware | Ives (IVE) | Hager, Rockwood |

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.2 EXISTING MATERIALS

- A. Where existing door hardware is indicated to be removed and reinstalled:
 1. Carefully remove door hardware and components.
 2. Clean, protect and store existing door hardware in accordance with storage and handling requirements specified herein.
 3. Reinstall in accordance with installation requirements for new door hardware.

2.3 MATERIALS

- A. Fasteners
 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Modification and Preparation of Existing Doors: Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
 1. Use materials which match materials of adjacent modified areas.
 2. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:
 1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
 2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.

3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.

2.4 HINGES

A. Provide five-knuckle, ball bearing hinges.

1. Manufacturers and Products:

- a. Scheduled Manufacturer and Product: Ives 5BB series.
- b. Acceptable Manufacturers and Products: Hager BB series, Stanley FBB series, Stanley FBB Series.

B. Requirements:

1. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
 - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
2. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
 - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
3. 2 inches or thicker doors:
 - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
 - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
4. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
5. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
7. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
8. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
9. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
10. Provide mortar guard for each electrified hinge specified, unless specified in hollow metal frame specification.

11. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.5 CONTINUOUS HINGES

A. Stainless Steel

1. Manufacturers:

- a. Scheduled Manufacturer: Ives
- b. Acceptable Manufacturers: Markar, Stanley

2. Requirements:

- a. Provide pin and barrel continuous hinges conforming to ANSI A156.26, Grade 2.
- b. Provide pin and barrel continuous hinges fabricated from 14 gauge, type 304 stainless steel.
- c. Provide twin self-lubricated nylon bearings at each hinge knuckle, with 0.25-inch (6 mm) diameter stainless steel pin.
- d. Provide hinges capable of supporting door weights up to 600 pounds, and successfully tested for 1,500,000 cycles.
- e. On fire-rated doors, provide pin and barrel continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
- f. Provide pin and barrel continuous hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
- g. Install hinges with fasteners supplied by manufacturer.
- h. Provide hinges with symmetrical hole pattern.

B. Cold-Rolled Steel

1. Manufacturers:

- a. Scheduled Manufacturer: Ives
- b. Acceptable Manufacturers: Markar, Stanley

2. Requirements:

- a. Provide pin and barrel continuous hinges conforming to ANSI A156.26, Grade 2.
- b. Provide pin and barrel continuous hinges fabricated from type 1012 cold rolled steel.
- c. Provide twin self-lubricated nylon bearings at each hinge knuckle, with 0.25-inch (6 mm) diameter stainless steel pin.
- d. Provide hinges capable of supporting door weights up to 600 pounds, and successfully tested for 1,500,000 cycles.
- e. On fire-rated doors, provide pin and barrel continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
- f. Provide pin and barrel continuous hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
- g. Install hinges with fasteners supplied by manufacturer.
- h. Provide hinges with symmetrical hole pattern.

C. Aluminum Geared

1. Manufacturers:

- a. Scheduled Manufacturer: Ives.
- b. Acceptable Manufacturers: Markar, Stanley.

2. Requirements:

- a. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
- b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.
- c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
- d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
- e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
- f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
- g. Install hinges with fasteners supplied by manufacturer.
- h. Provide hinges with symmetrical hole pattern.

2.6 ELECTRIC POWER TRANSFER

A. Manufacturers:

- a. Scheduled Manufacturer: Von Duprin
- b. Acceptable Manufacturers: ABH

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.7 FLUSH BOLTS

A. Manufacturers:

- 1. Scheduled Manufacturer: Ives
- 2. Acceptable Manufacturers: Hager, Rockwood

B. Requirements:

- 1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.8 SURFACE BOLTS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Hager, Rockwood

B. Requirements:

1. Surface bolts to have 1" throw for maximum security with concealed mounting that prevents vandalism. Units to be constructed of heavy duty steel and cUL listed up to three (3) hours when used on the inactive door of a pair up to 8' in height.

2.9 COORDINATORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives
2. Acceptable Manufacturers: Hager, Rockwood

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.

