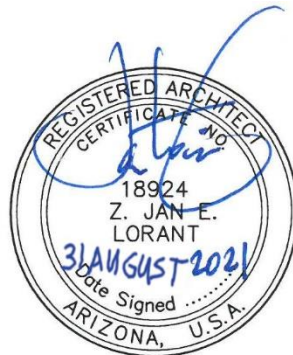




CONTRACT DOCUMENTS
FOR
CITY OF SEDONA
PUBLIC WORKS DEPARTMENT

Sedona Police Station Renovation Project

2021-PD-03



EXPIRES 6/30/2024

TABLE OF CONTENTS
CITY OF SEDONA
POLICE STATION RENOVATION
2020 PD-03

SECTION	TITLE	NO. OF PAGES
CS	Cover Sheet	
00 01 10	Table of Contents	
DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS		
00 63 13	Requests for Interpretation Form	
00 63 25	Substitution Request (After the Bidding Phase)	
DIVISION 1 - GENERAL REQUIREMENTS		
GC-1	City of Sedona General Conditions 2021	59
01 11 00	Summary of Work	4
01 21 00	Allowances	1
01 26 13	Contractor's Requests for Interpretation	3
DIVISION 02 – EXISTING CONDITIONS		
02 41 16	Structure Demolition	4
DIVISION 03 - CONCRETE		
03 53 00	Concrete Topping	5
DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES		
06 10 53	Miscellaneous Carpentry	5
06 40 00	Architectural Woodwork	7
06 61 16	Solid Surface Fabrications	4
DIVISION 7 - THERMAL & MOISTURE PROTECTION		
07 21 00	Building Insulation	4
07 21 19	Foamed-in-Place Insulation	6
07 24 19	Exterior Insulation Finish System	10
07 54 00	Thermoplastic Roofing	17
07 60 00	Flashing and Sheet Metal	5
07 84 00	Firestopping	8
07 90 00	Joint Sealers	5
DIVISION 08 – OPENINGS		
08 11 13	Steel Doors and Frames	5
08 11 19	Stainless Steel Doors and Frames	10
08 62 00	Unit Skylights	4
08 63 50	Operable Skylights	7
08 71 00	Door Hardware	18
08 80 00	Glazing	5
DIVISION 9 - FINISHES		
09 22 16	Non Structural Metal Framing	9
09 29 00	Gypsum Board	12
09 30 00	Tile	6
09 54 00	Acoustical Ceilings	4

▲ 1

09 65 13	Resilient Base and Accessories	3
09 65 19	LVT Flooring	5
09 68 13	Carpet Tile	5
09 81 00	Acoustical Insulation	2
09 91 00	Painting	9

DIVISION 10 - SPECIALTIES

10 14 00	Signage	5
10 21 13	Toilet Partitions	4
10 28 13	Toilet Accessories	3
10 44 00	Fire Protection Specialties	3
10 51 13	Personal Storage Lockers	10
10 51 26	Plastic Lockers	3

DIVISION 11 – EQUIPMENT

11 30 13	Appliances	4
11 52 00	Audio Visual Equipment	2

DIVISION 21 – FIRE SUPPRESSION

21 20 00	Fire Protection Systems	11
----------	-------------------------	----

DIVISION 22 – PLUMBING

22 05 00	Plumbing General Requirements	5
22 05 23	Valves	2
22 05 49	Installation Coordination	2
22 10 00	Piping	7
22 13 16	Sanitary Waste & Vent Piping	2
22 33 00	Water Heaters	2
22 40 00	Plumbing Fixtures	2

DIVISION 23 – HEATING VENTILATING AND AIR CONDITIONING

23 05 00	HVAC General Requirements	6
23 05 29	Hangers and Supports	2
23 05 49	HVAC Installation Coordination	2
23 05 93	HVAC Testing, Adjusting and Balancing	1
23 08 39	Air Handling and Air Distribution Systems	2
23 31 10	Sheet Metal Ductwork (Low Pressure)	5
23 34 16	Exhaust Air	3
23 80 00	HVAC Equipment	3

DIVISION 26 – ELECTRICAL

26 05 10	General Provisions	2
26 05 19	Low Voltage Electrical Power Conductors and Cables	6
26 05 26	Grounding and Bonding for Electrical Systems	9
26 05 29	Hangers and Supports for Electrical Systems	6
26 05 33	Raceways and Boxes for Electrical Systems	16
26 05 44	Sleeves and Sleeve Seals for Electrical Raceways and Cabling	4
26 05 53	Identification for electrical systems	13
26 09 36	Lighting Controls	6
26 24 13	Switchboards	17
26 24 15	Panelboards	12
26 27 26	Wiring Devices	17
26 28 13	Fuses	4
26 28 16	Enclosed Switches and Circuit Breakers	11
26 51 00	Lighting	8

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 31 00

Fire Detection and Alarm Modifications

9

END OF TABLE OF CONTENTS

DOCUMENT 00 63 13

REQUEST FOR INTERPRETATION FORM

Project: *Sedona Police Station Renovation* R.F.I Number: _____

From: _____

To: _____ Date: _____

_____ A/E Project Number: *gla 19107*

Specification Section: Paragraph: Drawing Reference: Detail

Request:

* Requested Date/Time for Response:

Signed by:

Response:

Attachments

Response From: To: * Date Rec'd: * Date Ret'd:

Signed by:

Copies: Owner Consultants _____ File

* Contractor shall allow up to 7 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 10 working days..

THIS PAGE IS BLANK

SECTION 00 63 25

SUBSTITUTION REQUEST
(After the Bidding Phase)

Project: *Sedona Police Station Renovation* Substitution Request Number: _____
 From: _____
 To: _____ Date: _____
 _____ A/E Project Number: *gla 19107*
 Re: _____ Contract For: _____

Specification Title: _____ Description: _____
 Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
 Manufacturer: _____ Address: _____ Phone: _____
 Trade Name: _____ Model No.: _____
 Installer: _____ Address: _____ Phone: _____
 History: New product 2-5 years old 5-10 years old More than 10 years old
 Differences between proposed substitution and specified product: _____

Point-by point comparative data attached – REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:
 Project: _____ Architect: _____
 Address: _____ Owner: _____
 _____ Date Installed: _____

Proposed substitution affects other parts of Work: No Yes; explain _____

Savings to Owner for accepting substitution: _____ (\$_____).

Proposed substitution changes Contract Time: No Yes [Add] [Deduct] _____ days.

Supporting Data Attached: Drawings Product Data Samples Tests Reports _____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

Substitution approved – Make submittals in accordance with A/E review comments.

Substitution approved as noted – Make submittals in accordance with A/E review comments.

Substitution rejected – Use specified materials.

Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Additional Comments: Contractor Subcontractor Supplier Manufacturer A/E _____

General Conditions

2021

TABLE OF CONTENTS

TITLE	PAGE
1. CONTENTS.....	4
2. DEFINITIONS AND TERMS.....	4
3. CONTRACTOR'S UNDERSTANDING	8
4. DEFECTIVE WORK.....	8
5. NOTICE AND SERVICE THEREOF.....	9
6. MATERIAL AND EQUIPMENT SPECIFIED BY NAME	9
7. CONTRACT BONDS AND GUARANTEES	10
8. INSURANCE.....	10
9. SCHEDULE OF CONSTRUCTION	15
10. PROGRESS MEETINGS	17
11. TAXES.....	17
12. ASSIGNMENTS.....	17
13. SUBCONTRACTING	18
14. COOPERATION AND COLLATERAL WORK	18
15. LINES AND GRADES.....	19
16. EXCAVATIONS , UNDERGROUND FACILITIES LOCATION, AND STORMWATER POLLUTION PREVENTION.....	19
17. EXISTING UTILITIES, RIGHTS-OF-WAY, EASEMENTS.....	22
18. OPERATIONS, LAYDOWN YARD AND STORAGE AREAS	23
19. RIGHT-OF-ENTRY	27

20. ACCESS AND DRAINAGE	27
21. SANITARY CONVENIENCES.....	27
22. CLEANUP PRACTICES.....	27
23. PLANS AND SPECIFICATIONS	28
24. CORRELATION OF DOCUMENTS	29
25. SHOP DRAWINGS, SAMPLES, AND OPERATOR'S INSTRUCTION	29
26. DRAWINGS SHOWING CHANGES DURING CONSTRUCTION.....	31
27. MATERIALS, EQUIPMENT, SUPPLIES, SERVICES, AND FACILITIES.....	31
28. WORKMANSHIP, MATERIALS, AND EQUIPMENT.....	32
29. QUALITY OF MATERIALS IN ABSENCE OF DETAILED SPECIFICATIONS.....	32
30. VARIATIONS FROM ESTIMATED QUANTITIES	32
31. PROGRESS PAYMENTS.....	33
32. PAYMENT WITHHELD	35
33. MEASUREMENTS	35
34. PAYMENT, USE OR OCCUPANCY OF WORK	37
35. CLOSEOUT PROCEDURE.....	38
36. FINAL PAYMENT	38
37. SUPERVISION BY CONTRACTOR.....	39
38. WEATHER.....	40
39. OVERTIME.....	40
40. INDEMNIFICATION.....	41
41. ACCIDENT PREVENTION - EMERGENCY - AUTHORITY TO ACT	42
42. PROTECTION OF WORK	42
43. PROTECTION OF PROPERTY	42
44. PROTECTION OF PERSONS.....	43
45. POTENTIALLY DANGEROUS WORK	44
46. PATENTS, COPYRIGHTS, AND ROYALTIES	44

47. CHANGE ORDERS FOR CHANGED OR EXTRA WORK.....	45
48. PROCEDURE FOR REQUESTING CHANGE ORDERS –EXTRA.....	47
49. PROCEDURE FOR REQUESTING CHANGE ORDERS--EXTRA TIME.....	48
50. DIFFERING SITE CONDITIONS.....	49
51. WARRANTY PERIOD.....	49
52. AUTHORITY OF ENGINEER.....	50
53. DECISIONS OF THE CITY.....	50
54. TEMPORARY SUSPENSION OF THE WORK.....	51
55. AUTHORITY AND DUTIES OF CITY’S FIELD REPRESENTATIVE.....	51
56. CHARACTER OF WORKERS, METHODS, AND EQUIPMENT.....	52
57. WARRANTY OF COMPLIANCE WITH STATE AND FEDERAL LAW.....	52
58. QUALITY CONTROL AND TESTING.....	53
59. TERMINATION OF CONTRACT.....	54
60. TIME IS OF THE ESSENCE.....	55
61. LIQUIDATED DAMAGES.....	55
62. CITY'S REMEDIES CUMULATIVE AND NONWAIVER.....	56
63. SEVERABILITY CLAUSE, DISPUTE RESOLUTION, APPLICABLE LAW.....	56
64. POTHOLING REQUIREMENTS.....	58
65. UNMARKED UTILITY REPAIR.....	58
66. UTILITY SEPARATION.....	58
67. NOTIFICATION TO RESIDENTS & COMMUNITY RELATIONS.....	58

GENERAL CONDITIONS

1. CONTENTS

The following Contract Provisions are general in scope and may refer to conditions, which will not be encountered in the performance of the work, included in this Contract and which are not applicable thereto. Any requirements, provisions or other stipulation of these General Conditions, which pertain to a non-applicable condition, shall be excluded from the scope of the Contract. Where conflict appears, "Special Condition" shall take precedence over "General Conditions". Full compensation for compliance with these General Conditions shall be considered as included in the total and various bid items of the contract and the contract time.

2. DEFINITIONS AND TERMS

When the Contract indicates that work shall be "accepted, acceptable, approve, authorized, condemned, considered necessary, contemplated, deemed necessary, designated, determined, directed, disapproved, established, given, indicated, insufficient interpreted, ordered, permitted, rejected, required, reserved, satisfactory, specified sufficient, suitable, suspended, unacceptable, unsatisfactory," it shall be understood that these expressions are followed by the words "by the City of Sedona".

Wherever the following abbreviations, terms, or pronouns are used in the specifications, plans, or other Contract Documents, the intent and meaning shall be interpreted as follows:

ABBREVIATIONS

AAN	American Association of Nurserymen
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADOT	Arizona Department of Transportation
AGC	Associated General Contractors of America
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute, Inc.
ARA	American Railway Association
AREA	American Railway Engineering Association
ARTBA	American Road and Transportation Builders Association
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATSSA	American Traffic Safety Services Association
A WG	American Wire Gauge
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute

EIA	Electric Industries Association
FHWA	Federal Highway Administration, Department of Transportation
FSS	Federal Specifications and Standards
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IMSA	International Municipal Signal Association
IPCEA	Insulated Power Cable Engineers Association
ITE	Institute of Transportation Engineers
MAG	Maricopa Association of Governments
MIL	Military Specifications
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NIST	National Institute of Standards and Technology
NSF	National Sanitation Foundation (NSF)
SAE	Society of Automotive Engineers
UL	Underwriters Laboratories, Inc.

ADVERTISEMENT - A public announcement inviting proposals for work to be performed or materials to be furnished.

AWARD - The acceptance by the City of a proposal.

BASIS OF PAYMENT - The terms under which "work" is paid, as a designated pay item in accordance with the quantity measured and the pay unit.

BIDDER - Any individual, partnership, joint venture, firm or corporation submitting a proposal for the advertised work, acting directly or through a duly authorized representative.

CALENDAR DAY - Each and every day shown on the calendar, beginning and ending at midnight.

CERTIFIED INVOICE - An invoice from a supplier which has been reliably endorsed by the Contractor guaranteeing that the material was purchased and received for the project and establishing the value of the material.

CLAIM - A written demand or request for additional compensation or additional time submitted to the Engineer that:

- A. Contains the words "This is a claim...", within its Subject line or the first paragraph
- B. Cites the contractual basis for the demand or request
- C. Relates the Contractual basis cited to factual events occurring or that have occurred within the project.

COMPLETION DATE - The date on which the contract work is specified to be completed

CONTRACT ITEM (PAY ITEM) - A specifically named unit of work for which a price is provided in the Contract. The description, whether general or detailed, the content of the named unit of work shall be as per the project plans and specifications.

CONTRACT CHANGE ORDER - A written order issued to the Contractor by the City covering extra work, additions or alterations to the plans and specifications, and establishing the basis of payment and time adjustment for the work affected by the changes. The Contract Change Order is the only method authorized for changing the Contract.

CONTRACT DOCUMENTS - The following comprise the Contract Documents: Advertisement for Bids, Information for and Instructions to Bidders, Bid Proposal and Bid Guarantee Bond, Construction Contract, Change Orders, Addenda, Performance Bond, Labor and Material Payment Bond, Special Conditions, General Conditions, Technical Specifications, Notice of Award, Notice to Proceed, Drawings, Plans, Standard Specifications and Certificate of insurability. All of these documents together constitute the **CONTRACT**.

CONTRACT TIME - The number of calendar days allowed for the entire completion of the Contract, including authorized time extensions and work required to be complete after substantial completion. Where a calendar date of completion is specified, the Contract shall be completed on or before that date.

CONTRACTOR - Party contracting directly with the City to furnish and perform all work and services in accordance with the Contract Documents.

COUNTY - The County in which the work is to be done.

DAY - Unless otherwise defined shall mean "calendar" day.

ENGINEER - The City Engineer; or his designated representative.

EXTRA WORK - Work not provided for in the Contract as awarded but determined by the City to be essential to the satisfactory completion of the Contract within its intended scope.

FINAL ACCEPTANCE - The acknowledgment by the City that the project or the work has been completed in accordance with the Contract Documents and provides the date at which the warranty or guarantee period begins.

INSPECTOR - A person, persons, or firm authorized by the Engineer to make detailed reviews, observations, reports and determinations of contract performance.

MAY - Used to refer to permissive actions.

METHOD OF MEASUREMENT - The manner in which a pay item is measured to conform with the pay unit.

NOTICE OF CLAIM - A written notification submitted to the Engineer that a demand or request for additional compensation or additional time may be made. The notification shall

1. Contain the words "notification of a potential claim" within its Subject line or the first paragraph
2. Describe the occurrence which is the reason that the Notice of Claim is being presented

NOTICE TO PROCEED - Written notice to the Contractor to proceed with the contract work including, when applicable, the date of beginning of contract time. Start of Construction, as defined below, may start at a later date.

PLANS - The drawings and pictures depicting the location and special orientation of the work to be done.

PROJECT - The work to be completed pursuant to this contract.

PROPOSAL - A standard form plus information supplied by the City, which contains spaces for completion by the Bidder which, when completed in its entirety and executed by the Bidder, along with all required additional documents, shall constitute the Bid. Said Bid shall constitute the Contractor's offer to perform all work required as set forth in the Contract Documents for the amount of money stated in the Bid.

PROPOSAL FORM - The documents furnished by the City on which the offer of a bidder is submitted.

PROPOSAL GUARANTY - The security furnished with a proposal to Guaranty that the bidder will enter into the Contract if the proposal is accepted.

RIGHT OF WAY - A general term denoting land, property, or interest therein, acquired for or devoted to the construction of an improvement.

SALVABLE MATERIAL - Material that can be saved or salvaged. Unless otherwise designated or directed by the City or shown on the plans, all salvable material shall become the property of the Contractor.

SAMPLES - Samples are physical examples furnished or constructed by the Contractor to illustrate materials, equipment, workmanship or finishes, and to establish standards by which the work will be judged.

SHALL - Refers to mandatory actions by either the Contractor or the City.

SHOP DRAWINGS - Drawings, diagrams, illustrations, certificates, test reports, schedules, performance charts, brochures, shop layouts, fabrication layouts, assembly layouts, foundation layouts, wiring and piping layouts, specifications and descriptive literature required by the Contract Documents which the Contractor is required to submit for approval.

START OF CONSTRUCTION – The date in which the Contractor begins physical work at the project site. Restrictions on start of construction are provided in the General Conditions and may be specified in the Special Conditions.

SUBCONTRACTOR - Party supplying labor and/or material for work at the site of the project for, and under separate contract or agreement with, the Contractor. Nothing contained in the Contract Documents shall create any contractual relationship between the City and any subcontractor.

SUBSTANTIAL COMPLETION - The date when the work is sufficiently completed so it may be safely, conveniently, and beneficially utilized by the City for all of the purposes for which it

was intended. Reduced liquidated damages are chargeable for a project or portions thereof which have separately specified damages, if there are items of work remaining to be performed relative to such work once full substantial completion status has been attained. In such cases the amount of liquidated damages due shall be twenty-five percent (25%) of the unreduced liquidated damage amount stated in the contract.

SUPERINTENDENT - The Contractor's authorized representative in charge of the work.

WORK - The furnishing of all labor, materials, equipment, and all other incidentals necessary to the successful and acceptable completion of all obligations as described in the Contract Documents, and the carrying out of all of the duties and obligations imposed by the Contract.

3. CONTRACTOR'S UNDERSTANDING

- A. It is understood and mutually agreed that by submitting a proposal, the Contractor acknowledges that he has carefully examined all documents pertaining to the work, the locations, accessibility, and general character of the site of the work and all existing buildings and structures within and adjacent to the site, and has satisfied himself as to the nature of the work, the condition of existing buildings and structures, the conformation of the ground, subsurface conditions, the character, quality, and equipment, machinery, plant, and any other facilities needed preliminary to and during prosecution of the work, the general and local conditions, the construction hazards, and all other matters, including but not limited to any labor situation which can in any way affect the work under the Contract. It is further mutually agreed that by submitting a proposal, the Contractor acknowledges that he has satisfied himself as to the feasibility and correctness of the Contract Documents for the construction of the work and that he accepts all the terms, conditions, and stipulations contained therein; and that he is prepared to work in peace and harmony with other Contractors performing work on the site.
- B. No verbal agreement or conversation with any officer, agent, or employee of the City, either before or after the execution of the Contract, shall affect or modify any of the terms, conditions, or other obligations set forth in any of the Contract Documents.
- C. The Contractor understands that, unless specifically stated otherwise in the contract documents, the intent of the contract documents is to provide complete and operable facilities. The Contractor's bid amount for this project, therefore, shall be and is considered to be for completion in conformity with this understanding, regardless of whether some aspect of the work to be performed is named as a separate bid item or not.

4. DEFECTIVE WORK

- A. A City Representative, designated by the City Engineer, shall give written notice of the noncompliance to the Contractor, when, and as often as the City Representative determines through his inspection that procedures, material, equipment or workmanship incorporated in the Project does not meet the requirements of the Contract. Within five (5) working days from the receipt of such notice, the Contractor shall undertake the work necessary to correct such deficiencies, and to bring the work into compliance with the Contract Documents. Should the Contractor not agree with the City Representative's determination, and as a condition precedent to any request for either additional compensation or time extension, or both, resulting from the City Representative's determination, the Contractor shall within three (3) working days provide a Notice of Claim to the Engineer that he may claim

additional compensation, time or both, and detailed explanation of the Contractor's position. The Contractor shall document the costs associated with the corrective work with daily records and cost data and shall furnish such information to the Inspector daily. Receipt of cost data shall not be construed to be an acceptance of the corrective work, or an authorization for a Change Order to cover the corrective work. Failure by the Contractor to provide the specified written notice of an intention to make a claim shall be sufficient basis to reject any related claim subsequently submitted.

- B. Prior to initial acceptance of the Project, the City may, at its option, retain work, which is not in compliance with the Contract if the City determines that such defective work is not of sufficient magnitude or importance to make the work dangerous or undesirable. The City also may retain defective work, if in the opinion of the Inspector, and with concurrence of the City Engineer, removal of such work is impractical or will create conditions, which are dangerous or undesirable. Just and reasonable value, for such defective work, shall be judged, by the Engineer and appropriate deductions shall be made in the payments due, or to become due to the Contractor. Initial acceptance shall not act as a waiver of the City's right to recover from the Contractor an amount representing the deduction for retention of defective work.

5. NOTICE AND SERVICE THEREOF

Where the manner of giving notice is not otherwise provided for in the Contract Documents, any notice to the Contractor from the City relative to any part of the Contract shall be in writing and considered delivered and the service thereof completed, when said notice is posted to the Contractor at the address given in the Contractor's proposal, or at the last business address known to the City, or delivered in person to the Contractor or his authorized representative on the site or transmitted electronically by facsimile or electronic mail using phone numbers and addresses last provided by the Contractor. It is mutually agreed that such notice shall be sufficient and adequate. The Contractor shall provide the City, upon written request, facsimile phone numbers and electronic mail addresses, in writing.

6. MATERIAL AND EQUIPMENT SPECIFIED BY NAME

When material or equipment is specified by reference to one or more patents, brand names, or catalog numbers, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements, and that other materials or equipment, of equal capacities, quality and function may be considered. The Contractor may offer material or equipment of equal or better quality and performance in substitution for those specified which he considers would be in the City's interest to accept. After the Award of the Contract, the City will consider offers for substitution only from the Contractor and will not acknowledge or consider such offers from suppliers, distributors, manufacturers, or Subcontractors.

Substitutions

The Contractor's offer of substitution shall be made in writing to the Engineer and shall include sufficient data to enable the Engineer to assess the acceptability of the material or equipment for the particular application and requirements. If the offered substitution necessitates changes to or coordination with other portions of the work, the data submitted shall include drawings and details showing such changes. Contractor agrees to perform these changes as part of the substitution of material or equipment. Within thirty (30) calendar days after the receipt of the offer of substitution, the Engineer will review the material submitted by the Contractor and notify the Contractor if

approved for use or objections, if any, to the proposed substitution or if further information is required. Upon notification by the Engineer, the Contractor shall either provide the approved material or equipment, which complies with project specifications, or furnish requested additional information. While the Engineer might not take any objections to the proposed substitution and may approve the same, such action shall not relieve the Contractor from responsibility for the efficiency, sufficiency, quality and performance of the substitute material or equipment, in the same manner and degree as the material and equipment specified by name. Any cost differential associated with a substitution shall be reflected in the Contractor's offer of substitution and the Contract Documents shall be modified by a Change Order.

When the specifications state the construction shall be performed by the use of certain methods and equipment, such methods and equipment shall be used unless other methods are authorized by the Engineer. If the contractor desires to use a method or type of equipment other than those specified, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the method and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given it will be on the condition that the Contractor will be fully responsible for producing construction work in conformity with the Contract Documents. If material or equipment is specified by only one patent or proprietary name, or by the name of only one manufacturer, it is for the purpose of standardization, or because the City knows of no equal. If standardization is the reason for using one name to specify any material or equipment, the specifications will so state, and substitutions will not be considered. In other cases, the Contractor may offer substitutions in the same manner as requesting a Change Order for products he considers being equal to those specified.

7. CONTRACT BONDS AND GUARANTEES

- A. The Contractor shall provide two surety bonds on the forms provided, each in an amount equal to 100% of the contract price. One shall serve as security for the faithful performance of the work and the other as security for the faithful payment and satisfaction of the persons furnishing materials and performing labor on the work. The bonds shall be issued by a corporation duly and legally licensed to transact surety business in the State of Arizona. Such bonds shall remain in force throughout the period required to complete the work and thereafter for a period of 365 calendar days after final acceptance of the work, plus 365 calendar days following the repair of any work pursuant to the guarantees herein made. The surety's liability on the bonds shall not exceed the underwriting limitations for the respective surety specified in Circular 570, published by the United States Department of the Treasury.
- B. Should any surety or sureties be deemed unsatisfactory at any time by the City, notice will be given to the Contractor to that effect and he shall forthwith substitute a new surety or sureties satisfactory to the City. No further payment shall be deemed due or will be made under this Contract until the new surety shall qualify and be accepted by the City.
- C. The Contractor guarantees to the City that all materials and equipment furnished under this Contract will be new and of good and sufficient quality, free from faults and defects as is necessary to complete the project as required by the Plans and Specifications.

8. INSURANCE

- A. The Contractor, at Contractor's own expense, shall purchase and maintain the herein stipulated minimum insurance with companies duly licensed, possessing a current A.M. Best,

Inc. Rating of B+6, as minimum and approved and licensed to do business in the State of Arizona with policies and forms satisfactory to the City.

- B. All required insurance herein shall be maintained in full force and effect until all work required to be performed under the terms of the Contract is satisfactorily completed and finally accepted - failure to do so may, at the sole direction of the City, constitute a material breach of this Contract.
- C. The Contractor's insurance shall be primary insurance, and any insurance or self-insurance maintained by the City shall not contribute to it.
- D. Any failure to comply with the claim reporting provisions of the policies or any breach of an insurance policy warranty shall not affect coverage afforded under the policy to protect the City.
- E. The policies, except Workers' Compensation, shall contain a waiver of transfer rights of recovery (subrogation) against the City, its agents, officers, officials and employees for any claims arising out of the Contractor's work or service.
- F. The insurance policies may provide coverage, which contains deductibles or self-insured retentions. Such deductible and/or self-insured retentions shall not be applicable with respect to the coverage provided to the City under such policies. The Contractor shall be solely responsible for deductible and/or self-insured retention and the City, at its option, may require the Contractor to secure the payment of such deductible or self-insured retentions by a surety bond or an irrevocable and unconditional letter of credit.
- G. The City reserves the right to request and to receive, within ten (10) working days, certified copies of any or all of the herein required insurance policies and/or endorsements. The City shall not be obligated, however, to review same or to advise Contractor of any deficiencies in such policies and endorsements, and such receipt shall not relieve Contractor from, or be deemed a waiver of, the City's right to insist on strict fulfillment of Contractor's obligations under this Contract.
- H. The insurance policies, except Workers' Compensation, required by this Contract shall name the City, its agents, officers, officials and employees as additional insured.
- I. The making of progress payments to the Contractor shall not be construed as creating an insurable interest by or for the City or be construed as relieving the Contractor or his Subcontractors of responsibility for direct physical loss, damage or destruction occurring prior to final acceptance.
- J. Any insured loss under the policies of insurance required by this Agreement shall be adjusted with the City and made payable to City for the insured, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph K of this Article of these General Conditions. City shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged work shall be repaired or replaced, the moneys so received shall be applied on account thereof, and the work and the cost thereof shall be covered by an appropriate Change Order.

- K. City shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within ten (10) working days after the occurrence of loss to City's exercise of this power. If such objection were made, City shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If required in writing by any party in interest, City shall upon the occurrence of an insured loss, give bond for the proper performance of these duties

- L. If City finds it necessary to occupy or use a portion or portions of the work prior to substantial completion of all of the work, such use or occupancy may be accomplished as provided in these General Conditions, provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or lapse on account of any such partial use or occupancy.

M. REQUIRED COVERAGE

The Contractor shall obtain for itself and provide the City with Certificates of Insurance indicating the scope and extent of coverage as set forth below. Required coverage's may be modified by an amendment to the Contract Documents.

1. GENERAL LIABILITY

Contractor shall maintain Commercial General Liability insurance with a limit of not less than \$3,000,000 for each occurrence with a \$3,000,000 Products and Completed Operations Aggregate and \$3,000,000 General Aggregate Limit. The policy shall include coverage for bodily injury, broad form property damage, personal injury, products/completed operations and blanket contractual coverage including, but not limited to, the liability assumed under the indemnification provisions of this Contract, which coverage will be at least as broad as Insurance Service Office, Inc. Policy Form CG 000211093, or any replacements thereof. The coverage shall not exclude X, C, U.

Such policy shall contain a severability of interest provision, and shall not contain a sunset provision or commutation clause, or any provision, which would serve to limit third party action over claims.

The Commercial General Liability additional insured endorsement shall be at least as broad as the Insurance Service Office, Inc.'s, Additional Insured, Form B, CG20101185, and shall include coverage for Contractor's operations and products and completed operations.

If required by this Contract, the Contractor subletting any part of the work, services or operations awarded to the Contractor shall purchase and maintain, at all times during prosecution of the work, services or operations under this Contract, an Owner and Contractor's Protective Liability insurance policy for bodily injury and property damage, including death, which may arise in the prosecution of the Contractor's work, service or operations under this Contract. Coverage shall be on an occurrence basis with a limit not less than \$3,000,000 per occurrence, and the policy shall be issued by the same insurance company that issues the Contractor's Commercial General Liability Insurance.

2. AUTOMOBILE LIABILITY

Contractor shall maintain Commercial Business Automobile Liability insurance with a combined single limit for bodily injury and property damage of not less than \$1,000,000 each occurrence and \$2,000,000 for more than one person and property damage in the sum of not less than \$1,000,000 resulting from any one accident which may arise from the operation, actions or omissions of the Contractor or any Subcontractor in the performance of the project, and with respect to the Contractor's owned, hired, and non-owned vehicles assigned to or used in performance of the Contractor's work. Coverage will be at least as broad as coverage code 1, "any auto", (Insurance Service Office, Inc. Policy Form CA 00011293, or any replacements thereof). Such insurance shall include coverage for loading and offloading hazards. If hazardous substances, materials or wastes are to be transported, MCS 90 endorsement shall be included and \$5,000,000 per accident limits for bodily injury and property damage shall apply.

3. WORKERS' COMPENSATION

The Contractor shall carry Workers' Compensation insurance to cover obligations imposed by federal and state statutes having jurisdiction of Contractor's employees engaged in the performance of the work; and, Employer's Liability insurance of not less than \$1,000,000 for each accident, \$1,000,000 disease for each employee, and \$1,000,000 disease policy limit.

In case any work is subcontracted, the Contractor will require the Subcontractor to provide Workers' Compensation and Employer's Liability to at least the same extent as required of the Contractor.

The Contractor shall furnish the City with a Certificate of Waiver of Subrogation under the terms of the Workmen's Compensation insurance. The Contractor shall defend, protect, and save harmless the City from and against all claims, suits, and actions arising from failure of the Contractor or the Subcontractor to maintain such insurance.

4. BUILDERS' RISK (PROPERTY) INSURANCE

The Contractor shall purchase and maintain, on a replacement cost basis, Builders' Risk insurance in the amount of the initial Contract Amount as well as subsequent modifications thereto for the entire work at the site. Such Builders' Risk insurance shall be maintained until final payment has been made or until no person or entity other than the City has an insurable interest in the property required to be covered, whichever is earlier. This insurance shall include interests of the City, the Contractor, and all Subcontractors and Sub-Subcontractors in the work during the life of the Contract and course of construction, and shall continue until the work is completed and accepted by the City. The insurance shall cover work performed under the Contract and materials, equipment or other items to be incorporated therein, while the same are located at the construction site, stored off-site, or at the place of manufacture. The policy shall cover not less than losses due to fire, mischief, weather, vandalism, malicious mischief, wind, collapse, riot, aircraft, smoke or any other casualty, including but not limited to earthquakes, tornadoes or other cataclysmic events, until the date of initial acceptance of the work. For new construction projects, the Contractor agrees to assume full responsibility for loss or damage to the work being performed and to the buildings under construction. For renovation construction projects, the Contractor agrees to assume responsibility for loss or damage to the work being performed at least up to the full Contract Amount unless otherwise required by the Contract Documents or amendments thereto.

Builders' Risk insurance shall be on an all-risk policy form and shall also cover false work and temporary buildings and shall insure against risk of direct physical loss or damage from external causes including debris removal, demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's service and expenses required as a result of such insured loss and other " soft costs" as required by the Contract.

Builders' Risk insurance must provide coverage from the time any covered property becomes Contractor's control and/or responsibility, and continue without interruption during construction or renovation or installation, including any time during which the covered property is being transported to the construction installation site, and while on the construction or installation site awaiting installation. The policy will provide coverage while the covered premises or any part thereof are occupied. Builders' Risk insurance shall be primary and not contributory.

If the Contract requires testing of equipment or other similar operations, at the option of the City, the Contractor will be responsible for providing property insurance for these exposures under a Boiler Machinery insurance policy.

The maximum deductible allowable under this policy shall be \$5,000. The policies providing this insurance shall name the City, its agents and attorneys, the City Engineer, and the Design Engineer as additional insured as their respective interests shall appear.

5. **BLASTING INSURANCE:**

If the Contractor determines that the performance of the project will require use of explosives, the public liability and property damage insurance shall specifically cover all liability arising out of the Contractor's acquisition, storage and use of explosives. If work requiring use of explosives is not discovered until after the commencement of the work, upon discovery, the Contractor shall immediately procure blasting insurance as required by this paragraph. The Contractor shall not undertake any blasting without submission to the City of a Certificate of Insurance covering all liability due to blasting regardless of amount. Any delays incurred by the Contractor in procuring blasting insurance shall not be grounds for an extension of time for completion of the project, nor for any additions to the contract price.

6. **OTHER INSURANCE:**

The Contractor shall carry and maintain all other insurance including Flood Insurance as may be required by Federal, State, County and City laws or ordinances. The Contractor may be required to, at the discretion of the City, maintain additional fire and extended coverage with an endorsement for vandalism and malicious mischief in his name and also in the name of the City in an amount of not less than \$100,000.00.

The Contractor may utilize up to \$2,000,000 in excess liability coverage to meet the above-required limits for insurance. Any deductibles shall be declared and the City may require deposits be made to it up the amount of such deduction, at its sole discretion.

7. **CERTIFICATES OF INSURANCE**

Prior to commencing Services under this Contract, Contractor shall furnish the City with Certificates of Insurance, or formal endorsements as required by the Contract, issued by

Contractor's insurer(s), as evidence that policies providing the required coverage's, conditions and limits required by this Contract are in full force and effect.

All Certificates of Insurance required by this Contract shall be identified with a bid serial number and title. A \$25.00 administrative fee shall be assessed for all Certificates received without the appropriate bid serial number and title. Each of the Certificates of Insurance shall contain a clause substantially in the following words:

It is hereby understood and agreed that if this policy is canceled, a written notice of such cancellation shall be mailed to the City of Sedona within ten (10) working days.

Such insurance coverage obtained by the Contractor other than Workmen's Compensation Coverage, shall name the City, the City Engineer, the Design Engineer, and their directors, officers, principals, agents, attorneys, and employees as Additionally Insured.

Insurance evidenced by these certificates shall not expire, be canceled, or materially changed without fifteen (15) days prior written notice to the City.

All certificates of insurance and endorsements required to be purchased by Contractor pursuant to this Article shall be filed with the City. Certificates shall be acceptable to City. If a policy does expire during the life of the Agreement, a renewal certificate of the required coverage must be sent to the City not less than five days prior to expiration date.

Each certificate of insurance shall include the job site and project number. Coverage shown on certificate of insurance must coincide with the requirements in the text of the Contract Documents.

9. SCHEDULE OF CONSTRUCTION

- A. The Contractor shall submit to the City within five (5) days after award of Contract, or as may be otherwise requested by the City, a schedule showing the order in which the Contractor proposes to carry on the work and at a rate sufficient to successfully construct all of the Work set forth in the Contract Documents within the Contract Period. Such schedule shall show the dates at which the Contractor will start and complete the several parts of the Work. The schedule shall identify the following items if applicable:
1. Potholing.
 2. Mobilization.
 3. Roadway work to be broken down at a minimum, on a street by street basis.
 4. Pipeline work to be broken down on a manhole to manhole basis and individual pump station construction or abandonment.
 5. Site prep.
 6. Drainage improvements prep and construction.
 7. Ramp prep, construction and finish.
 8. Sidewalk prep, construction and finish.
 9. Bridge prep, abutment construction, bridge construction, bridge placement, and finish.
 10. Traffic control.
 11. Demobilization

12. SWPPP.
13. Other items as applicable and/or listed in the bid schedule.

The schedule shall also show the order of construction and delivery dates at which the Contractor will start and complete the several other parts of the Work, the order of construction and delivery dates of critical materials and equipment along with monthly payment estimates, dates for submittal of working drawings and shop drawing to the Engineer for review, and the name of the project superintendent. The City shall be notified in writing of changes in the project superintendent. The schedule shall be subject to review and comment by the City as per MAG specifications section 108.4. The schedule shall be binding on the Contractor and shall be complied with by the Contractor unless, for good cause shown, a modification of the schedule shall be requested in writing to and approved by the City. The schedule shall also:

1. Be updated with each progress billing.
2. Include a detailed two week look ahead, indicate work requiring inspection, and be updated at each progress meeting.
3. Show work tasks progress in time periods of seven days or less unless otherwise approved by the Engineer.
4. Identify the critical path(s) for the work and task float.
5. Identify tasks corresponding to bid item descriptions when possible. Less comprehensive task designations may be used to comply with 2 above.
6. Conform to any time and location constraints identified in permits and the contract documents.
7. Span the current contract date to the end of the contract time.
8. Be submitted in an electronic format compatible with Microsoft Project Standard 2007, and hard copy format.
9. Identify long lead items.

The schedule format (size, color, type format) shall be such that the different tasks, durations, critical path and durations can be easily distinguished. The Contractor shall also provide a listing of tasks and durations with the schedule. If the schedule and list is being provided prior to a Notice to Proceed it need not include dates for start and completion of tasks. Any schedule and list provided after the Notice to Proceed has been issued shall include dates. A schedule and list shall be provided on the date of the Notice to Proceed. The Contractor shall begin work on the project site within five (5) working days of the Notice to Proceed, unless stated otherwise in specifications. Failure to do so is sufficient cause for termination in addition to other remedies the City may have.

- B. Where the City's operations require specific sequencing of the work, such sequencing requirements as provided for in the Contract Documents shall be followed.
- C. When progress has not kept pace within two weeks of the schedule or if otherwise requested by the City the Contractor shall update his schedule within five (5) working days of the City's written request. The revised schedule will include a description of what actions will be done by the Contractor to bring the project back on schedule. **Failure to not provide a revised schedule within one week of its request may result in the withholding of \$750 from any progress payment due.** Each written request by the City shall be considered a separate request and subject to the withholdings specified, provided it is within the following billing cycle from a previous request.

- D. The Contractor shall provide the City with a list of emergency phone numbers, addresses, pager numbers, facsimile numbers, and electronic mail addresses for contacting key personnel in the case of any after-hours emergency.
- E. The Contractor shall furnish the City with a schedule for hours of work. In it, the Contractor shall note the begin work, begin daily clean-up and daily shutdown times to be followed by the Contractor during the project unless otherwise changed. The Contractor's regular work hours on regular workdays shall be between 7:00 AM and 5:30 PM Monday through Thursday, unless otherwise stated in the specifications. Friday work is permitted between 7:00 AM and 5:30 PM for work that does not require City inspection. This work hours timeframe shall be considered to include start-up of equipment and daily clean-up of the work area. Weekends and Holidays for the City of Sedona shall be considered non-regular work hours. Permission to work non-regular work hours shall be subject to approval by the Engineer and the provisions of General Conditions, Section 39. **The Engineer may deduct \$250 per day for work outside of approved work hours after issuance of one written warning during the course of the project.**

The City of Sedona has the following holiday schedule:

New Year's Day, January 1st

Martin Luther King/Civil Rights Day, 3rd Monday of January

President's Day, 3rd Monday in February

Memorial Day, Last Monday in May

Independence Day, July 4th

Labor Day, 1st Monday in September

Veteran's Day, November 11th

Thanksgiving Day, 4th Thursday in November AND the Friday after Thanksgiving Day

Christmas Day, December 25th

10. PROGRESS MEETINGS

Periodic meetings shall be held between the City of Sedona officials, Contractor, and other affected agencies, at a standard time and place, and at a frequency to be established during the pre-construction meeting. These meetings shall be used to discuss scheduling and matters related to the project.

11. TAXES

The Contractor shall be responsible for and shall include in his bid prices all applicable taxes, including but not limited to Federal, State, and Local Taxes.

12. ASSIGNMENTS

The Contractor shall not assign the whole or any part of the Contract or any monies due or to become due hereunder without the written consent of the City and of the Surety on the Contractor's Bond. A copy of such consent of Surety, together with a copy of the assignment, shall be filed with the City. If the Contractor assigns all or any part of any monies due or to become due under the contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims and liens of all persons, firms, and corporations for services

rendered; for the payment of all materials and equipment furnished and for payment of all materials and equipment used or rented in the performance of the Work called for in the Contract; and for the payment of any liens, claims, or amounts due the Federal, State, or local government or any of their funds.

13. SUBCONTRACTING

- A. Subcontractors will not be recognized as employees or agents of the City, nor as having any privity of contract with the City. All persons engaged in the work of construction will be considered by the City to be employees of the Contractor. The Contractor will be held responsible for their work and for all materials provided by them, which shall be subject to the provisions of the Contract.
- B. Each subcontract shall contain a suitable provision for cancellation or termination thereof should the Subcontractor neglect or fail to conform to every provision of the contract.
- C. Subcontractors collectively shall not perform more than fifty percent (50%) of the value of the total work required pursuant to the Contract Documents. **The Contractor agrees that should this percentage be exceeded the City may consider the Contractor in breach of this contract and/or make deductions equal to one half of one percent of the total approved contract value for each one percent of subcontracted work beyond that allowed above.** The Contractor shall perform fifty percent (50%) of the contract work using the Contractor's own organization as construed in ADOT Standard Specifications 2000 Section 108.01.
- D. The City of Sedona encourages all contractors to utilize minority and women owned businesses whenever possible.

14. COOPERATION AND COLLATERAL WORK

- A. In general, the Contractor shall be responsible for the scheduling and coordination of his work with any other work, which may be, carried on in the construction areas for this project by other parties or by the City simultaneously with his construction work. The contractor shall include in his bid any costs, which may be involved on his part as a result of coordinating his construction with such other activity.
- B. \When two or more Contractors are employed by the City in related or adjacent work, each shall conduct his operations in such manner as to not cause any delay or hindrance to the other and shall properly connect and coordinate the execution of their respective work with the other. The City will not be responsible for damage caused by such delays, and such delays will not entitle the contractor(s) to an extension of time. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work.

If the proper execution of any part of the Contractor's work depends upon the work of any other Contractor, the Contractor shall inspect and promptly report to the City Engineer any discrepancies between the executed work and the drawings or any defects in such work that render it unsuitable for such proper execution. The failure of the Contractor to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his own work. The exception is for defects, which may develop in the other

contractor's work, after the execution of the Contractor's collateral work that would not have been discovered before the Contractor's collateral work began.

- C. The contractor shall coordinate his work, and cooperate with any other persons or entities operating on or adjacent to the site of the project.

Where persons employed by other persons or entities are engaged in or near the construction areas for this project, and where such work on the part of said parties results in a delay in performance by the Contractor, and where such delay, in the opinion of the City Engineer, is of such nature that it could not have reasonably been foreseen or anticipated by the Contractor in time for him to take steps to prevent same, then the Contractor shall be entitled to an extension of time.

The Contractor shall promptly make good any injury or damage caused by him that may be sustained by other Contractors or employees of the City. The Contractor shall join his work to that of others and perform his work in proper sequence in relation to that of others.

15. LINES AND GRADES

The Contractor shall be responsible for providing all construction staking and surveying needed to construct the facilities in accordance with the Plans and Specifications, and shall include such costs in his bid for the applicable items of work. The Contractor shall employ a surveyor licensed in the State of Arizona to perform all surveying necessary to construct this project to the lines and grades provided in the plans. The Contractor shall provide to the Engineer the Surveyor's listing of lines, grades, distances, curve information and point data (including northing, easting and elevation) used to actually establish project staking at least two working days prior to establishing subgrade, setting forms, placing pre-cast facilities, pouring concrete, installing pipe, or placing asphalt. The Contractor shall provide a set of as-built plans showing manhole and inlet inverts, rim and grate elevations, gutter elevations at 50-foot intervals, changes of grade, invert and finished grade elevations of concrete structures at the center and corners, and the inlet and outlet ends of pipes. The surveyor shall seal and designate them as as-built plans. This as-built plan is in addition to the Status As-Builts and Record As-Builts required under other provisions of these specifications. The Final contract payment shall not be due until all as-built plans have been submitted and accepted. Any work performed without complying with the Survey requirements in these specifications shall be considered unauthorized work and subject to the provisions of MAG section 105.11. As-Built plans shall be submitted in the following formats: hard copy in the same size as provided by the City to the Contractor for the contract, AutoCAD 2021, and .pdf.

The Contractor shall pothole utility facilities and report results to the Engineer at least two (2) working days prior to excavating for installation of roadways, asphalt patches, catch basins, underground pipes, manholes, footings, vaults, and basins. The report shall indicate any conflicts or inadequate clearances as related to the work to be performed. Failure to perform potholes and report results, as required, will result in the loss of the right to make a claim for changes in compensation and time due to conflicts, interference, protection or other costs related to the utility, as such, a claim would have been mitigated by performing the pothole timely.