2.10 ALUMINUM DOOR LOCKS – NARROW STYLE

A. Manufacturer and Product: Adams Rite 4900 series X 4568/9 Lever or 4590/1 Paddle

B. Requirements:

1. Provide narrow style aluminum door locks as specified. Cylinders: Refer to "KEYING" article, herein.
2. Provide locks with [1-1/8 inches (29 mm)][1-1/2 inches (38 mm)] backset as required for door detail with full 5/8 inch (16 mm) throw latchbolt.
3. Provide manufacturer's standard strikes unless extended lip strikes are necessary to protect trim.

2.11 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Schlage ND Series

B. Requirements:

1. Provide cylindrical locks conforming to ANSI A156.2 Series 4000, Grade 1. Cylinders: Refer to "KEYING" article, herein.

2. If Required- Provide cylindrical locks with classroom security function with an inside indicator that provides clear direction for users to safely and quickly secure the room.
3. Provide locksets able to withstand 1500 inch pounds of torque applied to locked outside lever without gaining access per ANSI A156.2 Abusive Locked Lever Torque Test and cycle tested to 3 million cycles per ANSI A156.2 Cycle Test.
4. Provide solid steel rotational stops to control excessive rotation of lever.
5. Provide completely re-functionable lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
6. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
7. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
8. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
9. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
10. Provide electrified options as scheduled in the hardware sets.
11. Lever Trim: Solid cast levers without plastic inserts, and wrought roses on both sides.
 - a. Lever Design: Schlage Rhodes.
 - b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.12 EXIT DEVICES OPTION WHEN REQUESTED TO SPECIFY VON DUPRIN AND/OR THE CONCEALED CABLE DEVICE NO SUBSTITUTE

A. Manufacturer and Product: Von Duprin 99/33 series OPTION 98/35 series, No Substitute

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, [OPTION for specific compliant products/applications: UL certified to meet maximum 5 pound requirements according to the California Building Code section 11B-309.4,] and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Quiet Operation: Incorporate fluid damper or other device that eliminates noise of exit device operation.
4. Touchpad: Extend minimum of one half of door width, but not the full length of exit device rail. Provide end-cap with two-point attachment to door. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. Provide compression springs in devices, latches, and outside trims or controls; tension springs prohibited.
5. Provide rim devices with a dual cylinder or inside thumb turn cylinder option with a visual security indicator that identifies the trims locked/unlocked status of the door from the inside of the room. Indicator in unlocked state presents a 1/2 inch x 1/2 inch white metal flag with black icon at top of device head. Indicator in locked state has no flag present. Provide rim devices without the dual cylinder or inside thumb turn cylinder option capable of being retrofitted with the visual security indicator.
6. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrical requirements.
7. OPTION XP 98/99 only: Static Load Resistance, Rim Exit Devices: 2000+ lbs.
8. OPTION XP 98/99 only: Latchbolt, Rim Exit Devices: Non-tapered smart latchbolt with 90° latchbolt to strike engagement under stress.

9. OPTION 98/9949 and/or 33/3549A only: Concealed Vertical Cable Exit Devices: Cable-actuated concealed vertical latch system in two-point and less bottom latch (LBL) configurations. Vertical rods not permitted.
 - a. Cable: Stainless steel core wire in stainless steel with polytetrafluoroethylene (Teflon®) liner color-coded to latches and center slides. Conduit and core wire ends snap into latch and center slides without use of tools.
 - b. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper-infiltrated steel, with molybdenum disulfide low friction coating.
 - c. Top Latchbolt: Minimum 0.382 inch (10 mm) and greater than 90 degree engagement with strike to prevent door and frame separation under high static load.
 - d. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
 - e. Product Cycle Life: 1,000,000 cycles.
 - f. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
 - g. Latch release does not require separate trigger mechanism.
 - h. Cable and latching system characteristics:
 - 1) Assembled prior to being installed in door.
 - 2) Installed in door as complete assembly.
 - 3) Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
 - 4) Connected to exit device at single attachment point.
 - 5) Bottom latch height adjusted from single point, after system is installed and connected to exit device, while door is hanging
 - 6) Latch position altered up and down 2 inches (51 mm) without additional adjustment.
 - 7) System may be removed while door is hanging.
 - 8) Configure latchbolt mounting: double or single tab mount for steel doors, and wood doors, face mount for aluminum doors, eliminating requirement of tabs.
 - 9) Provide adjustable exit device to latch center line adjustment. Ensures double tab mounting option for top latch, regardless of exit device centerline.
10. Provide exit devices with manufacturer's approved strikes.
11. Provide exit devices cut to door width and height. Locate exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
12. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
13. Provide cylinder[hex-key] dogging at non-fire-rated exit devices, unless specified less dogging.
14. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion that is removed by use of a keyed cylinder, which is self-locking when re-installed.
15. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
 - a. Lever Style: Match lever style of locksets.
 - b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.
16. Provide UL labeled fire exit hardware for fire rated openings.

17. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
18. Provide electrified options as scheduled in the hardware sets.

2.13 ACCESS CONTROL READER

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: aptiQ MT15. No substitute.

B. Requirements: Read Only Multi-technology Contactless reader

1. Access control card readers shall be as manufactured by a global company who is a recognized leader in the production of access control devices. Card reader manufactured for non-access control applications shall not be acceptable.
2. Multi-technology contactless reader shall read access control data from both 125 kHz and 13.56 MHz contactless smart cards and NFC-compatible. The multi-technology contactless reader shall be optimally designed for use in access control applications that require reading both 125 kHz Proximity and 13.56 MHz contactless smart cards by providing:
 - a. Configuration allows reader to be enabled to read smart, proximity or both technologies at the same time.
 - b. A migration platform to upgrade from the most popular 125 kHz proximity technologies to MIFARE or MIFARE DESFire EV1 by reading both 125 kHz proximity technology and 13.56 MHz contactless smart card technology.
 - c. Guaranteed compatibility to read all standard data formats ensuring card-to-reader interoperability in multi-location installations and multi-card/reader populations.
 - d. Secure access control data exchange between the smart card and the reader utilizing diversified keys and mutual authentication sequences.
 - e. Universal compatibility with most access control systems.
 - f. Ease of installation through industry standard wiring methods.
 - g. Compatibility with legacy 125 KHz proximity access control formats (all standard formats up to 37 bits, including HID Corporate 1000 formats).
 - h. Optimal read range and read speed for increased access control throughput.
 - i. Global availability.
 - j. Product construction suitable for both indoor and outdoor applications.
 - k. Customizable behavior for indicator lights and beeper.
3. Multi-technology contactless reader shall comply with the following 13.56MHz-related standards to ensure product compatibility and predictability of performance:
 - a. ISO 14443
4. Multi-technology contactless reader shall be configurable to read 13.56 MHz data simultaneously from the following cards (multiple credential support based on reader configuration):
 - a. Secure support - Mifare DESFire EV1 with PACSA, Mifare Classic, FIPS 201 PIV Credential.
 - b. UID/CSN Support – DESFire Classic V0.06, HID iClass, ISOX (my-d).
 - c. Proximity – Schlage Proximity, XID Proximity, HID Prox, AWID, GE/CASI, Lenel Prox, Inside Pictotag, TI Tagit, ST Micro.