16. EXCAVATIONS, UNDERGROUND FACILITIES LOCATION, AND STORMWATER POLLUTION PREVENTION.

The Contractor in the execution of the Work shall conform to all applicable Federal and State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over employment discrimination, wages and working conditions, and the construction of the Work, including but not limited to all construction codes, O.S.H.A. Requirements, and safety codes, which may apply to (1) performance of the Work; (2) protection of adjoining and adjacent property; (3) maintenance of passage-ways, guard fences or other protective facilities; and shall obtain all permits and pay for licenses and approvals necessary for the construction of the Work and give all required notices.

ARS-40-360.22 Excavations: Determining locations of underground facilities; providing information. This statute requires that no person shall begin excavation before the location and marking are complete or the excavator is notified that marking is unnecessary and requires that upon notification, the owner of the facility shall respond as promptly as practical, but in no event later than two working days. The “Arizona 811” (1-800-782-5348) (formerly Arizona Blue Stake Center) was formed to provide a more efficient method of compliance with this statute.

ARS-40-360.23 Making excavations in careful, prudent manner: liability for negligence. This statute states that obtaining information as required does no excuse any person making any excavation from doing so in a careful and prudent manner nor shall it excuse such persons from liability for any damage or injury resulting from his negligence.

ARS-40-360.28 Civil penalty: Liability. If the owner or operator fails to locate, or incorrectly locates the underground facility, pursuant to this article, the owner or operator becomes liable for resulting damages, costs and expenses to the injured party.

Licenses and Permits:

The Contractor shall be required to obtain, at his expense, the appropriate licenses and permits from the City of Sedona before the start of construction. It is the duty of the Contractor to determine that all necessary permits have been obtained. Costs associated with obtaining a license are not waived.

Arizona Pollutant Discharge Elimination System (AZPDES) Permit

A. General requirements:

The Contractor shall comply with the AZPDES Stormwater requirements for construction sites pursuant to the requirement of the Arizona Department of Environmental Quality (ADEQ). The Contractor shall be designated as permittee and shall be responsible for providing the necessary labor and materials, and for taking the appropriate measures to assure compliance with the ADEQ requirements, as well as other Federal, State and local requirements pertaining to storm water discharges. As the permittee, the contractor is responsible for completing, in a manner acceptable to the ADEQ, all documents required including the following:

1. Storm water Pollution Prevention Plan (SWPPP) for the project including certification form. The contractor will be required to submit for approval, update and revise the SWPPP as necessary throughout the construction of the project in order to assure compliance with permit requirements. The completed SWPPP shall be kept on the project site at all times during construction of the project.
2. Notice of Intent (NOI) to be covered by Arizona General Permit for Arizona including certification of signature.

3. Notice of Termination (NOT) of coverage under AZPDES (upon project completion).
- B. Regardless of whether compliance with AZPDES is required the Contractor shall prepare a Storm Water Pollution Prevention Plan. That Plan shall at a minimum address the following issues:
- Designation, maintenance and clean-up of vehicle storage, fueling, lubrication and maintenance areas
 - Clean up and off-site disposal of excess construction materials including asphalt, concrete, paints, oils, and wrapping materials
 - Daily work day clean-up of debris in work area
 - Prevention of wind born debris/Dust Control Plan
 - Prevention of erosion resulting from rain or watering activities'
 - Measures to prevent silt and debris generated by this project from migrating beyond the construction site boundaries. Measures such as trapping and removing debris and dirt generated, or other measures acceptable to the Engineer, shall be taken.
 - The Contractor shall comply with the City of Sedona General Storm Water Pollution Prevention Guidelines, this includes filing the City Notice of Intent.

C. Submittals:

1. Preliminary copies of the NOI and SWPPP shall be submitted to the Engineer two days prior to the preconstruction meeting. Any necessary revisions to the SWPPP shall be subject to review by the Engineer, prior to implementation.
2. The Contractor shall submit completed, signed NOI forms at least forty-eight (48) hours prior to the initial start of construction on the project to the Arizona Department of Environmental Quality in Phoenix, Arizona (ADEQ, 1110 West Washington Street, Phoenix, AZ. 85007). Generally projects of less than one (1) acre may not be applicable to this requirement at this time. If the project is subject to these requirements, the Contractor shall be designated the permittee.
3. Failure by the contractor (or any of its appropriate subcontractors) to submit the NOI forms within the required timeframe shall result in delay of the start of construction, but shall not prohibit issuance of the Notice to Proceed, at the City's sole discretion. A copy of the completed NOI shall be posted on the construction and a copy of the SWPPP shall be kept on the construction site.

Contractor's Responsibilities:

1. It is the Contractor's responsibility to perform inspection of all storm water pollution control devices on the project on a monthly basis and following each rainfall. The contractor shall prepare reports on these inspections and retain these reports for a period of three years following project completion. Inspection reports shall be submitted monthly to the CITY along with payment requests. The contractor shall maintain all storm water pollution control devices on the project in proper working order, including cleaning and/or repair during the duration of the project.
2. No condition of either the AZPDES or the SWPPP shall release the contractor from any responsibilities or requirements under other environmental statutes and regulations.

3. Upon total project completion, acceptance, and de-mobilization, the contractor shall submit its completed, signed NOT form to the ADEQ with copies to the same agencies who received copies of the NOI, thereby terminating all AZPDES permit coverage for the project.

D. Payment: There shall be no separate payment made to the Contractor for all material, labor, and other incidental costs relating to the provision, installation, and maintenance of items relating to this permit during project construction. Such incidental costs shall include contractor costs in order to assure proper operation of the pollution-control devices installed including all maintenance, cleaning, and disposal costs associated with clean-up and repair following storm events or other runoff or releases on the project.

17. EXISTING UTILITIES, RIGHTS-OF-WAY, EASEMENTS

A. EXISTING UTILITIES

Because of the nature of this contract, existing utilities are not shown or indicated in these specifications, except to note that their locations are within rights of way, streets and easements throughout the City of Sedona area. The fact that utilities are not shown shall not relieve the Contractor of the following responsibilities:

1. The Contractor shall be responsible for the preservation of all existing water, sewer, storm sewer, buried transmission lines or any cable or utility. If damaged, all costs for the necessary repairs shall be paid by the Contractor.
2. The Contractor shall locate and verify the location of all existing utilities prior to any excavation. This shall be done at least two (2) days prior to excavation for installation of project facilities or ordering equipment or materials for those facilities.
3. The Contractor shall be responsible for the location of all service lines.
4. Continuation of Service - All services shall be maintained to all areas at all times during the construction period, except when it is necessary to shut down a line to make a connection with the new line. Residents shall be given twenty-four (24) hour notice when it is known that the service will be interrupted. The Fire District shall be kept advised of the status of all fire hydrants affected by any work on this Project.
5. The Contractor is responsible for as-building all existing utilities within the improvement area (location, depth, and material).

B. RIGHTS-OF-WAY AND EASEMENTS

The City will furnish land, right-of-way, or easements as shown in the Contract Documents for the performance of the Work under the Contract. Contractor shall confine his operations to the land, right-of-way or easements furnished, and will restore the same to their original conditions to the extent reasonably possible prior to final acceptance of the work. Prior to construction or entry thereon, the Contractor shall obtain copies of and become familiar with any agreements and stipulations used by the City in acquiring temporary or permanent easements.

The Contractor shall remain within easement areas and rights-of-way obtained or owned by the City or easement areas the Contractor has obtained. Disturbed areas shall be reasonably restored upon completion of installation of the project improvements and related appurtenances in the easement. The Contractor shall be responsible to adhere to easement provisions whether the easement was obtained by Contractor or City. A temporary 4-foot high orange fence shall be placed to define the work area for all easements encompassing all work that occurs outside the City right-of-way. Clearing by manual means for the purpose of defining the area to be fenced shall be the only activity allowed on the easement before the fence is placed. City shall provide the Contractor with a copy of the easement agreement with the property owner, upon request. Contractor shall be responsible for all restoration of the easement as described in the easement agreement. Trees and larger vegetation shall be preserved to the maximum extent practicable.

The Contractor shall be responsible for the preservation of all existing property pins. If disturbed or damaged the Contractor shall be responsible for all costs associated with the restoration of any property pin disturbed by the Construction activities. Any property monuments, which require resetting, shall be reset under the direction of a licensed Surveyor by the State of Arizona and proper documentation recorded with the appropriate County.

Access by Residents: The Contractor shall ensure that all residents have access from the Street to their property each night. When access to a resident's property cannot be maintained during normal working hours (week days), the Contractor must personally notify the affected residents two working days in advance of the closure. Such notification shall be documented in writing to the Engineer. Emergency access shall not be blocked, for any reason without the express written permission from the owner.

Access to Public Facilities: The Contractor shall assure that safe access to facilities including, but not limited to, parking lots, picnic shelters, playgrounds, and pedestrian ways is provided. Any disruption to the public's normal use of said facilities shall not occur without the express written permission from the City.

Intersection and Driveway Maintenance: Once work has commenced in a particular street, the Contractor shall provide and maintain access facilities to all connecting streets, intersections and private driveways by ramping or surfacing with suitable materials to ensure access at all times. If in the opinion of the City, such facilities, or materials used, are not capable of supporting traffic, the Contractor shall remove the materials and provide better-suited materials, including asphalt concrete or similar, as directed by the Engineer. This work shall be considered incidental to the Project, and all costs shall be borne by the Contractor. Failure to comply with these requirements may result in stoppage of the work until corrected as determined by the Engineer, with no time extension being granted for such delay to the Project.

18. OPERATIONS, LAYDOWN YARD AND STORAGE AREAS

- A. All operations of the Contractor (including laydown yard, storage of materials, supplies, and equipment) shall be confined to areas authorized by the City. **The City of Sedona does not have available construction staging or material lay down facilities, except as specified otherwise in the specifications.** The Contractor is responsible for arranging and providing for such facilities as is deemed necessary for carrying out the work of this contract. The City does not warrant or represent in any way the availability of staging or material lay down

areas within the City or vicinity of the project. It is the Bidder's responsibility to make such determinations. The price paid for mobilization shall include all costs for and associated with providing construction staging and material lay down facilities necessary for constructing the project. If a mobilization item is not included in the specification, the cost for compliance with item shall be considered as included in the unit price (s) bid for the various items of work. The Contractor shall be liable for all and any damages caused by him to such premises.

The Contractor shall comply with the following, regarding laydown yards:

- Any use of vacant property adjacent to or near the project used for parking or servicing equipment and/or storing of material will require the Contractor to provide written approval from the property owner, homeowner associations as applicable, and the filing of a temporary use permit from the City of Sedona.
- A copy of the property owner's approval shall be submitted to the Engineer, stating the use of the laydown yard for use during the construction of this project is acceptable.
- The Contractors yard shall be enclosed with a six (6) foot temporary fence.
- Storage of Gasoline will require Fire Department approval.
- Clearing or grading of the site in excess of fifty (50) CY of soil will require a grading permit. No grading will be allowed which changes the drainage path for the parcel without the approval of the City Engineering Department. All existing pipes and drainage facilities at the laydown yard will be maintained in working order at all times.
- A stabilized construction entrance will be required if the vacant property laydown yard is not already gravel or pavement. The laydown yard shall be adequately maintained to control dust and mud from leaving the property.
- Work in the laydown yard shall be scheduled so as to comply with any City noise or light Ordinances and these specifications.
- Equipment, materials, etc., shall be located so as to minimize impact to adjacent properties.
- Before any grading of any laydown yard, property corners will be located for the parcel. Any property pins disturbed by the Contractors operations will be replaced prior to final acceptance of the project.
- The Contractor shall obtain a written release from the property owner, homeowner's associations or similarly concerned parties after completion of use. A copy of the release shall be presented to the Engineer.
- Equipment and material shall not be stored in the right-of-way and/or street easement during non-work hours without permission of the Engineer. Such permission shall be subject to finding that it is impractical to move the equipment or material because of size or that permission has been granted to close the right-of-way to all traffic, including local traffic. Lack of construction yard or other staging area shall not be considered as reason to grant permission. Such permission, if granted, shall be subject to conditions determined at the sole discretion of the Engineer.

B. The Contractor shall hold and save the City free and harmless from liability of any nature or kind arising from any use, trespass, or damage occasioned by his operations on the premises of third persons.

C. The Contractor shall be wholly responsible for the care, compliance with law, and storage of materials, supplies or equipment delivered on the work site or purchased for use thereon. Stored materials, supplies, or equipment shall be carefully and continuously protected from damage or deterioration and so located so as to facilitate inspection by the City. The responsibility for the care and storage of materials, supplies, or equipment shall be with the Contractor whether such materials, supplies, or equipment are furnished by the Contractor or by the City. Storage of materials, supplies, or equipment shall not unduly interfere with the progress of the Contractor's Work or the work of any other contractor.

D. Traffic Control:

Adequate traffic flow shall be maintained at all times, all barricading and temporary signage for detours and traffic control must meet the standards set by the Manual of Uniform Traffic Control Devices (MUTCD) and the City Engineer. If traffic control is not a separate bid item; then, it is considered incidental to the work and shall be included as appropriate in the Contractors bid. The Contractor must also take responsibility for public safety, meaning:

1. That, except for alleyways, one lane of the roadway for each direction must be kept open at all times; OR
2. Certified flaggers must be provided to properly channel traffic at all times when two separate lanes (one each direction) cannot be maintained open; OR
3. Total closure of a roadway shall only occur with the written permission of the City Engineer. For all rights-of-ways requiring closure for any work therein, appropriate permits shall be obtained. Prior to start of construction, the Contractor shall provide the Engineer with planned traffic control methods and procedures for this project. A notice of closure for residents, along with a map showing the planned area of distribution shall be included as part of the planned methods and procedure. Proper traffic control and advance warning signage shall be in place prior to any road closure.
4. When detours or road closures are implemented an overall map showing anticipated flow of traffic shall be provided.
5. The Contractor shall have a designated person responsible for overall traffic control on-site at all times.
6. A Traffic Control Plan shall be submitted for review. The plan is intended to be a guide; Contractor shall submit any proposed revisions for approval by the Engineer.
7. Pedestrian traffic must be maintained at all times, on at least one side of the road.
8. The Contractor shall supply a Public Announcement showing closures and detours.

E. Water Use

1. All water used by Contractor for testing, compaction, dust control, or other uses related to construction, shall be obtained by the Contractor from an approved water source. The Contractor shall be responsible for all deposits, charges and fees.

Reclaimed water is available to the Contractor for dust control and other on-site construction uses at no cost to the Contractor (other than testing costs noted below), according to the following limitations (any required water outside these limitations shall be provided by the Contractor from an approved source):

- a. Reclaimed water will be available for use by the Contractor Monday – Friday. It shall be the Contractor's responsibility to apply for and obtain a Type 2 General Water Reuse Permit (Class A+ Reclaimed Water) from ADEQ for dust control and other construction uses. Contractor shall also be responsible for the cost of fecal coliform testing. The cost of testing is \$50 for each day that water is taken for construction use.
- b. Water shall be provided from the effluent pump station wetwell at the Wastewater Treatment Plant using contractor-provided submersible pump.
- c. Contractor is responsible to supply conveyance and storage facilities for water made available by the City. Contractor shall record and report to the City on a weekly basis the date and amount of water used.

F. Dust and Debris Control

1. **The contractor shall cover all trucked loads of soil, rock and material that may drop from, be sifted from or blown from the vehicle. The City may require that trucks arriving with uncovered loads not be allowed to deliver material to the project, regardless of whether or not the truck is the contractor's, a subcontractor's, a service provider's, or a material supplier's vehicle. If trucks leave the site with uncovered loads the City reserves the right to do one or more of the following:**
 - a. The truck will not be allowed on the site
 - b. **The contract compensation will be reduced by \$150 per observed uncovered load. The contract time will be reduced by one day**
 - c. The Police Department may issue a citation.
2. Pine slash and/or cut down pine trees shall be removed from the City within 24 hours, including any non-working days, of being broken or cut. This measure is to minimize pine bark beetle infestation in Sedona.
3. The contractor shall take measures to prevent blowing debris and/or dust from the site.
4. Dust Control shall comply with the following:
 - a. Dust control shall be maintained at all times on the project. Spray nozzles shall be used as necessary on equipment to reduce dust. Mist shall be visible when standing adjacent to the equipment.
 - b. A Dust Control Plan shall be submitted prior to Start of Construction.
 - c. Cleanup and Dust Control shall be in compliance with MAG Section 104.1.3 and 104.1.4.
5. The contractor shall clean any dirt tracked from the project work area from streets and sidewalks using equipment and methods that will not create excessive dust. Sweeping is the preferred cleaning method. Washing of streets and/or sidewalk and other paved areas will require special permission from the Engineer and shall be subject to conditions imposed by the Engineer. The City reserves the right to require that the Contractor to cease work that is resulting in excessive tracked mud and/or dirt from and within the project area,

and to require cleaning prior to allowing the ceased work to continue. The exercise of the City's right and impacts there from shall not provide a basis for claim by the contractor. Failure of the Contractor to cease work shall be sufficient reason for the City to reduce the contract time by one calendar day per incident, at the City's sole discretion.

6. Dirt, debris, wastewater and other debris shall not be disposed of in stormwater facilities and/or natural drainage channels. The City may require inspection of stormwater facilities and/or natural drainage channels prior to and during the work to verify compliance with this requirement. The City may require the contractor to clean stormwater facilities and/or natural drainage channels if the contractor has disposed of material to them. Final Completion will not be issued until all stormwater facilities have been inspected and approved.

G. Open Trenches

MAG Specification Section 601.2.10 is modified to limit the length of open trench to 1100 feet within the project. An open trench includes any longitudinal excavated area 3 inches or more below adjacent land which has settled or been left lower intentionally. All open trenches shall properly marked and protected so as to warn pedestrians and vehicular traffic of a low area.

19. RIGHT-OF-ENTRY

Contractor shall provide to the City, Architect-Engineer, or representative of the Federal, State, County, District and Municipal governmental officials and services, the proper facilities for access to the Work, whenever it is in preparation or progress.

20. ACCESS AND DRAINAGE

The Contractor shall keep a sufficient clear area around fire hydrants to permit their full and effective use in case of fire. The Contractor shall keep natural drainage and watercourses unobstructed by spoil piles, material storage, or any other operations, or provide for other equal courses effectively placed.

21. SANITARY CONVENIENCES

The Contractor shall furnish the necessary sanitary conveniences, properly secluded, for the use of work persons during construction, and these conveniences shall be maintained in a manner that will be inoffensive and in compliance with Federal, State and local health and sanitation requirements.

22. CLEANUP PRACTICES

- A. The Contractor shall at all times during the progress of the work maintain a reasonably clean job site, this includes, but is not limited to, keeping signs clean and legible, minimizing mud, rock, and dirt on roadways, and keeping ditches free of trash and construction materials. If in the opinion of the Engineer, excessive dust, mud or debris exists at the job site, the Contractor shall immediately remove said material as directed. All costs associated with this work shall be borne by the Contractor. The location of debris and material stockpiles shall be as directed by the Engineer.

- B. The Contractor shall begin his daily clean-up process at a typical time agreed to by the City at the pre-construction meeting. If the Contractor's operations and daily shut-down exceed a forty hour work week or eight hour day then the City will be entitled to withhold a portion of the Contractor's progress payment for City "overtime" work pursuant to Section 32 and 39, unless authorized by the Engineer.
- C. The site shall be kept clean of trash and debris including but not limited to, loose construction materials, such as sand, cement, lime, wood pieces, building paper, and other miscellaneous paper. All trash and debris shall be placed in an appropriate number of approved containers and moved and disposed of off the site daily in a location where it will not be possible to be dispersed. No burning of trash or debris will be permitted on the site, except where designated by the Engineer. The laydown yard shall have a minimum of one container of appropriate size at all times.

When site daily clean-up has not been kept up as requested in writing by the City the Contractor shall bring the site into compliance with the City within 24 hours or the City shall withhold \$350 for each day out of compliance.

- D. Before final payment, the Contractor shall remove all rubbish, excess materials, temporary structures, and equipment. All parts of the work shall be left in a neat and presentable condition. Excess mounds of earth shall be leveled and ruts and depressions filled, such that the completed work is attractive. If in the opinion of the Engineer, the Contractor does not maintain the Construction Site in a safe and clean condition, or does not adequately clean up the site at the completion of the work, or rectify any valid complaints of damage to property resulting from the Construction, the City may clean up or rectify damage and charge the costs thereof to the Contractor.
- E. The Contractor shall be responsible for locating sites and making arrangements for disposal of all material removed from the site. This includes concrete, asphalt, unsuitable or unstable trench material and any other trash, rubbish or debris generated as a result of construction. Asbestos, hazardous substances or materials, hazardous waste or any other regulated substances or materials shall be disposed of in accordance with all applicable federal, state and local regulations.
- F. All vegetation and improvements removed from easements by the Contractor shall be removed or repaired by the Contractor in accordance with the easement agreement with the property owner, the same being done at no additional cost to the City.

23. PLANS AND SPECIFICATIONS

- A. The City will provide the Contractor with four (4) sets of plans, drawings, and specifications after the execution of the Contract. If additional plans, drawings, and specifications are required, the Contractor shall compensate the City for it.
- B. When, in the opinion of the City, revised partial plans, drawings and specifications are required to clarify or reflect authorized changes or additional work the City shall provide four (4) copies of such revisions to Contractor. The Contractor must pay for any additional copies. Contractor shall immediately post such revisions to his record set of Contract Documents.

- C. The plans, drawings, and specifications are the property of the City, and are furnished to the Contractor for the construction of Work under the Contract only.
- D. The data given in the specifications and shown on the plans and drawings is believed to be accurate but the accuracy is not guaranteed. The Contractor must confirm all levels, locations, measurements, and verify all dimensions on the job site prior to construction and adapt his Work into the exact limits of construction. Scale measurements taken from plans are only for reference.
- E. Drawings showing the details of the Work specified are designated "plans" or "drawings" and together with the specifications form an integral part of the Contract Documents.

24. CORRELATION OF DOCUMENTS

- A. Plans, drawings, and specifications are cooperative and supplementary. Portions of the Work, which can best be illustrated by the plans or drawings, may not be included in the specifications and portions best described by the specifications may not be depicted on the plans or drawings. All items necessary or incidental to completely construct or erect the Work specified shall be furnished, whether called for in the specifications or shown on the plans or drawings. Unless otherwise stated the plans and specifications shall be considered to require construction or erect of a complete and operable facility.
- B. Special Conditions shall take priority over Technical Specifications, which shall take priority over General Conditions; large-scale drawings shall take precedence over small-scale drawings. In case of a disagreement between the plans, drawings, and specifications, or within a document itself, the better quality and the greater quantity of work shall be estimated and included in the bid and contract sums and the matter drawn to the City's attention for further decision, and possible issuance of an addendum.

25. SHOP DRAWINGS, SAMPLES, AND OPERATOR'S INSTRUCTION

- A. The Contractor shall furnish all Shop Drawings and Samples required by the Contract Documents. Shop Drawings of equipment and devices offered by the Contractor for approval of the City shall be in sufficient detail to adequately show construction and operation. The above material shall be submitted to the City for review in electronic format (.pdf and/or .dwg). Shop drawings submitted as herein provided by the Contractor and approved by the City for conformance with the design concept shall be executed in conformity with the Contract Documents unless otherwise required by the City.
- B. Work performed in connection with the fabrication, manufacture, shipment, or purchase of material or equipment prior to approval as specified shall be at the Contractor's sole risk and responsibility.
- C. Shop Drawings and Samples shall be accompanied by a letter of transmittal indicating that the Contractor has reviewed and approved the submittal. The transmittal shall give a list of the numbers and dates of the submittal, and shall be in the form required by the City. Any re-submittals shall show numbers and dates of previous submittals. Shop Drawings shall be complete in every respect and bound in sets.

- D. The Contractor shall submit all Shop Drawings and Samples (submittals) sufficiently in advance of construction requirements to allow ample time for checking, correcting, resubmitting, and rechecking to avoid any delay in progress of the Work. In no case however shall this time be less than five (5) working days without the consent of the Engineer. In the case of submittals for pump installations and similarly complex equipment the minimum timeframe shall be twenty (20) working days. This timeframe shall also apply to resubmittals. If more than five (5) submittals are made in a week the minimum City review time shall be extended by five (5) days for each submittal. The Contractor shall be solely responsible for delays and costs related to resubmittals or untimely submittals.
- E. Shop Drawings or Samples submitted shall be marked with the name of the Project, numbered, and bear the stamp of approval of the Contractor as evidence that the Shop Drawings and Samples have been checked by the Contractor. Any shop drawings or samples submitted without this stamp of approval shall not be considered and shall be returned to the Contractor for resubmission. If the Shop Drawings or Samples show variation from the requirements of the Contract, the Contractor shall call such variation to the City's attention in his letter of transmittal in order that, if acceptable and City gives written approval to the variation, suitable action may be taken for proper adjustment.
- F. By approving and submitting shop drawings and samples, the Contractor thereby represents that he has determined and verified all field dimensions and measurements, field construction criteria, materials, catalog numbers, and similar data, and that he has checked, and coordinated such submittals with the requirements of the Work and the Contract Documents.
- G. If a Shop Drawing or Sample, as submitted, indicates a departure from the Contract requirements which the City finds to be in the interest of the City and to be so minor as not to involve a change in the contract price or time for performance, it may approve the Drawings or Samples; provided, however, such departure is slight in nature and does not affect the design concept of the Work.
- H. All items of standard equipment shall be the latest model at time of delivery.
- I. When Shop Drawings are submitted for the purpose of showing the installation in greater detail, their approval shall not excuse the Contractor from requirements shown on the plans and specifications.
- J. Shop Drawing and Sample submittals not conforming completely with the above requirements shall be returned to the Contractor, without action, for re-submittal and the resulting delay shall be entirely the responsibility of the Contractor.
- K. The City's check and approval of Shop Drawings and Samples, specifications, and descriptive literature submitted by the Contractor shall be only for general conformance with design concept, as otherwise provided, and shall not be construed as:
1. Permitting any departure from the Contract requirements;
 2. Relieving the Contractor of the responsibility for any error in details, dimensions, or otherwise that may exist in such submittals;
 3. Constituting a blanket approval of dimensions, quantities, or details of the material or equipment shown; or

4. Approving departures from additional details or instruction previously furnished by the City. Such check or approval shall not relieve the Contractor of the full responsibility of meeting all of the requirements of the Contract Documents.
- L. One (1) electronic copy and four (4) sets of bound operator's instructions and maintenance manuals shall be furnished by the Contractor for equipment furnished under the Contract that is specially listed or that is considered to be of a special or complex nature. Operator's instruction and maintenance manuals shall include, in part, detailed lubrication drawings showing type and frequency of lubrication. Detailed parts drawings shall show location, name and catalog numbers of parts.
- M. One (1) electronic copy and four (4) sets each of bound service parts manuals shall be furnished by the Contractor for all items of standard manufacture.
- N. All operator instructions, maintenance, and parts manuals shall be bound in permanent binders satisfactory to the City and shall be furnished to the City before final acceptance of the installation by the City.
- O. Four (4) copies of any manufacturer's guaranty/warranty or certificate for any type of material or equipment provided shall be submitted to the City prior to final acceptance of the Work by the City.

26. DRAWINGS SHOWING CHANGES DURING CONSTRUCTION

Throughout the progress of construction, the Contractor shall maintain a careful up-to-date record of all changes on the plans and drawings during actual construction. *With each progress payment invoice the Contractor shall provide a "Status As-Built" showing all work completed to date.* Callouts will identify type, size and quantity of each item installed. The Contractor shall annotate all sewer taps stationing upstream to downstream using swing ties from adjacent manholes or other method the Engineer may approve in writing. Upon completion of Work, and prior to acceptance by the City, the Contractor shall file with the City one set of complete contract drawings with all changes and Contractor's field construction notes neatly and legibly recorded thereon. Such drawings shall include but not be limited to, the exact routing and clearances, if changed from drawing location, of sewer, water, gas, oxygen supply, condenser water lines, fuel oil tanks and lines, fire protection lines, and any other major buried utility lines and routing of buried electrical feeder lines and changes to routing of conduit runs which are buried or concealed in concrete slabs. The Contractor shall furnish such As-Built utility and drainage invert and rim elevations as well as gutter, top of curb shots and horizontal location of valves and hydrants placed as a part of this construction. This information is for use by the City in the preparation of record "As-Built" Drawings. Curb and gutter shots shall be spaced no further than 50 feet apart and shall include any significant bends, drops or other deviations from a straight horizontal or vertical alignment.

27. MATERIALS, EQUIPMENT, SUPPLIES, SERVICES, AND FACILITIES

- A. It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, equipment rental, water, heat, light, fuel, power, transportation, superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the Work in a workman like manner within specified time.

- B. No materials, equipment, or supplies for the Work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.
- C. Equipment shall be properly equipped with safety devices including but not limited to spark arrestors, back up alarms, reflectors, signage, labeling, and lights.
- D. At least one (1) set of all appropriate Material Safety Data Sheets shall be maintained in a common location on the project site at an identified location during all working hours.

28. WORKMANSHIP, MATERIALS, AND EQUIPMENT

- A. All material and equipment furnished by the Contractor shall be new and unused and shall strictly conform to the Contract Documents. Competent labor, mechanics and tradesmen shall be used on the Work. Experienced manufacturer's representatives shall be used to supervise the installation of equipment as may be required by the City. Any special tools or equipment, which may be required, shall be provided by the Contractor.
- B. The acceptance at any time of materials or equipment by or on behalf of the City shall not be a bar to future rejection if they are subsequently found to be defective, inferior in quality or uniformity to the material or equipment specified, or are not as represented to the City.

29. QUALITY OF MATERIALS IN ABSENCE OF DETAILED SPECIFICATIONS

- A. Where the Contract requires that materials or equipment be provided or that construction work be performed, and detailed specifications of such materials, equipment or construction work are not set forth, the Contractor shall perform the work using materials and equipment as described in the specifications. Constructed or installed as described therein, and shall follow standard practices in the performance of construction work. The work performed shall be in conformity and harmony with the intent to secure a good, serviceable standard of construction.
- B. All tests and re-tests unless otherwise provided, shall be in accordance with the pertinent sections of the latest edition of the standards applicable to the material or devices to be tested. A partial list of the principal societies referred to and their Abbreviations follows:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASTM	American Society of Testing Materials
AWWA	American Water Work Association
CPI	Clay Pipe Institute
CS	Commercial Standards
FS	Federal Specifications
NEC	National Electric Code
TMCA	Tile and Marble Contractors of America

30. VARIATIONS FROM ESTIMATED QUANTITIES

When unit prices are utilized in the Contract Documents, it may be reasonably expected that there could be variations in final quantities from the estimated quantities by reason of actual conditions and/or change orders. An adjustment in compensation may be allowed only to the following extent:

- A. For a decrease greater than twenty percent (20%) in either the total cost of the contract or the total cost of a major item and when a reasonable cost analysis supports an increase in the pro rata share of fixed cost chargeable to this item in total, an adjustment in the monies due the Contractor may be made. The total amount, including any adjustment, will not exceed eighty percent (80%) of the original lump sum contract amount or, for a unit price item, the total amount, including adjustment, will not exceed eighty percent (80%) of the original extended unit bid price.
- B. For an increase greater than twenty percent (20%) in either the total cost of the contract or the total cost of a major item, any adjustment made will only apply to that cost in excess of one hundred twenty percent (120%) of the original bidding schedule. If either party presents a reasonable cost analysis that shows a change in the pro rata share of fixed costs chargeable to this item in total, an increase or decrease adjustment may be made. This increase or decrease adjustment will be made on such basis as is necessary to cover a reasonable estimate of cost, plus an allowance, not to exceed ten percent (10%), for overhead and profit.
- C. A major item is an item whose total cost, determined by multiplying the bidding schedule quantity and the contract unit price, is equal to or greater than the amount indicated below. A major item will remain a major item unless it is completely eliminated. Compensation for a completely eliminated major item shall be limited to the amounts indicated, but not to exceed the amount demonstrated by information provided to show the cost impact of the deletion, not including anticipated profit.

Total Contract amount as awarded equal to or greater than (in dollars)	But is less than (in dollars)	A major bid item Shall be equal to or greater than the following amount (in dollars)	If the item is completely eliminated compensation shall be limited to no more than (in dollars)
\$0.00	\$1,000,000	\$50,000 or 10% of the Contract amount as awarded	\$2,000
\$1,000,000	\$5,000,000	5% of the Contract amount as awarded	\$5,000
\$5,000,000	\$20,000,000	2.5% of the Contract amount as awarded	\$7,500

- D. For either an increase or decrease in cost, no claim shall be made by the Contractor for any loss of anticipated profits.

31. PROGRESS PAYMENTS

- A. When monthly progress payments are authorized, the Contractor shall, on the date determined during the pre-construction meeting, submit to the City an itemized application for payment, supported by “Status As-Builts” and such data substantiating the Contractor's right to payment as the City may require, on forms acceptable to the City. Progress payments shall be made no more than once each calendar month and provided that there are a minimum fifteen (15) calendar days between payments, unless otherwise authorized on a payment-by-payment basis by the City Engineer or City Manager. Progress payments are subject to retainage of ten percent (10%) with possible reduction to five percent (5%) in accordance with the provisions of Arizona Revised Statutes.
- B. The Contractor shall provide to the City at the time of payment, a waiver and release to date from the Contractor and each and every Subcontractor and material supplier whose work or materials are included in the application for payment, evidencing that said Contractor, Subcontractor or material supplier has been paid in full to date.
- C. Unless otherwise provided in the Special Provisions, payment will not be made on account of materials or equipment not incorporated in the work, at the time of a request for payment, but delivered and stored at the site. Similarly, payment will not be made for materials or equipment stored at some other location unless agreed upon in writing. If payment is allowed per the Special Conditions, payment for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the City to establish the City's title to such Materials or equipment or otherwise to protect the City's interest, including applicable insurance and transportation to the site for those materials and equipment stored off-site.
- D. The Contractor warrants that title to all materials, supplies, and equipment covered by an application for payment, whether incorporated into the Work or not, shall pass to the City, upon receipt of payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances; and that such materials, supplies or equipment furnished or installed comply with the applicable requirements of the Contract Documents.
- E. The passing of title to the City as herein provided shall not be construed as relieving the Contractor of the sole and complete responsibility for:
 - 1. The care and protection of the materials, supplies, equipment, and Work for which payment has been made.
 - 2. The restoration of any damaged or destroyed Work, materials, supplies or equipment. Such responsibility shall continue until all Work under the Contract has been completed and accepted by the City.
- F. Under no circumstances shall payment constitute a waiver of the City's right to require the Contractor to fulfill all of the terms and conditions of this Contract.
- G. INVOICE PROCESSING: The City will not accept inaccurate, illegible, or incomplete invoices (requests for payments). Invoices shall be hard copy, with original signature. Electronic or facsimile signatures are not acceptable on the invoice.
 - 1. The City distributes payments on every other Friday, beginning on 01/09/20 for calendar year 2021, unless holidays dictate otherwise.

2. The Engineer must receive an acceptable, correct invoice with required supporting documentation not later than close of business on the Wednesday, nine (9) calendar days prior to the expected check distribution day.
3. For projects longer than sixty (60) calendar days duration, each request for payment shall be accompanied by a progress schedule, effective through the invoice period. The City shall not release a payment until the contractor provides an acceptable, accurate, and updated project schedule.

32. PAYMENT WITHHELD

- A. The City may decline to certify payment on account of subsequently discovered evidence or observations, may nullify the whole or any part of any payment certificate previously issued to such extent as may be necessary to protect the City from loss on account of any one or more of the following:
 1. Defective Work not remedied.
 2. A reasonable doubt that the Contract can be completed for the balance then unpaid.
 3. Unsatisfactory prosecution of the Work.
 4. Not maintaining a current project schedule.
 5. Not providing adequate progress payment "Status As-Builts".
 6. Deductions for not conforming to daily clean-up requirements.
 7. Deductions for reimbursement of City overtime inspection.
 8. Liquidated damages payable by the Contractor.
 9. Disputed Work or Materials.
 10. Failure to comply with other material provisions of the Contract.
 11. Third-party claims filed or reasonable evidence that a claim will be filed.
 12. Failure of the Contractor or Subcontractor to make timely payments for labor, equipment, and materials.
 13. Damage to the Owner.

In addition, the City reserves its rights under ARS Sections 32-1129.01 and 34-2211.

- B. When any of the above problems are resolved, payment shall be made for amounts withheld pursuant to Article 31.

33. MEASUREMENTS

- A. The itemized Application for Payment will be used by the Engineer as a basis for evaluating requests for payment, except in cases where unit prices have established the basis for payment shall include as a minimum the following items:
 1. Separate cost itemizations for mechanical, piping, structural, electrical instrumentation, painting, pre-engineered structures, and architectural finish work.
 2. Separate cost line items, showing both purchase and installed cost, for the major equipment items listed in the bidding schedule.
 3. A separate line item for mobilization not to exceed ten percent (10%) of the total Contract amount. This limitation shall apply even when a bid item for mobilization is shown in the bid schedule, unless the Engineer has assigned a fixed cost for the item. Amounts excess of this limitation shall be included on the final payment.

4. A separate line item for demobilization, not to exceed one-half of one percent (0.5%) of the total Contract amount. This limitation shall apply even when a bid item for demobilization is shown in the bid schedule, unless the Engineer has assigned a fixed cost for the item. Amount in excess of this limitation shall be included on the final payment.
 5. Separate line items for earthwork, demolition and clearing and grubbing, where appropriate. Measurement and payment for the various items shown by the Contract Drawings and described in the construction Specifications, and comprising the completed work, shall be subject to this Article.
- B. The contractor may subdivide any of the lump sum bid items in the proposal as necessary to identify items per (A) above, however the neither the total bid or the total of any subdivided bid item line shall exceed the total in the bid proposal as awarded.
 - C. Payment for each item shall constitute payment in full for the furnishing of all materials, equipment, appurtenances, labor, plant and tools necessary to provide a complete workmanlike, finished, and satisfactory project, as shown by the Contract Drawings and described in the Specifications. Each item shall be completed with all necessary connections, testing, painting and related work accomplished to provide for the satisfactory use and/or operation of the item. No additional payment will be made for work related to each item, unless specifically noted or specified.
 - D. No additional payments will be made for work related to any item unless specifically noted and called for in the Bid Proposal. Payment will be made at the unit price or lump sum price bid in the Bid Proposal.
 - E. Measurement will be on the completed work in place, with no allowance for waste, and as may be more particularly described in the description of the various items set forth in the Specifications and as shown by the Contract Drawings.
 - F. The quantities set forth in the Bid Proposal are used for the purpose of determining the basis of the Award of the Contract, and may be varied by the Engineer to conform to the requirements of the work as set forth in the Contract Drawings, and the Contractor agrees to perform the work on the basis of the prices bid for the items contained in the Bid Proposal regardless of whether or not the items or units are decreased or increased.**
 - G. The Engineer shall have the right to order omitted from the Contract any item or a portion of the estimated quantity for any item found unnecessary to the work without violating the Contract or Performance Bond.
 - H. Except in cases where unit prices form the basis for payment under the Contract, the Contractor shall, within twenty (20) days of receipt of the notice to proceed, submit a breakdown of the Contract price showing the value assigned to each part of the work including an allowance for profit and overhead. In submitting the breakdown, the Contractor certifies that it is not unbalanced and that the value assigned to each part of the work represents his estimate of the actual cost, including profit and overhead, of performing that part of the work. The breakdown shall be sufficiently detailed to permit its use by the Engineer as one of the bases for evaluating requests for payment.
 - H. Mobilization and Demobilization: Payment for Mobilization shall include the cost for setting up Project offices and moving Equipment to the site, storage facilities, obtaining permits, and

all other items required to prepare the Project site for commencement of construction activities. Demobilization shall include removal of Contractor's facilities and Equipment, and final cleanup, and all other items required to complete Demobilization.

Payment for mobilization shall be in accordance with Section 901 of ADOT Standard Specifications for Road and Bridge Construction (most current edition), except as modified by this section and General Conditions Section 18, 33, and 66. Retention shall apply to mobilization payments. The first payment for mobilization shall be contingent on providing:

1. A traffic control plan that has been approved by the Engineer
2. The Storm Water Pollution Control Plan provisions are in place per the SWPPP in the Civil Plans
3. The Contractor shall have a City of Sedona or ADEQ NOI for stormwater pollution prevention
4. The Project Sign has been posted
5. A complete project schedule as required by the General Conditions, Section 9.

- I. Excavation-Generally: The excavation rates shall include the amount for working in such a manner as not to interfere with the stability of adjacent structures and properties, for the costs of all timbering or other support required, for all necessary measures to keep the excavation free from water and sewage whether affected by floods, storms or otherwise, for working space, refilling, consolidating and disposal of surplus material from temporary spoil heaps or disposal as directed by the Engineer. The rate shall apply to the excavation in any material, including rock.

No extra payment will be made if the position of the work as set out will not allow the use of a mechanical plant or necessitates the cartage to temporary spoil heaps of excavated material and the reloading and cartage back for refilling of excavations or disposal.

34. PAYMENT, USE OR OCCUPANCY OF WORK

- A. No progress or final payment, nor any partial or entire use or occupancy of the Work or improvement, nor acceptance thereof, by the City shall be evidence of the performance of the Contract or construed to be acceptance of defective work or improper materials, either wholly or in part. The Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute.
- B. The City shall have the right to take possession of, use, or occupy any completed or partially completed portions of the Work, notwithstanding the time for completing the entire Work or any portions, may, or may not, have expired. Such taking possession, use or occupancy shall not be deemed an acceptance of any Work until all Work has been completed in accordance with the Contract Documents. If such prior use or occupancy increase the cost, or delays the Work, the Contractor shall be granted such extra compensation or extension of time, or both, as City may determine.
- C. Consent of Surety and endorsement from the insurance carrier or carriers permitting prior occupancy or use of any completed or partially completed portions of the Work by the City shall be secured by the Contractor. Contractor and his Surety and enforcement from the insurance carrier or carriers permitting prior occupancy or use of any completed or partial

completed portions of the Work by the City shall be secured by the Contractor. Contractor and his Surety and insurance carrier hereby agree that such consent shall not be unduly withheld.

35. CLOSEOUT PROCEDURE

When the Contractor considers that the Work, or a portion thereof which the City has allowed to be accepted separately, is substantially complete, the Contractor shall prepare a letter stating the work, or a portion of the work, is substantially complete and submit to the City a comprehensive list of items to be completed or corrected. Substantial completion shall not operate to change the contract time to which liquidated damages are applicable. Reduced liquidated damages are chargeable for a project or portions thereof which have separately specified damages, if there are items of work remaining to be performed relative to such work once full substantial completion status has been attained. In such cases the amount of liquidated damages due shall be twenty-five percent (25%) of the unreduced liquidated damage amount stated in the contract, and shall not begin until after the contract completion date.

The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the City will make an inspection to determine whether the Work or designated portion thereof is substantially complete. The City Engineer shall have the sole right to determine if a Work or portion thereof is substantially complete. If the City's inspection discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the City. The Contractor shall then submit a request for another inspection by the City to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the City will prepare a certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Contractor and City for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix a reasonable time within which the Contractor shall finish all items on the list accompanying the Certificate. If the Contractor does not complete the items within the time fixed by the City, the City, upon ten (10) working days notice, shall have the option to complete the uncompleted Work for the Contractor and deduct the cost from any amount due to the Contractor, whether or not the contract completion date has passed.

The Contractor may request a written statement from the City Engineer of what constitutes substantial completion by writing a letter of "Notice Of Intent to Declare Substantial Completion." The letter shall be sent no later than fifteen (15) working days prior to the anticipated date of Substantial Completion. The letter shall state what items the Contractor intends to complete prior to declaring substantial completion and what date substantial completion is anticipated by. The City Engineer shall respond to the letter within ten (10) working days accepting or adding to the list of items to complete prior to substantial completion. The City Engineer's response to the list shall not prevent the City Engineer from amending the list within a reasonable time prior to the anticipated date of substantial completion, or from considering factors not known at the time the response was prepared.

36. FINAL PAYMENT

- A. Prior to receiving final payment, the work shall be completed according to the Contract Documents, as determined by the City. Retention shall be as provided in A.R.S. §34-221. This includes, but is not limited to, submittal of complete as constructed documents.
- B. The acceptance of final payment by the Contractor shall operate as a release to the City of all claims by the Contractor for all things done or furnished in connection with the Contract and for every act and neglect of the City, and others relating to or arising out of the Work under the Contract, except for claims made in writing and still unsettled, and specifically itemized at the time the final payment request is made.
- C. No payment, final or otherwise, shall operate to release the Contractor or his Surety from any obligations under the Contract or under the Performance Bond or Labor and Materials Payment Bond, including, but not necessarily limited to anyone or more of the following:
 - 1. Obligations arising from or relating to latent defects.
 - 2. Faulty or defective work or material, which does not comply with the requirements of the Contract.
 - 3. Failure of the construction, equipment, or fixtures to perform properly in accordance with the requirements of the Contract Documents.
 - 4. Unsettled claims.
 - 5. Claims for non-payment of laborers, mechanics, material men, or suppliers, or for equipment used or rented.
 - 6. Claims under the maintenance requirements of the Contract Documents or any special warranties provided for in the Contract Documents.

37. SUPERVISION BY CONTRACTOR

- A. The Contractor or his designated representative will be required to give personal attention to the fulfillment of this Contract and to keep the work under control and in accordance with the Schedule for Completion. The contractor shall provide a competent Representative with full authority to receive and execute such instructions, orders or directions as the Engineer, or his agents or representatives may issue in connection with the Contract.

The Contractor will supervise and direct the work at all times. He has the obligation to determine the means, methods, techniques, sequences and procedures of construction, except in those instances where the City, to define the quality of an item of work, specifies in the Contract a means, method, technique, sequence or procedure for construction of that item of work. The Contractor shall be responsible to perform the Work so that the quality of the Work conforms to the plans and the specifications while in progress and as finally completed.