5. Multi-technology contactless reader shall be configurable to read data from any compatible 125 kHz technology simultaneously with 13.56 MHz data. Compatible 125 kHz technologies include:
 - a. XCEEDID/Schlage/HID Prox (format in the card – formats up to 37-bits supported).
 - b. AWID PROX (SAME AS LENEL PROX - format in the card – formats up to 42-bits).
 - c. GE PROX - two possible format options.
6. Multi-technology contactless reader shall provide the ability to read card access data stored in the secure access control sector/application area of the ISO 14443 XceedID MIFARE or MIFARE DESFire EV1 card.
7. The Multi-technology contactless reader shall be configurable to provide multiple hierarchical degrees of key compatibility for accessing the smart card access control data. Compatibility shall be provided for the following key structure options:
 - a. Compatibility with the default manufacture's key structure to ensure convenient off the shelf compatibility with manufacture's cards and readers.
 - b. Compatibility with custom keys managed by manufacturer which provide a site-specific, unique, protected key structure.
 - c. Compatibility with high security customer managed custom keys.
8. The Multi-technology contactless reader shall be configurable to provide compatibility with all standard Prox formats up to 37 bits (including Corporate 1000®).
9. Multi-technology contactless reader shall allow the reader firmware to be upgraded in the field without the need to remove the reader from the wall through the use of factory-provided device.
10. Multi-technology contactless reader shall be suitable for global deployment by meeting worldwide radio and safety regulatory compliance including:
 - a. FCC Certification (US)
 - b. CE (EU)
 - c. C-tick (Australia, New Zealand)
 - d. R&TTE Directive (15EU)
 - e. UL294 (US)
 - f. ULC-S319
 - g. IC (Canada)
 - h. FIPS201 / PIV I
 - i. IP65
11. Multi-technology contactless reader shall be fully compliant with Restriction of Hazardous Substances directive (RoHS) restricting the use of specific hazardous materials found in electrical and electronic products.
12. Multi-technology contactless reader shall provide universal compatibility with most access control systems by outputting card data in compliance with the SIA AC-01 Wiegand standard.
13. Multi-technology contactless reader shall allow for secure installation practices through mounting methods utilizing tamper resistant screws.
14. Multi-technology contactless reader shall provide the ability to transmit an alarm signal via and integrated optical tamper switch if an attempt is made to remove the reader from the wall. The tamper switch shall be programmable to provide a selectable action to provide a selectable action compatible with various tamper communication schemes provided by access control panel manufacturers. The selectable action shall include one of the following:
 - a. The reader open collector line changes from a high state (5V) to a low state (Ground).
 - b. If utilizing OSDP Protocol reader shall report a tamper condition via RS485.

15. Multi-technology contactless reader shall provide the ability for mounting to standard electrical boxes through the use of universal international mounting holes.
16. Multi-technology contactless reader shall be provided with a full potted assembly.
17. Multi-technology contactless reader shall be provided with a quick connect wire harness.
18. The Multi-technology contactless reader shall provide customizable reader behavior options either from the factory, or defined in the field through the use of pre-configured command cards. Reader behavior programming options shall include:
 - a. LED & Audio configurations.
 - b. Ability to disable reading of specific card technologies or frequencies.
 - c. ISO 14443/15693 CSN output configuration.
 - d. Wiegand output spacing and timing.
19. Multi-technology contactless reader shall provide the following programmable audio/visual indication:
 - a. An audio beeper shall provide tone sequence to signify: access granted, access denied, power up, and diagnostics.
 - b. A light bar shall provide clear visual status (red/green/amber).
20. Multi-technology contactless reader shall be designed for low current operation to enable migration from most legacy proximity applications without the need to replace existing access control panels and/or power supplies. Contactless smart card power requirements shall be:
 - a. Operating voltage: 5 – 16 VDC, reverse voltage protected. Linear power supply recommended.
 - b. Current requirements: 160 mA DC, 195 mA PEAK @ 12 VDC
21. Multi-technology contactless reader shall meet the following physical specifications:
 - a. Dimensions: 5.1" x 3.25" x 0.83" (12.9 cm x 8.3 cm x 2.1 cm)
 - b. Weight: 9.6 oz. (272.15 g)
 - c. Material: UL94 Polycarbonate
 - d. Plastics: Consist of three-piece design with mounting plate, potted case and aesthetic cover.
 - e. Color: Black, Gray, Brown or Cream as approved by the project architect.
22. Multi-technology contactless reader shall meet the following environmental specifications:
 - a. Operating temperature: -31 to 151 degrees F (-35 to 67 degrees C)
 - b. Operating humidity: 5% to 95% relative humidity non-condensing
 - c. Weatherized design suitable to withstand harsh environments
 - 1) Certified rating of IP65
23. Multi-technology contactless reader cabling requirements shall be:
 - a. Cable distance: (Wiegand): 500 feet (150m)
 - b. Cable type: 5-conductor #22 AWG
 - c. Standard reader termination: 18" (0.5m) wire harness

2.14 ELECTRIC STRIKES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: HES

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide fail-secure type electric strikes, unless specified otherwise.
5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

2.15 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer: Medeco KeyMark.
2. Coordinate keying requirements with JJ Hall, Locksmith Lead, UNLV Lock Shop.