- B. Instructions and information given by the City, Engineer, or his agents or representatives to the Contractor's representative on the work shall be considered as having been given to the Contractor. Before any work is done at the job site, the Contractor shall give written notice to the Engineer stating the name, home address and telephone number of the Contractor's representative. The Contractor shall also inform the Engineer in writing prior to any change of representative. A statement naming more than one person to be in charge depending upon which one is present at the time will not be acceptable.
- C. The Contractor shall file with the Engineer the names, addresses, and telephone numbers of representatives who can be contacted at any time in case of emergency. These representatives

must be fully authorized and equipped to correct unsafe or excessively inconvenient conditions immediately on order of the Engineer.

- D. The Contractor shall pay and cause his Subcontractors to pay any and all accounts for labor, services, equipment, and materials used by the Contractor and his Subcontractors during the performance of work under this Contract, including all applicable taxes and insurance. Such accounts shall be paid as they become due and payable within the time limits set forth by law. The Contractor shall furnish proof of payment of such accounts to the City.
- E. **The plan or method of work suggested by the City or the Engineer to the Contractor but not specified or required, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor. The City and the Engineer assume no responsibility therefore and in no way will be held liable for any defects in the work which may result from or be caused by the use of such plan or method of work.**

38. WEATHER

- A. During periods when weather or other conditions are unfavorable for construction, the Contractor shall pursue only such portions of the work as shall not be damaged thereby. No portions of the work where acceptable quality or efficiency will be affected by unfavorable conditions shall be constructed while those conditions exist. It is expressly understood and agreed by and between the Contractor and the City that the Contract time for completion of the work described herein is a reasonable time taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.
- B. The Contractor shall not be assessed liquidated damages, nor the cost of engineering and inspection during any delay in the completion of work caused by Acts of God, acts of the public enemy, acts of a public agency or owner, or a utility to provide for removal or relocation of existing utilities, unless such delay is caused in whole or in part by Contractor or any of its Subcontractors.
- C. A rain, windstorm, high water or other natural phenomena for the specific locality of the work, which might reasonably have been anticipated from historical records of the general locality of the work, shall not be construed as abnormal. It is hereby agreed that rainfall greater than the following cannot be reasonably anticipated:
 - 1. Daily rainfall equal to, or greater than, one inch during a month when the monthly rainfall exceeds the normal monthly average by fifteen percent or more.
 - 2. Daily rainfall equal to, or greater than one and one-half (1-1/2) inch at any time.

Rainfall data shall be collected at the job site by the Contractor.

39. OVERTIME

Any Work necessary to be performed after regular working hours, on Sundays, or legal holidays, shall be performed without additional expense to the City unless otherwise provided in the Contract Documents.

The Contractor is responsible for completing his work activities within regular working hours. Should the Contractor elect to run his crews more than a typical 10-hour day, he may elect to with

prior coordination with the City. Any inspection, which is required beyond the City of Sedona's Standard 10-hour work day due to extended work hours or late daily cleanup, is subject to a withholding by the City from the Contractors progress payment for the cost of the overtime inspection during that period. The amount withheld shall be itemized by person and reflect any overtime premiums paid.

40. INDEMNIFICATION

A. To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the City, its agents, officers, officials and employees from and against all tortuous claims, damages, losses and expenses (including but not limited to attorney fees, court costs, and the cost of appellate proceedings), relating to, arising out of, or alleged to have resulted from the acts, errors, mistakes, omissions, work, and/or services of the Contractor, its agents, employees or any tier of Contractor's subcontractors in the performance of this Contract. Contractor's duty to defend, hold harmless and indemnify the City, its agents, officers, officials and employees shall arise in connection with any tortuous claim, damage, loss or expense that is attributable to bodily injury, sickness, disease, death, or injury to, impairment, or destruction of property including loss of use resulting there from, caused by Contractor's acts, errors, mistakes, omissions, work or services in the performance of this Contract including any employee of the Contractor, any tier of Contractor's subcontractor or any other person for whose acts, errors, mistakes, omissions, work or services the Contractor may be legally liable. The Contractor shall, with respect to all work which is covered by or incidental to this Contract, indemnify and hold the City, Engineering Dept., all officers, employees, attorneys, agents of the City and the City Engineer, harmless from and against all of the following made by any person or entity not a party to this Agreement:

1. Any claim, liability, loss, damage, costs, expenses, including reasonable attorneys' fees, expert witness fees, court costs and other expenses of litigation, awards, fines, or judgments, arising by reason of the death or bodily injury to persons, injury to property, design defects (if design originated by Contractor only) or other loss, damage or expense, including any of the same resulting from any alleged or actual negligent or intentional acts or omissions of the Contractor, the Subcontractors, or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether it is caused in part by a party indemnified by this Contract and regardless of whether said acts or omissions of such party are active or passive.
2. Any claim, liability, loss, damage, costs, expenses, including reasonable attorneys' fees, expert witness fees, court costs and other expenses of litigation, awards, fines, or judgments, arising out of any dispute regarding the Contract or any work performed under the Contract.
3. Any claim, liability, loss, damage, costs, expenses, including reasonable attorneys' fees, expert witness fees, court costs and other expenses of litigation, awards, fines, or judgments, arising out of any dispute regarding the Contract or any work performed under the Contract by any Subcontractor.
4. Any loss or damage that may happen to the work or any part thereof, and any loss or damage to any of the materials or other property used or employed in performing the work, including any loss or damage during transit or storage of any property or materials,

including any property or materials furnished by the City, including reasonable attorneys' fees, awards, fines, or judgments.

- B. However, the Contractor shall not be obligated under this Contract to indemnify the City with respect to the sole negligence or willful misconduct of the City or its agents or employees or Design Engineer.
- C. **The indemnity obligations of this Contract shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which otherwise exists by statute or under the common law of the State of Arizona, except those in conflict with the express terms of these General Conditions. The law of comparative negligence, as adopted by the State of Arizona, shall be binding upon the relationship between the parties, except as set forth herein.**
- D. The amount and type of insurance coverage requirements set forth herein will in no way be construed as limiting the scope of the indemnity in this paragraph.

41. ACCIDENT PREVENTION - EMERGENCY - AUTHORITY TO ACT

After the Contract Notice to Proceed has been issued through final acceptance of the Contractor's work, it shall be the Contractor's responsibility for protection and safety of the public and workers twenty-four (24) hours a day, seven (7) days a week. This responsibility will also be placed on the Contractor after final acceptance when the Contractor is on site performing any Guaranty/Warranty work.

Whenever, in the opinion of the Engineer, the Contractor has not taken sufficient precaution for the safety of the public or the protection of the work to be constructed under this Contract, or of adjacent structures or properly, and whenever, in the opinion of the Engineer, an emergency has arisen and immediate action is considered necessary, then the City, with or without notice may provide suitable protection by causing work to be done and materials to be furnished and placed. The cost of such work and materials shall be borne by the Contractor, and if the same is not paid on presentation of the bills, such costs will be deducted from any amounts due or to become due to the Contractor. The performance of such emergency work shall not relieve the Contractor of responsibility for any damage that may occur.

42. PROTECTION OF WORK

The Contractor, at no additional expense to City, shall at all times safely guard and protect his own Work; provide, erect, and maintain suitable barriers around all improvements, work areas, excavations, or obstructions to prevent accidents; and provide, place, and maintain during the night sufficient lights, signals, and signs for this purpose on or near the Work. The Contractor shall at all times, until its completion and final acceptance, protect his Work apparatus, equipment, and material from accidental or any other damage; and make good any damages thus occurring at no additional cost to the City.

43. PROTECTION OF PROPERTY

- A. The Contractor, at no additional expense to the City, shall at all times (1) safely guard the City's property and abutting or adjacent property from injury, loss, or damage in connection with the Contract; (2) protect by false work, braces, shoring, or other effective means all buildings,

foundations, walls, fences, property pins and other property along his line of Work, or affected directly by his Work, including, but not limited to the City's property, against damage; (3) cover or otherwise protect stockpiles of materials to avoid damage to any property from such materials; and/or (4) repair, replace, or make good any such damage, loss or injury, unless such is caused directly by the City or his duly authorized representatives.

- B. The Contractor shall exercise care to protect from injury all water lines, sanitary sewer lines, gas mains, telephone cables, electric cables, services pipes, and other utilities or fixtures which may be encountered during the progress of the Work. All utilities and other service facilities or fixtures if damaged, shall be repaired by the Contractor without additional compensation.
- C. The Contractor shall personally check and verify utility information on the plans. Where existing utilities or structures are shown on the plans or drawings, they are believed to be accurate but are not guaranteed to be such or that these are the only utilities or structures in the construction area. Protection is completely the responsibility of the Contractor and he must satisfy himself as to the existence and location of all utilities and structures.
- D. The Contractor shall give written notice of at least forty-eight (48) hours before breaking ground, to all persons, superintendents, inspectors, or those otherwise in charge of property, streets, water, gas, or sewer pipes, telephone or electrical cables, railroads, or otherwise who may be affected by the Contractor's operation in order that they may remove any obstruction for which they are responsible and have a representative on the site to see that their property is properly protected.

44. PROTECTION OF PERSONS

- A. The Contractor shall:
 - 1. At all times protect the lives and health of his employees under the Contract.
 - 2. Take all necessary precautions for the safety of all persons on or in the vicinity of the Work site.
 - 3. Comply with all applicable provisions of Federal, State, and Municipal safety laws and building codes.
 - 4. Comply with all pertinent provisions of the "Manual of Accident Prevention on Construction" issued by the Associated General Contractors of America, Inc., latest edition, to prevent accidents or injury to persons, on, or adjacent to the premises where the Work is being performed. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of persons and shall post danger signs warning against the hazards created by such features of construction as protruding nails, rod hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, and falling materials; and he shall designate a responsible member of his organization on the Work site whose duty shall be the prevention of accidents.
- B. The Contractor shall comply with all provisions of the "Occupational Safety and Health Act" (OSHA), including any amendments thereto and rules and regulations issued pursuant thereto, applicable to the Work and performance of the Contract. Whereas state in which Work is performed has passed legislation bearing on Occupational Safety and Health, such legislation and amendments thereto, together with rules and regulations issued pursuant thereto shall be complied with by the Contractor.

45. POTENTIALLY DANGEROUS WORK

- A. When the use of explosives, driving, or removal of piles, wrecking, excavation Work or other similarly potentially dangerous Work is necessary for the prosecution of the Work, the Contractor shall exercise the utmost care so as not to endanger life or property. The Contractor shall be fully responsible for any and all damages, claims, and for the defense of any actions against the City resulting from the prosecution of such Work in connection with or arising out of the Contract.
- B. The Contractor shall notify each private and public utility company or other owner of property having structures or improvements in proximity to the site of the Work, of his intent to perform potentially dangerous Work. Such notice shall be given sufficiently in advance to enable the companies or the owners of property to take such steps as they may deem necessary to relieve the Contractor of responsibility for all damages, claims, or the defense of any actions against the City resulting from the performance of such Work in connection with or arising out of the Contract.
- C. All explosives shall be stored in a secure manner and all storage places shall be marked clearly "EXPLOSIVES-KEEP OUT", and shall be in the care of competent watchmen at all times. Blasting Permits must be obtained from the Sedona-Oak Creek Fire District, 2860 Southwest Drive, Sedona, AZ 86336 (602) 282-6800.
- D. If blasting is required, building inspection reports must be conducted for properties within 150-foot of the proposed blasting area. For affected structures that are to remain after the construction, the report shall consider and document the existing structural and architectural condition of those structures. The intent of this report is to document the condition of such structures before construction, obtain agreement with the property owner, and use for comparison purposes after construction is completed, to ensure the structure was not damaged from construction activities. Blasting will only be considered if rock excavating equipment equal to or better than that provided by "drum-cutters" (see www.drumcutters.com), would not be effective for excavation.

46. PATENTS, COPYRIGHTS, AND ROYALTIES

- A. The Contractor shall assume all costs arising from the use of any patented article, material, device, equipment or process used or furnished by him in connection with, or incorporated in the Project. The Contractor shall save, and hold harmless the City and all officers and agents thereof from all damages, costs and expenses in law or equity (including attorneys' fees, expert witness fees, court costs, and other expenses of litigation) that may come at any time, arise or be set up by reason of any infringement or alleged infringement of any patent rights as a consequence of the installation or use of any such article, material, device, equipment or process in or about the Project. The Performance Bond required by Arizona Revised Statutes Section 34-221 shall be deemed to apply expressly to this provision of the Contract.
- B. Should the Contractor, his agent, employer or any of them be enjoined from furnishing or using any invention, article, material or plans supplied or required to be supplied or used under this Contract, the Contractor shall promptly pay such royalties and secure the requisite licenses; or, subject to acceptance by the City, substitute other articles, materials or appliances in lieu thereof which are of equal efficiency, quality, finish, suitability and market value to those

planned or required under the Contract. Descriptive information of these substitutions shall be submitted to the Engineer for determination of general conformance to the Design concept and the Construction Contract. Should the City elect to refuse a substitution, the Contractor agrees to pay such royalties and secure such valid licenses as may be requisite for the City, his representatives, agents and employees or any of them, to use such invention, article, material or appliance without being disturbed or in any way interfered with by any proceeding in law or in equity on account thereof.

47. CHANGE ORDERS FOR CHANGED OR EXTRA WORK

- A. The City reserves the right at any time during the progress of the Work to make necessary alterations of, deviations from, additions to, or deletions from the Contract, or may require the performance of extra Work neither covered by the specifications nor included in the Proposal, but forming a part of the Work contracted for; provided however, the Contractor shall not proceed with any such change or extra Work without a written Change Order approved by the City. Until a resolution is reached by the City and the Contractor, the Contractor is to continue work on the project. Additional time may or may not be added to the projected (and approved) contract end date. Such changes or extra Work shall in no way injuriously affect or invalidate the Contract or the Contractor's bond, but the difference in cost shall be added to or deducted from the amount of the Contract, as the case may be. Adjustments, if any, in the amounts to be paid to the Contractor by reason of any such change or extra work shall be determined by one of the following methods in the order as listed:
1. Method A Unit prices contained in the Contract Documents for the same type or class of work.
 2. Method B By an acceptable unit price proposal from the Contractor.
 3. Method C By an acceptable lump sum price proposal from the Contractor.
 4. Method D If neither Method "B" or "C" can be agreed upon before the change or extra work is started, then the Contractor shall be paid the "actual field cost" of the work plus eighteen percent (18%) or twelve percent (12%) as stated herein below.
- B. Whenever any change or extra work is to be done, for which unit prices for the same type or class of work are contained in the Contract Documents, such work shall be done and shall be measured and paid for pursuant to Method A herein above set forth and the other applicable portions of the Contract Documents, subject to Article 30 of the General Conditions. Full compensation for taxes, overhead and other costs shall be considered as included in the unit prices bid.
- C. Methods B and C shall include an itemized cost breakdown including overhead and profit. In determining the amount payable to the Contractor, an additional five percent (5%) may be added to the amount payable to a Subcontractor, but no "pyramiding" or additional percentage shall be authorized for any work done by a Subcontractor. This percentage may be increased to seven percent (7%) if the Contractor provides proof that it is paying transaction taxes for the subcontractor. The subcontractor percentage shall be considered as compensation for taxes paid on the subcontracted work, and any other costs or profit associated the subcontracted work. The taxes shall not be separately shown as a cost in the amount to which the seven percent (7%) is applied. Full compensation for taxes, overhead and other costs shall be considered as included in the unit price or lump sum price accepted whether such items are explicitly itemized or not.

- D. When any change or extra work is performed under "Method D", the term "actual field cost" of such change or extra work is hereby defined to be and shall include:
1. The actual wages paid to all the Contractor's workmen such as foremen, equipment operators, mechanics, and laborers, for the time actually performing the change or extra work. Superintendents are considered as compensated for in the overhead.
 2. All of the Contractor's materials and supplies incorporated in the change or extra work, unless the total cost for a particular material or supply is less than twenty dollars (\$20). Materials and supplies with a total cost of less than twenty dollars (\$20) will be considered as compensated for in the overhead and profit allowance.
 3. All machinery and equipment for the time actually employed or used in the performance of the changed or extra work shall be based on the submitted and approved schedule of equipment rates, unless the hourly cost for the machinery or equipment is less than twenty-five dollars (\$25.00) per hour or one hundred fifty dollars (\$150) per day. Items with rates less than twenty-five dollars (\$25.00) per hour or one hundred fifty (\$150) per day will be considered as compensated for in the overhead and profit allowance. The contractor shall submit machinery and equipment rates for approval prior to Start of Construction.
 4. Any transportation charges necessarily incurred in connection with any equipment authorized by the City for use on said change or extra work, but which is not already on site provided the transportation cost exceeds twenty-five dollars (\$25.00).
 5. All power, fuel, lubricants, water, and similar operating expenses as well as other expendable materials.
 6. Incidental expenses incurred as a direct result of such change or extra work, including payroll taxes and a pro rata portion of premium in the Performance Bond and Labor and Materials Payment Bond, and where the premiums therefore are based on payroll costs, on Public Liability and Property Damage insurance, Workmen's Compensation insurance, and Occupational Disease Disability insurance, Builder's Risk, and other insurance required by the Contract. **In order to be allowed these amounts shall be provided in writing when submitting the first request for a progress payment. These amounts payable by the City shall not change for the duration of the contract. The twelve percent (12%) mark-up shall not apply to these items.**
 7. No repairs, replacements, or other forms of overhead expense shall be included in "actual field costs".
 8. The Engineer may adjust the amount due under this method based upon a reasonable estimate of the actual cost of performing deleted work in the case of a change in work method or work material. In this case the amount due shall be the difference between the estimated cost to perform work per the original method based on conditions known at the time of the change to the extent such conditions are not the basis for a change, and the method proposed to be used plus the unit bid price for the original method.
- E. The Engineer may direct the form in which the accounts of the actual field costs shall be kept and may also specify in writing, before the work commences, the method of doing the work and the type and kind of machinery and equipment, if required, which shall be used in the performance of any change or extra work under method "D". In the event that machinery and heavy construction equipment are required for such change or extra work, the authorization and basis of payment for the use thereof shall be stipulated in the written Change Order.
- F. The twelve percent (12%) or eighteen percent (18%) of the "actual field cost" to be paid to the Contractor shall cover and be full compensation for the Contractor's profits, overhead, superintendence, and field and home office expense, and all other elements of cost not

embraced within the "actual field cost" as defined herein. Eighteen percent (18%) shall be payable for Contractor costs for that portion of total change orders less than or equal to thirty thousand dollars (\$30,000). For that portion exceeding thirty thousand dollars (\$30,000) the twelve percent (12%) factor shall be applied to Contractor costs. In determining the amount payable to the Contractor, an additional percentage per C above may be added to the amount payable to a Subcontractor, but no "Pyramiding" or additional percentage shall be authorized for any work done by Subcontractors.

- G. No claim for any change or extra work of any kind shall be allowed unless the work is ordered and approved in writing by the City in the form of a Change Order.
- H. No anticipated profits shall be allowed for work deleted.
- I. If the City has work accomplished by other sources due the Contractor's failure to perform required work it may deduct an additional five hundred dollars (\$500) or five percent (5%) of the cost of accomplishing the work, whichever is greater, in addition to the cost of accomplishing the work using other sources. The City shall consider this additional amount as compensation for overhead and administration.
- J. The Contractor shall furnish satisfactory bills, payrolls, and vouchers covering all items of cost and when requested by the City, give the City access to accounts relating thereto.
- K. Any Change or extra work shall be considered a part of the Contract, subject to all of its terms, conditions, stipulations, review, guaranties, and tests may be performed without notice to the surety on the Contractor's bond. The Contractor and surety hereby agree to these provisions.
- L. The following language shall apply to all change orders:
"THIS CHANGE ORDER CONSTITUTES FULL, FINAL, AND COMPLETE COMPENSATION TO THE CONTRACTOR FOR ALL COSTS, EXPENSES, OVERHEAD, PROFIT, AND ANY DAMAGES OF EVERY KIND THAT THE CONTRACTOR MAY INCUR IN CONNECTION WITH THE WORK DESCRIBED IN THIS CHANGE ORDER, INCLUDING ANY IMPACT ON THE DESCRIBED WORK OR ON ANY OTHER WORK UNDER THE CONTRACT, ANY CHANGES IN THE SEQUENCES OF ANY WORK, ANY DELAY TO ANY WORK, ANY DISRUPTION OF ANY WORK, ANY RESCHEDULING OF ANY WORK, AND ANY OTHER EFFECT ON ANY OF THE WORK UNDER THIS CONTRACT. BY THE EXECUTION OF THIS CHANGE ORDER, THE CONTRACTOR ACCEPTS THE CONTRACT PRICE CHANGE AND THE CONTRACT COMPLETION DATE CHANGE, IF ANY, AND EXPRESSLY WAIVES ANY CLAIMS FOR ANY ADDITIONAL COMPENSATION, DAMAGES OR TIME EXTENSIONS, IN CONNECTION WITH THE DESCRIBED WORK."
- M. The Contractor shall not be entitled to adjustments in contract price or contract time related to submittal of any cost estimates.

48. PROCEDURE FOR REQUESTING CHANGE ORDERS –EXTRA

- A. In case any instructions, either oral or written, appear to the Contractor to involve a change or extra work for which, in his opinion, he should receive extra compensation, he shall make a written request to the Engineer for a written Change Order authorizing such change or extra work. Should a difference of opinion arise as to what does or does not constitute a change or

extra work, or concerning the payment thereof, and the City insists on conformance, the Contractor shall proceed with the work after presenting written notice of claim for extra cost to the City and shall keep an accurate account of the "actual field cost" thereof as provided for in Method "D" under "Changed or Extra Work". The Contractor shall thereby not waive any right he might have to compensation for the claimed "extra cost" in connection with a change or extra work. The matter shall be submitted to the City for final determination as to whether or not a change or extra work was involved, and if so, the amount due to the Contractor.

- B. Any claims for extra cost pursuant to this section, together with supporting documents and receipts, must be filed within ten (10) consecutive calendar days after performing the work for which extra cost is claimed. The City shall have the right to reject any claim for extra cost if the foregoing procedure is not followed.
- C. In giving instructions, the Engineer shall have the authority to make minor changes that do not involve extra cost or time of performance and are not inconsistent with the design concept and purposes of the contracted work; but otherwise, except in an emergency endangering life or property, no change or extra work shall be performed unless authorized by a written "Change Order" approved by the City Council or its designee in accordance with the City Code, and no claim for extra cost shall be valid unless so approved, except as otherwise provided herein.

49. PROCEDURE FOR REQUESTING CHANGE ORDERS--EXTRA TIME

- A. The Contract time may be changed only by a change order either alone or in conjunction with other changes. Any claim for an extension of Contract time shall be based on written notice delivered to the Engineer within seven days of the occurrence of the event giving rise to the claim. Notice of the extent of the claim with supporting data shall be delivered within forty-five days of such occurrence unless Engineer allows an additional period of time to ascertain more accurate data. Notice of the extent of the claim must state the cause of the delay, the date of occurrence causing the delay, and the amount of additional time requested. Requests for extensions of time shall be supported by all evidence reasonably available or known to the Contractor, which would support the extension of time requested. If the Contractor is requesting an extension of time because of weather, he shall supply daily written reports to the Engineer describing such weather and the work which could not be performed that day because of such weather or conditions resulting there from and which he otherwise would have performed. The Engineer's acceptance of the daily reports shall not be deemed an admission of the Contractor's right to receive an extension of time or waiver of the City's right to strictly enforce the time provisions contained in the Contract Documents. Requests for extensions of time failing to include the information specified in this Article and requests for extension of time which are not received within the time specified above shall result in the forfeiture of the Contractor's right to receive any extension of time requested. Any change in the Contract time resulting from any such claim shall be incorporated in a change order. The percentages specified in Section 38 and 47 G above shall be considered to include full compensation for each day or portion thereof of extra time.
- B. The Contract time will be extended in an amount equal to time loss due to delays beyond the control of Contractor if a claim is made there for as provided in paragraph A. Such delays shall include, but not be limited to, acts or neglect by City or others performing additional work, or to fires, floods, labor disputes, epidemics, abnormal weather conditions, or act of God. No extension of the Contract time will be granted where the delay is attributable to a Subcontractor, manufacturer, fabricator, supplier or distributor or any other party performing

services or furnishing material or equipment on behalf of the Contractor unless such party's delay is attributable to one of the above enumerated causes. Time limits concerning substantial completion and final completion as stated in the Contract Documents are of the essence.

- C. An extension of time may be granted by the City after the expiration of the time originally fixed in the Agreement or as previously extended, and the extension so granted shall be deemed to commence and be effective from the date of such expiration. However, such extension shall not be deemed to be a release of any of the City's rights under the Contract Document unless expressly stated as such.

50. DIFFERING SITE CONDITIONS

If conditions or objects are encountered at the site which are (1) sub-surface or otherwise concealed and which differ materially and substantially from those indicated or anticipated in the Contract Documents or (2) are of an unusual nature, which differ materially and substantially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice, in writing, by the Contractor shall be given to the City promptly before conditions are disturbed and in no event later than 24 hours after first observance of the conditions. The City shall promptly investigate such conditions and, if they differ materially and substantially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work, shall provide an equitable adjustment in the Contract Amount or Contract Period, or both as per Sections 47 through 49 of these General Conditions. If the City determines that the conditions at the site are not materially and substantially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the City shall so notify the Contractor in writing, stating the reasons. No claim by the Contractor for an equitable adjustment shall be allowed if asserted after final payment has been made under this agreement. Weather, and the effects of weather on surroundings, surface, or subsurface are to be anticipated and do not constitute a differing condition. No contract change, which results in a benefit to the Contractor, shall be allowed unless the contractor has provided the required written notice. No contract adjustment will be allowed under this section for any effects caused on unchanged work.

51. WARRANTY PERIOD

- A. Besides guarantees required elsewhere, the Contractor shall and hereby does guarantee all work for a period of two (2) years after the date of final acceptance of the work by the City and shall repair and replace any and all work together with any other work, which may be displaced in so doing, that may prove defective in workmanship or materials within the two-year period from the date of final acceptance, without expense whatsoever to the City, ordinary wear and tear and unusual abuse or neglect excepted. If the Contractor is required to repair or replace any portion of the Project pursuant to the two-year guarantee provided by this section, the repair or replacement shall similarly be guaranteed for an additional one-year period from the date of completion of the repair. In the event of failure to comply with the above mentioned conditions, within a week (seven consecutive days) after being notified in writing by the City, the City is hereby authorized to proceed to have the defects repaired and made good at the expense of the Contractor, who hereby agrees to pay the cost and charges therefore immediately upon demand by the City. In case of emergency, where, in the opinion of the City, delay could cause serious loss or damage, repairs may be made without notice being sent to the Contractor and the expenses in connection therewith shall be charged to the Contractor.

- B. The Contractor guarantees to the City that all materials and equipment furnished under this Contract will be new and of good and sufficient quality, free from faults and defects as is necessary to complete the project as required by the plans and specifications.
- C. The City and the Contractor agree that the guarantee on the equipment possessed and used by the City, in accordance with Article 34 of these General Conditions, shall commence on the date that the City takes possession of the equipment and so notifies the Contractor in writing. City and Contractor further agree that such taking possession and use shall not be deemed as acceptance of any part of the work. Take-over of equipment may occur when such equipment can be put into routine service on a permanent basis at City's discretion.

52. AUTHORITY OF ENGINEER

- A. The Engineer shall furnish engineering services during construction of the work to the extent provided in the Contract Documents. He shall observe and review the work in the process of construction or erection. Compliance with the Contract Documents shall be the Contractor's responsibility notwithstanding such observation or review. The Engineer has authority to recommend suspension of the work when it appears such suspension may be necessary to accomplish the proper implementation of the intent of the Contract Documents. The authority to observe, review, or recommend suspension of all or any portion of the work, or exercise such other authority as may be granted by the Contract Documents, shall not be construed or interpreted to mean supervision of construction, which is the Contractor's responsibility, nor make the Engineer responsible for providing a safe place for the performance of work by the Contractor or by the Contractor's employees or those of suppliers or subcontractors or for access, visits, use, work, travel, or occupancy by any other person. The provisions of MAG Sections 104.1.4 and 104.2.5 as contained in the 2012 edition apply to this contract.
- B. The Engineer shall have authority to reject any or all work, materials, or equipment, which do not conform to the Contract Documents, and to decide technical questions, which arise in the execution of the work. The Engineer shall determine the amount, quality, acceptability, and fitness of the several kinds of work, materials, equipment, and supplies which are to be paid for under the Contract and shall decide all questions which may arise in relation to said work and the construction thereof. The Engineer's estimates and decisions shall be final and conclusive, except as otherwise expressly provided. In case any question shall arise between the parties to the Contract relative to the Contract Documents, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under the Contract affected in any manner or to any extent by such question.

53. DECISIONS OF THE CITY

If the Contractor is not in agreement with any final decision of the Engineer, then he may appeal, in writing, such decisions to the City Manager, who shall within a reasonable time after presentation, make decisions in writing on claims properly made by the Contractor. The appeal shall contain the final decision of the Engineer as an attachment, or in the absence of such final decision a copy of a certified letter sent to the Engineer, at least fifteen (15) working days prior to the appeal, requesting such a final decision in writing. The decision of the City Manager shall be regarded as final.

54. TEMPORARY SUSPENSION OF THE WORK

- A. The City Manager may, upon the recommendation of the Engineer, or by the Manager's own determination, suspend the work.
- B. Should the discovery of a potential archaeological or historic resource occur during construction, the Contractor shall cease work at that site, immediately notify the Engineer, and shall not proceed until instructed to do so by the City. In the event such a suspension of the work occurs, the provisions of Article 49 shall apply to extend the time for final completion of the work.

55. AUTHORITY AND DUTIES OF CITY'S FIELD REPRESENTATIVE

- A. Inspectors may be placed on the work to keep the City informed as to the progress of the work and the manner in which it is being done; to keep records; act as liaison between the Contractor and the City; and to call the attention of the Contractor to any deviations from the Contract Documents. However, failure of the inspector to call the attention of the Contractor to faulty work or deviations from the Contract Documents shall not constitute acceptance of said work.
- B. The inspector cannot control how the material is used; therefore, the responsibility for its safety and proper use shall be the Contractor's. Until the job is finally completed, the Contractor may do work that changes or modifies work previously done, and even though at any given time, a piece of work might be well done and acceptable in quality, the responsibility for keeping it in that condition until the work is complete is the sole responsibility of the Contractor. For this reason, it is impossible to accept, finally, any portion of a project until the project as a whole is accepted and control of said project is transferred from the Contractor by final official written acceptance by the City.
- C. Any personal assistance which an inspector may give the Contractor will not be construed as the basis of any assumption of responsibility in any manner, financial or otherwise, by the inspector or the City.**
- D. The inspector is not and does not purport to be a Safety Engineer and is not engaged in that capacity by the City and shall have neither authority nor the responsibility to enforce construction safety laws, rules, regulations, procedures, or the safety of persons on and about the construction site.
- E. The presence or absence of an inspector on any job will be at the sole discretion of the City, and such presence, or absence of an inspector will not relieve the Contractor of his responsibility to obtain the construction results specified in the Contract Documents.
- F. The inspector is not authorized to approve or accept any portion of the work or to issue instructions contrary to the Contract Documents. Approvals, acceptance or instructions, when given, must be in writing and signed by the City. The inspector shall have authority to reject defective materials; however the failure of the inspector to reject defective material or any other work involving deviations from the Contract Documents shall not constitute acceptance of such work.

- G. Nothing in this subsection shall in any way be so construed as to require or to place responsibility for the method, manner or supervision of the performance of the work under this Contract upon the inspector, or the City. Such responsibility rests solely with the Contractor.

56. CHARACTER OF WORKERS, METHODS, AND EQUIPMENT

- A. The Contractor shall at all times employ sufficient skilled labor in accordance with Federal, State and local labor laws; and the proper equipment for completing the project in the manner and time required by the Contract. All equipment, which is proposed to be used on the project, shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be used such that it will not damage property adjacent to the work area.
- B. Any person employed by the Contractor or any Subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed from the work by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer. Should the Contractor or Subcontractor fail to remove such person as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until such orders by the Engineer are followed by the Contractor. The Contractor or Subcontractor shall hold the City harmless from damages or claims for compensation that may occur in the enforcement of this section.
- C. The City may require submittal of Certified Payrolls at any time from the Contractor showing the employee names, addresses, Social Security Numbers, rates of pay, payments received, payroll deductions, occupational classification(s), and hours per day worked in such classification(s) for work performed on this project by employees. The contractor shall retain such records for the minimum time required by law or three (3) years after project completion, whichever is longer. The Contractor shall also be responsible to produce upon request from the City such payroll records from its subcontractors.

57. WARRANTY OF COMPLIANCE WITH STATE AND FEDERAL LAW

CONTRACTOR understands and acknowledges the applicability to it of the Americans with Disabilities Act, the Immigration Reform and Control Act of 1986 and the Drug Free Workplace Act of 1989. CONTRACTOR must also comply with A.R.S. § 34-301, "Employment of Aliens on Public Works Prohibited," and A.R.S. § 34-302, as amended, "Residence Requirements for Employees."

- A. Under the provisions of A.R.S. § 41-4401, CONTRACTOR hereby warrants to CITY that CONTRACTOR and each of its subcontractors will comply with, and are contractually obligated to comply with, all Federal Immigration laws and regulations that relate to their employees and A.R.S. § 23-214(A) (hereinafter "Contractor Immigration Warranty").
- B. A breach of the Contractor Immigration Warranty shall constitute a material breach of this contract and shall subject CONTRACTOR to penalties up to and including termination of this contract at the sole discretion of CITY.
- C. CITY retains the legal right to inspect the papers of any contractor or subcontractor employee who works on this contract to ensure that the contractor or subcontractor is complying with the

Contractor Immigration Warranty. CONTRACTOR agrees to assist CITY in regard to any such inspections.

- D. CITY may, at its sole discretion, conduct random verification of the employment records of CONTRACTOR and any subcontractors to ensure compliance with Contractor's Immigration Warranty. CONTRACTOR agrees to assist CITY in regard to any random verification performed.
- E. Neither CONTRACTOR nor any subcontractor shall be deemed to have materially breached the Contractor Immigration Warranty if CONTRACTOR or any subcontractor establishes that it has complied with the employment verification provisions prescribed by sections 274A and 274B of the Federal Immigration and Nationality Act and the E-Verify requirements prescribed by A.R.S. § 23-214, Subsection A.
- F. The provisions of this article must be included in any contract that CONTRACTOR enters into with any and all of its subcontractors who provide services under this contract or any subcontract. "Services" are defined as furnishing labor, time or effort in the State of Arizona by a contractor or subcontractor. Services include construction or maintenance of any structure, building or transportation facility or improvement to real property.

58. QUALITY CONTROL AND TESTING

- A. The Contractor will support the Testing Company when contracted by the City for Quality Control and testing for specification compliance and assurance.
- B. During the progress, the work shall be subject to the review and observation of the City. The Contractor shall afford every reasonable facility and assistance to the City to make such review. If any work is covered up without approval or consent of the City, it will be uncovered for examination at the Contractor's expense.
- C. The fact that the City is on the job site shall not be taken as an acceptance of the Contractor's work or any part of it. The Contractor shall notify the City upon completion of his Contract, and the work shall be given final construction review by the City, and any tests and re-tests shall be witnessed by the City or his representative. If all parts of the work are acceptable and substantially comply with the intent of the Contract Documents, initial acceptance shall be made by the City. If parts of the work are not acceptable and require additional work or rework by the Contractor to complete the Project, such costs shall be borne by the Contractor.
- D. Contractor shall submit to the City, ten (10) days in advance of construction and without charge, samples or specifications of materials he proposes to use and shall not use these materials until he has received approval from the City.
- E. Contractor shall furnish tests and reports on tests of all materials, equipment and installations called for in the Contract Documents. The testing laboratory must be approved by the City and the Contractor shall pay the cost of the tests, and necessary re-tests, including all transportation charges unless otherwise provided by the Contract Documents.
- F. Required certificates of inspection, testing, or compliance shall be secured by the Contractor and promptly delivered by him to the Engineer. Certificates shall be provided within five (5)

working days after the test is conducted. Each report shall indicate compliance with the specifications.

- G. The City reserves the right to perform additional inspections and testing deemed appropriate with their own forces or with outside consultants or testing agencies. Should such inspection or testing reveal work that is not in compliance with Contract Documents, such costs of inspection or testing, and any required rework shall be borne by the Contractor.
- H. Following is a summary of minimum frequency of testing the city shall require. If there are conflicts in the frequency of testing between this Section and the Technical Specifications, the stricter of the two will govern. This list is a partial list of major items of work, if an item is a part of the project and not listed the Contractor shall provide testing for that item. The Contractor shall provide the appropriate tests for the activities a part of the project. The City reserves the right to request a greater frequency for the testing.

The following frequencies are based on a maximum of 8” lifts. When the lifts are greater than 8”, the frequency of testing shall increase proportionately with the increased depth of lift.

Activity	Frequency
Roadway Fills	1 each 300 ft per lift
AB Subgrade	1 each 300 ft per lift
AC Pavement	1 each 300 ft per lift
Trench Backfill	1 each 300 ft per lift
Concrete Curb & Gutter	4 cylinders per 50 cy concrete
Concrete Sidewalk	4 cylinders per 50 cy concrete

59. TERMINATION OF CONTRACT

- A. The City may, at any time, terminate the Contract at the City’s convenience and without cause. Such termination shall be effective upon receipt by Contractor of written notice from the City of such termination for the City’s convenience. Contractor shall cease operations as directed by the City in the notice of termination and take actions necessary, or that the City may direct, for the protection and preservation of the work. In the event of a termination for convenience, the Contractor shall be paid only the direct value of its completed work and materials supplied as of the date of termination, and Contractor shall not be entitled to anticipated profit or anticipated overhead or any other claim of damages from the City. Further, in the event a termination of the Contractor for cause is determined to have been without legal right, then the termination shall be deemed to have been a termination for convenience.
- B. If the Contractor refuses or fails to prosecute the work or any separable part thereof with such diligence as will ensure its completion within the time specified herein, or any extension thereof granted in the manner specified herein, or fails to complete the work within such time, or if the Contractor fails to comply with any written order of the Engineer or the City or fails to timely pay Subcontractors, material, men, or laborers, or if the Contractor should be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he or any of his Subcontractors should violate any of the provisions of the Contract, then the City may serve written notice upon the Contractor and his surety of its intention to terminate the Contract and, unless within ten (10) days after the service of such notice such violations of the Contract cease

and satisfactory arrangements for the corrections thereof are made, the Contract shall without further notice, upon the expiration of said ten (10) days or such extensions thereof as may be expressly granted by the City in writing, cease and terminate.

- C. In the event of any such termination, the Contract shall be deemed terminated and not rescinded. Following such termination of the Contract, the City will take possession of the Project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, and finish the Project by whatever method the City may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the work is finished, or completion is permanently suspended by the City. If the unpaid balance of the Contract price exceeds the direct and indirect costs of completion of the project, including compensation for additional professional service, including but not limited to fees charged by the City's attorney, such excess shall be paid to the Contractor. If such costs or liquidated or actual damages as provided by this Contract exceed such unpaid balance, the Contractor shall pay the difference to the City. Such additional costs and any liquidated or actual damages due to the City under this Contract will be determined by the City Manager and be submitted to the City Council in the form of a Change Order to the Contract.
- D. Any extensions of time granted by Change Order or other extensions granted by the Council do not constitute a waiver of the City's right to terminate the Contract pursuant to this section for the Contractor's failure to complete the Project within the time specified in the Contract and any authorized extensions thereto, nor do such extensions constitute a waiver of the City's right to collect liquidated damages.
- E. If the work is stopped by order of a court, public authority, or the City for a period of ninety (90) calendar days or more, through no act or fault of the Contractor, anyone employed by such Contractor or his Subcontractors, then the Contractor may terminate the Contract in accordance with these Contract Documents.

60. TIME IS OF THE ESSENCE

It is mutually understood and agreed by and between the parties to the Contract that in the execution of the same, time is an essential element of the Contract, and it is important that the work progress vigorously to completion.

61. LIQUIDATED DAMAGES

For each and every calendar day that work shall remain uncompleted after the time specified for the completion of the work in the Contract, or as adjusted by a change order, the sum per calendar day, as stipulated in the Advertisement for Bids, shall be deducted from any money due or to become due to the Contractor, not as forfeit or penalty, but as liquidated damages. This sum is fixed and agreed upon between the parties because the actual loss to the City and to the public caused by delay in completion will be impractical and extremely difficult to ascertain and determine. It is agreed that the City has made a good faith attempt to estimate the loss caused by any delays and that the estimate is incorporated in the sum, which is agreed to be reasonable. If the City allows the Contractor to complete or attempt to complete the work subsequent to the date of completion specified herein, such action shall not constitute a waiver by the City of the imposition of the liquidated damages provision as specified herein.

62. CITY'S REMEDIES CUMULATIVE AND NONWAIVER

No right or remedy conferred upon or reserved to the City by the Contract shall be considered exclusive of any other remedy or contractual right, but the same shall be distinct, separate, and cumulative, and shall be in addition to every other remedy existing at law or in equity or by statute; and every remedy given by the Contract to the City may be exercised from time to time as often as the occasion may arise, or as may be deemed expedient. No delay or omission on the part of the City to exercise any right or remedy arising from any default on the part of the Contractor shall impair such right or remedy or shall be construed to be a waiver of any such default or an acquiescence thereto, or otherwise affect the right of the City to enforce the same in the event of any subsequent breach or default by the Contractor.

63. SEVERABILITY CLAUSE, DISPUTE RESOLUTION, APPLICABLE LAW

- A. This Contract shall be governed by the laws of the State of Arizona, and venue for any litigation arising out of this Contract shall be in the Superior Court of the State of Arizona in and for the County of Coconino or the County of Yavapai, depending upon the location of the work, if the amount in dispute is in excess of \$5,000.00. If the amount in dispute is less than \$5,000.00, jurisdiction and venue shall lie in the nearest Justice of the Peace Court of the appropriate county. Arbitration shall not be an alternative method of settling disputes unless separately agreed upon in writing by the parties. This Contract shall not be construed to create any contractual relationship of any kind between the Engineering Dept., and the Contractor or any Subcontractor, or between the City and any Subcontractor. During any dispute arising hereunder, the Contractor shall continue to perform all work in accordance with the Contract Documents. In the event of any dispute arising hereunder, the prevailing party in the resolution of such dispute shall be entitled to recover its attorney's fees and costs incurred.
- B. The provisions of this Contract shall be deemed to be severable, and if any term, phrase or portion of the Contract shall be determined to be unlawful or otherwise unenforceable, the remainder of the Contract shall remain in full force and effect.
- C. Any and all disputes relating to this Contract shall be subject to the provisions of Chapter 3.10 of the Sedona City Code. The City Code can be viewed on the City of Sedona website, as well as, the City Clerk's Office, City Hall, Sedona, Arizona.
- D. Notwithstanding the mediation provisions set forth in Paragraph 62.C above, either party may submit, by demand letter, correspondence or notice, to the other party, any claim, counterclaim, dispute or other matter in question between the Contractor and the City arising out of or relating to this Contract, the Contract Documents, the Plans, the Project or the work, or breach thereof, and such claim, counter claim, dispute or other matter in question shall be subject to and decided by arbitration in accordance with the Rules for Non-Administered Arbitration of Business Disputes (the "Rules") of the Center for Public Resources ("CPR") currently in effect, except as provided herein and except where modified by the provisions hereof.
- E. Any arbitration arising out of this Contract, the Contract Documents, the Plans, the Project or the work, or any breach thereof may include, by consolidation or joinder, or in any other manner, at the discretion of either the Contractor or the City, any other entities or persons whom the Contractor or the City, as the case may be, believes to be substantially involved in a common question of law or fact.

- F. All demands for arbitration and all responses thereto that include any monetary claim, must contain a statement that the total sum or value in controversy as alleged by the party making such demand or response is not more than \$150,000.00 (exclusive of interest and arbitration fees and costs). The arbitrators will not have jurisdiction, power or authority to consider or make findings except the denial of their own jurisdiction concerning any controversy where the amount at issue is more than \$150,000.00 (exclusive of interest and arbitration fees and costs) or to render a monetary award in response thereto against any party which totals more than \$150,000.00 (exclusive of interest and arbitration fees and costs). Notwithstanding the foregoing provisions, the parties may mutually agree to waive the jurisdictional limitations set forth in this sub-paragraph. In the event of such mutual waiver, all other provisions in this sub-paragraph shall apply.
- G. Demand for arbitration shall be filed with the other party in accordance with Rules. A demand for arbitration shall be made within a reasonable time after the claim, dispute, or other matter in question has arisen. In no event shall the demand for arbitration be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question could be barred by the applicable statute of limitations.
- H. In the event the amount in controversy is less than \$50,000.00 a sole arbitrator shall be appointed in accordance with Rules. In the event the amount in controversy is \$50,000.00, the demanding party shall appoint one party-appointed arbitrator in its notice demand for arbitration. The responding party may within ten (10) days, appoint a second party-appointed arbitrator. The party-arbitrators shall appoint a third arbitrator in accordance with the Rules. If the party-arbitrators fail to appoint a third arbitrator, the third arbitrator shall be appointed in accordance with the Rules. If the responding party fails to appoint a second party-appointed arbitrator within the time so provided, selection of the second arbitrator shall be in accordance with the Rules.
- I. The decision of the arbitrators shall be in accordance with laws of the State of Arizona and the United States. The arbitrators shall prepare written findings of fact and conclusions of law upon which the decision and award shall be based. The arbitrators may award compensatory damages and attorneys' fees and costs to the prevailing party. The arbitrators shall have no authority to award consequential damages or punitive damages, and the parties hereby waive any claim to those damages to the fullest extent allowable by law.
- J. The demanding party shall select the locale of arbitration, but shall not choose a location greater than twenty-five (25) miles from the Project site.
- K. This agreement to arbitrate shall be specifically enforceable by either party under the prevailing laws of the State of Arizona and the United States. Any award rendered by the arbitrators shall be final and enforceable by any party to the arbitration, and judgment shall be made upon it in accordance with the applicable laws of any court having jurisdiction thereof. The arbitrators' decision shall be final and conclusive as to the facts. Either party may appeal manifest errors of law to a court of competent jurisdiction within fifteen (15) days of the award.
- L. Unless otherwise agreed in writing, and notwithstanding any other rights or obligations of either of the parties under the Contract, the Contractor and the City shall carry on with the performance of their respective duties, obligations and services hereunder during the pendency of any claim, dispute or other matter in question giving rise to arbitration or mediation, as the case may be. The City shall be under no obligation to make payments to the Contractor on or

against such claims, disputes or other matters in question giving rise to arbitration or mediation, during the pendency of such arbitration or mediation or other proceedings to resolve such claims, disputes or other matters in question.

64. POTHOLING REQUIREMENTS

The Contractor shall pothole all existing utilities 1,000 feet ahead of trenching activities to allow adequate time and distance to allow for the adjustment of grade or location of the construction activities. The contractor shall pothole at least two (2) working days ahead of installing facilities such as manholes, sidewalks, storm drainage inlets, footing, headwalls, and similar non-longitudinal installations. The Contractor shall backfill the pothole after verifying the depth, size and location of the utility. If a potential conflict is encountered, temporarily plating the potholed utility will be allowed for review and coordination of a resolution of the conflict with the City and affected utilities representatives.

The City requests a minimum of five (5) working days notification of a potential conflict for marked utilities. This requirement does not relieve the Contractor of the responsibility to make the City aware of conflicts timely of the Contractor's awareness. If potholing 1,000 feet in advance of trenching activities has not been kept up and a conflict creates down time or delays in work no extension of time or compensation for down time will be considered for that conflict.

65. UNMARKED UTILITY REPAIR

If in the course of work, a conflicting utility line that was not shown on the plans is discovered, the Contracting Agency will either negotiate with the owner of the Utility for relocation, change the alignment and grade of the trench or roadbed, provide encasement or sleeving, relocate the utility, or as a last resort, declare the conflict as "extra work" to be accomplished by the Contractor in accordance with Section 47 of these General Specifications. In the case of unmarked or incorrectly marked utilities the Contractor shall consider that responsibilities are per Arizona State Statutes Section 40 –360.

The Contractor shall contact the City and utility affected immediately upon damaging or breaking an unmarked utility. If an unmarked utility is found the Contractor shall take every precaution to not damage the utility and work around the conflict with the City and Utility representatives. No interpretation of this provision that changes the responsibility for non-located and improperly located utilities per Arizona State Statutes Section 40 –360 shall be valid.

66. UTILITY SEPARATION

The Contractor shall maintain as a minimum one (1) foot of vertical clearance and three (3) feet of horizontal clearance for all utility crossings. Water/sewer minimum separations will be two (2) feet vertical clear and six (6) feet horizontal clear. If less than one (1) foot but more than six (6) inches clearance is all that can be accommodated concrete encasement shall be provided.

67. NOTIFICATION TO RESIDENTS & COMMUNITY RELATIONS

The Contractor shall inform the residents along the construction area of the proposed work. This notification and community relations shall include, but not necessarily be limited to:

A. Mailings

The Contractor shall prepare a letter for mailing to the residents located adjacent to the project. This mailing will include a description of work to be done, work hours, date's for begin and end construction, Contractor representative contact name and phone number. The cost for the mailings shall be incidental to the project.

B. Informational Signage

The Contractor shall provide and install advance information signs and project information signs before beginning construction to inform the public of the forthcoming project, construction dates, and suggested alternate routes. Sign layout shall be as approved by the Engineer. Signs shall not be constructed or installed prior to approval by the Engineer for the designs, sizes and locations. The Contractor shall maintain the signs as necessary and update the information as requested by the Engineer. The information signs shall be shown on the traffic control plan. The cost for this work shall be included in the unit bid price for Mobilization.

C. Meetings

The Contractor may be requested to attend and participate in a pre-construction public meeting if deemed necessary by the Engineer. Meeting time, location and agenda will be determined by the Engineer. The cost for this meeting if held shall be incidental to the project.

D. Driveway impact notification

The Contractor shall notify any resident or business of any access restrictions at least 48 hours prior to access restriction. Notification to residents is considered incidental to the projects activities and included in the unit price of the various activities.

SECTION 01 11 00

SUMMARY OF WORK

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project: consists of the phased implementation of an Addition at the existing Patio area of approximately 1,830 SF and the renovation of approximately 4,000 SF within the existing the Sedona Police Department Building (the Boynton Building of Sedona City Hall). The Project will include new locker rooms, Shower and Restrooms, new offices, and renovated spaces. The site is an existing building and construction work activities will be conducted while there is ongoing use of the surrounding and neighboring City Hall facilities.
- B. This Specification Section is supplemental to the Owner-provided Division 01 General Conditions, City of Sedona 2021.
- C. Base Bid: The bid shall include labor, material, equipment, services and transportation necessary for the construction of the Project.

1.02 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS'

- A. Standards of quality and performance indicated on the Drawings or described in the Specifications shall be understood to be minimum requirements only. When building codes or other legal authority demand higher standards, such as legal requirements, they shall be met.
- B. Where a conflict arises about or between the Contract Documents the higher quality, the better workmanship, the more costly solution shall govern, unless directed otherwise by the Architect or Owner, whose decision shall be final.

1.03 WORK BY OWNER

- A. Items noted 'NIC' (Not in Contract) will be furnished and installed by Owner.
 - 1. Access Control System
 - 2. Furniture throughout the building.

1.04 OWNER FURNISHED ITEMS

- A. Products furnished to the site and paid for by Owner shall be as noted on Drawings.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed Shop Drawings, Product Data, and Samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for Manufacturers' warranties, inspections and service.
- C. Contractor's Responsibilities:
 - 1. Contractor shall give Owner written notice stating dates when Owner-furnished items must be received at the job site to insure Project completion in accordance with established schedule.

2. Review Owner-reviewed Shop Drawings, Product data, and Samples
3. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
4. Handle, store, assemble, install, connect and finish such products, including furnishing lubricants and fluids and procedures required to render product serviceable and operative.
5. Contractor is responsible for the coordination and interface of Owner-Furnished and Installed work with Work of this Contract to provide all required mechanical and electrical rough-ins, openings, supports, dimensions, etc., as required for a complete installation

1.05 CONTRACTOR USE OF SITE

- A. General: Contractor shall have full use of the site within Contract Limit Lines indicated in the drawings for construction operations during the construction period. Contractor shall facilitate ongoing operations at City Hall and, more specifically, for Police Department operations during the construction period.
- B. Use of site shall allow for:
 1. Owner occupancy and usage of the adjacent building spaces.
 2. Work by Other Contractors and Work by Owner.
 3. Use of site by public.
- C. Owner Operations:
 1. At no time during the work shall Contractor place, or cause to be placed, materials or equipment, or other items, at a location which would impede or impair access to or from the present facilities for customers, employees or delivery personnel.
 2. Contractor shall cooperate with the Owner in providing traffic control during course of construction in order to minimize inconvenience to Owner's employees and customers.
- E. Emergency Building Exits During Construction: Provide protection of emergency exits for the Police Department and adjacent buildings as directed by and approved by Owner during the entire course of construction.
- F. Time Restrictions for Performing Work:
 1. Standard construction hours as directed by Owner.
 2. Restrictions have been placed on certain types of work and areas of site activity depending on Owner needs as described in the drawings.
- G. Utility Outages and Shutdown:
 1. Interruption of utility services to the existing building(s) is not permitted without prior (30 day minimum) notice to Owner.
 2. Utility lines and utility meters serving the buildings shall be protected during construction.

1.06 PERMITS, FEES AND NOTICES

- A. Plan check fees have been paid by the Owner.
- B. The Contractor shall secure and pay for the building permit and for other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received or negotiations concluded.

- C. The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authority bearing on the performance of the Work.
- D. It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Architect and Owner in writing, and any necessary changes shall be accomplished by appropriate Modification.
- E. If the Contractor performs Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect and Owner, the Contractor shall assume full responsibility therefor and shall bear attributable costs.

1.07 SPECIAL SITE CONDITIONS

- A. The Contractor shall be solely and completely responsible for protecting the existing building from damage and/or injury due to this Work and shall repair at his expense and to the Owner's satisfaction, all areas damaged as a result of his Work.
- B. Contractor shall make consideration of dust and debris. Means for maintaining operations shall be discussed with, and approved by the Owner prior to commencing work.
- C. Contractor shall provide a visual screen as part of, or in addition to, the site fencing wherever, in the opinion of the Owner, additional privacy is needed for building patrons.

1.08 APPROVED APPLICATORS

- A. Where specific instructions in the Specifications require that a particular product and/or material be applied and/or installed by an "approved applicator" it shall be the Contractor's responsibility to ensure that any Subcontractor or Sub subcontractor used for such Work is in fact currently certified, or otherwise approved in writing, by the particular Manufacturer for this type of installation or application.

1.09 APPROVED MANUFACTURERS

- A. Each Section includes a list of Manufacturers whose equipment is acceptable as to manufacture, subject to conformance with the Contract Documents. Careful checking must be made by the Contractor and the manufacturer or equipment supplier to verify that the equipment will meet all capacities, requirements, space allocations and is suitable to the intended purpose.

1.10 REFERENCE DATA

- A. The Contract Documents include owner-provided archive construction drawings associated with the existing building and portions thereof (see Volume II). This archive reference data is provided to assist the Contractor in performance of the Work. The Contractor shall field verify accuracy of the archive reference data. Reference data made available to the Contractor is for the Contractor's information only, and neither the Owner nor the Architect assume any responsibility for the Contractor's conclusions.
- B. The Contractor shall establish and maintain all buildings and construction grades, lines, levels, and bench marks. This Work shall be performed by a licensed Civil Engineer or Surveyor under the employ of the Contractor, who shall certify to the Architect/Owner that he has performed this service.
- C. The Contractor shall not remove any property line markers or monuments, or data established by the Owner.

1.11 ARCHITECTURAL BARRIERS

- A. It is the desire of the Owner that the facilities and improvements constructed under this Contract meet or exceed the intent of applicable public law concerning prohibition of discrimination, and that no individual be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of this completed Project.
- B. The designers and drafters of these Documents have intended to incorporate those Owner's intentions into these Documents.
- C. It is recognized that there may be products not incorporated into these Documents that may more nearly meet the Owner's desires than those included.
- D. The Owner hereby solicits those providing elements of this Project to bid and contract for the Project as required by these Documents, but at the time of submitting Shop Drawings, or sooner when appropriate, and without causing delay in the Project, to also submit proposals for improving the accessibility of the Project to physically or mentally impaired persons.

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Allowances which Contractor shall provide for designated work on the Project and shall include in the Bid Proposal.

1.02 ALLOWANCES:

- A. Miscellaneous Improvements directed by Owner \$30,000.00
- B. Door Hardware materials and installation \$35,000.00

Include the stipulated sum shown for the cost of the Door Hardware as indicated in the Contract Documents. Coordination with Owner Security Vendor will be required.

Allowances subtotal \$75,000.00

1.03 ADMINISTRATION OF ALLOWANCES

- A. Allowances shall cover the cost to the Contractor, less applicable Trade discount(s) for the materials and equipment required by the allowance, delivery to the site, and applicable taxes.
- B. Whenever the cost is more than or less than the Allowance, the Contract Sum will be adjusted accordingly by Change Order, the amount of which will recognize handling costs on the site, labor, installation costs, overhead, profit and other expenses.
- C. Contractor shall make the Owner and Architect aware in writing for review and approval of the Contractors intent to use whole or in-part described amount/sum of the Allowance prior to use. Contractor to allow for time so as to limit the impact of the schedule.

END OF SECTION

SECTION 01 26 13

REQUESTS FOR INTERPRETATION

PART 1 - PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Administrative requirements for requests for information interpretation.

1.02 DEFINITIONS

- A. Request for Information/Interpretation (RFI):
1. A document submitted by the Contractor requesting clarification of a portion of the Contract Documents, herein after referred to as RFI.
 2. A properly prepared request for information/interpretation shall include a detailed written statement that indicates the specific Drawings of Specification in need of clarification and the nature of the clarification requested.
 3. Drawings shall be identified by drawing number and location on the drawing sheet.
 4. Specifications shall be identified by Section number, page, and paragraph.
 5. Requests for Information: Request made by Contractor in accordance with Owner's Representative's third party obligations to the Contract for construction.
 6. Requests for Interpretation: Request made by Contractor in accordance with Owner's Representative's third party obligations to the Contract for construction.
- B. Improper RFI's:
1. RFI's that are not properly prepared.
 2. Hand-written RFI's are not acceptable.
 3. Improper RFI's will be processed by the Architect after receiving corrected or clarified RFI forms. The Contractor will be notified by the Architect prior to the processing of improper RFI's.
- C. Frivolous RFI's:
1. RFI's that request information that is clearly shown on the Contract Documents.
 2. Frivolous RFI's may be returned unanswered or may be voided. The Contractor will be notified by the Architect prior to the processing of frivolous RFI's.

1.03 CONTRACTOR'S REQUESTS FOR INFORMATION

- A. RFI's shall be submitted on a form acceptable to the Design Professional and Owner.
1. Forms shall be completely filled in, and shall be fully legible after photocopying or transmission by facsimile (fax).
 2. RFI's shall be submitted in numerical order with no breaks in the consecutive numbering.

3. Each page of attachments to RFI's shall bear the RFI number and shall be consecutively numbered in chronological order.
 4. RFI's may be submitted by E-Mail or via online project management system.
- B. When the Contractor is unable to determine from the Contract Documents, the material, process, or system to be installed, the Design Professional shall be requested to make a clarification of the indeterminate item.
1. Wherever possible, such clarification shall be requested at the next appropriate project meeting, with the response entered into the meeting minutes. When clarification at the meeting is not possible, either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Design Professional.
 2. RFI requesting clarification of an item required of a document known to have been prepared by a consultant to the Design Professional, may be sent directly to the consultant with a simultaneous copy to the Design Professional, if this direct communication is approved by the Design Professional.
- C. Contractor shall endeavor to keep the number of RFI's to a minimum. In the event that the process becomes unwieldy, in the opinion of the Design Professional (and validated by Owner), because of the number and frequency of RFI's submitted, the Design Professional may require the Contractor to abandon the process and submit future requests as either submittals, substitutions or requests for change.
- D. RFI's shall be originated by the Contractor.
1. RFI's from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Contractor prior to submittal to the Architect.
 2. RFI's from subcontractors or material suppliers sent directly to the Owner's Representative, Design Professional or the Design Professional's consultants shall not be accepted and will be returned unanswered.
- E. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFI's which request information available in the Contract Documents will be deemed either "improper" or "frivolous" as noted above.
- F. In cases where RFI's are issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items, the Contractor shall fully lay out a suggested solution using drawings or sketches drawn to scale, and submit same with the RFI. RFI's which fail to include a suggested solution will be returned unanswered with a requirement that the Contractor submit a complete request.
- G. RFI's shall not be used for the following purposes:
1. To request approval of submittals
 2. To request approval of substitutions,
 3. To request changes which are known to entail additional cost or credit. (A Change Order Request form shall be used.)
 4. To request different methods of performing work than those drawn and specified.
- H. In the event the Contractor believes that a clarification by the Design Professional results in additional cost or time, Contractor shall not proceed with the work indicated by the RFI until a Change Order (or Construction Change Directive, if applicable to project)

is prepared and approved. RFI's shall not automatically justify a cost increase in the work or a change in the project schedule.

1. Answered RFI's shall not be construed as approval to perform extra work.
2. Unanswered RFI's will be returned with a stamp or notation: Not Reviewed.

- I. Contractor shall prepare and maintain a log of RFI'S, and at any time requested by the Design Professional, Contractor shall furnish copies of the log showing outstanding RFI'S. Contractor shall note unanswered RFI's in the log.
- J. Contractor shall allow up to 7 working days review and response time for RFI'S, unless review is required of multiple consultants, then the review and response period shall be 10 working days.
 1. The Design Professional will endeavor to respond in a timely fashion to RFI's.
 2. RFI shall state requested date/time for response, however, this requested date/time for response is not a guarantee that the RFI will be answered by that date/time if that date/time is too expeditious.

1.04 DESIGN PROFESSIONAL'S RESPONSE TO RFI'S

- A. Design Professional will respond to RFI's on one of the following forms:
 1. Properly prepared RFI's:
 - a Response directly upon Request for Information / Interpretation form.
 - b Design Professional's Supplemental instruction.
 - c Request for Proposal.
 2. Improper or Frivolous RFI's
Notification of Processing Fee(s).
Unanswered RFI's will be returned with a stamp or notation: Not Reviewed.
 3. Answers to properly prepared RFI's may or may not be made directly upon the RFI form as deemed appropriate by the Design Professional.

1.05 CONFIRMING RFI'S

- A. The Contractor shall provide confirming RFI's or other acceptable means of tracking verbal directive and their resolution, whether initiated by the Design Professional, Contractor or Owner.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

SECTION 02 41 16
STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY.

- A. Section Includes:
 - 1. Demolishing designated structures.
 - 2. Demolishing, disconnecting, and capping designated utilities.
 - 3. Protecting items designated to remain.
 - 4. Removing demolished materials.

1.2 SUBMITTALS

- A. Shop Drawing: Indicate demolition and removal sequence and location of salvageable items; location and construction barricades, fences, and temporary work.
- B. Existing Building Documentation: Submit the following for existing building indicated to remain.
 - 1. Survey indicating position and elevation of exterior building features.
 - 2. Photographic survey indicating conditions before, during, and after demolition work.
- C. Submit copy of permits required by regulatory agencies for demolition and sidewalk and street closings.

1.3 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of capped utilities and subsurface obstructions.
- B. Operation and Maintenance Data: Submit description of system, inspection data, and parts lists.

1.4 QUALITY ASSURANCE

- A. Conform to applicable code for demolition of structures, safety of adjacent structures, dust control, runoff control, and disposal.
- B. Conform to applicable code for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.

1.5 QUALIFICATIONS

- A. Demolition Firm: Company specializing in performing work of this section with minimum ten years documented experience.

1.6 MEETINGS

- A. City of Sedona General Conditions Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.7 SEQUENCING

- A. Contract Documents: Requirements for sequencing.
- B. Sequence activities so owner can transition from existing building to new without any interruptions in operations.
 - 1. Existing building(s) are to remain and be occupied by owner during construction.
 - 2. Demolition of existing building cannot occur until new building has been fully occupied.

1.8 PROJECT CONDITIONS

- A. Building indicated to be demolished will be vacated before start of demolition.
- B. Owner assumes no responsibility for actual condition of building to be demolished.
- C. Notify Owner/Architect/Engineer upon discovery of hazardous materials.
- D. Do not sell demolished materials on-site.
- E. Maintain existing sidewalks and curb cuts during construction to greatest extent possible.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 EXISTING BUILDING DOCUMENTATION

- A. Document condition of adjacent buildings/structures indicated to remain.
- B. Make arrangements with building owners and occupants to survey interior and exterior of existing buildings.

3.2 EXAMINATION

- A. Examine existing building indicated to be demolished before demolition.
- B. Determine where removals may result in structural deficiency or unplanned building collapse during demolition. Coordinate demolition sequence and procedures to prevent structures from becoming unstable.
- C. Determine where demolition may affect structural integrity or weather resistance of adjacent buildings indicated to remain.
 - 1. Identify measures required to protect buildings from damage.
 - 2. Identify remedial work including patching, repairing, bracing, and other work required to leave buildings indicated to remain in structurally sound and weathertight and watertight condition.
- D. Verify hazardous material abatement is complete before beginning demolition.

3.3 PREPARATION

- A. Call Local Utility Line Information service not less than three working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Notify affected utility companies before starting work and comply with utility's requirements.
- C. Do not close or obstruct roadways, sidewalks, or hydrants without permits.
- D. Erect, and maintain temporary barriers and security devices, including warning signs and lights, and similar measures, for protection of the public, Owner, and existing improvements indicated to remain.
- E. Protect existing landscaping materials, trees, appurtenances, and structures indicated to remain.
- F. Prevent movement or settlement of adjacent structures.

3.4 DEMOLITION REQUIREMENTS

- A. Use of explosives is not permitted.
- B. Conduct operations with minimum interference with adjacent structures.
- C. Cease operations immediately when adjacent structures appear to be in danger. Notify Architect/Engineer. Do not resume operations until directed.
- D. Conduct operations with minimum interference to public or private accesses to occupied adjacent structures. Maintain protected egress and access from adjacent structures at all time.
- E. Obtain written permission from adjacent property owners when demolition equipment will traverse, infringe upon or limit access to their property.

3.5 DEMOLITION

- A. Disconnect and cap utilities as designated in Contract Drawings. Identify utilities at termination of demolition. Record termination or capped location on Record Documents.
- B. Remove foundation walls and footings as required for completion of work.
- C. Remove materials to be re-installed or retained in manner to prevent damage. Store and protect in accordance with Owner requirements.
- D. Backfill areas excavated resulting from demolition, in accordance with civil and geotechnical requirements
- E. Rough grade and compact areas affected by demolition to maintain site grades, contours and to accommodate subsequent construction operations.
- F. Continuously clean-up and remove demolished materials from site. Do not allow materials to accumulate in building or on site.
- G. Do not burn or bury materials on site. Leave site in clean condition.

SECTION

SECTION 03 53 00
CONCRETE TOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Formwork
- B. Reinforcing Steel
- C. Bond Breaker Membrane
- D. Joint Fillers and Sealers
- E. Portland Cement Concrete
- F. Nonslip Aggregate Materials
- G. Concrete Hardener
- H. Concrete Curing Materials

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301 Standard Specifications for Structural Concrete
 - 2. ACI 117 Standard Specification for Tolerances for Concrete Construction and Materials.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C618 Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
 - 2. ASTM C1017 Specification for Chemical Admixtures for Use in Producing Flowing Concrete
 - 3. ASTM D2178 Specification for Asphalt Glass Felt Used in Roofing and Waterproofing

1.3 Submittals

- A. Shop Drawings:
 - 1. Submit drawings that indicate the locations of all joints in concrete slabs, including construction joints, expansion joints, isolation joints, weakened plane joints and contraction joints.
 - 2. Submit drawings that indicate concrete placement method, sequence, and location.
- B. Product Data: Submit manufacturer's product data for nonslip floor ingredients and concrete hardener material.

- C. Samples: As required by Engineer.

1.4 QUALITY ASSURANCE

- A. Applicator/Installer: Topping slabs shall be installed and finished by a skilled and experienced installer specializing in the installation and finishing of architectural concrete slabs. The Contractor shall submit evidence that the slab installer and finisher is approved by the manufacturer of the nonslip materials.
- B. Floor Finish: "Nonslip Finish" in combination with a "troweled finish" or fin "broom finish" conforming to applicable requirements of ACI 301.
- C. Floor Tolerance: "Flat" tolerance conforming to ACI 117.
- D. Cold Joints: Cold joints in concrete will not be permitted unless planned and treated properly as construction joints and submitted for approval as specified under submittals above.
- E. Site Mock-Ups: If slab is to be exposed, provide site mock-up if requested by Owner/Architect, at least 3 feet by 4 feet in size, of exposed slab finish for the Owner's review and approval. Provide additional mock-ups, as required, until the desired finish is obtained. Site mock-up requires approval of the Owner before work may proceed.
- F. Manufacturer's Instructions: Application of the nonslip floor ingredients and concrete hardener material and finishing of the concrete topping slabs shall be in accordance with the written or printed instructions and recommendations of the manufacturer of nonslip floor ingredients and concrete hardener materials.

PART 2 - PRODUCTS

2.1 TOOLS AND EQUIPMENT

- A. The Contractor shall furnish all materials, tools, equipment, facilities, and services as required for performing the required topping slab placing and finishing work.

2.2 MATERIALS

- A. Formwork: Reference ACI 347 Guide to Formwork for Concrete.
 - 1. Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - a. Plywood, metal or other approved panel materials.
 - b. Form Ties: Factory-fabricated, removable, or snap-off metal or glass fiber reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
- B. Reinforcing Steel:
 - 1. Concrete Reinforcing Steel Institute (CRSI)
 - a. Manual of Standard Practice
 - b. Placing reinforcing bars.

2. American Welding Society (AWS):
 - a. AWS D1.1 – Structural Welding Code – Steel
 - b. AWS D1.4 – Structural Welding Code – Reinforcing Steel
 3. American Society for Testing and Materials (ASTM)
 4. American Concrete Institute (ACI):
 - a. ACI 117 – Specification for Tolerances for Concrete Construction and Materials
 - b. ACI 301 – Specification for Structural Concrete
 - c. ACI 315 – Standards on Details and Detailing of Concrete Reinforcement.
- C. Bond Breaker Membrane: ASTM D2178 asphalt glass felt, Type III – standard ply sheet
- D. Joint Fillers and Sealers
- E. Portland Cement Concrete
1. Topping slab concrete shall have a minimum compressive strength at 28 days of 4,000 psi. Maximum size of aggregate shall be 1 inch, except that 3/8 inch maximum size aggregate shall be used for locations where congestion and other conditions indicate the need for smaller aggregate. Minimum cement content per cubic yard of concrete shall be size and a half 94-pound sacks.
 2. Mix design for topping-slab concrete shall include up to ten percent replacement of the cement content with fly ash (ASTM C618) along with a plasticizing admixture, conforming with ASTM C1017, to provide a dense and plastic concrete mix which will trowel more easily with less surface bleeding of water.
- F. Nonslip Aggregate Material: Crushed ceramically bonded or fused aluminum oxide as specified in ACI 301. Provide 25 pounds per 100 square feet as specified. All aggregate particles shall pass a No. 8 U.S. Standard Sieve, and shall be graded from No. 16 to No. 8 mesh.
- G. Concrete Hardener and Dustproofer: Chemical clear liquid hardener which produces a dense, hard, and dustproof concrete surface, manufactured specifically for the intended purpose.
- H. Concrete Curing Materials:
1. Provide for damp curing only. Curing compound will not be permitted on floors to receive hardener and dustproofer.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Inspect forms, structural slab surfaces, waterproof membranes and protection board where they occur, reinforcement, and embedded items, and obtain the Engineer's approval thereof before placing concrete.

3.2 PREPARATION

- A. At least 48 hours prior to actual placement, notify the Engineer and nonslip material manufacturer's representative of the intention to deliver and place concrete.

- B. Before placing concrete, broom clean structural slab surfaces and install bond breaker membrane. Lap edges and ends of asphalt glass felt 6 inches. Small dabs of bituminous cement may be used to hold felt sheets in place during subsequent placing operations.

3.3 PLACING AND FINISHING

- A. Placement and Finishing Standards: Concrete topping slabs shall be placed, consolidated, and finished in accordance with applicable requirements of ACI 301.
- B. Placement:
 - 1. Topping slabs shall be placed and finished monolithically. Strike off and screed slabs to true, plane surfaces at required elevations, and thoroughly compact concrete with vibrators, floats, and tampers to force coarse aggregate below the surface. Finish slab within four hours of concrete placement.
 - 2. Whether indicated or not, in areas where drains occur, slope finished slab to drains. Slope shall be a minimum of 1/8 inch per foot unless otherwise indicated.
- C. Finishes:
 - 1. As required for proper installation of floor finish materials as indicated in the Drawings.
 - 2. Topping slab shall receive a "troweled finish" or fine "broom finish" in combination with a "nonslip finish," as selected by the Architect, with "flat" tolerance, as specified in ACI 117.
 - 3. Flooring shall be sealed with Architect approved sealant.
 - 4. Application of the nonslip material and finishing of the topping slabs shall conform with the nonslip material manufacturer's application instructions and recommendations.

3.4 CURING

- A. Curing of the concrete topping slabs shall conform with applicable requirements of ACI 301, except that the duration of the curing period shall be ten days minimum.
- B. Provide damp curing. Curing compounds will not be permitted.

3.5 APPLICATION OF CONCRETE HARDENER

- A. Allow slab surfaces to cure and dry a minimum period of 28 days before applying hardener/dustproofer material. Slab surfaces shall be clean and dry at the time hardener/dustproofer material is applied.
- B. Apply clear liquid hardener/dustproofer compound to slab surfaces, after the damp-curing and drying period, in accordance with the manufacturer's application instructions. Rate of application and number of coats shall conform with the manufacturer's instructions and recommendations.

3.6 PROTECTION

- A. Protect exposed concrete slab surfaces as required to prevent damage from impact or stains.
- B. Protect fresh concrete from drying winds, rain, damage, or soiling.

3.7 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment, and debris away from premises. Leave work in a clean condition.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS CARPENTRY

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Rough carpentry including, but not limited to:
 - 1. Fire retardant treated plywood telephone and electrical backer boards.
 - 2. Fire retardant treated miscellaneous backing, blocking, nailers and curb, including wood construction related to roofing
 - 3. General: Blocking and Backing.

1.02 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
- B. Submit technical data for wood preservative and fire retardant products.

1.03 QUALITY ASSURANCE

- A. Identify each piece of lumber or plywood used for structural framing with grade and trade mark of a lumber grading organization. Trade mark of manufacturer shall also appear on each piece.
- B. Grading Rules: Conform with applicable requirements of American Lumber Standards "Simplified Practice Recommendation R-16" and to grading rules of manufacturer's association under whose rules the lumber is produced.
- C. Standards: Conform with requirements of American Plywood Association, U. S. Dept. of Commerce Commercial Standards and American Wood Preservers Association
- D. Standards, as they apply.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.
- C. Handling: Comply with manufacturer's instructions.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements: Store materials for which a maximum moisture is specified in areas where humidity can be controlled.

PART 2 - PRODUCTS

2.01 WOOD PRODUCTS - GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSA Board of Review. Grade lumber by an agency certified by the ALSA Board of Review to inspect and grade lumber under the rules indicated.
- B. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable design stresses, as published by manufacturer, shall meet, or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.02 LUMBER MATERIALS

- A. Species: Douglas Fir – Larch, Hem Fir graded in accordance with Standard Grading and Dressing Rules of WCLIB. Framing lumber shall be stress grade. All sides shall be surfaced.
- B. Lumber Grades: As follows unless noted differently on the Drawings:
 - 1. Misc. blocking, bridging, etc.; including nailers at roofing: Utility.
 - 2. Grounds and furring: Construction Grade Douglas Fir or No. 2 White Pine.
- C. Moisture Content:
 - 1. Lumber shall be air-dried or kiln-dried.
 - 2. At time of installation, moisture content, expressed as a percentage of the weight of the oven-dry wood, shall not exceed 19 percent for lumber of up to
 - 3. two inches nominal thickness and 15 percent for exterior trim and siding.
 - 4. Moisture content of lumber over two inches nominal thickness shall conform to the rules of the association under which it is graded.
- D. Blocking and nailers at roofing: Furnish wood blocking and nailers, sizes as detailed and as required by Section 07 53 16. Provide longest lengths possible for blocking and nailers to eliminate joints.

2.03 SHEATHING MATERIALS

- A. Plywood Backing Panels:

1. For mounting of telephone and electrical equipment, provide Grade C-D Exposure 1 plywood panels, 15/16 inch thick, unless otherwise indicated.
2. For roofing: 1/2 inch thickness, fire treated Douglas Fir, C-D Exterior glue and shall be stamped with grade trademark of the American Plywood Association and shall meet the requirements of the latest edition of U.S. Product Standard PS-1 for softwood plywood.

2.04 FACTORY WOOD TREATMENT

A. Preservative Treatment:

1. Materials:
 - a. Chromated copper arsenate (CCA) shall not be allowed.
 - b. Provide ammoniacal copper quaternary (ACQ) or copper boron azole (CBA) as produced by the following manufacturers:
 - 1) Arch Wood Protection, Inc., Smyrna, GA (866) 789-4567, www.wolmanizedwood.com or www.naturalselect.com.
 - 2) Chemical Specialties, Inc., Charlotte, NC (800) 421-8661,
 - 3) www.treatedwood.com
 - 4) Osmose, Inc., Wood Preserving Division, Griffin, GA (800) 241- 0240, www.osmose.com.
2. Locations Required:
 - a. Wood sillplates and ledgers bolted in direct contact with concrete or masonry, located at or below grade only shall be pressure treated lumber.
 - b. Blocking and nailers occurring on top of or above the roof deck, including the nailer beneath the flashing at parapet caps, shall be treated lumber.
 - c. Other locations as required by Code.

B. Fire-Retardant Treatment: Hickson Corp. Dricon FRTW in accordance with UL label.

1. All, wood studs, plates, sheathing, blocking, etc. shall be fire retardant treated.
2. Dimensioned lumber shall be kiln dried to a maximum moisture content of 18 percent before and after milling and fire protective treatment.

2.05 ACCESSORIES

- A. Nails: Common wire, galvanized for exterior Work, meeting ASTM F1667 of the sizes indicated on the Drawings.
- B. Screws: Standard domestic manufacture, bright steel, except galvanized for exterior use and of brass, bronze, aluminum, or stainless steel when used to attach items made of those materials. Screws used for attaching interior trim and finish to drywall partitions shall be Type S self-drilling, self-tapping corrosion resistant coated steel drywall screws of required lengths as specified in Section 09 29 00.
 1. Screws used for attaching preservative and fire treated wood shall be Type S self-drilling, self-tapping corrosion resistant coated steel screws. Acceptable products include the following:
 - a. DEC-KING Exterior Wood Screw with Climacoat.
 - b. Tapcon Concrete Anchor with Blue Climaseal or White UltraShield.
 - c. Wood-To-Metal TEKS with Grey Spex.
 - d. Roofgrip with Spex or Blue Climaseal.
 - e. GY-FAST Nail with Climacoat.
 - f. Maxi-Set Tapcon White UltraShield.

- C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers as indicated. Bolts, nuts, and washers wholly or partially exposed on exterior shall be galvanized.
- D. Lag screws, shear plates and split ring connectors: Conform to requirements of the "National Design Specifications for Stress Grade Lumber and its Fastenings" of National Forest Products Association.
- E. Power driven inserts for attachment of wood blocking and nailers (including blocking and nailers at roofing): Ramset, or as approved by Structural Engineer through Architect meeting FS GGG-D-777a. Install as per manufacturer's printed directions. Charge shall be powerful enough to prevent spalling of concrete.
- F. Galvanizing: ASTM A653.
- G. Toggle Bolts: FS FF-B-588.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Wood Backing: Provide wood backing, furring, stripping, or blocking indicated or required for installation and attachment of work of other trades. Provide fire-proofed wood backing approved by Building Official at roofing and where required by Code in noncombustible or fire-rated construction.
- B. Plywood Backing Panels: Install with the "C" or best face on exposed side.
- C. Connections: Subdrill where necessary to avoid splitting.
- D. Bolts: Drill bolt holes 1/32 inch larger than bolt diameter. Use square plate or malleable iron washers under heads and nut where they bear against wood. Re-tighten bolts immediately prior to concealing with finish materials. Re-tighten exposed bolts immediately prior to final inspection by Building Official.
- E. Lag Screws and Screws: Subdrill, use square plate or malleable iron washer under lag screw heads when they bear on wood.
- F. Blocking and nailers at roofing: Install with mechanical fasteners at locations as detailed including but not limited to edge conditions, penetrations, curbs, and parapets.
 1. Where indicated on Drawings, or where required by roofing manufacturer, install one layer of 1/2 inch treated plywood mechanically fastened to wall.
 2. Installation to concrete shall be with powder driven fasteners.

3.02 CLEANING

- A. During the course of the Work and on completion, remove excess materials, equipment and debris and dispose of away from premises.

B. Construction Waste: In accordance with City of Sedona General Conditions.

END OF SECTION

SECTION 06 40 00

ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Architectural wood cabinets.
 - 2. Plastic-laminate-faced architectural cabinets.
 - 3. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.

1.02 SUBMITTALS

- A. Samples:
 - 1. Submit two 12 inch x 12 inch samples of each wood species to receive transparent finish at job site and at mill.
 - 2. Submit two 6 inch x 6 inch samples of type or color of plastic laminate.
- B. Product Data: For each type of product, including cabinet hardware and accessories and finishing materials and processes.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, largescale details, attachment devices, and other components.
 - 1. Show locations and sized of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 2. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
 - 3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

1.03 REFERENCES

- A. Reference Standards: Comply with the following:
 - 1. Architectural Woodwork Standards (AWS), Edition 1.
 - 2. ANSI/NEMA LD3 for laminates.

1.04 QUALITY ASSURANCES

- A. Applicable Standard: Perform work in accordance with Referenced Standards for the following Grades of Work.
 - 1. Provide Premium when not otherwise indicated.
 - 2. Affix Quality Grade Stamp to each unit of product (e.g., each case; each panel; each bundle of trim, etc.).

1.05 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements in "Field Conditions" Article.

1.06 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.07 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-veneer-faced architectural cabinets can be supported and installed as indicated.

PART 2 - PRODUCTS

2.01 ARCHITECTURAL CABINET FABRICATORS

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural cabinets and ornamental woodwork.

2.02 WOOD MATERIALS

- A. Hardwood Lumber: Premium Grade in accordance with applicable standard specified herein under "Quality Assurance" average moisture content of 6 percent; species and cut to match wood veneer used for hardwood plywood unless otherwise indicated on Drawings.

2.03 SHEET MATERIALS

- A. Hardwood Plywood: Core materials of particleboard, type of glue recommended for application; face veneer and cuts as indicated on Drawings.
- B. Softwood Plywood: DOC PS 1, MDO (Medium Density Overlay), or other overlay plywood product suitable for application of plastic laminate as approved by the Architect. Provide 3/4 inch thick Marine Grade plywood for underlayment at counters.
- C. Wood Particleboard:
 - 1. Standard in accordance with applicable standard specified herein under "Quality Assurance," for grade of work specified, composed of wood chips, 45 lb. density, made with water resistant adhesive; of grade to suit application; sanded faces for drawer construction and shelving.
 - 2. Wood and agrifiber products must contain no added urea-formaldehyde resins...
- D. Hardboard:
 - 1. Wood fiber with resin binder, tempered grade, 1/4 inch thick, smooth one side, for drawer bottoms, gables, and backs.
 - 2. Wood and agrifiber products must contain no added urea-formaldehyde resins
- E. Medium Density Fiberboard (MDF): Medite II (or Medite FR as applicable) as manufactured by SierraPine, Roseville, CA, 800-676-3339 www.sierrapine.com , complying with the following:
 - 1. Fabricate from 90% pre-consumer wood residuals
 - 2. Fabricate without formaldehyde.
 - 3. Provide Medex in lieu of Medite II at all wet areas or within 2 feet of any sink or source of water.
 - 4. MDF may be used in lieu of wood particleboard where acceptable to Architect.
- F. Strawboard: In conformance with ANSI-M3 composite panel boards standard and fabricated using formaldehyde-free MDI binder. Strawboard may be used in lieu of wood particleboard where acceptable to Architect.
 - 1. WoodStalk as manufactured by Dow BioProducts, Elie, MB Canada (800) 441- 4DOW www.dow-bioproducts.com
 - 2. PUREKOR as manufactured by Panel Source International, St. Alberta, Canada (877) 4647246 www.panelsource.net.
 - 3. PrimeBoard as manufactured by PrimeBoard, Wahpeton, ND (701) 642-1152 www.primeboard.com

2.04 LAMINATE MATERIALS

- A. Plastic Laminate: High pressure decorative type. Minimum requirements:
 - 1. Grade: NAAWS Premium Grade.
 - 2. Vertical Grade: NEMA LD-3, Grade GP28, (.028 inch thickness). This grade of laminate shall be counterbalanced.
 - 3. Post Forming Grade: NEMA LD-3, Grade PF 42.
 - 4. Cabinet Liner Grade: NEMA LD-3, Grade CL-20, (.020 inch thickness). This grade of laminate shall be counterbalanced.
 - 5. Backer: NEMA LD-3, Grade BK-20 (.020 inch thickness).
 - 6. Finishes, Colors and Patterns: [Wilsonart Moteverdi 8236K-05](#).

2.05 ACCESSORIES

- A. Adhesive: Type recommended by Laminate Manufacturer to suit application and as follows.
 - 1. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
 - 2. PVA (polyvinyl acetate) or MDI (polyisocyanurate) adhesive shall be used.
- B. Wall Adhesive:
 - 1. Cartridge type compatible with paneling and wall substrate.
 - 2. In accordance with the low-emitting materials requirements of Section 01 60 00 - Materials and Equipment.
- C. Edge Trim: Extruded convex or flat shaped plastic as indicated on Drawings; smooth finish; self-locking serrated tongue; of width to match component thickness; color as selected or noted on Drawings.
- D. Glass: As specified in Section 08 80 00
- E. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application. Threaded steel for concealed joints.

2.06 HARDWARE

- A. Drawers:
 - 1. For each drawer:
 - a. 1 set full extension drawer slides, ball bearing, side mount, lever disconnect:
 - 1) For drawers up to 24 inches wide (75-pound class) - Accuride 2601.
 - 2) for drawers over 24 inches wide (100-pound class) - Knap & Vogt No. 1429, Grant No. 5632 or Accuride 3832.
 - b. 1 pull – Doug Mockett DP128 in Satin Nickel Finish.
 - 2. For each drawer to be locked: 1 lock - Olympus Lock: "Schlage C" with removable cylinder.
- B. Doors: For each 3/4-inch-thick single door - flush overlay design:
 - 1. 1 pair hinges - European overlay: Blum all metal hinge, nickelplated "Clip Top". All metal, nickel finish.
 - 2. 1 pull – Doug Mockett DP128- 6-11/16" Round Top Drawer Pull in Satin Nickel Finish.
 - 3. All cabinets require a lock, provide Olympus Lock: "Schlage C" with removable cylinder. Satin Finish.
- C. Shelves: For each set of adjustable wood shelves:
 - 1. Line bore with Knap & Vogt 1/4" anochrome steel shelf supports.
- D. Grommets: ABS plastic, 2 or 3-inch cutout (as selected by Owner) diameter unless otherwise indicated, with removable cap, Doug Mockett & Co., Inc. "Series TG" or as approved, color as selected by the Architect.
- E. Finish: Exposed hardware to be Satin Finish.

2.07 FABRICATION

- A. Fabricate architectural woodwork and cabinets in conformance with AWI Custom Grade Standards.
- B. Exposed fasteners are not allowed in the finish Work on exposed and semi-exposed surfaces.
- C. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- D. Cap shelves, doors, and other exposed edges with 3/8 inch matching hardwood or matching plastic laminate edging as applicable. Use one piece for full length only.
- E. Cap semi-exposed edges with 3/8 inch matching hardwood or matching plastic laminate edging as applicable. Use one piece for full length only.
- F. Door and Drawer Fronts: 3/4 inch thick reveal overlay style.
- G. Shelves: Fabricate shelves with 3/4 inch thick wood particleboard cores with plastic laminate finish, all sides, and edges, unless otherwise indicated.
- H. Shelf Standards within Casework: Set shelf standards within recessed groove of same width and depth as shelf standard.
- I. Plastic Laminate Faced Countertops: Fabricated plastic laminate faced countertops with separate back splash and separate side splashes with integral scribe for fitting to wall.
 - 1. Countertop Edge Treatment: Square self-edge.
- J. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- K. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
- L. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- M. Provide cutouts for appliances, outlet boxes, fixtures, and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

2.08 SHOP FINISHING

- A. Sand Work smooth and set exposed fasteners; apply wood filler.
- B. Seal surfaces in contact with cementitious materials.
- C. Seal internal surfaces of cabinets with two coats of sealer, except where cabinets are constructed of prefinished plywood or finished internally with cabinet liner.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Set and secure cabinetry and other woodwork in place; rigid, plumb, and level, and in accordance with applicable standard specified herein under "Quality Assurance" for grade of work specified.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Secure and align adjoining cabinet units and counter tops with concealed joint fasteners.
- D. Scribe casework abutting other components, with maximum gaps of 1/32 inch (0.03125 inch). Do not use additional overlay trim for this purpose.
- E. Secure cabinet and bases to floor using appropriate angles and anchorages.
- F. Where exposed anchors or fasteners are unavoidable in the finish Work, countersink anchorage devices at exposed locations and conceal with plastic or laminate faced plugs to match surrounding plastic laminate, finish flush with surrounding surfaces.
- G. Install trim in single lengths without splices where possible. Miter external corners and cope internal corners.

3.03 FIELD FINISHING

- A. Sand Work smooth and set exposed fasteners.
- B. Prime, fill, and finish Work of this Section in accordance with Section 09 90 00

3.04 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 06 61 16

SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Solid polymer fabrications, as indicated on Drawings and as specified, including, but not limited to kitchen, lavatory, and counter tops.

1.02 SUBMITTALS

- A. Product Data: Indicate product description, fabrication information and compliance with specified performance requirements.
- B. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- C. Samples: Submit minimum 6 inches x 6 inches samples. Indicate full range of color and pattern variation. Approved samples will be retained as a standard for work.
- D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions.

1.03 QUALITY ASSURANCE

- A. Fabricator/Installer Qualifications:
 - 1. Certified or approved by the Manufacturer.
 - 2. Subject to approval by Architect.
 - 3. Have adequate physical facilities and sufficient production capacity to produce, transport, deliver, and install the required units without causing delay in the work.
 - 4. Have a minimum of 2 years of fabrication experience.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to project site until areas are ready for installation. Store indoors in a dry area and away from extreme temperatures.
- B. Deliver materials and accessory products in manufacturer's unopened containers.
- C. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 WARRANTY

- A. Provide manufacturer's ten year limited warranty against visible defects and failure due to manufacturing defects. Damage caused by physical or chemical abuse or damage from excessive heat is excluded from warranty. Warranty shall provide material and labor to repair or replace defective materials.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish plastic products of one of the following manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. HI-MACS® as manufactured by LG Hausys America, Inc., Atlanta, GA (866) 544- 4622 www.lghausys.com/us
 - 2. Or approved equal.

2.02 MATERIALS

- A. Provide edge details as shown on the Drawings.
- B. Exposed joints shall be in locations shown on the Drawings. Seams not indicated on the Drawings shall be unexposed and adhesively joined. **Adhesive shall be low-emitting materials.**
- C. Provide backsplashes, where shown on the Drawings, to dimensions shown on the Drawings.
- D. Provide sinks in locations shown on the drawings.
- E. Finish and Color: L014 – “Geyser.”