B. Small Format IC cylinders distributed throughout the Project as indicated.

1. Security: dual-locking cylinder with interchangeable core requiring restricted, patented keyway. Medeco Keymark

2.16 CYLINDERS OPTION: FOR EXISTING KEY SYSTEM

A. Manufacturer: Medeco

1. Scheduled Manufacturer: Keymark, No Substitute

B. Requirements: Provide cylinders/cores complying with the following requirements.

1. Cylinders/cores compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated.

C. Manufacturer-keyed permanent cylinders/cores, configured into existing keying system per "KEYING" article herein. Must coordinate keying with JJ Hall, Locksmith Lead, UNLV Lock Shop.

D. Nickel silver bottom pins.

1. Identification:

E. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Blind code marks shall not include actual key cuts.

F. Identification stamping provisions must be approved by the Architect and Owner.

G. Failure to comply with stamping requirements shall be cause for replacement of cylinders/cores involved at no additional cost to Owner.

1. Forward cylinders/cores to Owner, separately from keys, by means as directed by Owner.

EDIT – Descriptions below are provided as a guide for cylinder mechanism type distribution throughout the Project. Modify as required for Project requirements and coordinate with “Series” descriptions above.

2. Exterior Doors: Security cylinders with [permanent][interchangeable] cores requiring use of restricted, patented keys incorporating dual-locking mechanism with 5 interlocking pins to check for patented key features.
NOTE – High Security may not be available with interchangeable cores. Coordinate with temporary construction cylinder keying below.
3. Doors Designated as High Security: High security cylinders with permanent cores requiring use of restricted, patented keys incorporating dual-locking mechanism with 5 interlocking pins to check for patented key features; compliant with UL437 for drill and pick resistance; and integrated into exterior keying system without change to bitting combinations.
EDIT – Following description is for conventional cylinders with ability to be operated with a high security keying system.
4. Interior Doors [and Exterior Exit Device Cylinder Dogging]: Conventional cylinders with [permanent] [interchangeable] cores [requiring use of restricted, patented keys incorporating dual-locking mechanism with 1 nickel silver blocking pin to check for patented key features; and integrated into exterior system without change to bitting combinations.]
EDIT – Select only one of the following options.

2.17 DOOR CLOSERS OPTION

- A. Manufacturer and Product: LCN 4040XP series. No Substitute
- B. Requirements:
 1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
 3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
 6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
 7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
 8. Pressure Relief Valve (PRV) Technology: Not permitted.
 9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
 10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.18 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product: Stanley Magic Force Auto Operators

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19.
 - a. Opening: Powered by DC motor working through reduction gears.
 - b. Closing: Spring force.
 - c. Manual, hydraulic, or chain drive closers: Not permitted.
 - d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
 - e. Cover: Aluminum.
2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, or adapters for arms as required to suit details.
4. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
7. Provide units with inputs for smoke evacuation doors, where specified, which allow doors to power open upon fire alarm activation and hold open indefinitely or until fire alarm is reset, presence detector input, which prevents closed door from opening or door that is fully opened from closing, hold open toggle input, which allows remote activation for indefinite hold open and close second time input is activated, vestibule inputs, which allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.19 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Hager, Rockwood.

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.

2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.20 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Burns, Rockwood.

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:
 - a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
 - c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.21 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers: Glynn-Johnson
2. Acceptable Manufacturers: Hager, Rockwood

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.22 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Hager, Rockwood.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.23 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer: National Guard Products.
2. Acceptable Manufacturers: Pemko, Zero.

B. Requirements:

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds:
 - a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
 - b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.24 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Hager, Rockwood.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.25 MAGNETIC HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer: LCN.
2. Acceptable Manufacturers: Rixson, Sargent.