2.03 ACCESSORY PRODUCTS

- A. Adhesives: Solvent free, zero VOC, nonflammable, nontoxic.
 - 1. Joint Adhesive: To create inconspicuous, non-porous joints. Color to match fabrication material.
 - 2. Panel Adhesive: ANSI A136.1-1967 and UL(R) listed.
- B. Sealant:
 - 1. For conditions exposed to moisture; Manufacturer's standard mildew-resistant, FDA/UL(R) recognized silicone sealant in colors matching components.
 - 2. For conditions not exposed to moisture; Manufacturer's standard silicone sealant in colors matching polymer material.
 - 3. Sealants shall be low-emitting materials .
- C. Sink/Bowl Mounting Hardware: Manufacturer's approved bowl clips, panel inserts and fasteners for attachment of undermount sinks/bowls.

2.04 FABRICATION

- A. Factory fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.
- B. Form joints between components using manufacturer's standard joint adhesive without conspicuous joints.
- C. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
- D. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Repair or reject defective and inaccurate work.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install components plumb and level, scribed to adjacent finishes, in accordance with approved shop drawings and manufacturer's installation instructions.
- B. Form field joints using manufacturer's recommended adhesive with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- C. Provide backsplashes and side splashes as indicated on the drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant and panel adhesive.
- D. Keep components and hands clean during installation. Remove adhesives, sealants, and other stains. Keep clean until Date of Final Completion. Replace stained components.
- E. Lavatories/Sinks:
 - 1. Make plumbing connections to sinks in accordance with applicable Division 22 Sections.
 - 2. Adhere undermount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.

3.03 PROTECTION

- A. Protect surfaces from damage until Date of Final Completion. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

3.04 CLEANING

- A. During the course of the Work and on completion of the Work, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 21 00
BUILDING INSULATION

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Product Data: Submit Manufacturer's data, installation instructions, limitations and recommendations. Include certification and test data substantiating R-Values and combustibility of each type of insulation.

1.02 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics.
- B. Provide certificate of compliance acceptable to authorities having jurisdiction indicating conformance to fire-resistance requirements.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Materials shall be properly identified on each package with the Manufacturer's name and R value.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Johns-Manville
 - 2. Owens-Corning Fiberglas Corp.
 - 3. CertainTeed
 - 4. Knauf Insulation
 - 5. Rockwool Insulation
- B. Materials designated for a specific application shall be the products of one Manufacturer.

2.02 MATERIALS

A. Glass-Fiber Blanket

1. Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASATM E84; passing ASTM E 136 for combustion characteristics.
2. Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
3. Kraft Faced: ASTM C665: Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
4. Reinforced Foil Faced: ASTM C655, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
5. Foil Faced: ASTM C655, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

B. Batt Insulation (Fiberglass):

1. Batts shall be a single thickness to meet the required R value, multiple layers of batts will not be accepted.
2. Thickness: Provide minimum thickness as required to provide the resistance values [as indicated on Drawings](#), for various locations.
3. Roofs or other exposed horizontal surfaces shall attain a minimum composite R value of 30.
4. Exterior walls or other exposed vertical surfaces shall attain a minimum R value of 20.

C. Fire Safing Insulation: ASTM C24, E119 and E136. Thickness shall be as required by the Manufacturer to provide a fire rating equal to that of the assembly of which it is a part. Where smoke stop protection also is required, install Thermafiber SmokeSeal Caulking Compound as needed to meet UL Standard 1479 and ASTM E814 procedure.

D. Acoustical Batt Insulation: As specified in Section 09 81 00

E. Separate Vapor Barrier/Cover Sheet (All exposed batt ceiling insulation to be covered):

1. Construction:
 - a. Typical: Aluminum Foil, Elastomeric Polymer Barrier Coating, Tri-directional fiberglass and polyester reinforcing, 14# natural kraft
 - b. Where exposed to view in final work: Provide black polypropylene film, metallization, fiberglass, and polyester scrim, 14# black kraft
2. WVTR Perm: 0.02
3. Tensile Strength (lbs./in)
 - a. Machine Direction:
 - 1) Typical: 55
 - 2) Exposed to view (black): 40
 - b. Cross Direction: 35
4. Beach Puncture:
 - a. Typical: 85
 - b. Exposed to view (black): 125
5. NRC: 0.85
6. Comply with the following standards:
 - a. UL-723
 - b. ASTM E-84
 - c. Factory Mutual

7. Acceptable Manufacturer and Product:
 - a. Typical: Lamtec R03035 HD or approved equal.
 - b. Exposed to view (black): Lamtec WMP-10 or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Batt Insulation:
 1. Apply no insulation until such time as the Construction has progressed to the point that inclement weather will not damage or wet the insulation material.
 2. Fully insulate small areas between closely spaced framing members, pipes, conduits, or other obstruction by cutting and fitting insulation material as required to maintain the integrity of the insulation.
 3. Batt insulation at metal studs, concrete tees, and other non-nailable members shall be installed continuously tight against framing members. Secure in place with string wire or other method as approved by Architect.
 4. Place insulation tight to exterior wall or roof substrate without voids.
 5. Insulation shall not be laid directly on accessible ceilings. Provide horizontal insulation at the top of the cavity, and extend vertical insulation up to that level.
 6. Provide mechanical attachment for all insulation per manufacturer instructions. Insulation shall not be adhesive applied or installed loose.
 7. Insulation is to be free of gaps, holes, tears, and loose insulation.
 8. End match neatly with ends fitting snugly.
 9. Areas behind spandrel glass sections shall be insulated.
- A. Fire Safing Insulation: Install in proper sizes on safing clips as needed but not to exceed 24 inches O.C. Leave no voids between walls and edges of slabs.
- B. Separate Vapor Barrier/Cover Sheet:
 1. Adhesive apply over exposed surfaces of insulation with joints lapped and glued or mechanically fasten per manufacturer requirements and as approved by Design Professional.
 2. Adhesive shall be low-emitting.
 3. **No insulation shall be left exposed.**
 4. Membrane shall be closely fitted around pipes, conduits, columns, and other protrusions."

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.
- B. Protection: Take precautions to protect insulation, both during and after installation, from damage of any kind until covered.

END OF SECTION

SECTION 07 21 19

FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following:
1. Closed-cell, medium-density spray polyurethane foam insulation.

1.2 REFERENCES

- A. ASTM International:
1. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 2. ASTM C1029 Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
 3. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 4. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 5. ASTM Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 6. ASTM D1940 Method of Test for Porosity of Rigid Cellular Plastics.
 7. ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.
 8. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 9. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 10. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
 11. ASTM E283 Standard Test Method for Determining Rate of Air Leakage.
 12. ASTM E413 Classification for Rating Sound Insulation.
 13. ASTM E2178 Standard Test Method for Air Permeance of Building Materials.
 14. ASTM E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- B. CAN/ULC
1. CAN/ULC-S774-VOC emissions profiling by Dynamic Chamber Analysis.
- C. NFPA
1. NFPA 285 Standard Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
 2. NFPA 286 Standard Test Method of Fire Tests for Evaluation Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
 3. Section 015000 – Temporary Facilities and Controls; requirement to schedule work to prevent sunlight and weather exposure of materials beyond limits established by manufacturer; requirement to protect materials from damage after installation and prior to installation of enclosing work.

1.3 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test methods indicated below or other testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface Burning Characteristics (ASTM E84): 25/450.
 - 2. Assembly Fire Resistance Rating (NFPA 285): Passes NFPA 285 as part of an approved assembly.
 - 3. Combustion Characteristics (NFPA 286): Pass.
- B. Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 pounds per square foot) when tested in accordance with ASTM E2357. Assembly shall accommodate movements of building materials by providing expansion and control joints as required. Expansion/control joints, changes in substrate and perimeter conditions shall have appropriate accessory materials at such locations.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, instructions for evaluating, preparing and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
- B. Mock-Up: If required by Owner/Architect, submit shop drawings of proposed mock-ups showing plans, details. Submit test results of air leakage test and water leakage test of mock-ups in accordance with specified standards.
- C. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.
- D. Preconstruction Meeting: Convene a minimum of two weeks prior to commencing Work of this Section. Agenda shall include, at a minimum, construction and testing of mock-up (if required), sequence of construction, coordination with substrate preparation, compatibility of materials, coordination with other trades.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing urethane foam products and systems of this section with minimum ten years documented experience.
- B. Installer Qualifications: A minimum of five (5) years experience installing urethane foam products documented.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

- B. Store materials in their original undamaged packages with seals unbroken, labeled with manufacturer's name, product, date of manufacturer, and directions for storage.
- C. Handle materials in accordance with manufacturer's recommendations.

1.7 PROJECT CONDITIONS

- A. Temperature: Install closed-cell, medium density spray polyurethane foam air barrier within range of ambient and substrate temperatures recommended by air barrier manufacturer. Do not apply air barrier to a damp or wet substrate.
- B. Field Conditions: Do not install air barrier in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.
- C. Sequencing: Do not install air barrier before the roof assembly has been sufficiently installed to prevent a buildup of water in the interior of the building.
- D. Compatibility: Do not allow closed-cell, medium density spray polyurethane foam to come in contact with chemically incompatible materials.
- E. Ultra-violet exposure. Do not expose the air barrier material to sunlight longer than as recommended by the manufacturer (if applicable).

1.8 WARRANTY

- A. Manufacturer's Warranty: Provide manufacturer's standard product warranty, for a minimum 1 year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FOAMED-IN-PLACE INSULATION

- A. Medium Density Closed Cell Spray Polyurethane Foam Air Barrier: Basis of Specification is **JM Corbond III**, manufactured by Johns Manville. Air barrier system shall not require the priming of substrates nor the application of sealing tape at wallboard seams and other wall penetrations.
 - 1. Third Party Verification: IAPMO ES #0146.
 - 2. Application Rate: Up to 3.5 inches in a single pass, to the total thickness required for the project.
 - 3. Physical Properties:
 - a. Nominal Density (ASTM D1622): 2.0 lb.cu.ft.
 - b. Compressive Strength, 1 inch thickness (ASTM D1621): 36 psi.
 - c. Compressive Strength, 3 inch thickness (ASTM D1621): 30 psi.
 - d. Closed-Cell Content (ASTM D1940): Greater than 90 percent.
 - e. K-Factor (ASTM C518 initial): 0.15.
 - f. K-Factor (ASTM C1029 180-day aged): 7.0.
 - g. R-Value (ASTM C518 initial): 7.0.
 - h. R-Value (ASTM C1029 180-day aged): 7.0.

- i. Water Absorption (ASTM D2842): 0.020 (gm/cc).
- j. Water Vapor Transmission (ASTM E96): 0.61 perms at 1.5 inches.
- k. Air infiltration (ASTM E283): 75 Pa 0.001 L/S.m² (1.57 psf) (les than 0.001 cfm/ft²); 300 Pa 0.001 L/S/m² (6.24 psf) (less than 0.001 cfm/ft²).
- l. Air Permeance (ASTM E2178): 75 PA 0.000055 L/S/m². Pa 0.000117 ft³/min.mw.Pa; 300 Pa 0.000024 L./m²Pa 0.000051 ft³/min.mw.Pa.
- m. Sound Transmission Coefficient (STC) (ASTM E90 and ASTM E413): 36 STC; 2x4 wood stud, 16 inches o.c., 2.76 of JM Corbond III SPF, 15/32 inch exterior OSB sheathing, ½ inch gypsum wallboard.
- n. Recycled Content of Side B: 10 percent (pre-and post-consumer).

B. Other manufacturer, as approved by Architect.

C. Transition Strip at Joint Between Wall and Foundation: Provide a minimum 40-mil self-adhering transition strip between the wall construction and the foundation to shed water to the exterior. Comply with both air barrier manufacturer's recommendations and material manufacturer's recommendations.

2.2 ACCESSORIES

A. Primer: As required by insulation manufacturer base on substrate materials and conditions.

B. Thermal Barrier: Spray applied foam insulation must be separated from the interior of the building by an approved thermal barrier, such as ½-inch (min) gypsum wallboard, or an equivalent 15-minute thermal barrier complying with the applicable code. The alternative thermal barrier coating system shall be applied to the closed cell polyurethane foam insulation and tested to the criteria of NFPA 286, UL 1715 for duration of 15 minutes by an accredited fire testing facility and satisfies the International Building Code (IBC) requirements.

- 1. Alternative thermal barrier coating – Intumescent Coating: Subject to compliance with requirements of Contract Documents.
- 2. Ignition Barrier: when the insulation is installed within an attic space where entry is made only for service of utilities, an ignition barrier must be installed in accordance with IBC. The ignition barrier must be consistent with the requirements for the type of construction required by the applicable code. The ignition barrier may be an intumescent coating approved by the SPF manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which the air barrier assembly will be installed, with Installer present, for compliance with requirements.
 - 1. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 2. Ensure that the following conditions are met:
 - a. Surfaces are sound, dry, even, and free of oil, grease, dirt excess mortar or other contaminants.

- b. Concrete surfaces are cured and dry, smooth without large voids or sharp protrusions.
 - c. Masonry joints are reasonably flush, and all excess mortar sitting on masonry ties has been removed.
3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263 and take suitable measures until substrate passes moisture test.
 4. Verify sealants are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealant are adhered.
 5. Notify Architect in writing of anticipated problems using closed-cell, medium density spray polyurethane foam over substrate prior to proceeding.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
 1. Ensure that penetrating work by other trades is in place and complete.
 2. Prepare surfaces by brushing, scrubbing, scraping, grinding or compressed air to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion of the closed-cell, medium density spray polyurethane foam.
 3. Where there are release agents or other non-compatible coatings, wipe down metal surfaces to remove these release agents or other non-compatible coatings, using clean sponges or rags soaked in a solvent compatible with the spray polyurethane foam.
 4. Ensure veneer anchors are in place.
- B. Protection from Spray Applied Materials:
 1. Mask and cover adjacent areas to protect from overspray.
 2. Ensure any required foam stop or back up material are in place to prevent over spray and achieve complete seal.
 3. Seal off existing ventilation equipment. Install temporary ducting and fans to ensure exhaust fumes. Provide for make-up air.
 4. Erect barriers, isolate area and post warning signs to advise non-protected personnel to avoid the spray area.

3.3 INSTALLATION

- A. Spray Polyurethane Foam Installation: Install materials in accordance with manufacturer's recommendations, ULC S 705.2 and the following:
 1. Apply only after transition strip at foundation and wall intersection has been installed.
 2. Installer shall use proper personal protective equipment (PPE) during the installation of material in accordance with US Government regulation 29 CFR 1910.134
 3. Warning signs shall be displayed and non-protected personnel shall be kept from the spray areas in accordance with ULS S705.2.
 4. Equipment used to spray polyurethane foam shall comply with ULC S 705.2 and the manufacturer's recommendations for the specific type of application. Record equipment settings on the Daily work Record as required by the ULC S 705.2 installation standard. Each proportioner unit shall supply only one spray gun.
 5. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer or the ULC 705.2 installation standard.

6. Apply in consecutive passes as recommended by manufacturer to thickness as indicated on drawings. Passes shall be not less than 1/2 inch and not greater than 3.5 inches (75 mm). An additional pass shall only be done after the first pass has had time to cool down.
7. Install within manufacturer's tolerances, but not more than minus 1/4 inch (6mm).
8. Do not install spray polyurethane foam within 3 inches (75mm) of hear emitting devices such as light fixtures and chimneys.
9. Finished surface of foam insulation to be free of voids and embedded foreign objects.
10. Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened. Ensure cleaning methods do not damage work performed by other sections.
11. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
12. Clean and restore surfaces soiled or damaged by work of the section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.
13. Complete connections to other components and repair any gaps, holes, or other damage using material which conforms to ULC S 710.1 (single component) or ULC S 7111.1 (two components) and installed in accordance with ULC S 710.2 or ULC S 711.2 as applicable.

3.4 FIELD QUALITY CONTROL

- A. Owner's Inspection and Testing: If required, cooperate with Owner's testing agency. Allow access to work areas and staging. Notify Owner's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Do not cover Work of this Section until testing and inspection is accepted.

3.5 PROTECTING AND CLEANING

- A. Protect material from damage during installation and the remainder of the construction period, according to manufacturer's written instructions.
 1. Coordinate with installation of materials which cover the air barrier assemblies, to ensure exposure period does not exceed that recommended by the manufacturer.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION

SECTION 07 24 00

EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior Insulation and Finish System (EIFS) finished masonry wall
2. Exterior Insulation and Finish System (EIFS) finished wood or metal stud wall.
3. Direct-applied Exterior Finish System (DEFS) over exterior gypsum wallboard at vertical walls and soffits.

1.2 DEFINITIONS

- A. Base Coat: Material used to encapsulate one or more layers of reinforcing mesh fully embedded that is applied to the outside surface of the EPS.
- B. Building Expansion Joint: A joint through the entire building structure designed to accommodate structural movement.
- C. Expansion Joint: A structural discontinuity in the EIFS system.
- D. Finish: An acrylic-based coating, available in a variety of textures and colors that is applied over the base coat.
- E. Insulation Board: Expanded polystyrene (EPS) insulation board, which is affixed to the substrate and creates a layer of continuous insulation.
- F. Reinforcing Mesh: Glass fiber mesh used to reinforce the base coat and to provide impact resistance.
- G. Sheathing: A substrate in sheet form.
- H. Substrate System: The total wall assembly including the attached substrate to which the EIFS system is affixed.

1.3 System Description

A. Design Requirements

1. General: The Exterior Insulation and Finish System (EIFS), Class PB, consisting of an air/water-resistive barrier, an adhesive, expanded polystyrene insulation board, base coat, reinforcing mesh(es) and finish.
2. Separate insulation board from interior of building by minimum ½ inch gypsum sheathing or equivalent thermal barrier material which will limit the average temperature rise of the unexposed surface to not more than 250 degrees F. after 15 minutes of fire exposure when subjected to the ASTM E119 time-temperature curve. Install thermal barrier in a manner assuring its remaining in place for a minimum fire exposure of 15 minutes.
3. At fire rated construction, provide assembly I accordance with UL requirements for hourly rating indicated.
4. Insulation Board: Use the maximum thickness in accordance with applicable building code requirements. Length and slope of inclined surfaces shall follow guidelines listed below:
 - a. Minimum slope; 6 inches of rise in 12 inches of horizontal projection.
 - b. Maximum length of slope: 2.3 time the thickness of the insulation
 - c. Inclined surfaces shall not be used for areas as defined as roofs by building codes.
5. Substrate Systems: engineered to withstand applicable loads including live, dead, positive and suction wind, seismic, etc. Bond strength, fastener strength and connection strength shall be analyzed and engineered. Maximum deflection under positive or suction full design loads of substrate system shall not exceed 1/240th of span.
6. Sheathing substrates shall be oriented with their strong axis perpendicular to the supporting framing. At all locations the insulation board shall be completely encapsulated by the reinforcing mesh and adhesive or substrate
7. Expansion Joints: Install continuous expansion joints at the following location:
 - a. Where expansion joints occur in the substrate.
 - b. Where building expansion occurs.
 - c. At floor lines in wood frame construction.
 - d. Where the EIFS/DEFS abuts other materials.
 - e. Where the substrate changes.
 - f. Where significant structural movement occurs, such as at:
 - 1) Changes at roof lines.
 - 2) Long continuous elevations
 - 3) Changes in building shape and structural system.
 - g. Expansion and contraction of the field applied EIFS/DEFS and adjacent materials shall be taken into account in the design of expansion joints, with proper consideration given to sealant properties. Installation conditions, temperature range, coefficient of expansion of materials, joint width-to-width rations, etc.
 - h. Where indicated on Drawing to create an aesthetic pattern.
8. Details: Follow EIFS/DEFS manufacturer's latest published information for standard detail treatments. Corners shall be reinforced by wrapping the standard reinforces mesh around the corner from both directions for a minimum of 8 inches (200mm) as recommended by the

manufacturer. Openings shall be reinforced using a 9 inch wide strip of standard reinforcing mesh laid at a 45 degree angle to the opening corner as recommended by the manufacturer.

1.4 SUBMITTALS

- A. Shop Drawings: Provide drawings showing wall layout, all details including weep details, connections and expansion joints.
- B. Samples: Provide color and texture sample(s) for Architect's approval. Sample shall be 12 inches x 12 inches, of each finish, texture and color. Each sample shall be prepared using the same tools and techniques proposed for the actual installation.
- C. Test Reports: Submit copies of ICC Research Report verifying the performance of the EIFS/DEFS.
- D. Certificates: Submit a copy of applicator's current certificate of approval from EIFS/DEFS manufacturer for this project.

1.5 MAINTENANCE

- A. Furnish the following maintenance materials:
 - 1. For each finish and color, one can of finish
 - 2. One can of adhesive
 - 3. 20 square feet of standard reinforcing mesh.
 - 4. 20 square feet of insulation board.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Insulation Board: Listed in the UL Building Materials Directory and have Flame Spread and Smoke Developed rating of not greater than 25 and 450, respectively, in accordance with ASTM E84.
 - 2. EIFS/DEFS: Approved for use by ICC as described in current ICC Research Committee Report.
 - 3. The EPS shall be separated from the interior of the building by a minimum 15-minute thermal barrier.
 - 4. The use and maximum thickness of EPS shall be in accordance with the applicable building code(s).
- B. Quality Assurance Program: Work of this Section shall be in accordance with the following:
 - 1. Approved Applicators: Application of EIFS/DEFS materials shall be performed by manufacturer approved applicators that possess current Labor and Material applicator certificates.

2. Construction Document Review: Provide EIFS manufacturer a complete set of Construction Documents, including Shop Drawings, for review at least 60 days prior to start of Work of this Section.
 - a. EIFS manufacturer will review system conditions and details of proposed application for compliance with manufacturers approved details and specifications and provide a written detail report with recommendations and revisions required by the manufacturer to qualify the installation for the wall system warranty.

3. Pre-Installation conference: Schedule a pre-installation conference at least 15 days prior to start of Work of this Section to review exterior insulation and finish system specifications and procedures.
 - a. Attendees: Authorized representatives of the Architect, contractor, EIFS installer, EIFS manufacturers representative, Owner and other trades relevant to the work are required to attend.
 - b. Agenda: Discuss items of importance, including the following:
 - 1) Review construction Documents to ensure all parties present are in possession of the latest approved documents.
 - 2) Coordination of the EIFS applicator's Work with other work which connects with, is adjacent to, or will be concealed by Work of this Section.
 - 3) Storage of materials and staging areas.
 - 4) Physical requirements for proper installation or application and, if applicable, proposed protection procedures.
 - 5) Schedule of required quality assurance inspections.
 - 6) Lines of communication and establishment of responsibility for the proper communication of non-conforming work and correction procedures.

4. Mock-Ups:
 - a. Prior to the start of work, construct a sample panel, using job site materials, approximately 6'-0" by 6'-0", under the direction of the Architect. Mockup to show color, reveals and other details of the wall construction. This mockup section may be included as part of the finished building if approved by the Architect.
 - b. The sample wall shall provide a standard of workmanship, range of color and texture, and shall include flashings, control joints and sealant system.
 - c. Construct successive sample panels until the standard is approved.
 - d. When accepted, sample wall shall be the standard of comparison for the remainder of the work.
 - e. Upon completion of the project, remove the sample wall from the site and dispose in a legal manner.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packing with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
 1. Protect coatings (pail products) from freezing and temperatures in excess of 90°F (32°C). Store away from direct sunlight.
 2. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover and off the ground in a dry location.

- C. Handling: comply with manufacturer's instruction.

1.8 PROJECT/SITE CONDITIONS

A. Physical Requirements for Proper Installation of Application:

1. Ambient air temperature shall be 40 degrees F. or greater and rising at the time of installation of the EIFS/DEFS materials, and remain so for at least 24 hours thereafter.
2. For EIFS/DEFS installation in ambient temperatures less than 40 degrees F. maintain supplementary heat for at least 24 hours after EIFS/DEFS installation. Subsequent to installation of the EIFS/DEFS, the wall shall remain free of residual moisture.
3. Temperatures shall be maintained with adequate air ventilation and circulation for a minimum of 24 hours thereafter, or until the products are completely dry.
3. Existing Conditions: The contractor shall have access to electric power, clean water and a clean work area at the location where the EIFS materials are to be applied.

1.9 WARRANTY

- A. Provide manufacturer's written moisture drainage and limited materials warranty against defective material.
- B. The applicator shall warrant workmanship separately. Provide a five (5) year workmanship warranty associated with the installation of the specified and approved system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Product equaling or exceeding quality recommendations of the specified product, of the following manufacturers, as follows or as approved are acceptable for bidding:
 1. **Basis of Design: Outsulation® Plus MD System.** Dryvit System, Inc., West Warwick, RI
 2. Parex, Redan, GA
 3. Pleko Southwest, Tempe AZ
 4. Senergy, Inc. Cranston RI
 5. STO Industries, Atlanta GA

2.2 MATERIALS

- A. Exterior Gypsum Sheathing: Dens-glass Gold Gypsum sheathing as manufactured by Georgia-Pacific.

- B. Sheathing Fasteners: Corrosion resistant, with anti-corrosive coating capable of withstanding no more than 5 percent red rust after 500 hours of Salt Spray Tests in accordance with ASTM B117. Size and type as used in wind load tests.
- C. Adhesives: 100% acrylic polymer dispersion with a quartz or silica aggregate that is field blended with Type I and Type II Portland Cement 1:1 by weight.
- D. Insulation Board: Expanded polystyrene, ASTM C578 Class II. Aged (air dried) for 6 weeks at 68 degrees F. minimum, or for 5 days at 140 degrees F. before use.
 - 1. Flame Spread (ASTM E84 or UL 723); Less than 25
 - 2. Average Density: 1.0 pound per cubic foot.
 - 3. K-value: 0.23 per inch.
 - 4. Thickness: One inch, or as indicated
 - 5. Size: 24 inches x 48 inches.
- E. Standard Reinforcing Mesh: Treated, balanced, open weave, glass fiber type, minimum weight of 4oz/yd. available in 38 inch and 9 inch widths.
- F. High Impact Armor Mesh: Treated, balanced, open weave, glass fiber type, minimum weight of 20 oz/yd., available in 38 inch widths.
- G. Waterproofing Base Coat for Low-Slope and Sill Conditions: Acrylic-based Portland cement mixed, waterproof base coat and adhesive specifically formulated as a waterproofing base coat for use at low slope parapets, sills, and projections.
- H. Finish Coat Materials:
 - 1. Factory mixed, acrylic based finish coat with colorfast mineral pigments, sound stone particles, and fillers to achieve finish indicated.
 - 2. Color: Match existing
- I. Portland Cement: ASTM C150, Type I or II. White or gray in color, fresh and free of lumps.
- J. Water: Clear, potable, and free of all foreign matter.
- K. Sealant System: Shall be one of the following as approved by manufacture:
 - 1. Tremco Dymeric Plus, with Primer No.1
 - 2. Pecora Dynatrol li with Type P75 Primer
 - 3. Dow-Corning 790 with 1200 Primer and Ethafoam backer rod for EIFS/DEFS to EIFS/DEFS joints, Dow-Corning 795 for EIFS/DEFS to dissimilar materials.
- L. Accessories: Provide starter track, surface mounted "L" bead, casing bead, corner bead, control joints, and furring strips as required to provide a complete installation and as recommended by manufacturer.

2.3 MIXES

- A. Adhesive:
 - 1. Use clean container, free of foreign substance, for mixing and preparing material. Do not use container which has been used or cleaned with petroleum product.

2. Use a mixer similar to Goldblatt Jiffler Mixer No. 1531H7, powered by ½ inch drill 400-500 RPM.
 3. Measure a given weight of adhesive into a container, and an equal weight of Portland cement into another container.
 4. While stirring the adhesive, add small amounts of Portland cement in increments to obtains a final ration of one-to-one by weight. Continue stirring until the mixture is homogenous.
 5. Small amounts of water may be added to the adhesive mixture to adjust workability. The mixture shall not be “watered down.”
 6. A period of 5 minutes shall elapse after the initial mixing, then the mixture shall be tempered by stirring again.
 7. Use mixture immediately after tempering. Pot life is the same as plaster-like materials and depends on ambient temperatures and humidity conditions and substrate. Keep container closed when not in use.
 8. Under no circumstances use additives, or materials of any kind such as rapid binders, antifreeze, accelerators, fillers, or pigments.
- B. Finish Coating:
1. Thoroughly stir coating with a clean high speed mixer as specified above until a uniform workable consistency is obtained.
 2. A small amount of water may be added to adjust workability. Coating shall not be “watered down.” Maximum water, 8 ounces per pail.
 3. Under no circumstances use additives, or materials of any kind such as rapid binders, antifreeze, accelerators, fillers, or pigments.
 4. Apply coating immediately after mixing. Keep container closed when not in use. Pot life depends on ambient temperature and humidity conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions
1. Representative of the EIFS/DEFS manufacturer shall inspect and approve gypsum substrate prior to the application of insulation, as well as the insulation prior to application of the finish.
 2. Masonry, concrete and brick substrates shall be flat within 1/4 inch (96mm) within any 4 feet. Follow manufacturer’s recommendations for application of additive of leveling coat to assure a smooth surface.
 3. Verify framing is installed as required to provide adequate support for gypsum sheathing.
 4. Prior to installation of the System, the architect or general contractor shall insure that all needed flashings and other waterproofing details have been completed. Additionally, the contractor shall ensure that:
 - a. Metal roof flashing has been installed in accordance with the manufacturer’s requirements, and roofing manufacturer’s requirements, or as otherwise necessary to maintain a watertight envelope.

3.2 APPLICATION

GLA #19107

07 24 00

8/31/2021

- 7

SEDONA POLICE DEPT. RENOVATION

EXTERIOR INSULATION AND
FINISH SYSTEM

CITY OF SEDONA

- A. Application of the exterior insulation finish system shall be in accordance with the Manufacturer's printed instructions, ASTM C1397 "Standard Practice for Application of Class PB "Exterior Insulation and Finish System" and as specified herein.
- B. Glass Matt Exterior Sheathing Board (Dens-Glass Gold Sheathing):
1. Install in accordance with manufacturer's printed instructions. Yellow side of sheathing shall face to the exterior with the white face facing the interior of the building.
 2. Verify that surface of framing members do not vary from more than ¼ inch from the plane of faces of adjacent members.
 3. End joints shall be offset. Joints should fit snugly and flashing installed around openings.
 4. Panels of the maximum length possible shall be used to minimize the number of joints. Edge joints must be located parallel to and with vertical orientations on framing. End joints of adjacent lengths of sheathing must be staggered.
 5. Attach sheathing to metal framing with screws spaced 8 inches o.c. at perimeter and 8 inches o.c. in field.
 6. Fasteners must be driven so as to bear tight against and flush with surface of sheathing. Fasteners must not be countersunk.
 7. Fasteners must be located a minimum of 3/8 inch from edges and ends of sheathing panels.
- C. Accessories: Install starter track, casing beads and control joints as recommended by manufacturer and as indicated on Drawings.
- D. Insulation Board (EIFS):
1. Begin application at the base from firm, permanent or temporary support.
 2. Apply adhesion to clean hard surface.
 3. Apply board with long edge oriented horizontally with its joints offset with respect to the substrate joints and using a running bond pattern.
 4. Precut insulation board as required to fit openings, corners and projections.
 5. Stagger vertical joints and interlock at corners.
 6. Insulation board pieces smaller than 24 inches x 48 inches may be used, such as at corners. In all cases the perimeter of the insulation board shall have the 2 inch ribbon per the Ribbon and Dab Method. Maintain 32% minimum contact area.
 7. Foam shapes (popouts), as details on the drawings, shall be adhered directly to the face of the installed insulation board by applying mixed Adhesive or missed Dry Adhesive to back o the foam shape and pressing it firmly into position.
- E. Adhesive Mixture (Insulation Board Application – EIFS)
1. Ribbon and Dab Method (Masonry Substrates): By trowel apply ribbon of mixed adhesive to one surface of insulation board. Ribbons shall be 2 inches wide x 3/8 inch thick around the entire perimeter of each board. The adhesive shall not be applied to the ends of the insulation boards. Apply 8 dabs of adhesive mixture 4 inches diameter x 3/8 inch thick to be area within the perimeter ribbon. A minimum of 32% of the insulation board surface shall be in contact with the adhesive mixture.
 2. Notched Trowel Method: Apply beads of adhesive mixture to one surface of the insulation board using a notched trowel having an edge profile meeting EIFS manufacturer's requirements. The beads shall stand out 5/8inch from the surface of the insulation board. Apply ribbons of adhesive mixture 2 inches wide x 5/8 inches thick around entire perimeter of the insulation board using a trowel. Adhesive mixture shall not be applied to the ends of the insulation board. Use this method for gypsum sheathing substrates only.

F. Mesh (EIFS and DEFS)

1. Reverse roll as necessary to remove the tendency of the mesh to curl.
2. Standard Mesh Base Coat:
 - a. Using a stainless steel trowel, apply the adhesive to the surface to a uniform dry thickness of 1/16 inch. Apply base coat in 2 applications.
 - b. Immediately embed the standard reinforcing mesh into the wet adhesive mixture using a trowel.
 - c. Smooth the surface of the adhesive mixture with a trowel until the reinforcing mesh is fully embedded.
 - d. The pattern of the mesh shall not be visible beneath the surface of the adhesive mixture.
 - e. Lap reinforcing mesh pieces a minimum of 2-1/2 inches on all sides, working from the center to the edge while smoothing out wrinkles.
 - f. A period of 24 hours shall elapse to allow the base coat to form a positive bond.
 - g. Protect base coat from damage and weather while curing.
3. Heavy Duty Mesh Basecoat: Provide the following at ground floor applications and facades exposed to abnormal stress or deliberate impacts.
 - a. Using a stainless steel trowel, apply the adhesive mixture to the surface to a uniform thickness of 3/32 inch.
 - b. Immediately embed the high impact armor mesh into the wet adhesive mixture using a trowel.
 - c. Smooth the surface of adhesive mixture with a trowel until heavy duty reinforcing mesh is fully embedded.
 - d. The pattern of the mesh shall not be visible beneath the surface of the adhesive mixture.
 - e. Ends of adjacent heavy duty mesh pieces shall be tightly butted, not lapped.
 - f. Where heavy duty mesh abuts standard mesh coat, apply sufficient adhesive mixture over adjacent standard mesh, and feather a sufficient distance to provide a smooth invisible transition between the two meshes.
 - g. Work heavy duty mesh into the adhesive mixture, working from the center to the edge while smoothing out wrinkles.
 - h. A period of 24 hours shall elapse to allow the base coat to form a positive bond.
 - i. Protect base coat from damage and weather while curing.
 - j. Examine the surface of the first layer after curing for projections, loose strands of heavy duty mesh, and correct to produce a flat surface.
 - k. Apply a second layer consisting of adhesive mixture and standard reinforcing mesh over heavy duty mesh as specified above.

G. Fully Reinforced Base Coat (DEFS):

1. Apply by steel trowel an approximately 1/16 inch layer of base coat material to entire area to receive direct applied exterior finish system.
2. Immediately place reinforcing mesh against the wet base coat material and trowel from center to edge to fully embed mesh into base coat.
3. Apply mesh over all areas to receive direct applied exterior finish system and continuous at corners.
4. Avoid wrinkles while embedding mesh.
5. Smooth and remove defects with a wet brush.
6. Mesh pieces shall overlap at least 3 inches with adjoining pieces.
7. Allow sufficient time for drying to a hard surface, but not less than 12 hours, before applying finish.

- H. Finish (EIFS and DEFS):
1. Apply finish continuously and in one operation to the entire wall surface.
 2. Maintain a wet edge.
 3. The finish shall not be allowed to set up in a distinct area.
 4. Employ sufficient manpower, scaffolding and equipment to ensure a continuous operation and a uniform appearance.
 5. Work shall proceed toward the joints and corners.
 6. Use clean plastic float for floating.
 7. A small amount of clean, potable water may be used to adjust the workability of the finish. Maximum 8 ounces (226 gm) per pail.
 8. Until dry, protect the finish from airborne contamination due to dust and soot, and from weather and other damage.
 9. Finish shall not be returned into sealant joints.
 10. Finish Texture: Sand finish to match (existing) adjacent EIFS as acceptable to Architect/Owner and to match approved Mockup.
- I. Finish (DEFS):
1. Inspect base coat layer to ensure that it is dry and hard before proceeding with finish application. Remove irregularities by sanding. Skim coat with base coat material all areas not completely covered as necessary.
 2. Apply specified finish directly over a base coat to the thickness of the largest aggregate or approximately 1/16 inch with a clean steel trowel. Some finishes may also be applied by use of spray equipment if recommended by manufacture and approved by the Architect.
 3. Maintain wall surface in wet stage and finish from corner to corner to joint to avoid cold joints or staging marks.
- J. Sealant:
1. System materials shall be fully cured prior to sealant installation.
 2. Color of sealant shall be as selected.
 3. Joint design and surface preparation shall be based on sealant manufacturer's recommendations and project conditions.
 4. Sealant shall be applied to base coat materials and shall not be applied to finish material.
 5. Follow additional requirements contained in EIFS/DEFS manufacturer's detailed sealant specification.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: During construction the work shall be inspected by the EIFS/DEFS manufacturer or authorized representative.
- B. EIFS/DEFS Special Instructions: Installation of EIFS/DEFS shall be inspected during construction as required by Section 1704 of the IBC.
1. Provide free access to Work and cooperate with appointed firm.
 2. Inspections shall be performed by a representative of a qualified independent special inspector acceptable to the Owner and meeting qualification requirements.
 3. Inspector shall prepare reports indicating that work inspected was done in conformance to approved Construction Documents.
 4. Discrepancies shall be immediately corrected by the Contractor.

5. Completed work which does not conform to approved construction documents shall be reported to the Architect.
6. Work completed that does not comply with approved Construction Documents shall be rejected.

3.4 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 54 00

THERMOPLASTIC POLYOLEFIN ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Thermoplastic Polyolefin Single-Ply Roofing Membrane
 - 2. Thermoplastic Polyolefin Flashings
 - 3. Thermoplastic Polyolefin Accessories
 - 4. Insulation
- B. Related Sections
 - 1. Section 06100: Rough Carpentry
 - 2. Section 07600: Sheet Metal Flashing and Trim

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM) - Annual Book of ASTM Standards
 - 1. ASTM D-751 – Standard Test Methods for Coated Fabrics
 - 2. ASTM D-2137 - Standard Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics
 - 3. ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials
 - 4. ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
 - 5. ASTM D-471 - Standard Test Method for Rubber Property—Effect of Liquids
 - 6. ASTM D-1149 - Standard Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment
 - 7. ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
 - 8. ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
 - 9. ASTM E 903 – Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres
 - 10. ASTM G155 - Standard Practice For Operating Xenon Arc Light Apparatus For Exposure Of Non-Metallic Materials
 - 11. ASTM D573 - Standard Test Method For Rubber - Deterioration In An Air Oven
- B. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) -
*Architectural Sheet
Metal Manual*
- C. National Roofing Contractors Association (NRCA)

- D. American Society of Civil Engineers (ASCE)
- E. U.S. Green Building Council (USGBC)
 - 1. Leadership in Energy and Environmental Design (LEED)
- F. California Title 24 Energy Efficient Standards
- G. ENERGY STAR
- H. Cool Roofing Rating Council (CRRC)
- I. Underwriters Laboratories (UL) - *Roofing Systems and Materials Guide* (TGFU R1306)

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

1.4 SUBMITTALS

- A. Product Data: Provide product data sheets for each type of product indicated in this section.
- B. Shop Drawings: Provide manufacturers standard details and approved shop drawings for the roof system specified.
- C. Samples: Provide samples of insulations, fasteners, membrane materials and accessories for verification of quality.
- D. Certificates: Installer shall provide written documentation from the manufacturer of their authorization to install the roof system, and eligibility to obtain the warranty specified in this section.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: GAF shall provide a roofing system that meets or exceeds all criteria listed in this section.
- B. Installer's Qualifications:
 - 1. Installer shall be classified as a **Master or Master Select™** contractor as defined and certified by GAF.
- C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing manufacturer.
- D. Final Inspection

1. Manufacturer's representative shall provide a comprehensive final inspection after completion of the roof system. All application errors must be addressed, and final punch list completed.

1.6 PRE-INSTALLATION CONFERENCE

- A. Prior to scheduled commencement of the roofing installation and associated work and as required by the Owner, conduct a meeting at the project site with the installer, architect, owner, GAF representative and any other persons directly involved with the performance of the work. The installer shall record conference discussions to include decisions and agreements reached (or disagreements) and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to roofing work.

1.7 PERFORMANCE REQUIREMENTS

- A. Provide an installed roofing membrane and base flashing system that does not permit the passage of water and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.
- B. Single source manufacturer shall provide all primary roofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

1.8 REGULATORY REQUIREMENTS

- A. All work shall be performed in a safe, professional manner, conforming to all federal, state and local codes.
- B. Exterior Fire Test Exposure: Provide a roofing system achieving a UL Class A rating for roof slopes indicated.
- C. Windstorm Classification: Provide a roofing system which will achieve a 105psf wind uplift rating.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver all roofing materials to the site in original containers, with factory seals intact. All products are to carry a manufacturer label.
- B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

- D. Remove manufacturer supplied plastic covers from materials provided with such. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each workday. Do not remove any protective tarpaulins until immediately before the material will be installed.
- E. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application.

1.10 PROJECT CONDITIONS

- A. Weather
 - 1. Proceed with roofing only when existing and forecasted weather conditions permit.
 - 2. Ambient temperatures must be above 45°F (7.2°C) when applying hot asphalt or water-based adhesives.

1.11 WARRANTY

- A. Provide Manufacturers standard EverGuard® Diamond Pledge™ Guarantee with single source coverage and no monetary limitation where the manufacturer agrees to repair or replace components in the roofing system, which cause a leak due to a failure in materials or workmanship.
 - 1. Duration: Twenty (20) years from the date of completion.
 - a. Materials and workmanship of listed products within this section are included when installed in accordance with current GAF application and specification requirements. Contact GAF Technical Support Services for the full terms and conditions of the guarantee.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. GAF® - 1 Campus Drive, Parsippany, NJ 07054
- B. Other – As approved by Architect/Owner.

2.2 COVER BOARD

- A. Fiber-reinforced gypsum panel with an integral water-resistant core. **Securock® Brand Ultralight Glass Mat Roof Board** by US Gypsum.
 - 1. Board Thickness: ½”
 - 2. Board Size: 4’ x 8’
 - 3. Thermal Resistance (R value) of: .53

2.3 MEMBRANE MATERIALS

- A. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved. White membrane is Energy Star Listed, CRRC Listed and Title 24 Compliant.
 - 1. EverGuard® TPO 60 Mil Membrane by GAF.
 - a. 10' X 100', each roll contains 1000 sq. ft. of material weighing 322 lbs.
 - b. Color: TAN

2.4 CURB/WALL FLASHING MEMBRANE

- A. GENERAL
 - 1. EverGuard® membrane flashing should be of the same type and thickness as the roof membrane. EverGuard® Freedom™ TPO can be used with EverGuard® TPO membrane for flashing in the same thickness as the field membrane.
 - 2. Because colored TPO membranes may exhibit different welding characteristics, please call the GAF Technical Support Services hotline at 800-766-3411 before attempting to weld different-colored TPO membranes with white membranes or flashings.
 - 3. EverGuard® TPO Fleece-Back membranes are optional flashing membranes for all EverGuard® TPO systems. These membranes may be a solution when a contaminated substrate is encountered.
- B. FLASHING MEMBRANE
 - 1. A smooth type, polyester scrim reinforced thermoplastic polyolefin membrane for use as a single ply roofing membrane. Meets or exceeds the minimum requirements of ASTM D-6878. UL Listed, FM Approved, Dade County Product Approval, Florida Building Code Approved. White membrane is Energy Star Listed, CRRC Listed and Title 24 Compliant.
 - a. EverGuard® TPO 60 Mil Membrane by GAF.

2.5 ADHESIVES, SEALANTS AND PRIMERS

- A. Sprayable, Low VOC solvent-based contact adhesive used for bonding smooth EverGuard® and EverGuard® Extreme® TPO membranes. One canister covers 10 squares. **EverGuard® TPO Quick Spray Adhesive LV50** by GAF®.
- B. Low VOC solvent based primer for preparing surfaces to receive butyl based adhesive tapes, **EverGuard® TPO Low VOC Primer**, by GAF.
- C. Low VOC TPO cleaner designed to clean exposed or contaminated seams prior to heat welding to remove any residual soap or revitalize aged membranes. Contains only 50 grams per liter of Volatile Organic Content and has been formulated using a blend of primarily VOC-exempt ingredients to be in compliance with air quality regulations for single ply roofing products. **EverGuard® CleanWeld® Cleaner** by GAF®.
- D. One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. **EverGuard® Water Block**, by GAF.
- E. One-part, moisture-cure, self-leveling sealant designed for use in pitch pans on single ply roof systems. **EverGuard® One-Part Pourable Sealant**.

2.6 FASTENERS AND PLATES

A. Mechanical Fasteners & Plates

1. **Drill-Tec™ #14 HD Fastener:** Drill-Tec™ #14 HD Fastener is designed to secure insulation to heavy steel decks (18 ga. - 22 ga.), wood decks, structural concrete, and lightweight insulating concrete. It is available in lengths from 1-1/4" – 14" (31.8 –355.6 mm). The Drill-Tec™ #14 HD Fastener is Factory Mutual approved.
2. **Drill-Tec™ RhinoBond® TPO XHD Plates:** Galvalume, 3" (7.6 cm) diameter, specially coated for use in RhinoBond® attachment systems.

2.7 FLASHING ACCESSORIES

A. GENERAL FLASHING ACCESSORIES

1. A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. **EverGuard® TPO Detailing Membrane**, by GAF.
2. An 8 inch (20 cm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, Tan, Gray, Regal Red, Regal Blue, and Hartford Green **EverGuard® TPO Flashing Membrane**, by GAF.
3. 24 gauge steel with 0.025" thick TPO based film as required for fabrication into metal gravel stop and drip edge profiles, metal base and curb flashings, sealant pans, and scupper sleeves. Standard sheet size 4' x 10', sheet weight 47 lbs. Custom sizes available, **EverGuard® TPO Coated Metal**, by GAF.
 - a. Available Stock Colors: White Gray Tan Regal Red Regal Blue Hartford Green
 - b. Available Pre-Formulated Colors: Colonial Red, Dark Brown, Dark Bronze, Desert Tan, Electric Blue, Goldenrod, Ivy Green, Moss Green, Patina Green, Slate Gray, Teal, Terra Cotta, Tropical Green, Smoke Gray, Energy Gray, Energy Tan
 - c. Custom colors available
4. Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6" on center or 8" on center. 3/4" x 10' with 0.090" cross section, **DRILL-TEC™ Termination Bar**, by GAF®.
5. Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof to wall and roof to roof applications, made of .060" reinforced TPO membrane, available in 5 standard sizes for expansion joint openings up to 8" wide. **EverGuard® TPO Expansion Joint Covers**, by GAF
6. .055" thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. **EverGuard® T-Joint Patches**, by GAF.

B. ROOF EDGE ACCESSORIES

1. A 6 inch (14 cm) wide, smooth type, heat-weldable polyester scrim reinforced thermoplastic polyolefin membrane strip. Designed for use as a cover strip over non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, 6" X 100'. **EverGuard® TPO Heat-Weld Cover Tape**, by GAF.

C. WALL & CURB ACCESSORIES

1. .045" reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6" x 100', **EverGuard® RTA (Roof Transition Anchor) Strip™**, by GAF
2. 55 mil TPO membrane and 24 gauge coated metal prefabricated into standard and custom size thru wall scuppers. Available in two sizes: 4" x 6" x 12" (l x w x d) with a 5.75" x 3.75" opening and 8" x 10" x 12" (l x w x d) with a 9.75" x 7.75" opening, **EverGuard® TPO Scupper**, by GAF
3. .045" or .060" thick reinforced TPO membrane fabricated corners. Available in four standard sizes to flash curbs that are 24", 36", 48", and 60" in size. Four corners are required to flash the curb, **EverGuard® Corner Curb Wraps**, by GAF®.
4. 0.060" thick molded TPO membrane outside corners of base and curb flashing. Hot-air welds directly to EverGuard® TPO membrane. Size 4" x 4" with 6" flange, **EverGuard® TPO Universal Corners** by GAF®.
5. 0.055" molded TPO membrane inside corners of base and curb flashing. Hot-air welds directly to EverGuard TPO membrane. Size 6" x 6" x 5.5" high **EverGuard® TPO Preformed Corners** by GAF.
6. 8" diameter, nominal .050" vacuum formed unreinforced TPO membrane for use in flashing outside corners of base and curb flashings, **EverGuard® TPO Fluted Corner**, by GAF.

D. PENETRATION ACCESSORIES

1. 0.075" thick molded TPO membrane sized to accommodate most common pipe and conduits, (1" to 6" diameter pipes), including square tube. Hot-air welded directly to EverGuard TPO membrane, supplied with stainless steel clamping rings, **EverGuard® TPO Preformed Vent Boots** by GAF.
2. 0.045" thick molded TPO membrane preformed boots are split to accommodate most common pipes and conduits and available in three standard sizes, **EverGuard® TPO Split Pipe Boots**, by GAF.
3. 0.045" thick molded TPO membrane preformed square boots are split to accommodate most common square penetrations and conduits and available in three standard sizes, **EverGuard® TPO Square Tube Wraps**, by GAF.
4. .070 thick molded penetration pocket to provide structure and foundation for the application of a pourable sealant for a variety of roof penetrations, weldable and 9" x 6" x 4" (l x w x h). **EverGuard® TPO Pourable Sealer Pocket**
5. Constructed from spun aluminum and preflashed using .055" thick smooth type, unreinforced thermoplastic polyolefin membrane. Available in a wide range of sizes to allow a proper fit into any size roofing drain. **EverGuard® TPO Drain** by GAF
6. Aluminum drain unit coated with a weldable TPO compound. TPO membrane can be heat welded directly to the drain body, resulting in a strong, secure installation. Each drain is fitted with a BlueSeal® mechanical drain seal for a secure, tight seal into the building drain system. Available in two sizes (3" and 4"), and custom sizes are available. **EverGuard® TPO Coated Metal Drain** by GAF®

E. WALKWAYS

1. 1/8" thick extruded and embossed TPO roll 34.25" x 50', heat welds directly to roofing membrane. Unique "diamond tread" traction surface and features a 2" (51 mm) welding strip (smooth border) along each longitudinal edge that is compatible with hand or automatic welders. Available in gray or safety yellow, **EverGuard® TPO Walkway Rolls**, GAF.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

- A. Obtain verification that the building structure can accommodate the added weight of the new roofing system.
- B. Confirm the adequacy of the new roofing system to provide positive slope to drain. Eliminate ponding areas by the addition of drainage locations or by providing additional pitch to the roof surface.
- C. Prepare substrate surfaces thoroughly prior to application of new roofing materials. This is particularly important for re-cover and reroofing applications. Providing a smooth, even, sound, clean, and dry substrate minimizes the likelihood that underlying deficiencies will cause premature deterioration or even failure of the new roofing system.
- D. All defects in the roof deck or substrate must be corrected by the responsible parties before new roofing work commences. Verify that the deck surface is dry, sound, clean, and smooth, and free of depressions, waves, or projections.
- E. Protect building surfaces against damage and contamination from roofing work.
- F. Where work must continue over completed roof areas, protect the finished roofing system from damage.
- G. Deck preparation is the sole responsibility of the building owner or roofing contractor. All defects in the roof deck or substrate must be corrected before roofing work commences.
- H. Refer to GAF Roof Guarantee Program for specific requirements for extended guarantees.

3.2 SUBSTRATE PREPARATION

- A. Tear-off
 1. Remove all existing roofing materials to the roof decking, including flashings, metal edgings, drain leads, pipe boots, and pitch pockets, and clean substrate surfaces of all asphalt and adhesive contaminants.
 2. Confirm the quality and condition of the roof decking by visual inspection. Fastener pull-out testing must be conducted by the roof fastener manufacturer.
 3. Secure all loose decking. Remove and replace all deteriorated decking.
 4. Remove abandoned equipment and equipment supports.
 5. Confirm that the height of equipment supports will allow the installation of full-height flashings.
- B. Plywood Deck
 1. Plywood sheathing must be C-D Exposure 1 APA Rated, minimum 4 ply, and not less than 15/32" thick.
 2. Preservatives or fire retardants used to treat the decking must be compatible with roofing materials.
 3. The deck must be installed over joists that are spaced 24" (61 cm) o.c. or less.
 4. The deck must be installed so that all four sides of each panel bear on and are secured to joist and cross blocking. The panels must be secured in accordance with APA-The Engineered Wood Association recommendations, "H" clips are not acceptable.

5. Panels must be installed with a 1/8" to 1/4" (3mm – 6mm) gap between panels and must match vertically at joints to within 1/8" (3mm).
6. Decking should be kept dry and roofed promptly after installation.
7. Moisture content not to exceed 16%.
8. Insulation above the deck may be necessary to prevent condensation from adversely affecting the deck.
9. Must meet minimum pull out values. Minimum 5 test pulls per 1,000 sq. ft. (93 sq. m.).
10. Code standards apply when their requirements exceed those listed here.

3.3 NAILER INSTALLATION

A. Acceptable Wood

1. Solid Blocking: Non-pressure treated wood as required, #2 Grade or better, nominal 1 1/4" (30 mm) x 4" (102 mm) with a minimum thickness of 3 1/2" (88 mm).
2. Shim Material: Plywood, 1/2" (13 mm) x width to match solid blocking.
3. Verify the condition of existing roof nailers and anchor to resist 250 lb. per ft. (550 kg) load applied in any direction. New nailers should meet same load requirements.
4. DRILL-TEC™ HD screws 18" (457 mm) o.c. attachment to structural wood, steel decks with a 1" (25 mm) thread embedment.
5. DRILL-TEC™ spikes or HD screws 18" (457 mm) o.c. attachment to concrete decks. Min. 1" (25 mm) shank or thread penetration.
6. Wood nailers attached to gypsum, concrete, cellular concrete and cementitious wood fiber must be fastened 12" (305 mm) o.c., through the nailer into the substrate with substrate approved DRILL-TEC™ fasteners.
7. Three anchors per length of wood nailer minimum.

B. Metal Blocking

1. 20 Ga. galvanized steel box with pre-punched holes and supplied with corrosion-resistant fasteners.
2. Closure and finish strip required for metal decking.
3. Secure in place using provided #14 x 1½-in. universal fasteners through pre-punched holes to roof edge.
4. Install end cap and top of box section with #14 x 1½-in. universal fasteners.

3.4 INSTALLATION – GENERAL

- A. Install GAF's EverGuard® TPO roofing system according to all current application requirements in addition to those listed in this section.
- B. GAF EverGuard® TPO Specification #: TRBTI60
- C. Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

3.5 INSULATION

A. GENERAL

1. Do not apply roof insulation or roofing until all other work trades have completed jobs that require them to traverse the deck on foot or with equipment. A vapor retarder coated lightly with asphalt may be applied to protect the inside of the structure prior to the insulation and final roofing installation. Before the application of the insulation, any damage or deterioration to the vapor retarder must be repaired.
2. Do not install wet, damaged or warped insulation boards.
3. For new construction over a metal deck or tear off down to a metal deck, install insulation boards so that all edges are supported by the high flutes of the decking with no more than ¼" gap between adjoining boards. With the EverGuard® RhinoBond® Attachment System, the first (or only layer) of insulation does not need to be staggered. Butt the insulation, overlay/recover boards tightly together with no more than a ¼" gap between boards. If installing multiple layers of insulation, the boards should be staggered a min of 6".
4. Overlay/recover boards may be installed using all full-size overlay boards in a non-staggered manner. These overlay/recover include gypsum (Dens Deck and Securock). If plywood or OSB is specified, it must be a minimum thickness of ¾".
5. When installing the EverGuard® RhinoBond® Attachment System over tapered insulation, it is critical the RhinoBond® plates are flat and flush against the insulation surface to ensure proper welding of the plate to the membrane. For this reason, it is preferable to install the tapered insulation first and cover the tapered system with an overlay/recover board.
6. Do not install any more insulation than will be completely waterproofed each day.
7. Do not align seams with rows of plates, as the step-down that is created will cause an incomplete weld of the RhinoBond® plate.
8. Do not straddle plates over insulation joints, as the gaps will create an incomplete weld of the RhinoBond® plate.
9. Use the appropriate length and type of Drill-Tec™ Fastener for the structural deck. See the EverGuard® RhinoBond® Attachment Table.
10. EverGuard® RhinoBond® plates are different in type and color. TPO plates are a yellow/green, while the PVC plates are black in color. The appropriate plate must be used with the appropriate membranes.
11. Mechanical attachment for the three distinct areas or zones of a roof.
12. Roof areas have three distinct areas or zones. They are corners (either inside or outside), roof perimeter, and the field of the roof. Each of these areas have their own attachment rates.
13. These zones or areas have to be determined before the insulation, cover or overlay board's fasteners are installed. A building's perimeter edges and corner areas or zones are determined by the height and width and other conditions referenced by ASCE 7 and FM 1-29.
14. Securing the EverGuard® RhinoBond® Plate and Fastener
 - a. Insulation, overlay/recover boards are to be mechanically attached to the structural deck in accordance with the RhinoBond® Attachment Table or code requirements.
 - b. Install the proper number of fasteners per insulation overlay/recover board per roof zone or area. Fastener density shall be increased in corner and perimeter as needed for design wind uplift resistance
 - c. Fasten to the substrate in an appropriate grid pattern as established by the RhinoBond® Attachment Table. Using chalk lines to make the grids on the substrate is the easiest way to make sure the grid is consistent and plates are easy to find.
 - d. Fasteners must be tight enough that the EverGuard® RhinoBond® Plate does not turn or rock.
 - e. Over-driven fasteners that distort the face or top of the plate must be removed and discarded. A new EverGuard® RhinoBond® Plate and Fastener must be reinstalled next to the original, but not into the same space and hole.
 - f. Under driven or "high fasteners" must be re-driven to proper depth.
 - g. When installation of RhinoBond® Plates and Fasteners are complete, the area should be blown or broomed clean to remove any dirt or debris from the substrate

surface or contaminates from the plate's bonding surface. This is critical so as not to puncture the membrane from beneath or to impair the welding of the membrane to the EverGuard® RhinoBond® Plate.

3.6 INSULATION – BASE LAYER

A. LOOSE LAID

1. Loose apply the insulation. Minimal fastening should be performed to avoid movement of the boards.

3.7 INSULATION – 2ND LAYER

A. LOOSE LAID

1. Loose apply the insulation. Minimal fastening should be performed to avoid movement of the boards.

3.8 INSULATION – 3RD LAYER

A. MECHANICALLY ATTACHED (RB SYSTEMS)

1. The insulation must be securely attached to the roof deck with Drill-Tec™ #14 HD Fasteners and Drill-Tec™ RhinoBond® TPO XHD Plates. Refer to the attachment tables in the latest version of the EverGuard® specification manual. Fastener density shall be increased in corner and perimeter as needed for design wind uplift resistance.
2. Fasten using the following pattern: Fasteners are to be driven into wood supports:
 - a. Field: 36" X 24" grid
 - b. Perimeter: 20" X 24" grid
 - c. Corners: 14" by 24" grid
3. EverGuard® RhinoBond® plates are different in type and color. TPO plates are a yellow/green, while the PVC plates are black in color. The appropriate plate must be used with the appropriate membranes.

3.9 SINGLE PLY MEMBRANE APPLICATION

A. GENERAL

1. Substrates must be inspected and accepted by the contractor as suitable to receive and hold roof membrane materials.
2. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
3. Membrane that has been exposed for more than 12 hours or has become contaminated will require additional cleaning methods.
 - a. Light Contamination - Membrane that has been exposed overnight up to a few days to debris, foot traffic, or dew or light precipitation can usually be cleaned with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner, a low-VOC cleaner) for TPO membranes.
 - b. Dirt-Based Contamination - Membrane that is dirt encrusted will require the use of a low-residue cleaner, such as Formula 409® and a mildly abrasive scrubbing pad to remove the dirt. This must be followed by cleaning with a white cloth moistened with

EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes.

- c. Exposure-Based Contamination - Membrane that is weathered or oxidized will require the use of EverGuard® TPO Cleaner, EverGuard® CleanWeld™ Conditioner and a mildly abrasive scrubbing pad to remove the weathered/oxidized top surface layer. This must be followed by cleaning with a white cloth moistened with EverGuard® TPO Cleaner (or EverGuard® CleanWeld™ Conditioner) for TPO membranes. Unexposed membrane left in inventory for a year or more may need to be cleaned as instructed above. Be sure to wait for solvent to flash off prior to welding.
- d. Chemical-Based Contamination - Membrane that is contaminated with bonding adhesive, asphalt, flashing cement, grease and oil, and most other contaminants usually cannot be cleaned sufficiently to allow an adequate heat weld to the membrane surface. These membranes should be removed and replaced.

B. RhinoBond

1. Place roof membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent securement.
2. Full-width rolls shall be installed in the field and perimeter regions of the roof.
3. Overlap full roof membrane sheets a minimum of 3" for side and end laps.
4. Install membrane so that the lap runs across the roof slope and lapped toward the drainage points if possible.
5. All exposed sheet corners shall be rounded a minimum of 1".
6. All cut edges of reinforced TPO membrane must be sealed with EverGuard® TPO Cut Edge Sealant.
7. Weld TPO to RhinoBond® Plates with RhinoBond® Portable Bonding Tool. Weighted cooling magnets are placed over the bonded membrane/plates for a minimum of 45 seconds.

3.10 FLASHINGS

A. GENERAL

1. All penetrations must be at least 24" (61 cm) from curbs, walls, and edges to provide adequate space for proper flashing.
2. Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
3. All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
4. Hot-air weld all flashing membranes, accessories, and coated metal. A minimum 2" wide (hand welder) weld or minimum 1 - 1/2" automatic machine weld is required.
5. All cut edges of reinforced membrane must be sealed with EverGuard® TPO Cut Edge Sealant.
6. Consult the EverGuard® *Application and Specifications Manual* or GAF Contractor Services for more information on specific construction details, or those not addressed in this section

B. Coated Metal Flashings:

1. Coated metal flashings shall be formed in accordance with current EverGuard construction details and SMACNA guidelines.
2. Coated metal sections used for roof edging, base flashing and coping shall be butted together with a 1/4" gap to allow for expansion and contraction. Hot-air weld a 6" wide reinforced membrane flashing strip to both sides of the joint, with approximately 1" on either

side of the joint left un-welded to allow for expansion and contraction. 2" wide aluminum tape can be installed over the joint as a bond-breaker, to prevent welding in this area.

3. Coated metal used for sealant pans, scupper inserts, corners of roof edging, base flashing and coping shall be overlapped or provided with separate metal pieces to create a continuous flange condition, and pop-riveted securely. Hot-air weld a 6" wide reinforced membrane flashing strip over all seams that will not be sealed during subsequent flashing installation.
4. Provide a ½" hem for all exposed metal edges to provide corrosion protection and edge reinforcement for improved durability.
5. Provide a ½" hem for all metal flange edges whenever possible to prevent wearing of the roofing and flashing membranes at the flange edge.
6. Coated metal flashings shall be nailed to treated wood nailers or otherwise mechanically attached to the roof deck, wall or curb substrates, in accordance with construction detail requirements.

C. Reinforced Membrane Flashings:

1. The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.
2. Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with "Construction Detail Requirements".
3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application.
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.
6. Heat-weld all laps in EverGuard® smooth-reinforced flashing membrane in accordance with heat-welding guidelines. All seams in fleece-back membrane and smooth field sheet must be stripped in with 8" (203 mm) flashing strip.
7. For extended length guarantees, separate counterflashing is required; exposed termination bars are not acceptable.

D. Un-Reinforced Membrane Flashings:

1. Un-reinforced membrane is used to field-fabricate penetration or reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed.
2. Penetration flashings constructed of un-reinforced membrane are typically installed in two sections, a horizontal piece that extends onto the roofing membrane and a vertical piece that extends up the penetration. The two pieces are overlapped and hot-air welded together.
3. Apply the adhesive only when outside temperature is above 40°F. Recommended minimum application temperature is 50°F to allow for easier adhesive application. Water-based adhesives are approved for use with smooth TPO membranes for flashings only.
4. The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
5. Please note that solvent-based adhesives must be allowed to dry until tacky to the touch before mating flashing membrane. Water-based adhesive must be allowed to flash off completely.

E. Roof Edges:

1. Roof edge flashings are applicable for gravel stop and drip edge conditions as well as for exterior edges of parapet walls.

2. Flash roof edges with coated metal flanged edging with a minimum 3" (76 mm) wide flange nailed 4" (102 mm) on center to wood nailers, and heat weld 8" (203 mm) membrane strip to metal flanges.
3. When the fascia width exceeds 4" (102 mm), coated metal roof edging must be attached with a continuous cleat to secure the lower fascia edge. The cleat must be secured to the building no less than 12" (305 mm) o.c.
4. Flash roof edge scuppers with a coated metal insert that is mechanically attached to the roof edge and integrated as a part of the metal edging.
5. Alternatively, roof edges may be flashed with a 2-piece snap on fascia system, adhering the roof membrane to a metal cant and face nailing the membrane 8" (152 mm) on center prior to installing a snap-on fascia.
 - a. Submit design drawings for review and approval to Architect or Specifier before fabrication.
 - b. Installing contractor shall check as-built conditions and verify the manufacturer's roof edging details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the roof edging manufacturer's installation guide when setting edging.

F. Parapet and Building Walls:

1. Flash walls with EverGuard® TPO membrane adhered to the substrate with bonding adhesive, loose applied or with coated metal flashing nailed 4" (102 mm) on center to pressure-treated wood nailers.
2. Maximum flashing height without intermediate fastening is 24" (610 mm) for loose-applied flashing and 54" (1.4 m) for adhered flashing
3. Secure membrane flashing at the top edge with a termination bar. EverGuard® Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 6" (152 mm) on center for guarantees less than 20 years and 12" (305 mm) on center for guarantees greater than 20 years or that are counter-flashed.
4. Exposed termination bars must be sealed with Flexseal™ Caulk Grade Sealant.
5. Roof membrane must be mechanically attached along the base of walls with screws and plates 12" (305 mm) on center [6" (152 mm) on center for Ballasted Systems]
6. Metal cap flashings must have continuous cleats or be face fastened 12" (305 mm) o.c. on both the inside and outside of the walls.
7. Flash wall scuppers with a coated metal insert that is mechanically attached to the wall and integrated as part of the wall flashing.
8. Roof Transition Anchor (R.T.A.) Strip may be installed as the alternate method of base securement for a RhinoBond® non-penetrating base attachment detail.

G. Curbs and Ducts:

1. Flash curbs and ducts with EverGuard® TPO membrane adhered to the curb substrate with bonding adhesive, loose applied or with coated metal flashing nailed 4" on center to pressure-treated wood nailers.
2. Maximum flashing height without intermediate fastening is 24" (610 mm) for loose-applied flashing and 54" (1.4 m) for adhered flashing
3. Secure membrane flashing at the top edge with a termination bar. EverGuard® Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 6" (152 mm) on center for guarantees less than 20 years and 12" (305 mm) on center for guarantees greater than 20 years or that are counter-flashed.
4. Exposed termination bars must be sealed with Flexseal™ Caulk Grade Sealant.

5. Roof membrane must be mechanically attached along the base of walls with screws and plates 12" (305 mm) on center [6" (152 mm) on center for Ballasted Systems]
6. Metal counterflashings may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with Flexseal™ Roofing Cement.
7. All coated metal curb flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings.

H. Roof Drains:

1. Roof drains must be fitted with compression type clamping rings and strainer baskets. Original-type cast iron and aluminum drains, as well as retrofit-type cast iron, aluminum or molded plastic drains are acceptable.
2. Roof drains must be provided with a minimum 36" x 36" sump. Slope of tapered insulation within the sump shall not exceed 4" in 12".
3. Extend the roofing membrane over the drain opening. Locate the drain and cut a hole in the roofing membrane directly over the drain opening. Provide a ½" of membrane flap extending past the drain flange into the drain opening. Punch holes through the roofing membrane at drain bolt locations.
4. For cast iron and aluminum drains, the roofing membrane must be set in a full bed of water block on the drain flange prior to securement with the compression clamping ring. Typical water block application is one 10.5 ounce cartridge per drain.
5. Lap seams shall not be located within the sump area. Where lap seams will be located within the sump area, a separate roof membrane drain flashing a minimum of 12" larger than the sump area must be installed. The roof membrane shall be mechanically attached 12" on center around the drain with screws and plates. The separate roof drain flashing shall be heat welded to the roof membrane beyond the screws and plates, extended over the drain flange, and secured as above.
6. Tighten the drain compression ring in place.

I. Expansion Joints:

1. Any prefabricated expansion joint metal nailing strips must be fastened to wood nailers, curbs or secured to walls with appropriate nails or DRILL-TEC™ Fasteners.
2. Roof membrane must be mechanically attached along the base of raised curb-expansion joints with screws and plates a minimum of 12" (305 mm) o.c. The expansion joint cover bellows shall be at least 2 times the expansion joint opening.
3. Metal nailing strip must be set in FlexSeal™ Caulk Grade Sealant and secured with fasteners and neoprene washers fastened 6" (152 mm) o.c
4. Expansion joints may be field fabricated. Reference appropriate Construction Detail.

J. Scuppers:

1. Coated-metal roof-edge scuppers must be provided with a min. 4" (102 mm) wide flange nailed to wood nailers, with hemmed edges and secured with continuous clips in accordance with the gravel stop assembly.
2. Coated-metal wall scuppers must be provided with 4" (102 mm) wide flanges, with additional corner pieces pop-riveted to the flanges to create a continuous flange. All flange corners must be rounded.
3. Install wall scuppers over the roof and flashing membrane and secure to the roof deck/wall with DRILL-TEC™ Fasteners 6" (152 mm) o.c., a minimum of 2 fasteners per side.
4. All corners must be reinforced with EverGuard® PVC or EverGuard® TPO Universal Corners or field-fabricated from EverGuard® non-reinforced materials.
5. Strip-in scupper with flashing membrane target sheet.

6. Alternately, a wall scupper box may be field-flashed using non-reinforced flashing membrane heat-welded to membrane on the wall face and roof deck. Fully adhere to the scupper box and terminate on the outside wall face with a termination bar and FlexSeal™ Caulk Grade sealant.
7. EverGuard® TPO has prefabricated scuppers in standard and custom sizes available

K. Wood Support Blocking:

1. Wood support blocking, typically 4" x 4" (102 mm x 102 mm), is usually installed under light-duty or temporary roof-mounted equipment, such as electrical conduit, gas lines, condensation, and drain lines.
2. Install wood support blocking over a protective layer of EverGuard® TPO walkway rolls or PVC walkway pads. Place wood blocking on oversized slip sheet, fold two sides vertically, and fasten with roofing nails into the blocking.

3.11 TRAFFIC PROTECTION

- A. Install walkway rolls at all roof access locations and other designated locations including roof-mounted equipment work locations and areas of repeated rooftop traffic.
- B. Walkway pads must be spaced 6" apart to allow for drainage between the pads.
- C. Heat-weld walkway rolls to the roof membrane surface continuously around the perimeter of the roll.

3.12 ROOF PROTECTION

- A. Protect all partially and fully completed roofing work from other trades until completion.
- B. Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
- C. When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
- D. Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

3.13 CLEAN-UP

- A. All work areas are to be kept clean, clear and free of debris at all times.
- B. Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- C. All tools and unused materials must be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

- D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.
- E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
- F. Clean and restore all damaged surfaces to their original condition.

END OF SECTION

SECTION 07 60 00

FLASHING AND SHEET METAL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes: Flashings, sheet metal work and related items including, but not limited to:
 - 1. Counterflashing at vertical surfaces.
 - 2. Flashing at roof penetrations.
 - 3. Edge flashing.
 - 4. Metal copings.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Drawings indicating type of material, gage, dimensions, profiles, locations where used, fastening and anchoring methods, joints, and provisions of expansion and contraction.
- B. Samples: Submit samples of each type of prefinished metal in selected color.

1.03 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with design and installation methods of SMACNA Architectural Sheet Metal Manual.
 - 2. Comply with The NRCA Roofing and Waterproofing Manual installation details.
 - 3. Comply with ANSI/SPRI, ES I-98.
- B. Performance Requirements: Designed and installed to withstand local wind pressures identified in the code analysis.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site. Do not store materials on ground.
- C. Handling: Comply with Manufacturer's instructions. Handle with care so as not to buckle or warp metal, or damage solder joints.

1.05 WARRANTY

- A. Furnish 5 year warranty against flashing and sheet metal failure, in which contractor agrees to repair or replace flashing and sheet metal as necessary to maintain work in watertight condition during the warranty period. Warranty to cover workmanship, materials and repair or replacement of same, at no cost to Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. **Prefinished Metal:**
 - 1. Aluminum, 0.050 inch thickness (16 gauge).
 - 2. Finish: Full strength Kynar 500/Hylar 5000 Fluorocarbon coating, applied by the Manufacturer on a continuous coil coating line, with top side dry film thickness of 0.70 to 0.90 mil over 0.25 to 0.35 mil prime coat, to provide a total dry film thickness of 0.95 to 1.25 mil.
 - a. Bottom side: Coated with primer with a dry film thickness of 0.25 mil.
 - b. Finish: Conform to all tests for adhesion flexibility, and longevity as specified by the Kynar 500 finish supplier.
 - c. Color: Custom color as indicated on Drawings or as selected by Architect from manufacturer's full range of colors.
 - 3. Strippable film: Liquid applied to top side of painted coil to protect finish during fabrication, shipping and field handling.

- B. **Galvanized Steel:** ASTM A653, 22 gauge minimum and as indicated, with G-60 coating.
Used for sheet metal flashing and trim at concealed from view locations and concealed clips and reinforcements only.

2.02 ACCESSORIES

- A. Provide local/regional materials.
- B. Reglets and Counter flashings: Fry Reglet Corporation, Type as applicable for substrate/finishes. Provide prefabricated inside and outside reglet and counterflashing corners.

- C. Solder: ASTSM B32 50/50 type D
- D. Flux: FS O-F-506.
- E. Sealant: As specified in Section 07 92 00.F
- F. Plastic Cement: ASTM D4586.G
- G. Peel-N-Stick waterproof membrane: WR Grace Bituthene 3000 or approved equal
Plastic Cement: ASTM D4586.G.

- H. Bituminous Coating: FS TT-C-44 or SSPC paint - 12, dry film 15 mils per coat.

- I. Sheet Metal Fasteners: Pre-finished galvanized steel with soft neoprene washers at exposed fasteners. Where exposed in the finished work of prefinished metal, provide fasteners with prefinished heads matching prefinished metal.

- J. **Prefinished Metal Seam Sealers and Adhesives:** As recommended by prefinished metal manufacturer for waterproof and weather-resistant seaming and adhesive applications of flashing and sheet metal work.
 - 1. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape.
 - 2. Butyl Sealant: ASTM C1311, single-compound, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

2.03 FABRICATION

- A. Fabricate Flashing and sheet metal from the following:
 - 1. Fabricate flashing and sheet metal exposed to view in the finished work, including wall caps/coping), fascia, drip edges, etc., from prefinished galvanized steel sheet.
 - 2. Fabricate flashing and sheet metal concealed from view in the finished work from galvanized steel sheet.
- B. Minimum Gauges: Fabricate flashing from sheet metal of the following minimum thickness, unless otherwise indicated on Drawings:
 - 1. Copings, Gravel Stops, Cleats and Similar Trim: 22 gauge.
 - 2. Flashings, Counter flashings, Roof Penetration Flashings, Reglets and Similar Items: 22 gauge.
- C. Fabricate sheet metal with lines, arris, and angles sharp and true, and plane surfaces free from objectionable wave, warp or buckle.
 - 1. Hem exposed edges to form a 1/2 inch wide hem on the side concealed from view
 - 2. Provide concealed stiffeners and reinforcements as necessary to provide surfaces free of objectionable wave, warp or buckle.
- D. Forming, anchoring, expansion and contraction details, shall conform to referenced quality standards.
- E. Provide for thermal expansion of running trim, flashing, expansion joints, and other items exposed for more than 15 feet continuous length.
- F. Fabricate cleats and starter strips of same material as sheet.
- G. Form pieces in longest practical lengths, except form flashing and fascia in 8 to 10 foot units.
- H. Fabricate coping covers with butt seam with backup plate, fastened one side seams (item 19, figure 3-3 per SMACNA Architectural Sheet Metal Manual).
- I. Solder and seal metal joints or use seam sealer/adhesive as recommended by prefinished metal manufacturer. After soldering, remove flux. Wipe and wash solder joints clean.
- J. Fabricate corners from one piece with minimum 18 inch long legs, with mitered corners; solder for rigidity, seal with sealant.
- K. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.
- L. Where prefabricated counterflashing and reglet system is used, form upper edge of counterflashing with an approved snap lock flange to engage reglet receiver and to provide a spring action at bottom edge against built-up flashing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine sub surfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of sub surfaces.

1. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
 2. Verify membrane termination and base flashings are in place, sealed, and secure.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Installation shall conform to NRCA and SMACNA manuals.
- B. Expansion Seams: Maintain a watertight installation at expansion seams. Locate expansion seams as shown or if not shown, at the following maximum spacing for each general flashing use:
1. Flashing, expansion joints, gravel stops, and trim: At 10 foot intervals, 24 inches on each side of corners and intersections.
 2. Sealant-type expansion joints: Where sealant-filled expansion joints are used, embed the hooked flanges of the joint members not less than 1 inch into the sealant. Form joints to completely conceal the sealant. When ambient temperature is moderate at the time of installation (40 to 70 degrees F.), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant type joints at temperatures below 40 degrees F. Installation of sealant is specified in Section 07 92 00.
- C. Where dissimilar materials abut, provide proper separation or protection to minimize the possibility of galvanic action.
- D. Soldering:
1. Except where other methods of joining are indicated or specified, solder joints and connections of Sheet Metal Work.
 2. Remove grease and dirt from metal surfaces to be joined.
 3. Remove flux residue by scrubbing, neutralizing with ammonia or a 5 to 10 percent solution of washing soda, followed by a clear water rinse.
 4. Assemble parts and solder using regular non-corrosive resin flux. Heat metal thoroughly to completely sweat solder through full contact area.
- E. Sealed Joints: Form non expansion, but movable joints in metal with flat lapped seams to accommodate elastomeric sealant to comply with SMACNA Standards. Fill joint with sealant and form metal to completely conceal sealant.
1. Seal joints at copings and at other movable, non-expansion type joints.
- F. Reglets: Install reglets in masonry, concrete or stucco to receive flashings.
- G. Counterflashing:
1. Provide metal counterflashing at top edges of built-up base flashings and at other locations indicated.
 2. Lap end joints a minimum of 3 inches. Do not solder or weld joints. Make flashing continuous at angles. Counterflashing shall overlap base flashing a minimum of 4 inches, unless otherwise indicated.
 3. Where counterflashing terminates in reglets, fasten flashing with lead wedges every 12 inches. Fill reglets continuously with synthetic rubber type sealant.
- H. Copings:

1. Cover top of parapet walls where indicated with 20 gauge galvanized metal coping formed to design shown. Before applying metal, cover top of wall or wood blocking with peel and stick waterproof membrane.
2. Extend front edge of coping covering down over the lock into a previously placed continuous edge strip. Secure edge strips with nails spaced 12 inches apart.
3. Join rear edge of coping covering to adjacent flashings as indicated.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Tested firestop systems, used in specific locations as follows:
 1. Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways, and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
 2. Safing slot gaps between edge of floor slabs and curtain walls.
 3. Openings between structurally separate sections of wall or floors.
 4. Gaps between the top of walls and ceilings or roof assemblies.
 5. Expansion joints in walls and floors.
 6. Openings and penetrations in fire-rated partitions or walls containing fire doors.
 7. Openings around structural members which penetrate floors or walls.
 8. Other locations as indicated on Drawings.

1.02 DEFINITIONS

- A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.03 SYSTEM DESCRIPTION

- A. Provide UL Classified or Warnock Hersey Listed firestopping system to prevent the spread of fire, smoke, and gasses through penetrations in fire resistive walls, floors, and partitions, including but not limited to, the following areas:
 1. Unprotected openings and openings accommodating penetrating items such as cables, cable trays, pipes, ducts, boxes and conduits through fire rated floors, walls, and smoke barriers.
 2. Head of wall openings between wall and connecting floor or roof deck assemblies.
 - a. Meet requirements for exposure to hose stream test.
 - b. Applicable for use with steel fluted deck floor assemblies.
 - c. Allow deflection of floor or roof above.
- B. Firestop systems shall not be intended to support live loads and traffic unless specifically approved by Testing Agency.
- C. Firestop systems shall be approved by Code Authority.
- D. Firestop products shall remain flexible where subject to movement without affecting the integrity of the product.
- E. Performance Requirements:

1. Provide products that upon curing, do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water, or other forms of moisture characteristic during and after construction.
2. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion, and other normal building movement without damage to the seal.
3. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
4. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.
5. When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.
6. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
7. Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.
8. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in Standards, ASTM E-1399, ASTM E-1966 or ANSI/ UL 2079.
9. Provide penetration firestop systems, fire-resistive joint systems, or perimeter fire barrier systems subjected to an air leakage test conducted in accordance with Standard, ANSI/ UL1479 for penetrations and ANSI/UL2079 for joint systems with published L-Ratings for ambient and elevated temperatures as evidence of the ability of firestop system to restrict the movement of smoke.
10. Provide T-Rating Collar Devices tested in accordance with ASTM E-814 or ANSI/UL1479 for metallic pipe penetrations requiring T-Ratings per the applicable building code.

1.04 SUBMITTALS

- A. Product Data: Submit Manufacturer's Specifications, performance criteria, Drawings, and instructions.
 1. Submit technical data for each material including the composition and limitations, documentation of qualified tested firestop systems to be used and manufacturer's installation instructions.
 2. Provide manufacturer's engineering judgment identification number and document details when no qualified tested system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in document.
- B. Shop Drawings: Submit Manufacturer's complete Shop Drawings showing proposed material, reinforcement, anchorage, fastenings method of installation and UL or Warnock Hersey listing number.
- C. Test Reports: Submit UL or Warnock Hersey test report description for firestopping system.

- D. Provide certificate of compliance from authority having jurisdiction indicating approval of firestop systems.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Installers must be experienced, certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
 - 2. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in project to a **single sole source firestop specialty contractor**.
 - 3. The work is to be installed by a contractor with at least one of the following qualifications:
 - a. Hilti Accredited Fire Stop Specialty Contractor (HAFSC)
 - b. 3M "Master Contractor"
 - c. Hilti "Certified Contractor" with current letter from manufacturer
 - d. 3M "Certified Contractor" with current letter from manufacturer
 - e. UL Approved Contractor
 - f. FM 4991 Approved Contractor
 - 4. Installing firm must not have less than 3 years experience with fire stop installation.
 - 5. Installing firm must have successfully completed not less than 3 comparable scale projects using similar systems.
- B. Regulatory Requirements: Conform to applicable code for fire resistance ratings and surface burning characteristics:
 - 1. ASTM E 136, ASTM E 119, and ASTM E 814, as applicable.
 - 2. UL 1479 fire test to achieve required fire-rating as noted on Drawings.
 - 3. Listing:
 - a. UL Fire Resistance Directory (current edition).
 - b. WH International Listings
- C. Firestop Systems:
 - 1. Fire-Test-Response Characteristics: Provide through-penetration firestop systems and fire-resistive joint systems that comply with specified requirements of tested systems.
 - 2. Firestop system installation must meet requirements of ASTM E 814, UL 1479 or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.
 - 3. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
 - 4. Firestop systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
 - 5. For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by Code Officials.

- D. Pre-Installation Conference:
 - 1. Convene a pre-installation conference to review specifications and procedures with the Architect, Contractor, installer, manufacturer's representative, Owner, and other trades relevant to the work, prior to ordering materials.
 - 2. Notify Architect at least 48 hours prior to starting Work.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.
- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions.
- D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- E. Do not use damaged or expired materials.

1.07 PROJECT CONDITIONS

- A. Do not use materials that contain flammable solvents.
- B. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN), and perimeter firestop systems (XHDG) listed in Volume 2 of the UL Fire Resistance Directory; provide products of the following manufacturers as identified below:
 - 1. Hilti, Inc., Tulsa, Oklahoma, 800-879-8000/www.us.hilti.com
 - 2. 3M Company, St. Paul, Minnesota, 800-328-1687/www.3m.com/firestop

3. Provide products from the above acceptable manufacturers; *no substitutions will be accepted.*

2.02 MATERIALS

A. General:

1. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
2. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
3. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

B. Firestop System Materials - General: Use only firestop products that have been UL 1479, ASTM E 814 or UL 2079, ASTM E 1966 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

1. Appropriate for penetration.
2. Include every component required for code approved installation, including; but not limited to:
 - a. Firestopping putties or compound.
 - b. Backing material.
 - c. Wrap strips.
 - d. Primers, clips, and collars.
 - e. Forming and damming materials.
 - f. Sealant and solvent cleaner. At interior applications, provide sealant in accordance with the low-emitting materials requirements of Section 01 60 00– Product Requirements.

C. Properties:

1. Free of asbestos, halogens, and volatile components after curing and shall not slump or sag, (except for self-leveling products).
2. Capable of maintaining an effective barrier against flames, heat, and smoke in compliance with the requirements of ASTM E814, UL 1479 and U.B.C. Standard 7-5.
3. Non-combustible per ASTM E 136.
4. UV resistant where exposed to sunlight.
5. Water resistant where exposed to moisture.
6. Firestop system shall accommodate movement without adversely affecting fire rating of wall/floor assembly.
7. Shrink resistant.
8. Paintable or capable of receiving finish materials in those areas which are exposed to view and which are scheduled to receive finishes.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 1. Verify penetrations are properly sized and in suitable condition for application of materials.
 - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - 3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - 4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 - 5. Do not proceed until unsatisfactory conditions have been corrected.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 COORDINATION

- A. Coordinate construction of openings, penetrations, and construction joints to ensure that the fire stop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- C. Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.
- D. Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector, per requirements of Section 109, IBC 2018.

3.03 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- B. Remove incompatible materials which affect bond.
- C. Install backing materials to arrest liquid material leakage, if required.

3.04 INSTALLATION

- A. General:
 - 1. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory or Omega Point Laboratories Directory.
 - 2. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
 - 3. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

4. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 5. Protect materials from damage on surfaces subjected to traffic.
- B. Installation shall conform to requirements of qualified designs or manufacturer approved modifications as supported by engineering reports, and shall be approved and accepted by the authority having jurisdiction.
1. Apply primer and firestop materials in accordance with Manufacturer's instructions and in accordance with the appropriate UL Fire Resistance Directory or with the appropriate Warnock Hersey International Listing.
 2. Apply firestopping material in sufficient thickness to achieve rating, to ensure against the passage of flames, smoke, and toxic gases, and to a uniform density and texture.
 3. Protect materials from damage on surface subjected to traffic and install cover plates as required on firestop system that will or may be subject to traffic.
 4. Tool surfaces of firestop products to provide a smooth and clean appearance.
- C. Provide firestopping for conditions specified whether or not firestopping is indicated, and, if indicated, whether such material is designated as insulation, safing or otherwise. Insulation types specified in other sections shall not be installed in lieu of firestopping materials.
- D. Building Exterior Perimeters:
1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.
 2. Mineral wool by itself shall not constitute an acceptable firestop. If mineral wool is part of firestop system, the mineral wool shall be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant.
 3. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.
 4. Provide firestopping to continuously fill open spaces where an exterior wall of composite type construction passes a perimeter structural member, such as a girder, beam or strut, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire- resistive integrity of the wall system, and creating a space that would otherwise remain open between the interior face of the wall and lower edge of the structural members.
- E. Interior Walls and Partitions:
1. Construction joints between top of fire rated walls and underside of floors above shall be firestopped.
 2. Firestop systems installed shall have been tested by either UL or Warnock Hersey, including exposure to hose stream test, and including test for use with steel fluted deck floor assemblies.
 3. Firestop system used shall allow for deflection of floor or roof above.
- F. Penetrations:
1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
 2. Provide firestopping to fill spaces in accordance with ASTM E 814 (UL 1479) where a penetration occurs through a structural floor or roof and a space would otherwise remain

open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, except at floors on grade.

3. Requirements for penetrations shall apply whether or not sleeves have been provided. Firestop the annular space between sleeve and surrounding surfaces.

3.05 FIELD QUALITY CONTROL

- A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- B. Keep areas of work accessible until inspection by applicable code authorities.
- C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- E. Product Manufacturer's Field Services Duties: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly to both the general contractor and the Authority Having Jurisdiction.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.
 1. Remove equipment, materials, and debris, leaving area in undamaged, clean condition.
 2. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses..

END OF SECTION

SECTION 07 92 00

JOINT SEALERS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Product Data:
 - 1. Submit manufacturer's current specifications and recommended installation procedures.
 - 2. Submit sample warranty to be signed jointly by applicator and manufacturer.
 - 3. Submit manufacturer's standard color chart.
- B. Shop Drawings: Illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades.
- C. Field Adhesion Test and Stain Reports: Submit copies of logs and test reports showing results of field adhesion testing and stain testing.
- D. Contract Closeout: Submit Manufacturer's Warranty.

1.02 QUALITY ASSURANCE

- A. Qualifications:
 - 1. An approved manufacturer's installer shall perform the work, and have not less than 5 years of successful experience in the installation of caulks and sealants.
 - 2. Installers shall be thoroughly trained and experienced in the necessary skills and shall be thoroughly familiar with the specified requirements.
- B. Field Adhesion Testing: Perform preconstruction adhesion testing for each type of sealant and substrate as follows:
 - 1. Arrange for manufacturer's field technical representative and Architect to be present during testing.
 - 2. Install sealant in test joints in minimum 60 inch lengths.
 - 3. Test joints by standard field adhesion hand pull test.
 - 4. For joints with dissimilar substrates, test adhesion to each substrate separately as recommended by sealant manufacturer.
 - 5. Conduct number of field adhesion tests for each type of sealant and each type of substrate as follows:
 - a. Not less than 10 tests for the first 1,000 feet of installed sealant and 1 test for each additional 1,000 feet of sealant installed, or 1 test per floor per elevation.
 - 6. Document results of field adhesion tests and record results in field adhesion test log.
 - 7. Include in log data on pull distance used to test each joint sealant.
 - 8. Include data on joints where material connected with pull portion of sealant failed to adhere to joint substrate or tore cohesively.
 - 9. Inspect joints and record data for the following:
 - a. Complete fill.
 - b. No voids.
 - c. Joint dimensions matching those of manufacturer's recommended details.

10. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
11. Do not install joint sealants that fail to adhere to joint substrates during testing.
12. Repair sealant test areas by removing damaged materials and applying sealant to test area using same procedure used to originally install the sealant.

- C. Stain Testing: Perform Stain testing of natural stone, masonry and other porous substrates proposed for use in the Work. Obtain actual samples of materials proposed for use and test to determine if permanent discoloration of porous surfaces will occur from direct contact with sealants. Perform stain testing in conformance with ASTM C1248 and as follows:
1. Arrange for manufacturer's field technical representative and Architect to be present during examination of test results.
 2. Cut substrate to provide flat surface for application of sealant.
 3. Separate substrate materials by removable shims to create 1/2 x 1/2 x 3 inch joint.
 4. Fill joint with scheduled sealant, tool, and allow to cure for 21 days at room temperature.
 5. After 21 day curing, remove shims, compress joint to 50 percent of original joint width to 1/4 inch, and place in an oven at 158 degrees F. for 14 days.
 6. After 14 days in oven, remove and allow sample to cool to room temperature.
 7. Examine sample to determine presence of discoloration or change in appearance in any way to exposed surfaces.
 8. After visual inspection, cut sample in half to determine presence of discoloration or change in appearance in any way into the sample itself at the adhesive bond line and presence of bleeding into the area around the adhesive bond line.
 9. Document results of stain tests and record results in stain test log.
 10. Do not install sealants that show evidence of staining substrates.
- D. Field Color and Workmanship Samples: Caulk a section of joint as directed, under job conditions, at least 7 days prior to start of work for review by Architect. When approved, sample shall be used as a standard of comparison for remainder of work.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site. Maintain product in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Handling: Comply with manufacturer's instructions.