B. Requirements:

1. Provide wall or floor mounted electromagnetic door release as specified with minimum of 25 pounds of holding force. Coordination projection of holder and armature with other hardware and wall conditions to ensure that door sits parallel to wall when fully open. Wire magnetic holders on fire-rated doors into the fire control panel for fail-safe operation.

2.26 LATCH PROTECTORS

A. Manufacturers:

1. Scheduled Manufacturer: Ives.
2. Acceptable Manufacturers: Hager, Rockwood.

B. Provide latch protectors of type required to function with specified lock.

2.27 FINISHES

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 630 (US32D)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Where on-site modification of doors and frames is required:
 - 1. Remove existing hardware being replaced, tag, and store according to contract documents.
 - 2. Field modify and prepare existing door and frame for new hardware being installed.
 - 3. When modifications are exposed to view, use concealed fasteners, when possible.
 - 4. Prepare hardware locations in accordance with:
 - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
 - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
 - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).

- I. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as indicated in keying section.
 - 2. . OPTION: Furnish permanent cores to Owner for installation.
- J. Lead Protection: Lead wrap hardware penetrating lead-lined doors. Levers and roses to be lead lined. Apply kick and armor plates on lead-lined doors with adhesive as recommended by manufacturer.
- K. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Testing and labeling wires with Architect's opening number.
- L. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- M. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- N. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- O. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
 - 1. Configuration: Provide [one power supply for each door opening][least number of power supplies required to adequately serve doors] with electrified door hardware.
- P. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- Q. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- R. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- S. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- T. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

- A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three[six] <Insert number> months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

- A. Provide training for Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.8 DOOR HARDWARE SCHEDULE

- A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
- B. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled to include the appropriate additional hardware required for proper application and functionality.

HW SET 01

For use on mark/door #(s):

119A

| Qty | | Description | Catalog Number | Finish | Mfr |
|-----|----|---------------|--|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | ENTRANCE LOCK | ND53BDCD RHO | 626 | SCH |
| 1 | EA | SFIC CORE | KEYMARK – confirm kwy w/UNLV Lock Shop | 626 | MED |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET 02

For use on mark/door #(s):

119B

| Qty | | Description | Catalog Number | Finish | Mfr |
|-----|----|----------------|--|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | STOREROOM LOCK | ND80BDCD RHO | 626 | SCH |
| 1 | EA | SFIC CORE | KEYMARK – confirm kwy w/UNLV Lock Shop | 626 | MED |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET 03

For use on mark/door #(s):

113A 118A

| Qty | | Description | Catalog Number | Finish | Mfr |
|-----|----|-------------------|------------------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | PRIVACY LOCK | ND40S RHO | 626 | SCH |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | MOP PLATE | 8400 4" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 1 | EA | COAT AND HAT HOOK | 582 | 626 | IVE |

HW SET 04

For use on mark/door #(s):

116

| Qty | | Description | Catalog Number | Finish | Mfr |
|-----|----|-------------|----------------|--------|-----|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |

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| | | | | | |
|---|----|-------------|--------------|-----|-----|
| 1 | EA | PASSAGE SET | ND10S RHO | 626 | SCH |
| 1 | EA | WALL STOP | WS406/407CCV | 630 | IVE |
| 3 | EA | SILENCER | SR64 | GRY | IVE |

HW SET 05 - BIFOLD

For use on mark/door #(s):

113B 115

| Qty | | Description | Catalog Number | Finish | Mfr |
|-----|----|------------------|--|--------|-----|
| 1 | EA | 2 DOOR TRACK SET | 1700 2-DOOR SET COMPLETE KIT-INCUDING ALL HARDWARE | 626 | JOH |

HW SET 06 - Other than key cylinder (if needed), hardware is part of the motorized roll-up door package.

For use on mark/door #(s):

125

| Qty | | Description | Catalog Number | Finish | Mfr |
|-----|----|-------------------|---|--------|-----|
| 1 | EA | SFIC MORTISE CYL. | 80-111 | 626 | SCH |
| 1 | EA | SFIC CORE | KEYMARK – confirm kwy w/UNLV Lock Shop | 626 | MED |
| | | HARDWARE | BY DOOR MFG | | B/O |

End of Section