1.04 PROJECT/SITE CONDITIONS

- A. Physical Requirements for Proper Installation or Application: Observe manufacturer's temperature service range. Do not apply sealant when weather conditions will inhibit bonding and curing.

1.05 WARRANTY

- A. Provide warranty, in writing and signed jointly by the installer and sealant manufacturer, to replace sealants which fail at no additional cost to the Owner because of loss of cohesion or adhesion, or do not cure, and which fail to achieve air-tight and water-tight seal.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following manufacturers subject to compliance with specifications requirements:
 - 1. Pecora www.pecora.com
 - 2. Tremco www.tremcosealants.com
 - 3. Dow Corning Corp. www.dowcorning.com
 - 4. Sika Corp. www.sika.com
 - 5. Sonneborn / Chemrex www.chemrex.com
- B. Single Source Responsibility for Joint Sealer Materials:
 - 1. Obtain joint sealer materials from a single manufacturer for each different product required.
 - 2. If sealants from separate manufacturers must be used and could come in contact with each other, provide written certification from every manufacturer involved that the sealants are compatible and will adhere to each other.

2.02 MATERIALS

- A. General:
 - 1. Sealants, primers, back-up materials, preformed joint fillers, bond breakers and related materials shall be compatible with adjoining materials.
- B. Sealant:
 - 1. The selection of proper sealant for a particular joint shall be in accordance with current published recommendations of the manufacturer.
 - 2. General: Silicone base, conforming to ASTM C-920, color to match adjacent, installed at joints and where required to weatherproof and waterproof the building.
 - a. Sealant to have permanent elasticity to allow continuous movement and flexibility.
 - b. Sealant shall have extremely high thixotropy (gap filling properties) and excellent weather and water resistance.
 - 3. Sealants at fire penetrations: As specified in Section 07 84 00.
 - 4. Color: Provide standard or custom colors as selected by Architect, In general, colors shall match adjacent materials.
- C. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- D. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- E. Joint Filler (Backer): Compatible with sealant.
 - 1. Buildings: ASTM C1330, Type B; round bi-cellular or closed cell polyethylene or polyolefin, or open cell polyurethane foam rod as recommended by the sealant manufacturer for the

- application; oversized 30 to 50 percent; "SofRod" as manufactured by Nomaco, or as approved.
2. Pavement: ASTM D5249, Type 3, round bi-cellular or closed cell polyethylene, urethane or neoprene foam rod; oversized 30 to 50 percent; "SofRod" as manufactured by Nomaco.
- F. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
- G. Gloss Reducer: Silica sand No. 20, color to match adjacent surface. Gloss reducer shall be provided at traffic sealant applications.
- H. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and approved by the sealant manufacturer as compatible, subject to the review of the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.02 PREPARATION

- A. Clean, prepare, and prime joints in accordance with manufacturer's instructions. Remove loose materials and other foreign matter which may impair adhesion of sealant.
- B. Verify that joint shaping materials and release tapes are compatible with sealant.
- C. Examine joint dimensions and size materials to achieve required width/depth ratios.
- D. Use joint filler to achieve required joint depths, to allow sealants to perform properly.
- E. Use bond breaker where required.
- F. Protect adjacent surfaces from damage by masking when necessary.

3.03 INSTALLATION

- A. General:
 1. Install sealant in accordance with manufacturer's instructions.

2. In general, seal openings and other locations which normally require sealant to seal against infiltration from air, water and most insects, including; but not limited to:
 - a. Construction and expansion joints.
 - b. Joints between dissimilar materials.
 - c. Joints around windows, door frames, louvers and other penetrations and openings in the exterior wall. Provide minimum 3/8 inch sealant installation (exteriors only) around doors and windows.
 - d. Interior wall openings.
 - e. Other locations indicated on drawings.
 3. Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature ranges.
- B. Joints:
1. Free of air pockets, foreign embedded matter, ridges, and sags.
 2. Tool joints concave.
- C. Apply sealant under pressure with hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed.
- D. Neatly point or tool joint surfaces to provide slightly concave surfaces, free of wrinkles and skips, uniformly smooth and with perfect adhesion along both sides of joint.

3.04 CLEANING

- A. Clean adjacent surfaces of sealant as work progresses.
- B. Use solvent or cleaning agent as recommended by sealant manufacturer.
- C. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

END OF SECTION

SECTION 08 11 10

STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Shop Drawings:
1. Submit shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door and frame types, conditions at openings, wall anchoring, details of construction, location and installation requirements of door and frame hardware reinforcements, and details of joints and connections.
 2. Provide a schedule of doors and frames using same reference numbers for details and door openings as those on the contract documents. Include the following information:
 - a. Location of opening.
 - b. Material thickness and/or gauge.
 - c. Jamb Depth and Throat Size.
 - d. Handing of opening.
 - e. Door core material.
 - f. Mortises and reinforcements.
 - g. Anchorage types.
 - h. Locations of exposed fasteners.
 - i. Glazed, louvered and paneled openings.
 - j. Mounting locations of standard hardware.
 - k. Independent Lab Certification of Compliance to ANSI A250.4 – 1996
- B. Fire Rated Doors and Frames:
1. Installation Instructions: Door and frame manufacturer shall clearly identify the hardware products, other materials and work requirements necessary to maintain compliance with UL 10(c) (positive pressure testing) as required by 2003 IBC Section 714.
 2. Certification: Submit certification that fire rated doors (including frames and hardware as a unit) will comply with UL 10(c) (positive pressure testing) as required by 2003 IBC Section 714.
- C. Furnish recognized independent test lab certification that products comply with ANSI A250.4,

1.02 DELIVERY AND STORAGE

- A. Deliver welded frames with spreaders and doors with wrappers.
- B. Store doors and frames under protective cover in dry, enclosed spaces at the site. Place doors and frames on non-staining blocking Raise bottoms of doors at least 4 inches high and provide 1/4 inch air space between stacked doors to avoid metal to metal contact and permit air circulation.

1.03 QUALITY ASSURANCE

- A. Manufacturer shall be a member in good standing of the Steel Door Institute (SDI.)
- B. Doors and frames shall be certified to comply with ANSI A250.4, Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcing, and ANSI A250.8, Recommended Specifications for Standard Steel Doors and Frames.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide standard hollow metal doors and frames by the following:
 - 1. Steelcraft Manufacturing Co.
 - 2. Curries Company www.curries.com
 - 3. The Ceco Corporation www.cecodoor.com
 - 4. The Kewanee Corp. www.kewaneecorp.com
 - 5. Republic Builders Products www.republicdoor.com
 - 6. Fleming Steel Doors and Frames
- B. Doors and frames shall be furnished by the same Manufacturer.

2.02 MATERIALS

- A. Doors and frames shall be manufactured of commercial quality cold rolled steel per ASTM A366 and A568 general requirements or galvanized to A60 coating weight standard per ASTM-A924. Internal reinforcing may be manufactured of hot rolled pickles and oiled steel per ASTM-A569.
- B. Supports and anchors shall be fabricated of not less than 18 gauge sheet steel, galvanized where galvanized frames are used.
- C. Where items are to be built into exterior walls, inserts, bolts, and fasteners shall be hot dipped galvanized in compliance with ASTM-A153, Class C or D as applicable.
- D. Rust inhibitive enamel or paint primer shall be used, baked on, and suitable as a base for specified finish paints complying with ANSI A224.1, "Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces on Steel Doors and Frames."

2.03 FABRICATION- DOORS

- A. Provide 1-3/4" thick doors of materials and ANSI/SDI-100 grades and models specified below, or as indicated on drawings or schedules:
 - 1. Interior Doors: Grade II, Model 2
 - a. Interior doors shall be minimum 18 gauge steel with both lock and hinge rail edge of door welded and ground smooth the full height of door.
 - 2. Exterior Doors: Grade III, Model 2
 - a. Exterior doors shall be minimum 16 gauge galvanized steel with both lock and hinge rail edge of door welded and ground smooth the full height of door. Exterior doors shall be insulated with a solid slab of expanded polystyrene foam permanently

bonded to the inside of each face skin. The top of all doors shall be closed flush by the addition of a 16 gauge screwed-in top cap to prevent water infiltration.

- B. Doors shall be reinforced for hardware as shown below where necessary to preclude the use of thru-bolts.
 - 1. Exit Devices: 14 gauge
 - 2. Door Closers: 12 gauge
- C. Doors shall be beveled 1/8" in 2" on lock side and have top and bottom channels of not less than 16 gauge, flush or inverted, welded to the face sheets. Doors shall have a full height 14 gauge hinge rail reinforcement channel, or individual 7 gauge hinge reinforcements with high frequency hinge reinforcements.
- D. Doors to conform to ANSI-A250.4-1996 Level "A" criteria and be tested to 1,000,000 operating cycles and 23 twist tests. Independent Lab Certification of Level "A" doors is to be submitted with shop drawings.
- E. Fire-Rated Doors: Provide fire rated doors investigated and tested as fire door doors, complete with type of hardware to be used. Identify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors. Doors required to meet smoke and draft control assembly requirements shall have labels that identify that the door has been tested and approved for smoke and draft control assemblies (S-label). Construct doors to comply with NFPA Standard No. 80 and UL-10(c).

2.04 FABRICATION - FRAMES

- A. Provide hollow metal frames for doors, transoms, sidelights, borrowed lights, and other openings, of types and styles as shown on the drawings and schedules. Conceal fastenings unless otherwise indicated.
 - 1. Interior Frames: 16 gauge
 - 2. Exterior Frames: 16 gauge
- B. Fabricate frames with mitered and faces only welded corners, re-prime at the welded areas. All welds to be flush with neatly mitered or butted material cuts.
- C. Frames shall have minimum 7 gauge hinge reinforcements, 14 gauge lock strike reinforcing, and 12 gauge closer reinforcing. All frames shall have minimum 7 gauge hinge reinforcements with an additional high frequency 12 gauge hinge reinforcement welded to the top hinge, 14 gauge lock strike reinforcing, and 12 gauge closer reinforcing.
- D. Provide temporary shipping bars to be removed before setting frames.
- E. Except on weather-stripped frames, drill stops to receive three (3) silencers on strike jambs of single frames and two (2) silencers on heads of double frames.
- F. Provide minimum 0.0179" thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.
- G. Construct frames for UL labeled doors in accordance with UL requirements and label as scheduled. Frames required to meet smoke and draft control assembly requirements shall have

labels that identify that the frame has been tested and approved for smoke and draft control assemblies (S-label).

2.05 FABRICATION - GLAZING FRAMES

- A. Construct in accordance with applicable parts of door frame Specification and as detailed. Extend partition frames around all four sides of openings.
- B. Provide glazing stops, removable one side and integral from the other side, secured with countersunk flat head Phillips screws spaced at not more than 16 inches on center and 2 inches from corners. Miter stops at corners.
- C. Provide fire-rated glazing as indicate on Drawings.

2.06 FABRICATION TOLERANCES

- A. Allowable Tolerances for Fabrication: As specified in ANSI/SDI-117, Manufacturing Tolerances Standard Steel Doors and Frames.

2.07 LOUVERS

- A. Where louvers will be utilized in an exterior door, provide weatherproof, stationary, Z- blade type (minimum 20 ga. Galvanized). Provide insect screen on interior face of louver. Where louvers will be utilized in an interior door, provide sight proof inverted V or Y louver(minimum 18 ga.), blades spaced for minimum 20 percent free area.

2.08 PAINTING

- A. Bonderize and prime doors and frames with one shop coat of rust inhibitive primer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install steel doors, frames, and accessories according to shop drawings, manufacturer's data, and as specified.
- B. Comply with provisions of SDI-105, "Recommended Erection Instructions for Steel Door Frames," unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - 1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings
 - 2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
 - 3. Install fire-rated frames according to NFPA 80.

- C. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100. Install fire rated doors with clearances specified in NFPA 80

3.02 FIELD QUALITY CONTROL

- A. Manufacturer's representative shall inspect fire rated doors (including frames and hardware as a unit) and verify compliance with UL 10C (positive pressure testing) as required by 2003 IBC Section 714. Fire rated doors (including frames and hardware as a unit) which do not comply with UL 10C (positive pressure testing) as required by 2003 IBC Section 714 shall be removed and replaced at no additional cost to Owner.

3.03 CLEANING

- A. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.
- B. Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- C. Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08 11 19

STAINLESS-STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Stainless-steel, hollow-metal doors.
 - 2. Stainless-steel, hollow-metal frames.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, temperature-rise rating, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Location of reinforcement and preparations for hardware
 - 5. Details of each different wall opening condition.
 - 6. Details anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of molding, removable stops, and glazing.
 - 9. Details of conduit and preparation for power, signal, and control systems.
- C. Sample for Verification:
 - 1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 125mm).
 - 2. Doors: Include section of vertical-edge, top, and bottom construction; core construction; glazing; and hinge and other applied hardware reinforcement.
 - 3. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- D. Schedule: Provide a schedule of stainless-steel, hollow-metal work prepared by under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with a door hardware schedule.

1.3 INFORMATIONAL SUBMITTALS

- A. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of stainless-steel, hollow-metal door and frame assembly.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain stainless-steel, hollow-metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection rating indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies proved certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250DEG C) above ambient after 30 minutes of standard fire-test exposure.
- C. Smoke – and Draft – Control Door Assemblies: At corridors, smoke barriers, and smoke partitions, provide 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 the tested pressure differential of 0.3 – inch wg (75 Pa) of water.
- D. Fire – Rated Borrowed – Light Frame Assemblies: Assemblies that are listed and labeled, by a testing agency acceptable to authorities having jurisdiction, for fire – protection rating indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite. Install in compliance with NFPA 80.
- E. Pre – installation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Shipping Spreaders: Deliver welded frames with two removable spreader bars across bottom of frames, tack welded or mechanically attached to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up. Spaced by blocking, on minimum 4 – inch – (100 – mm -) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
 - 1. If wrappers on doors become wet, remove cartons immediately. Provide minimum ¼- inch (6 – mm) space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for stainless-steel frames. Furnish setting drawings; templates, and directions for installing anchorages, including sleeves, inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ambico Limited
 - 2. Ceco Door Products; ASSA ABLOY Group Company.
 - 3. CURRIES Company; an ASSA ABLOY Group Company.
 - 4. Steelcraft; an Allegion product line.

2.2 STAINLESS-STEEL DOORS

- A. Description: Stainless – steel doors, not less than 1-3/4 inches (44mm) thick, of seamless, hollow-metal construction. Construct doors with smooth, flush surfaces without visible joints or seams on faces.
 - 1. Face Sheets: Fabricate from 0.078-inch-(1.98-mm-) thick, stainless-steel sheet.
 - 2. Core Construction:
 - a. Honeycomb cores.
 - b. Fire-Rated Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches (3mm in 50mm)
 - 4. Top and Bottom Channels: Closed with continuous channels, 0.062-inch- (1.59 -mm-) thick stainless steel.
 - a. Securely fastened using adhesive
 - 5. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.
 - a. Where indicated for installation of wiring, provide access plates to junction boxes, fabricate from same material, and thickness as face sheet and fasten with at least four security fasteners spaced not mor than 6 inches (152mm) o.c.
- B. Performance: Level A, ANSI A250.4
- C. Materials
 - 1. Stainless-Steel Sheet: ASTM A240/M, austenitic stainless steel, Type 316 for wet areas installation as indicated.
 - 2. Steel Sheet: ASTM A1008/A1008M or ASTM A1011/A1011M, Commercial Steel (CS), Type B.
 - 3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
 - 4. Honeycomb Cores: Manufacturer’s standard Kraft honeycomb board core impregnated with phenolic resin and laminated to both face sheets.
- D. Stainless-Steel Finishes:
 - 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passive and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. **Directional Satin Finish: No. 4.**

2.3 STAINLESS-STEEL PANELS

- A. Provide stainless-steel panels of same construction, materials, and finish as specified for adjoining stainless-steel doors.

2.4 STAINLESS-STEEL FRAMES

- A. Description: Fabricate stainless-steel frames of construction indicated, with faces of corners mitered and contact edges close tight.
 1. Door Frames: Saw mitered and full (continuously) welded.
 - a. Weld frames according to HMMA 820
 2. Sidelight Transom and Borrowed-Light Frames: Saw mitered and full (continuously) welded.
 3. Door Frames for Openings 48 Inches (1219 mm) Wide or Less: Fabricate from 0.078-inch- (1.98 -mm-) 0.109-inch- (2.78 -mm-) thick, stainless-steel sheet.
 4. Door Frames for Openings More Than 48 Inches (1219 mm) Wide: Fabricate from 0.109-inch-(2.78-mm) thick, stainless-steel sheet
 5. Borrowed-Light Frames: Fabricate from 0.078-inch-(1.98-mm-) thick, stainless-steel sheet.
 6. Sidelight and Transom Frames: Fabricate from stainless-steel sheet of same thickness as adjacent door frame.
 7. Glazing and Panel Stops: Formed integral with stainless-steel frames, minimum 5/8 inch (16mm) high, unless otherwise indicated.
 8. Loose Stops for Glazed Lites and Panels: 0.038-inch- (0.95-mm-) thick stainless steel.
 9. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.
 10. Head Reinforcement: 0.109-inch- (2.78 -mm-) tick, stainless-steel channel, or angle stiffener for openings widths more than 48 inches (1219mm).
 11. Jamb Anchors:
 - a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.062-inch-(1.59-mm-) thick stainless steel with corrugated or perforated straps not less than 2 inches (50mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.156 inch (4.0 mm) thick.
 - b. Stud-Wall Type: Designed to engage stud, welded to back of frame; not less than 0.050-inch- (1.27-mm-) thick stainless steel.
 - c. Compression Type for Slip-on Frames: Fabricate adjustable compression anchors from stainless steel.
 - d. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch (9.5-mm) diameter, stainless-steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
 12. Floor Anchors: Not less than 0.078-inch- (1.98-mm-) thick stainless steel, and as follows:
 - a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

- b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.
- 13. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- (9.5-mm-thick by 50-mm-) wide from stainless steel.
- 14. Plaster Guards: Not less than 0.019-inch- (0.48-mm-) thick stainless steel.

B. Performance: Level A, ANSI A250.4.

C. Materials:

- 1. Stainless-Steel Sheet: ASTM A240/A240M, austenitic stainless steel, Type 304 or 316 as indicated.
- 2. Steel Sheet: ASTM A1008/A1008M or ASTM A1011/A1011M, Commercial Steel (CS), Type B.
- 3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- 4. Frame Anchors: Stainless-steel sheet. Same type as door face.
- 5. Frame Anchors: Steel sheet, hot-dip galvanized according to ASTM A153/A153M, Class B.
- 6. Inserts, Bolts, and Anchor Fasteners: Stainless-steel components complying with ASTM F593 and ASTM F594, Allow Group 1 or 2 (ASTM F738M and ASTM F836M, Alloy Group 1 or 4) for bolts and nuts.
- 7. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

D. Finishes:

- 1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - c. **Directional Satin Finish: No. 4**

2.5 ACCESSORIES

- A. Glazing: Comply with requirements in Section 08 80 00 "Glazing"
- B. Grout: Comply with ASTM C476, with a slump of not more than 4 inches (102 mm) as measured according to ASTM C143/C143M.
- C. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15- mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- D. Mineral Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

2.6 FABRICATION

- A. **Stainless-Steel Door Fabrication:** Stainless-steel doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.
1. **Seamed Edge Construction:** Both vertical door edges joined by visible continuous interlocking seam (lock seam) full height of door.
 2. **Seamed Edge Construction:** Both vertical door edges joined by visible seam that is projection, spot, or tack welded on inside edges of door at minimum 6 inches (152 mm) o.c.
 3. **Seamless Edge Construction:** Door face sheets joined at vertical edges by continuous weld extending full height of door; with edges ground and polished, providing smooth flush surfaces with no visible seams.
 4. **Exterior Doors:** Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
 5. **Stops and Molding:** Factory cut openings in doors. Provide stops and moldings around glazed lites. Form corners of stops and moldings with butted or mitered hairline joints.
 - a. **Glazed Lites:** Provide fixed stops and moldings welded on secure side of door.
 - b. **Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.**
 6. **Hardware Preparation:** Factory prepare stainless-steel doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware"
 - a. **Reinforce doors to receive non-templated mortised and surface-mounted door hardware.**
 7. **Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."**
 8. **Tolerances:** Fabricate doors to tolerances indicated in ANSI/NAAMM-HMMA 866.
- B. **Stainless-Steel Frame Fabrication:** Fabricate stainless-steel frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site clearly identify work that cannot be permanently factory assembled before shipment.
1. **Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.** Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
 2. **Mullions Rails and Transom Bars:** Provide closed tubular members with no visible face seams or joints. Fasten members at crossings and to jambs by butt welding according to joint designs in HMMA 820.
 - a. **Provide false head member to receive lower ceiling where frames extend to finish ceilings of different heights.**
 3. **Provide countersunk, flat-, or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.**
 4. **Floor Anchors:** Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 5. **Jamb Anchors:** Provide number and spacing of anchors as follows:
 - a. **Masonry Type:** Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813mm) o.c. and as follows:
 - 1) **Two anchors per jamb up to 60 inches (1524mm) in height.**
 - 2) **Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.**
 - 3) **Four anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.**

- 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof more than 96 inches (2438 mm) in height.
- b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches (1524 mm) in height.
 - 2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
 - 3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610mm) or fraction thereof more than 96 inches (2438 mm) in height.
 - 5) Two anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.
- c. Compression Type: Not less than two anchors in each jamb.
- d. Post-installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.
6. Head Reinforcement: For frames more than 48 inches (1219 mm) wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows: Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
8. Stops and moldings: Provide stops and moldings around glazed lites and solid panels where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 - a. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
 - b. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each lite is capable of being removed independently.
 - c. Coordinate rabbet width between fixed and removable stops with type of glazing or panel and type of installation indicated.
9. Hardware Preparation: Factory prepare stainless-steel frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 "Door Hardware"
 - a. Reinforce frames to receive non-templated mortised and surface-mounted door hardware.
 - b. Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
10. Plaster Guards: Weld guards to frame at back of hardware mortises and mounting holes in frames to be grouted.
11. Tolerances: Fabricate frames to tolerances indicated in ANSI/NAAMM-HMMA 866.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of stainless-steel doors and frames.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of stainless-steel, door-frame connections before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace stainless-steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - 1. Squareness: Plus, or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus, or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus, or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus, or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install stainless-steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with ANSI/NAAMM-HMMA 866 and manufacturer's written instructions.
- B. Stainless-Steel Frames: Install stainless-steel frames of size and profile indicated.
 - 1. Set frames accurately in position: plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frame before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Apply corrosion-resistant coating to backs of grout-filled frames.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
 - a. Floor Anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors, if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 5. In place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
 7. Grouted Frames: Solidly fill space between frames and substrate with grout. Take precaution, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
 8. Installation Tolerances: Adjust stainless-steel frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus, or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus, or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus, or minus Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus, or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- C. Stainless-Steel Doors: Fit non-fire rated doors accurately in frames with the following clearances:
1. Non-Fire-Rated Doors:
 - a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm)
 - b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm)
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19mm).
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105.
- D. Glazing: Install glazing in sidelights, transoms, and borrowed lights to comply with installation requirements in Section 08 80 00 "Glazing."
1. Secure stops with countersunk, flat-, or oval head machine screws spaced uniformly not more than 9 inches (230 mm) o.c., and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work including stainless-steel doors or frames that are warped, bowed, or otherwise unacceptable.

- B. Clean grout and other bonding material off stainless-steel doors and frames immediately after installation.
- C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

END OF SECTION

SECTION 08 62 00

UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Curb-mount polycarbonate unit skylights
 - 2. Curb-mount motorized polycarbonate unit skylight (1).
- B. Related Sections:
 - 1. Division 06 "Miscellaneous Carpentry"
 - 2. Division 07 Thermoplastic Roofing
- C. Refer to roofing systems for roofing accessories to be built into the roofing system to accommodate Work of this Section.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Provide unit skylights capable of withstanding loads indicated without failure. Failure includes the following:
 - 1. Thermal stresses transferred to the building structure.
 - 2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing.
 - 3. Noise or vibration created by thermal and structural movement and wind.
 - 4. Loosening or weakening of fasteners, attachments, and other components.
 - 5. Sealant failure.
- B. Skylights:
 - 1. Thermal performance must be NFRC Certified and posted as such with the NFRC.
 - 2. Thermal and VLT performance:
 - a. Tufflite 60% VLT, 0.71 U Factor, 0.26 SHGC.
 - 3. Conform with Federal, state and local code bodies having jurisdiction.
 - 4. Designed to withstand forces of nature deemed necessary by those code bodies for specified project location.
 - 5. Meet or exceed thermal performance values of ICC IECC.
 - 6. Meet or exceed requirements of ASHRAE 90.1
 - 7. Conform to recommendations of AA Specifications for Aluminum Structures.
 - 8. Designed to carry minimum 20 psf tributary roof load or greater per site as specified in ICC, IBC.
 - 9. Teste to AAMA/WDMA/CSA 101/I.S.2/A440.
 - 10. Performance criterions supported by test reports from an accredited, third party test laboratory.
 - 11. Certified to FBC TAS 201, 202, and 203.
 - 12. FM approved Class Number 4431.

1.3 SUBMITTALS

- A. Product Data: For each type of skylight specified, including details of construction relative to materials, dimensions of individual components, profiles, finishes, and glazing light transmission and thermal characteristics.
- B. Shop Drawings: Show fabrication and installation of skylights, including plans, elevations, sections, details of components, and attachments to other units of Work.
- C. Samples for Selection: Manufacturer's color charts showing a full range of colors available for each type of skylight glazing, retainer, frame, and curb indicated.

1.4 DELIVERY, HANDLING, STORAGE

- A. Deliver products in manufacturer's original containers dry, undamaged, seals and labels intact.
- B. Store and protect products in accordance with manufacturer's recommendations.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Primary products supplied by single manufacturer with minimum of ten (10) years' experience.
- B. Installer Qualifications: Skylights installed by single installer with minimum of five (5) years demonstrated experience in installing products of same type and scope as specified.

1.6 PROJECT CONDITIONS

- A. Do not install skylights unless temperature, humidity, and ventilation are within limits set by manufacturer.

1.7 WARRANTY

- A. Provide manufacturer's standard five (5) year limited warranty against manufacturing defects, outlining terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN:

- 1. Kingspan Light + Air, 401 E Goetz, Ave, Santa Ana, CA 92707, phone 714-540-8950, fax 714.540.5415 <http://www.kingspanlightandair.us>
- 2. Applicable models:
 - a. Kingspan Tufflite 1919 aluminum framed skylight with thermal barrier. Outside curb dimension 22" x 22".
 - b. Bristol Curb Mounted Sky Vent 1919-AL-ESD (motorized skylight unit) with thermal barrier.. Outside curb dimension 22" x 22".

2.2 MATERIALS

- A. Aluminum Extrusions:
 - 1. ASTM B221, 6063-T-6 alloy and temper.

2.3 UNIT SKYLIGHTS

- A. Dome Shape: Bubble
- B. Glazing:
 - 1. Outer glazing: Clear polycarbonate
 - 2. Inner glazing: White polycarbonate
- C. Dome Material: Tested to and pass:
 - 1. UBC-26-7 and ASTM D635 achieving minimum CC1 rating.
 - 2. ASTM D2843.
 - 3. ASTM D1929.
 - 4. FM 4431 (hail test).
- D. Frame:
 - 1. Frame type: Curb mounted, with thermally barrier break.
 - 2. Frame construction:
 - a. Architectural grade extruded aluminum, minimum 0.075 inch thick,
 - b. Squared with 90 degree corners and flat on one plane be insertion of corner stabilizers prior to full heliarc welding.
 - c. Full perimeter condensation trough with minimum of six non-clog weep holes routed to outside of frame.
 - d. Contain AAMA compliant "poured and debridged" long life, polyurethane thermal break separating interior and exterior aluminum.
 - e. Utilize continuous UL Listed PVC long life "thermal barrier break"insulating interior and exterior aluminum.
 - 3. Frame cap:
 - a. Architectural grade extruded aluminum, minimum 0.050 inch thick
 - b. Frame cap squared and flat prior to full heliarc welding.
 - 4. Sealing gasket: Custom formed, UL Listed, 25 years, engineered thermoplastic.
 - 5. Frame Finish: Clear anodized.

2.4 FABRICATION

- A. Skylights factory assembled and glazed, ready for installation.
- B. Fabricate skylights weather tight and free of visual distortions and defects.
- C. Protect exterior drip/counter flashing and drainage ports from weather and airborne debris.
- D. Miter and full penetration weld corners of curb and retaining frames.
- E. Seal retaining frames securing glazing panels along each side under spring tension with silicone sealant along full perimeter of retaining frame.

- F. Pre-drill frames for anchorage to roof curbs.
- G. Seal glazing panels to base frame with allowance for expansion and contraction.
- H. Provide exterior weep hole arrangement.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting skylight performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Metal Protection: As follows:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
 - 3. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.
- B. Coordinate with installation of roof deck and other substrates to receive skylight units.
- C. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- D. Counter Flashing: Where counter flashing is required as component of the skylight, install to provide an adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

3.4 CLEANING AND PROTECTION

- 1. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

2. Clean and polish plastic skylight units, inside and out, not more than 5 days prior to date of substantial completions.

END OF SECTION

SECTION 08 63 50
OPERABLE SKYLIGHTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Performance and product component information for VELUX top hinged VSS solar deck mount venting skylight
- B. Related Sections:
 - 1. Division 06 "Miscellaneous Carpentry"
 - 2. Division 07 Thermoplastic Roofing
- C. Refer to roofing systems for roofing accessories to be built into the roofing system to accommodate Work of this Section.

1.2 REFERENCE STANDARDS

- A. ASTM E 283 – Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors While under Specific Pressure differences Across the Specimen.
- B. ASTM E 330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- C. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- D. ASTM E 1886 – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles(s) and Exposed to Cyclic Pressure Differentials.
- E. ASTM E 1996 – Standard Specifications for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.

1.3 SYSTEM DESCRIPTION

- A. Skylight: Top hinged ventilated deck mounted skylight that consists of the following integrated components – an interior condensation drainage gasket, pre-finished white wooden frame and sash for all sizes, a solar operator, exterior maintenance free aluminum cladding/counter flashing, ASA corner keys, and an insulating thermal pane glass unit with two panes, warm edge spacer system, three coats of low e silver to increase visible light transmittance while reducing solar heat and a continuous deck seal mounting system with durable foam seal.

- B. Configuration: Outward opening, continuous top hinged, production-installed electric, solar or manual chain operator, engineered deck seal mounting system with durable foam seal to seal the skylight to the roof deck. Pre-installed accessory mounting brackets and pre-wired for VSE electric venting models.
- C. Operation: Sash is operated by either an [electric skylight operator for (VSE)] or [manual skylight operator for (VS)] or [solar skylight operator for (VSS)]
 - a. Solar operator (VSS) 2.4 GHz radio frequency remote control and a chain driven operator is powered by a solar charged battery operator. Battery pack is a 9 cell Panasonic NiMH 10.8V, 2100 mA.H. a.
- D. Condensation Control: Integral internal condensation collection system and drainage slots.
- E. Power supplies and electric controls to be provided (sold separately).
 - 1. KLB 100 Battery backup for VSE
 - 2. KLI 110 Wall mounted keypad

1.4 PERFORMANCE REQUIREMENTS

- A. The VSS deck mount skylights independently tested in accordance with listed standards for compliance with the unit skylight provisions of the 2006, 2009 and 2012 IBC, IECC, and IRC. Performance is dependent on skylight size and glazing type. The maximum values have been listed below.
 - 1. AAMA/WDMA/CSA 101/I.S.2/A440-08 (NAFS – 08) and/or AAMA/WDMA/CSA 101/1.S.2/A440-11 (NAFS – 11) performance grades must be greater than or equal to the following listed in i and ii.
 - i. Downward design pressure = 175 psf
 - ii. Uplift Design Pressure = 50 psf
- B. Air leakage: Less than or equal to 0.7 l/s/m² (0.13 CFM/ft²) of total unit area, measured at a pressure of 75 Pa (1.57 psf) as measured in accordance with ASTM E 283, on test sizes listed per the NAFS in (A).
- C. Water infiltration: No water penetration noted as measured in accordance with ASTM E 331 with a test pressure differential of 720 Pa (15.0 psf). Exceeds requirements of NAFS standards in (A).
- D. Thermal Performance: No greater than U = 0.43 Btu/hr*ft² * F°, SHGC = 0.23 and Vt = 0.52 or greater (clear) or Vt = 0.39 (white). Tested and certified in accordance with NFRC 100 and 200 procedures. Meets ENERGY STAR® criteria for all zones.
- E. VSS skylights with impact glazing (06): Tested and certified in accordance with ASTM E 1886 and ASTM E 1996, cycle pressure +/- 50, Missile level C, Wind Zone 3.
- F. Limit member deflection to flexure limit of glass with full recovery of glazing materials.
- G. System accommodates without damage to components or deterioration of seals, movement between sash and frame and perimeter framing.

- H. Weep drainage system designed to channel water entering joints, condensation, or migrating moisture occurring within system to exterior by means of Santoprene® gasket with integrated condensation gasket.
- I. Listed Florida product approval number.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's installation details and product data sheets included:
 - 1. Preparation details and installation instructions
 - 2. Product Data sheets with storage and handling information
- B. Architectural/Cross Sectional Drawings
 - 1. Mounting details
 - 2. Frame sizes
 - 3. Flashing details
- C. Shop Drawings
 - 1. Indicate material types, gauge, finishes, and installation details.
- D. Maintenance data: For unit skylights unit skylight flashing system to include in maintenance manuals.
- E. Warranty: Sample of warranty or special warranty

1.6 DELIVERY, HANDLING, STORAGE

- A. Deliver products in manufacturer's original containers dry, undamaged, seals and labels intact.
- B. Store and protect products in accordance with manufacturer's recommendations.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Skylight manufacturer shall have a minimum of ten years experience in design and fabrication of deck mount glass skylights.
 - 2. Skylights shall be manufactured to the highest standards of quality and craftsmanship in ISO 9001 and ISO 14001-certified facilities.
 - 3. Flashings shall be engineered and manufactured for the roofing material and skylight.

4. Skylight installed with three layers of protection: Deck seal mounting system, adhesive underlayment wrapped round the skylight frame and onto the roof deck, and engineered flashings, carries a "No Leak" installation warranty.
- B. Source Limitations: Obtain unit skylights, flashings, and accessories from single source and from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and Labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application
- D. Unit Skylight Standard: Comply with AAMA/WDMA 101/I.S.2./NAFS, North American Fenestration Standard Voluntary Performance specifications for Windows, Skylights and Glass Doors, and all later editions for minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
- E. Provide WDMA Hallmark certified unit skylight with an attached label.
- F. Thermal Performance – rated per applicable NFRC procedures.

1.8 COORDINATION

- A. Coordinate unit skylight flashing requirements with roofing system.
- B. Coordinate size and locations of site built curbs with ECB flashing for actual unit skylight if the slope of the roof is less than 14 degrees.

1.9 WARRANTY

- A. Standard VELUX warranty, as specified in VELUX Warranty, publication XUS 20194.
- B. 10-Year "No Leak" installation warranty, as specified in VELUX Warranty, publication XUS 20194.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in manufacturer's original containers, dry, undamaged, seals and labels intact.
- B. Store and protect products in accordance with manufacturer's recommendations.
- C. Do not install skylights unless temperature, humidity, and ventilation are within limits set by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Acceptable Manufacturer: VELUX America Inc., P.O. Box 5001, Greenwood, SC 29648-5001; Toll Free Tel: 800-888-3589; Fax: 864-943-2631; Web: www.VELUXusa.com

- B. Substitutions: Not permitted

2.2 MATERIALS

- A. Wood: Kiln-dried, laminated Ponderosa Pine pre-painted with two coats of white finish. Special order stain grade variant available upon request. Wood shall be Forest Stewardship Council (FSC) certified or have an FSC certified chain of custody certification.
- B. Maintenance free exterior cladding: Roll formed 0.65 mm aluminum frame coverings, 0.57 mm aluminum sash coverings, 0.55 mm copper frame coverings, 0.50 copper sash coverings prefinished, production engineered, and fabricated to fit exterior exposed surfaces.
- C. Dual sealed Glazing
- D. Dual sealed thermal pane with warm edge technology, 95% argon gas, and with three layers of LoE³ silver that increases visible light over standard low e coatings while lowering the solar heat gain. The following glazing options are selected:
- E. 08 – Tempered LoE³ pane with Neat coated exterior over a laminated heat strengthened interior pane with a (0.030”) white vinyl interlayer
- F. Operators
 - 1. Solar operator (VSS) is powered by a solar charged battery operator. Battery pack is a 9 cell Panasonic NiMH 10.8V, 2100 mAH. 60 Hz rating assembly that uses a robust chain driven system to open the skylight 11 inches. A 2.4 GHz radio frequency remote control pad is standard component with each VSS. Optional interface controls include the KLF/repeater sensor interface and the KLI 110 wall mounted keypad.
- G. Fasteners: 1-1/4 inch ring shank nails provided for attaching deck seal mounting flange to roof decking. Ring shank nails are double hot dipped zinc coated.
- H. Weather stripping: Factory applied neoprene and thermoplastic elastomer weather stripping throughout entire frame and sash, profiled to effect weather seal.
- I. Screen: Aluminum screen profile, spring metal clip attachment, 0.28 mm glass fiber thread with PVC coating, charcoal in color.
- J. Mounting System: Continuous corrosion resistant steel mounting system with a durable foam seal and rough opening alignment notches

2.3 FLASHING OPTIONS

- A. Type EDL Flashing is a prefabricated step flashing system designed for use with roofing materials less than 1/2" thick and for slopes of 14 degrees to 85 degrees.
- B. Type EDW Flashing is a prefabricated gutter flashing system designed for use with roofing material greater than 3/4" thick, or high profile material, and for roof slopes of 14 degrees to 85 degrees. Sill flashing section consists of corrugated apron to allow form fit of high profile material.

- C. Type EDM Flashing is a prefabricated flashing system designed for use with metal roofing materials and for roof slopes of 14 degrees to 85 degrees. Sill flashing section consists of corrugated apron to allow form fit of roofing material profile.
- D. Type EDL Flashing is a prefabricated step flashing system designed for use with roofing materials less than 1/2" thick and for slopes of 14 degrees to 85 degrees.
- E. Type EDW Flashing is a prefabricated gutter flashing system designed for use with roofing material greater than 3/4" thick, or high profile material, and for roof slopes of 14 degrees to 85 degrees. Sill flashing section consists of corrugated apron to allow form fit of high profile material.
- F. Type EDM Flashing is a prefabricated flashing system designed for use with metal roofing materials and for roof slopes of 14 degrees to 85 degrees. Sill flashing section consists of corrugated apron to allow form fit of roofing material profile.

2.4 FABRICATION

- A. Fabricate frame with slip mortise and tendon corners that are glued and nailed for strength and stability.
- B. Fabricate frame components with precision tolerances enabling installation and movement of sash and dynamic movement of perimeter weather stripping.
- C. Provide permanent external drainage channels to manage water flow and drain to the exterior. Provide internal drainage of glazing spaces to exterior through gasketing.
- D. Assemble insect screen of rolled aluminum rectangular sections. Sections are square cut and assembled using square corner keys. Fit mesh taut and secure with vinyl spline.
- E. All units factory glazed with hot melt silicone-based exterior seal
- F. Rough opening to be framed per manufacturer's listed dimensions.

2.5 FINISHES

- A. Exterior surfaces: Exposed exterior wood surfaces to be covered with roll formed maintenance free [aluminum] [copper as a special order] cladding pieces. Aluminum has a neutral gray, Kynar 500 polyvinylidene fluoride resin finish. Copper is roll-formed, mill finish.
- B. Maintenance-free flashing: Roll formed aluminum, neutral gray, baked on polyester polyamid primer and finish coats. Copper is roll formed, mill finish.
- C. Interior surface: All exposed interior wood surfaces to be finished white with a 10-year maintenance free finish.
- D. Screens: Frames – white aluminum, mesh – charcoal.
- E. Operator - concealed beneath white removable cover.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting skylight performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Metal Protection: As follows:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
 - 3. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.
- B. Coordinate with installation of roof deck and other substrates to receive skylight units.
- C. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- D. Counter Flashing: Where counter flashing is required as component of the skylight, install to provide an adequate waterproof overlap with roofing or roof flashing (as counterflashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

3.4 CLEANING AND PROTECTION

- 1. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.
- 2. Clean and polish plastic skylight units, inside and out, not more than 5 days prior to date of substantial completions.

END OF SECTION

08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

1. Finish hardware for doors.
2. Electronic hardware.
3. Thresholds & weatherstripping
4. Keying System
5. Templates
6. Hardware schedule

1.2 RELATED SECTIONS

1. 08 11 00 - Hollow metal doors and frames.
2. 08 14 00 - Wood doors.
3. 08 41 00 - Entrances and Storefronts.

1.3 REFERENCES

- A. Publications of agencies and organizations listed below form a part of this specification section to the extent referenced.
1. DHI - Recommended Locations for Builders' Hardware.
 2. NFPA 80 - Standards for Fire Doors and Windows.
 3. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
 4. UL - Building Material Directory.
 5. DHI - Door and Hardware Institute
 6. WHI - Warnock Hersey
 7. BHMA - Builders Hardware Manufacturers Association
 8. ANSI – American National Standards Institute
 9. IBC - International Building Code Edition as adopted and amended by local building code authorities

1.4 SUBMITTALS

- A. Schedules: Submit detailed finish hardware schedule and product data in accordance with section 01 35 00.

1. Furnish a typewritten schedule in vertical format complete with catalog cuts. Schedule shall be complete, including type, manufacturers name and number, and finish of each item required. Include complete schedule of keying system.
- B. Samples: If requested, submit sample of each type of finish hardware proposed for the project. If approved, samples may be used on project.
- C. Templates: Furnish templates required for fabrication of hollow metal doors and frames, aluminum and glass doors, or other items related to hardware

1.5 QUALITY ASSURANCE

- A. Supplier: Hardware supplier shall have a minimum of three years experience in supplying hardware for projects of this size and scope and shall have in his employ a certified Architectural Hardware Consultant (AHC) to prepare submittals and coordinate proper preparation for and installation of hardware.
- B. Substitutions: Manufacturers and model numbers listed are owner's standards, no substitution.
- C. Regulatory requirements: Conform to code requirements applicable to fire rated doors and frames and to accessibility for the physically handicapped.
- D. 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 and/or security consultants.

1.6 COORDINATION

- A. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Package each item of hardware in original containers and mark each to correspond with heading numbers on the hardware schedule.
- B. Include necessary instructions, templates, drawings and fasteners for proper installation.
- C. Store off the floor in a clean dry area out of the way of work in progress

GLA #19107

Sedona Police Station Renovation
City of Sedona

05/14/21
Door Hardware

1.8 WARRANTY

- A. Provide warranty of hardware items for one year.
 - 1. Provide a ten year warranty for door Lever locks.
 - 2. Provide a one year warranty for door Electrified locks.
 - 3. Provide a ten year warranty for door Closers.

PART 2 - PRODUCTS

MANUFACTURERS

- A. Catalog numbers of manufacturers listed in the first column have been used to establish the quality required. Manufacturers listed in the other columns are acceptable. No Substitution.

Hinges	Ives
Locks	Falcon, Schlage as noted
Closers	Falcon
Flat goods	Ives
Exit Device	Falcon
OH Stops	Glynn Johnson
Thresholds.	Zero
Weatherstrip	Zero

2.02 MATERIALS

- A. Screws and Fasteners: Furnish all exposed fasteners to match item being secured. Make all fasteners of the same material as item being fastened except provide stainless steel or brass for securing aluminum items.
- B. 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.
 - 4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with enough and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

GLA #19107

Sedona Police Station Renovation
City of Sedona

05/14/21
Door Hardware

C. Hinges:

1. Full mortise template hinges, ball bearing type.
2. Non-removable pin and heavy weight at exterior doors.
3. Furnish quantity of hinges as follows:
 - a. Doors to 60" high: 2 hinges
 - b. Doors over 60" to 90" high: 3 hinges
 - c. Doors over 90" to 120": 4 hinges
4. Furnish hinge sizes as follows:
 - a. For 1 3/4" doors to 3'0" wide: 4.5" x 4.5" as specified
 - b. For 1 3/4" doors over 3'0" wide: 5 x 4.5" heavy weight
 - c. Width of hinges adjusted to clear adjacent trim.
5. Provide hinges with electrified options as scheduled in the hardware sets. Provide with enough and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

D. Locksets and Latchsets

1. Bored type locksets complying with ANSI 156.2 Series 4000 Grade 1.
2. Provide 2 3/4" backsets unless job conditions dictate otherwise.
3. Provide strikes with extended lip where required to protect trim from damage by latchbolt.
4. Falcon T series Dane levers specified as the standard of quality.
5. Mortised type locksets complying with ANSI 156.13 Series 1000 Grade 1.
6. Provide 2 3/4" backsets unless job conditions dictate otherwise.
7. Provide strikes with extended lip where required to protect trim from damage by latchbolt.
8. Schlage L9000 06A levers specified as the standard of quality.
9. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
10. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:
 - a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
 - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
 - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
 - d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
 - e. Connections – provide quick-connect Molex system standard.

E. Exit Devices

GLA #19107

Sedona Police Station Renovation

City of Sedona

05/14/21

Door Hardware

1. All to be U.L. approved for casualty. All fire doors to be equipped with rated exit devices meeting fire label requirements.
2. Provide all exit devices from one manufacturer.
3. Falcon 24/25 series specified as the standard of quality.
4. Provide cylinders as required by exit device for proper operation.

F. Door Closers

1. Bodies to be cast aluminum with three separate control valves, including backcheck, ANSI Grade 1.
2. Closers to match adjacent hardware.
3. Provide all closers with thru bolts.
4. All closers to comply with Americans with Disabilities Act requirements.
5. Falcon Series: SC71A – Exterior, SC81A – Interior as the standard of quality.

G. Kick Plates

1. Provide .050 x 10" high x 2" less than door width for single doors and 1" less than door width for pairs.
2. Provide bevel four edges, countersink fasteners.
3. Ives 8400 series specified as the standard of quality.

H. Push Plates

1. Provide .050 x 8" x 16" push plates unless conditions dictate otherwise.
2. Ives 8200 series specified as the standard of quality.

I. Pull Plates

1. Provide .050 x 4" x 16" plate with 10" c/c pull.
2. Ives 8303 series specified as the standard of quality.

J. Flush Bolts

1. Manual flush bolts equal to Ives FB458 with 12" rods.
2. Provide extension rods where conditions dictate.

K. Door Stops

1. Wall stops shall be used whenever possible. Use dome type floor stops where wall stops cannot be used.
2. Ives WS406/407 specified as the standard of quality.

L. Silencers

1. Provide 3 for each single door and 2 for each pair of doors. Not required on door having weatherstripping or gasketing.

GLA #19107

Sedona Police Station Renovation

City of Sedona

05/14/21

Door Hardware

M. Thresholds and Weatherstripping as listed in hardware sets.

2.03 FINISHES

A. Provide matching finishes for hardware items at each door opening to the greatest extent possible, except as otherwise indicated.

B. Provide finishes which comply with those established by BHMA listed in "Materials and Finishes Standard 1301".

C. Finishes for this project are as follows;

1. Hinges	652/630
2. Locksets	626
3. Exit Devices	626
4. Flat Goods	630
5. Stops	630
6. Closers	689

2.04 KEYING

A. Key all locks into existing master key system in accordance with owner's instructions.

B. Key cabinet to be 150% of capacity, equal to Lund 1200 Series.

C. Knox Box as directed by Architect, must meet local Fire Dept Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine doors, frames and related items for conditions that would prevent proper application of finish hardware. Do not proceed until defects have been corrected.

3.02 INSTALLATION

A. Install each item in accordance with manufacturer's instructions and recommendations. Set units level, plumb and true to line and location. Do not install surface mounted items until finishes have been completed on substrate.

B. Hardware vendor to coordinate with general contractor on all blocking requirements.

GLA #19107

Sedona Police Station Renovation

City of Sedona

05/14/21

Door Hardware

- C. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- D. Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

3.03 ADJUST AND CLEAN





- A. At final completion hardware shall be left clean and free from disfigurement. Make a final adjustment to closers and other items of hardware. Where hardware is found defective repair or replace or otherwise correct as required.
- B. Occupancy Adjustment: Approximately **six** 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.

3.04 HARDWARE SETS

- A. While the following hardware sets are intended to cover all doors and establish a type and standard of quality, it is the responsibility of the hardware supplier to examine the plans and specifications and furnish proper hardware for all openings. The hardware supplier shall review the entire specification versus the door schedule and notify the architect of any errors, inconsistencies, or omissions during the bid period.

⚡ = Hardware Item Requiring Electrical Coordination

HARDWARE GROUP NO. 200

005	006	015	016			
Provide each SGL door(s) with the following:						
QTY	EA	DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5		630	IVE
1	EA	PRIVACY LOCK	MA311 OCCUPIED/VACANT DGM		630	FAL
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

PROVIDE 3 HINGES AT OPENINGS UNDER 7'6" HEIGHT.

GLA #19107

Sedona Police Station Renovation
City of Sedona









05/14/21

Door Hardware

HARDWARE GROUP NO. 201

007 017

Provide each SGL door(s) with the following:









QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4 NRP		652	IVE
1	EA	CLASSRM DEADBOLT	D111P6		626	FAL
1	EA	PUSH PLATE	8200 8" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	SC81A HW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	DOOR SEAL	488S		BK	ZER

PROVIDE 3 HINGES AT OPENINGS UNDER 7'6" HEIGHT.

HARDWARE GROUP NO. 202

010 011 014

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4 NRP		652	IVE
1	EA	CLASSRM DEADBOLT	D111P6		626	FAL
1	EA	PUSH PLATE	8200 8" X 16"		630	IVE
1	EA	PULL PLATE	8303 10" 4" X 16"		630	IVE
1	EA	SURFACE CLOSER	SC81A HW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	DOOR SEAL	488S		BK	ZER





PROVIDE 3 HINGES AT OPENINGS UNDER 7'6" HEIGHT.

MOUNT CLOSER ON PULL SIDE.

HARDWARE GROUP NO. 203

019 024 025 026 028





Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRY / OFFICE LOCK	T511CP6 DAN		626	FAL
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	DOOR SEAL	488S		BK	ZER

HARDWARE GROUP NO. 204

022 027

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRY / OFFICE LOCK	T511CP6 DAN		626	FAL
1	EA	OH STOP	410S		689	GLY
1	EA	DOOR SEAL	488S		BK	ZER

GLA #19107

Sedona Police Station Renovation

City of Sedona








05/14/21

Door Hardware

HARDWARE GROUP NO. 205

008 030







Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRY / OFFICE LOCK	T511CP6 DAN		626	FAL
1	EA	OH STOP & HOLDER	410H		689	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 206

012








Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	STOREROOM LOCK	T581CP6 DAN		626	FAL
1	EA	OH STOP & HOLDER	410H		689	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 207

013 021







Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	T581CP6 DAN		626	FAL
1	EA	OH STOP & HOLDER	410H		689	GLY
1	EA	SURFACE CLOSER	SC81A RW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 208

020 023

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	MA311 OCCUPIED/VACANT DGM		630	FAL
1	EA	SURFACE CLOSER	SC81A RW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	DOOR SEAL	488S		BK	ZER

GLA #19107

Sedona Police Station Renovation

City of Sedona

05/14/21

Door Hardware

HARDWARE GROUP NO. 209

009 018

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CLASSRM DEADBOLT	D111P6		626	FAL
1	EA	SMALL PULL	1822		630	TRM
			MOUNT ON INSIDE			
1	EA	FLUSH PULL	950		626	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 210

029

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	HINGE	5BB1HW 4.5 X 4 NRP		652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8	⚡	652	IVE
1	EA	EL MORTISE LOCK	L9095P6EL 06A RX CON 12/24 VDC	⚡	626	SCH
1	EA	SURFACE CLOSER	SC81A RW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	DOOR SEAL	488S		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER
1	EA	THRESHOLD	656A-MSLA-10		A	ZER
1	EA	WIRE HARNESS	CON-XXP SIZE AS REQUIRED	⚡		SCH
2	EA	CREDENTIAL READER	BY SECURITY VENDOR		BLK	HID
1	EA	DOOR CONTACT	679-05 BY SECURITY VENDOR	⚡	WHT	SCE
1	EA	POWER SUPPLY	PS902 900-BBK 900-2RS		LGR	SCE
1	SET	WIRING & CONNECTIONS	BY DIVISION 26 / DIVISION 28			
1	SET	CONDUIT & RACEWAY	BY DIVISION 26 / DIVISION 28			
1	EA	WIRING DIAGRAMS	ELEVATION 2009	⚡		VON

DOOR NORMALLY CLOSED AND LOCKED.

PRESENT CREDENTIAL TO CARD READER FOR ENTRY / EGRESS, KEY OVERRIDE.

AUTHORIZED CREDENTIAL TO SHUNT DOOR POSITION SWITCH UPON ENTRY/ EGRESS.

LOCKSET TO BE TIED TO THE FIRE ALARM, FREE EGRESS.

DOOR TO REMAIN UNLOCKED, FAIL SAFE DURING POWER FAILURE.

GLA #19107

Sedona Police Station Renovation

City of Sedona

05/14/21

Door Hardware

HARDWARE GROUP NO. 211

001	002	003	004		FINISH	MFR
Provide each SGL door(s) with the following:						
QTY		DESCRIPTION	CATALOG NUMBER			
2	EA	HINGE	5BB1HW 4.5 X 4 NRP		652	IVE
1	EA	ELECTRIC HINGE	5BB1HW 4.5 X 4.5 CON TW8		⚡ 652	IVE
1	EA	EL MORTISE LOCK	L9095P6EL 06A RX CON 12/24 VDC		⚡ 626	SCH
1	EA	SURFACE CLOSER	SC81A RW/PA FC		689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	DOOR SEAL	488S		BK	ZER
1	EA	DOOR SWEEP	111AA		AA	ZER
1	EA	WIRE HARNESS	CON-XXP SIZE AS REQUIRED		⚡	SCH
2	EA	CREDENTIAL READER	BY SECURITY VENDOR		BLK	HID
1	EA	DOOR CONTACT	679-05 BY SECURITY VENDOR		⚡ WHT	SCE
1	EA	POWER SUPPLY	PS902 900-BBK 900-2RS		LGR	SCE
1	SET	WIRING & CONNECTIONS	BY DIVISION 26 / DIVISION 28			
1	SET	CONDUIT & RACEWAY	BY DIVISION 26 / DIVISION 28			
1	EA	WIRING DIAGRAMS	ELEVATION 2009		⚡	VON

DOOR NORMALLY CLOSED AND LOCKED.
 PRESENT CREDENTIAL TO CARD READER FOR ENTRY / EGRESS, KEY OVERRIDE.
 AUTHORIZED CREDENTIAL TO SHUNT DOOR POSITION SWITCH UPON ENTRY/ EGRESS.
 LOCKSET TO BE TIED TO THE FIRE ALARM, FREE EGRESS.
 DOOR TO REMAIN UNLOCKED, FAIL SAFE DURING POWER FAILURE.

END OF SECTION

GLA #19107

Sedona Police Station Renovation
 City of Sedona

05/14/21
 Door Hardware

SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.01 PERFORMANCE REQUIREMENTS

- A. Glass thickness indicated on Drawings. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with IBC Chapter 24 and as published by the Glass Association of North America (GANA).

1.02 SUBMITTALS

- A. Product Data: Submit manufacturer's Product Data for glass, including the following:
 - 1. Structural, physical and environmental characteristics.
 - 2. Size limitations.
 - 3. Special handling or installation requirements
 - 4. Special application requirements for glazing materials.
- B. Samples: Submit samples as follows:
 - 1. Two samples 8 x 8 inch in size, illustrating glass units, coloration and design.
 - 2. Four inch long bead of glazing sealant, color as selected.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform to IBC Chapter 24, to local requirements and to State law.
- B. Standards:
 - 1. ASTM C1036 – Standard Specification for Flat Glass.
 - 2. ANSI Z97.1 – Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
 - 3. GANA'S - Glazing Manual and Laminated Glass Design Guide.
- C. Perform Work in accordance with GANA Glazing Manual, GANA Sealant Manual, and Laminators Safety Glass Association - Standards Manual for Glazing Installation Methods.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions

1.05 WARRANTY

- A. Provide Manufacturer's standard warranty for glass types

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Glass Materials: Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 1. Vitro PPG S
 2. Pilkington LOF. www.pilkington.com .
 3. Guardian Industries. www.guardian.com .
 4. Oldcastle Glass Group. www.oldcastleglass.com .
 5. PPG Industries. www.ppg.com .
 6. Viracon. www.viracon.com .

2.02 GLASS MATERIALS

- A. Interior:
 1. Standard: Clear, Tempered, 1/2" thick glass in steel frame as shown in Drawings.
 2. Standard: Tempered, frosted, 9/16" thick, matte finish, in steel channel as shown in Drawings.
 3. Standard: Insulated tempered glass unit(s) as shown on drawings with translucent PVB interlayer.
 4. Glass Block: Clear, 4"x8"x4" Pittsburg Corning Argus ® high performance glass.
 5. Glazing Partitions: 1/2" thick tempered with PVB interlayer for translucent appearance. Anodized aluminum channel, support as indicated on drawings.
 6. Safety Glass: 1/2" thick (or as noted in drawings), clear fully tempered glass conforming to ASTM C 1048.
- B. Mirror Glass: ASTM C1036, Type 1 transparent flat, Class 1 clear, Quality q1 mirror select; 1/4 inch thick, sizes noted on Drawings. Provide full width mirror with stainless steel channel frames.

2.03 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene or other resilient blocks of 70 to 90 Shore A durometer hardness tested for compatibility with glazing sealant, minimum length 4 inches.
- B. Spacers: Neoprene blocks of 40 to 50 Shore A durometer hardness, adhesive backed on one face only and tested for compatibility with specified glazing sealant.
- C. Glazing Gaskets: As specified by manufacturer.
- D. Interior Glazing Compound:

1. Polymerized Butyl Rubber and Inert Fillers (pigments), solvent based with minimum 75% solids, non-sag consistency, tack-free time of 24 hours or less, paintable non-staining.
- E. Exterior Glazing Compound: Conforming to ASTM C920, Type S, Grade NS, Use G. Compound shall be paintable, or colored to match frame.
- F. Glazing Tape: Pre-shimmed 10 percent solids, non-shrinking, butyl rubber tape compatible with sealants. If exposed, tape shall be paintable, or colored to match frame.
- G. Butt Glazing Sealant:
 1. GE 1200 Series Silicone, clear..
- H. Mirror Mastic: Polymer type mirror mastic resistant to water, shock, cracking, vibration and thermal expansion. Mastic shall be compatible with mirror backing paint and approved by mirror manufacturer.

2.04 MARKINGS

- A. Tempered glass shall have each light permanently etched with Manufacturer's name and his compliance with ANSI Z-97.1.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Examine framing or glazing channel surfaces, backing, removable stop design, and conditions under which glazing is to be performed.
- C. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 FIELD TESTING

- A. Newly installed fenestration product(s) shall be field tested in accordance with AAMA 502, ASTM E1105, and E783.
- B. Test three (unless otherwise specified) of the fenestration products after they have been installed.
- C. Water penetration resistance tests shall be conducted at a static test pressure equal to 20 percent of the positive design wind load times 0.667.

3.03 INSTALLATION

- A. Comply with combined recommendations of Glass Manufacturer, frame manufacturer and manufacturer of sealants and other materials used in glazing., except where more stringent requirements are shown or specified.
- B. Clean the glazing, channel, or other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to the substrate.
- C. Do not attempt to cut, seam, nip or abrade glass which is tempered or heat strengthened
- D. Comply with "Glazing Manual" by GANA, except as shown and specified otherwise by Manufacturers of glass and glazing materials.
- E. Inspect each piece of glass immediately before installation, and discard those which have observable edge damage or face imperfections.
- F. Install setting blocks of proper size at quarter points of sill rabbet.
- G. Provide spacers inside and out, and of proper size and spacing, for glass sizes larger than 50 united inches. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width.
- H. Unify appearance of each series of lights by setting each piece to match others as nearly as possible. Inspect each piece and set with pattern, draw and bow oriented in the same direction as other pieces.
- I. Miter cut and bond ends together at corners where gaskets are used for channel glazing, so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.

3.04 INTERIOR COMBINATION METHOD (TAPE AND SEALANT)

- A. Cut glazing tape to proper length and install against permanent stop, projecting 1/16 inch above sightline.
- B. Place setting blocks at 1/4 point.
- C. Rest glass on setting blocks and push against tape with sufficient pressure to ensure full contact and adhesion at perimeter.
- D. Install removable stops; spacer strips inserted between glass and applied stops at 2 foot intervals, 1/4 inch below sightline.
- E. Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.
- F. Neatly trim off excess tape to sightline.

3.05 ADHESIVE INSTALLATION OF MIRRORS

- A. Apply mirror mastic to cover not more than 25 percent of back of mirror.
- B. Set mirror in support on setting blocks or continuous gasket, and press against substrate to ensure bond of adhesive.
- C. Leave open ventilation space, 1/8 inch or more in thickness between mirror and substrate, over 75 percent of mirror area (wherever there is no adhesive).

3.06 ADJUSTING

- A. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in any other way during the construction period, including natural causes, accidents and vandalism.

3.07 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.
- B. Remove labels after Work is completed.

3.08 PROTECTION

- A. Protect glass from breakage immediately upon installation, by attachment of crossed streamers to framing held away from glass.
- B. Do not apply markers of any type to surfaces of glass.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior partitions.
 - 2. Suspension systems for interior ceilings and soffits.
 - 3. Grid suspension systems for gypsum board ceilings.

1.02 SUBMITTALS

- A. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, limitations, and installation instructions.
- B. Certificates: Mill Certification shall be provided with shipment to verify chemical composition, yield strength, tensile strength, elongation, and coating thickness. Include listing of applicable ASTM standards specified in this section and comparison of ASTM requirements to actual materials provided to jobsite.
- C. Manufacturer's letter: Manufacturer shall provide letter stating that the material supplied to the specific project meets or exceed the performance standards listed in these specifications.

1.03 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.

- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E4 13 by and independent testing agency.
- C. Horizontal Deflection: For composite wall assemblies, limited to 1/360 of the wall height based on horizontal loading of 5 lb./sq.ft.

2.02 FRAMING SYSTEMS

- A. Studs, Runners, and Furring Channels:
 - 1. ASTM C 645, electro-galvanized to meet ASTM A 591, manufactured from steel supplied in accordance with ASTM A 653, Structural Quality Grade 33; G60 designation galvanized sheet steel.
 - 2. Thickness: In accordance with stud schedule provided herein.
 - 3. Deflection Track:
 - a. Slotted Top Track (non-fire rated and fire-rated, as applicable): SLP- TRK® as manufactured by Sliptrack Systems (888) 475-7875 www.BradyInnovations.com, as distributed by Cemco *800) 775-2362 (western U.S) and Unimast Inc. (800) 654-7883 (eastern U.S.), gauge as per ICBO ER-5344, Table 2. Provide fire rated assemblies in accordance with manufacturer's literature, where applicable.
 - b. Non-Fire Rated Slotted Top Track - Single Track Slip System for Interior Partitions: As manufactured by Metal Lite, Inc., 3070 E. Miraloma Avenue, Anaheim, CA 92806 (800) 886-6824. Provide for partitions that are not required to be fire rated.
- B. Studs: C-shaped, non-load bearing rolled steel, punched for utility access, of size shown on Drawings.
- C. Ceiling Runners: Cold or hot-rolled steel, meet ASTM C 754.
- D. Hanger and Tie Wire: Meet ASTM C 754.
- E. Furring and Bracing Members: Of same gauge, material and finish as studs, thickness to suit purpose.
- F. Clips, Brackets: Galvanized wire or sheet metal designed for attachment of framing, furring, and bridging members.
 - 1. Deflection Clips: If acceptable to Building Official, VertiClip™ as manufactured by Signature Industries, LLC, P.O. Box 68005, Raleigh, NC 27613 (919) 844- 0789 may be provided for attachment of framing to roof and floor construction at head and slide conditions. Provide sizes as required for stud depth(s). Clips shall be manufactured of steel conforming to ASTM A 653 Prime Certified G60 galvanized material or better, 50 ksi yield strength and 65 ksi ultimate strength. Deflection clips to have positive attachment to structure and stud material while allowing for frictionless movement.
 - 2. Bridging Clips: If acceptable to Building Official, BridgeClip™ as manufactured by Signature Industries, LLC, P.O. Box 68005, Raleigh, NC 27613 (919) 844- 0789 may be provided for attachment of bridging to studs.
- G. Fasteners: GA 203, self-drilling, self-tapping screws.

- H. Anchorage Devices: Power driven, powder actuated, drilled expansion bolts or screws with sleeves as required for positive anchorage.

2.03 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Power-Actuated Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch in diameter.
- D. Flat Hangers: Steel sheet 1 by 3/16 inch.
- E. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a bas steel thickness of 0.0538 inch and minimum ½ inch wide flanges.
 - 1. Depth: 2 inches or as indicated on Drawings.
- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum ½ inch wide flanges, ¾ inch deep.
 - 2. Steel Studs and Tracks: ASTM C645
 - 3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.
 - 4. Resilient Furring Channels: ½ inch deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical or hat shaped.
- G. Grid Suspension System for gypsum board ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

2.04 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing; Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide [one of] the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D226/D226/M, Type I (No. 15 asphalt felt), nonperforated.
 - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
- C. Acoustic Sealant: As specified in Section 09 29 00.
- D. Primer: FS TT-P-645, for touch-up of galvanized surfaces.

- E. Backing: "Notch-Tite" and "Flush Mount" as manufactured by Metal Lite, Inc., 3070 E. Miraloma Avenue, Anaheim, CA 92806 (800) 886-6824.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates, with installer present, and including welded hollow metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Verify field measurements are as shown on Drawings.
- C. Verify that rough-in utilities are in proper location.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance rating indicated. Protect adjacent fire-resistive materials from damage.

3.03 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
 - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

- C. Install supplementary framing and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.
- E. Install bracing at terminations in assemblies.

3.04 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum ½ inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

- F. Z-Shaped Furring Members:
 - 1. Erect insulation specified in Section 07 21 00 "Thermal Insulation" vertically and hold in place with Z-shaped furring members.
 - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- G. Installation tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.
- H. Align and secure top and bottom runners at spacing indicated on Drawings. Place two beads of acoustic sealant between runners and substrate.
- I. Backing and Blocking: Provide backing and blocking attached to studs. Bolt or screw steel channels to studs. Install backing and blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, and hardware. If proprietary system is used, install in accordance with manufacturer's printed instructions.
- J. Construct corners using minimum three studs.
- K. Coordinate erection of studs with requirements of door and window frame supports and attachments.
- L. Refer to Drawings for indication of partitions extending to ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide nested extended leg ceiling runners, deflection clips or proprietary slip track.
- M. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

3.05 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Laterally brace entire suspension system.
- F. At steel beams, joists or other steel construction wrap hangers around, inset through, or clip or bolt to the supports, so as to develop the full strength of the hangers.
- G. At lights or other openings that interrupt the main runner or furring channels reinforce grillage with 3/4 inch cold-rolled channels, wire tied atop and parallel to the main runner channels.
- H. Do not bridge control and expansion joints with metal furring. Provide separate supports on each side of joint.
- I. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.06 STUD SCHEDULE

- A. Stud Table: Maximum limits based upon 5 psf deflection limit, 33 ksi yield stress, and composite wall sheathed both sides full height with 1/2 inch thick gypsum wallboard attached with No. 6 screws at 12 inches on center minimum, from the SSMA "Product Technical Information" - "Wall Height Tables for Composite Allowable Wall Heights." Maximum allowable deflection as follows:
1. Walls receiving gypsum wallboard finishes: L/240.
 2. Walls receiving plaster and brittle finishes, including stucco, stone masonry, and mirrors: L/360.
 3. Walls receiving ceramic and stone tile finishes: L/360.

STUD WIDTH	DESIGN THICKNESS (Gauge)	STUD SPACING	PARTITION HEIGHT		BRACING SPACING WHERE OCCURS
			L/240	L/360	

1 5/8"	18 mils .0188 in. (25)	16	8' - 4"	---	4' - 0" O.C.
		24	7' - 11"	---	4' - 0" O.C.
	33 mils .0346 in. (20)	16	9' - 8"	8'-5"	4' - 0" O.C.
		24	8' - 9"	7'-8"	4' - 0" O.C.
2-1/2"	18 mils .0188 in. (25)	16	11' - 3"	9'-10"	6' - 0" O.C.
		24	10' - 7"	9'-3"	6' - 0" O.C.
	33 mils .0346 in. (20)	16	12' - 10"	11'-2"	6' - 0" O.C.
		24	11' - 7"	10'-0"	6' - 0" O.C.
3-1/2"	18 mils .0188 in. (25)	16	14' - 4"	12'-4"	8' - 0" O.C.
		24	13' - 5"	11'-7"	8' - 0" O.C.
	33 mils .0346 in. (20)	16	16' - 5"	14'-3"	8' - 0" O.C.
		24	14' - 9"	12'-9"	8' - 0" O.C.
4"	18 mils .0188 in. (25)	16	15' - 4"	13'-4"	8' - 0" O.C.
		24	14' - 2"	12'-4"	8' - 0" O.C.
	33 mils .0346 in. (20)	16	18' - 4"	15'-11"	8' - 0" O.C.
		24	16' - 5"	14'-3"	8' - 0" O.C.
6"	18 mils .0188 in. (25)	16	19' - 9"	17'-11"	10' - 0" O.C.
		24	16' - 9"	16'-9"	10' - 0" O.C.
	33 mils .0346 in. (20)	16	24' - 6"	21'-4"	10' - 0" O.C.
		24	21' - 7"	18'-10"	10' - 0" O.C.

3.07 FIELD QUALITY CONTROL

- A. Testing: At Owner's request, Contractor shall provide spot testing of actual properties of steel framing to verify compliance with specifications.

3.08 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Exterior gypsum board for ceilings and soffits.
 - 3. Tile backing panels.
 - 4. Texture finishes

1.02 SUBMITTALS

- A. Product Data: Submit data on gypsum board, joint, finish and accessories.
- B. Samples: Submit sample of textured finish prior to application.
- C. Reports: Submit fire test report for fire rated assemblies, and acoustical performance test reports for acoustically-rated assemblies.
- D. Samples for verification for the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch length for each trim accessory indicated.
 - 2. Textured finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.03 QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in Gypsum Board Systems Work with 2 years documented experience and approved by Manufacturer.
- B. Regulatory Requirements: Conform to applicable code for fire rated assemblies as shown on the Drawings.
- C. Comply with applicable specification recommendations of GA-216 and GA-600 as published by the Gypsum Association.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.05 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Fire-resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by and independent testing agency.
- B. STC-Rated Assemblies; For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.02 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.03 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Pabco Gypsum www.pabco gypsum.com
 - 2. G-P Gypsum www.gp.com/gypsum/
 - 3. Gold Bond Building Products Div., National Gypsum Co. www.nationalgypsum.com
 - 4. United States Gypsum Co. www.usg.com
 - 5. CertainTeed (formerly BPB Gypsum) www.certainteed.com

2.04 INTERIOR GYPSUM BOARD

- A. Standard Gypsum Board: ASTM C1396/C1396M.
 - 1. **5/8 inch** thick, (or as noted on Drawings),
 - 2. Long Edges: Tapered.

- B. Gypsum Board Type X: ASTM C1396/C1396M
 1. Thickness: 5/8 inch thick, (or as noted on Drawings),
 2. Long Edges: Tapered.

- C. Flexible Gypsum Board: ASTM C1396-C1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 1. Thickness: 5/8 inch thick, (or as noted on Drawings),
 2. Long Edges: Tapered.

- D. Gypsum Ceiling Board: ASTM C1396/C1396M.
 1. Thickness: 1/2 inch or 5/8 inch, as noted on Drawings.
 2. Long Edges: Tapered.

- E. Foil-Backed Gypsum Board: ASTM C1396/C1396M.
 1. Core: As indicated on Drawings.
 2. Long Edges: Tapered.

- F. Impact-Resistant Gypsum Board: ASTM C1396-C1396M.
 1. Core: 5/8 inch thick, (or as noted on Drawings),
 2. Surface Abrasion: ASTM C1629-C1629M, meets or exceeds [Level 1] [Level 2] [Level 3] requirements.
 3. Indentation: ASTM C1629/C1629M, meets or exceeds [Level 1] [Level 2] [Level 3] requirements.
 4. Soft-Body Impact: ASTM C1629-C1629M, meets or exceeds [Level 1] [Level 2] [Level 3] requirements.
 5. Hard=Body Impact: ASTM C1629-C1629M, meets or exceeds [Level 1] [Level 2] [Level 3] requirements.
 6. Long Edges: Tapered.
 7. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

- G. Mold-Resistant Gypsum Board: ASTM C1396-C1396M. With moisture and mold resistant core and paper surfaces.
 1. Core: 5/8 inch thick, (or as noted on Drawings),
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.05 SPECIALTY GYPSUM BOARD

- A. Gypsum Board, Type C: ASTM C1396/C1396M. Manufactured to have increased fire- resistive capability.
 1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 2. Long Edges: Tapered.

- B. Glass-Mat Interior Gypsum Board: ASTM C1658/C1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
 1. Core: 5/8 inch thick, (or as noted on Drawings),
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

- C. Acoustically Enhanced Gypsum Board: ASTM C1396/C1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound absorbing polymer core.

1. Products:
 - a. Basis of Design: Pabco Gypsum QuietRock 530; 5/8".
 - b. CertainTeed SilentFX.
 - c. National Gypsum SoundBreak.
- D. Skim-Coated Gypsum Board: ASTM C1396-C1396M. Manufactured with a factory-applied skim coat.
 1. Core: 5/8 inch thick, (or as noted on Drawings).
 2. Long Edges: Tapered.

2.06 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Glass-Mat Gypsum Sheathing Board: ASTM C1177/C1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
 1. Core: 1/2, (or as noted on Drawings).

2.07 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
 1. Core: 5/8 inch thick, (or as noted on Drawings).
 2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 1. Core: 5/8 inch thick, (or as noted on Drawings).
 2. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- C. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.
 1. Core: 5/8 inch thick, (as noted on Drawings).

2.08 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
- B. Exterior Trim: ASTM C1047.
 1. Material: Hot-dip galvanized-steel sheet, plastic, or rolled zinc.
 2. Shapes:
 - a. Cornerbead.

- b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.
- C. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
- 1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221 (ASTM B221M), Alloy 6063-T5.
 - 2. finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.09 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
- 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
- 1. Prefilling: At open joints, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use [setting type-taping] [drying-type, all-purpose] compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use [setting-type, sandable topping] [drying-type, all- purpose] compound.
 - 4. Finish Coat: For third coat, use [setting-type, sandable topping] [drying-type, all- purpose] compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting type, sandable topping compound.
- D. Joint Compound for Exterior Applications:
- 1. Exterior Gypsum soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 - 2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.
- E. Joint Compound for Tile Backing Panels:
- 1. Glass-Mat, water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.
 - 3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.10 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
 - 1. Install acoustical sealant in accordance with Manufacturer's instructions.
 - 2. Install acoustical sealant at gypsum board perimeter at:
 - a. Metal framing: Two beads.
 - b. Base layer of double layer applications, if applicable.
 - c. Face layer.
 - d. Caulk partition penetrations by conduit, pipe, ductwork, and rough-in boxes.
- F. Install acoustical sealant where gypsum board joins other walls or surfaces at sound control partitions.
- G. Thermal Insulation: As specified in Section 072100 "Building Insulation".

2.11 TEXTURE FINISHES

- A. Primer: As recommended by texture finish manufacturer.
- B. Polystyrene Aggregate Ceiling Finish: Water-based, job-mixed, polystyrene aggregate finish with flame-spread and smoke-developed indexes of not more than 25 when tested according to ASTM E84.
 - 1. Texture: [fine]
- C. Aggregate Finish: Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
 - 1. Texture: [Light Spatter]
- D. Non-Aggregate Finish: Premixed, vinyl texture finish for spray application.
 - 1. Texture: [Orange Peel] [Match existing finish on adjacent wall areas.](#)
- E. Acoustical Finish: Water-based, chemical-setting or drying-type, job-mixed texture finish for spray application.
 - 1. Application Thickness: ½ inch (12.7mm)

2. Surface-burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: [25] or less.
 - b. Smoke-Developed Index: [50] or less.
3. NRC: [0.55] according to ASTM C423.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5mm) of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceiling, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow ¼-to 3/8-inch- (6.4 to 9.5mm) wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide ¼-to ½-inch (6.4 to 12.7mm) wide spaces at these locations and trim edges with edge

trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.03 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Multilayer Application:
 - 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - 3. ON Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws, or with screws; fasten face layers with adhesive and supplementary fasteners.

- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instruction and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- D. Curved Surfaces:
 - 1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch (300 mm) long straight sections at ends of curves and tangent to them.
 - 2. For double layer construction, fasten base layer to studs with screws 16 inches (400mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300mm) o.c.

3.04 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 - 1. Install with 1/4 -inch (6.4mm) open space where panels abut other construction or structural penetrations.
 - 2. Fasten with corrosion-resistant screws.

3.05 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panels: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4mm) gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.
- C. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4mm) gap where panels abut other construction or penetrations.
- D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.06 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. Bullnose Bead: Use at outside corners where indicated.
 - 3. LC-Bead: Use at exposed panel edges where indicated.
 - 4. L-Bead: Use where indicated.
 - 5. U-Bead: Use at exposed panel edges where indicated.
 - 6. Curved-Edge Cornerbead: Use at curved openings.

- D. Exterior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
- E. Aluminum Trim: Install in locations indicated on Drawings.

3.07 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere s required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 0 (Temporary Construction): No taping, finishing, or accessories required.
 - 2. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - a. Joints and interior angles shall have tape embedded in joint compound.
 - b. Surface shall be free of excess joint compound.
 - c. Tool marks and ridges are acceptable.
 - 3. Level 2: Panels that are substrate for tile.
 - a. Joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating joint compound over joints and interior angles.
 - b. Fastener heads and accessories shall be covered with a coat of joint compound.
 - c. Surface shall be free of excess joint compound.
 - d. Tool marks and ridges are acceptable.
 - e. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
 - 4. Level 3: Where indicated on Drawings
 - a. Joints and interior angles shall have tape embedded in joint compound and one (1) additional coat of joint compound applied over joints and interior angles.
 - b. Fastener heads and accessories shall be covered with two (2) separate coats of joint compound.
 - c. Joint compound shall be smooth and free of tool marks and ridges.
 - d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
 - e. Un-textured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Section 09 91 00, as applicable.
 - 5. Level 4: To be used typically throughout at exposed gypsum board construction. Appearance areas to receive flat paints, light texture or where backed wall coverings are to be applied. This level of finish is not to be used where gloss, semi-gloss and enamel paints are to be applied.
 - a. Joints and interior angles shall have tape embedded in joint compound and two (2) separate coats of joint compound applied over flat joints and one (1) separate coat of joint compound applied over interior angles.

- b. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound.
 - c. Joint compound shall be smooth and free of tool marks and ridges.
 - d. Surface to be coated with Drywall Primer as specified herein prior to application of texture.
 - e. Un-textured surfaces to be coated with Drywall Primer prior to application of final finishes as specified in Sections 09 90 00 and 09 72 00, as applicable.
6. Level 5: Where indicated on Drawings.

- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- G. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.08 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture (matching approved mock-up) free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written instructions.

3.09 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet, or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are wet, or moisture damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.10 CLEANING

- A. After completion of wallboard installation, taping and texturing, remove rubbish, excess material and equipment from building and job site, leaving floors and other surfaces clean.
- B. Remove overspray from adjoining construction.
- C. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 31 00

TILE

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Product Data: Submit Manufacturer's data for tile and accessory materials, including recommended procedures for mixing materials and setting tile.
- B. Samples: Submit samples of each type of ceramic tile required, marked with Manufacturer's name and location where tile is to be installed.

1.02 QUALITY ASSURANCE

- A. Comply with applicable requirements of ANSI A-108 Series and the TCA "Handbook for Ceramic Tile Installation". Tile shall bear the TCA grade seal.
- B. Pre-Installation Meeting: Prior to commencing the work of this Section, schedule and attend a meeting at the job site to discuss conformance with Project requirements.
- C. Blending:
 - 1. Tile manufacturer to blend tile at the factory.
 - 2. Provide additional blending at the job site as needed to obtain the Architect's approval.
- D. Mock-ups: Provide job site mock-ups, which will be used as data for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.
- E. Regulatory Requirements: Provide floor tiles with co-efficient of friction in accordance with ADA guidelines.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Deliver manufactured materials in original, unbroken containers bearing name of Manufacturer, brand, and grade seals. Keep materials dry, clean and protected against deterioration.

1.04 PROJECT CONDITIONS

- A. Extra materials: Furnish One (1) square foot of tile for each 100 square feet of each color and size of tile and grouting materials used in the Project. If less than 100 square feet is installed, provide a minimum of one (1) square foot of extra stock. Extra materials shall be furnished in original packaging.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, subject to compliance with Specification requirements:
1. Ceramic Tiles:
 - a. DalTile Corporation, Dallas, TX (214) 398-1411
 - b. American Olean Tile Company, a division of Daltile Corporation, Dallas, TX (214) 398-1411, www.americanolean.com
 - c. Interceramic, Garland, TX (800) 365-6733, www.interceramic.com
 - d. Emser International, Los Angeles
 2. Setting and Grouting Materials:
 - a. C-Cure, as manufactured by Bonded Materials Company, Phoenix, AZ 85041, (623) 873-0001, www.c-cure.com (Arizona Representative: Ceramic Tile International, Gary Kroeger (602) 253-5551).
 - b. Custom Building Products, Seal Beach, CA (562) 598-8808, www.custombuildingproducts.com (Arizona Representative: Ceramic Tile International, Gary Kroeger (602) 253-5551).
 - c. Hydroment, a division of Bostik, Middleton, MA (800) 726-7845 (Arizona Distributor: Bedrosians (602) 268-2000).
 - d. Laticrete, Bethany, CT (800) 243-4788, ext.491, www.laticrete.com (Arizona Representative: Mike Wirges, mfaso@laticrete.com).
 - e. MAPEI Corporation, Garland, TX (800) 442-MAPEI, www.mapei.com (Arizona Representative: Mike Granatowski (888) 300-4422, Box 2054).
 - f. Tec Specialty Products, Inc., an H.B. Fuller Company, Palatine, IL (800) 323-7407, www.texspecialty.com (Arizona Representative: Joyce Ferko (949) 632-1678).

2.02 TILE MATERIALS

- A. Tiles:
1. Wall Tile (Full Height): Basis of Design is a 4 x 12 format Ceramic wall tile, Daltile "Linear" Collection.
 - a. Women's: Daltile Linear 4 x 16 glazed. 0190(1) Arctic White.
 - b. Men's: Daltile Linear 4 x 16 gloss. 0190(2) Architectural Gray.
 2. Floor Tile: Basis of Design is a 12 x 24 format Ceramic floor tile, Daltile "Portfolio" Collection.
 - a. Restrooms/Locker Rooms: Daltile Portfolio 12 x 24. PF11 "Noce"
 - b. Showers: American Olean unglazed color body 2" x 2" A94(1) "Willow Speckled"
- B. Tile Trim Shapes: Provide Manufacturer's full selection of trim shapes as required.
1. Provide all bases, caps, stops, returns, trimmers and other shapes indicated or required to produce a completely finished installation.
 2. Except as may be shown otherwise on the Drawings, provide color and finish matching in the adjacent tile.
- C. Aluminum Trim Shapes:

1. Schluter Dilex at coves.
 2. Schluter Rondex at exposed corners
- D. Marble Thresholds: As indicated on Drawings.

2.03 INSTALLATION MATERIALS

- A. Mortar for Thin Set Installation: Latex-Portland cement mortar per ANSI A118.4 and applicable TCA Method.
- B. Grout:
1. Latex grout: Conforming to ANSI 118.6 and the TCA Handbook, by an approved Manufacturer. Grout shall be sealed as recommended by manufacturer.
 2. Epoxy grout: Chemical-resistant per ANSI 118.3, water-cleanable during installation, by an approved Manufacturer.
 3. Grout Sealer: Microseal as manufactured by Rainguard International Convers, GA www.rainguard.com

2.04 ACCESSORIES

- A. Cleavage Membrane: Provide one of the following:
1. DaITile CIS or Nobleseal CIS, 30 mil CPE with non-woven spun bond polyester fabric laminated to both sides. Adhesive for application of membrane shall be compatible with substrate.
 2. 0.004-inch thick polyethylene sheeting complying with ASTM d2103.
 3. 15 lb. asphalt-saturated felt complying with ASTM D226.
- B. Cementitious Backer Units (Ceramic Tile Backer Board): Provide cementitious backer units conforming to ANSI A118.9. Georgia-Pacific Dens-Shield Modulars Inc. WonderBoard, or USG Durabond Division Durock Tile Backer Board are acceptable products. Furnish with tape joint.
- C. Expansion/Control Joint Backing Material: Provide closed cell polyethylene foam weighing not less than 2.7 lbs. per cubic feet, and in dimension approximately 20% thicker than width of the expansion joint in which used.
- D. Expansion/Control Joint Sealant: Provide in colors selected by the Architect, complying with requirements of Section 07 90 00.
1. At joints between floors and walls, and at perimeter of metal door frames, provide one-part low modulus moisture cure silicone rubber sealant conforming to FS TTS-001543A, Class A, FS TT-S-00230C, Type II, Class A and ASTM C920, Type S, Grade NS, Class 25, Use NT, M, G, A and O.
 2. At joints in traffic areas, and at perimeter joints, provide two-part polyurethane material conforming to ASTM C920, Type M, Grade P, Class 25, Use T, with Shore A hardness of 35-45.
- E. Waterproof Membrane: Provide one of the following:
1. PRP 315 two-component synthetic polymer anti-fracture and waterproofing membrane and as manufactured by Mapei Corporation, meeting ANSI A118.10, trowel applied.
 2. Schluter KERDI sheet waterproofing membrane.

3. Other sheet waterproofing membrane meeting Uniform Plumbing Code and so labeled and acceptable to Architect.
- F. Schluter trim: Provide finishing and edge-protection at tile installation areas. Coordinate size and shape required with Architect tile selection.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine sub-surfaces to receive Work and report detrimental conditions in writing. Commencement of Work will be construed as acceptance of sub-surfaces.
- B. Coordinate with other Work that affects, connects with, or is concealed by this Work. Before proceeding, make certain required inspections have been made.
- C. Where tile units will be thin-set directly to the substrata, do not commence installation of the tile units until substrata are within the following tolerances:
 1. Horizontal surfaces: Level within 1/8-inch in ten feet in all directions.
 2. Vertical Surfaces: Level within 1/8-inch in eight feet in all directions.
 3. Deflection:
 - a. Horizontal Surfaces: Less than 1/360 of the span.
 - b. Vertical Surfaces: Verify that design of the wall or partition will not permit deflection exceeding 1/360 of the span for point and uniform loading. Space wood or metal studs not less than 16-inches O.C.
- D. Conditions of Surfaces to Receive Tile:
 1. Verify that surfaces to receive tile are firm, dry, clean, and free from oily or waxy films and curing compounds.
 2. Verify that grounds, anchors, plugs, recess frames, bucks, electrical work, mechanical work, and similar items in or behind the tile have been installed before proceeding with installation of tile.
 3. Scarify hard steel trowel finish concrete surfaces.
 4. Completely remove curing compounds on concrete surfaces by scarification or cleaning methods acceptable to tile setting materials manufacturer.

3.02 PREPARATION

- A. Lay out Work so that no tile of less than half size occurs.
 1. For heights stated in feet and inches, maintain full courses to produce nearest attainable heights without cutting tile.
 2. Align joints in wall tile vertically and horizontally except where other patterns are shown or specified. Align joints in walls to conform to patterns selected.
 3. Align joints in floor tile at right angles to each other and straight with walls and conform to patterns selected or indicated.

- B. Obtain exact locations of expansion joints and accessories before installing tile.
- C. Locate accessories in tile walls as indicated on Drawings or as directed by Architect. Where the size of accessory does not line up with the jointing pattern of adjacent tile, the cutting of tile and arrangement of joints around the accessories shall be as directed by Architect.

3.03 INSTALLATION

- A. Cementitious Backer Units: Install cementitious backer units at wet area walls as indicated on Drawings in accordance with Manufacturer's directions.
 - 1. Where two units abut, leave a gap from 1/8 to 3/16-inch wide (or as recommended by the manufacturer), fill solid with mortar, and cover with the fiberglass tape embedded in a skim coat of mortar.
- B. Tile – General:
 - 1. Install tile in accordance with ANSI Specifications A108.1 through A118.1 and Manufacturer's recommendations. Masonry walls to receive tile shall have a leveling coat of mortar applied prior to installation of tile.
 - 2. Cut and drill neatly as required without marring tile. Rub smooth necessary cuts with a fine stone. Set cut edge against fixture, cabinet or other tile with joint at least 1/16-inch wide.
- C. Waterproof Membrane (Adhesive): Utilize where membrane is required beneath tile. Waterproof covers at wet areas in accordance with Manufacturer's recommendations to a minimum height of 8-inches above floor. Allow adhesive type waterproof membrane to cure before applying bonding materials.
- D. Thin Set: Where indicated to be thin-set, install tile using TCA Method for substrate condition and type for latex-Portland cement mortar.
- E. Grout:
 - 1. Mix grout to a creamy consistency.
 - 2. Mix only as much grout as can be used in one hour.
 - 3. Thoroughly force into joints, fill entire depth.
 - 4. Finished surface of joints shall be uniformly smooth, and continuously level with edges of tile.
 - 5. Seal grout in accordance with manufacturer's recommendations.
- F. Expansion and Control Joint Sealant:
 - 1. Provide expansion/control joints where indicated on Drawings and:
 - a. Interior: 24'-0" to 36'-0" in each direction.

2. Joints in between tile and door frames and other metal accessories, tile and ceiling, wall tile and wall tile at inside corners, and wall tile and floor tile shall be sealed with silicone rubber sealant.
3. Provide expansion joints at tile columns, curbs, and pipes, and fill with sealant. At building structural joints extend expansion joints through the tile. Seal with sealant. In no case shall tile be carried over expansion joints without a joint in the tile.

3.04 CURING

- A. Damp cure all tile installations, including Portland cement grouts, for 72 hours minimum.
 1. Cover with clean non-staining 40 lb. Kraft paper.
 2. Do not use polyethylene sheets directly over tile on horizontal surfaces.
 3. Keep all traffic off newly installed floors for at least 72 hours. Protection may be necessary.

3.05 TOLERANCES

- A. Tile: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes, and alignments shown:
 1. Horizontal Surfaces: 1/8-inch in 10'-0" in all directions.
 2. Vertical Surfaces: 1/8-inch in 8'-0" in all directions.
 3. Lippage: 1/8-inch maximum.
 4. Maximum Variation of Joint Width: 1/16-inch.

3.06 CLEANING

- A. Wipe surfaces clean after grouting; remove traces of mortar and grout. Do not use acid solution for cleaning glazed tile.
- B. During the course of the Work and on completion of the Work, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

3.07 PROTECTION

- A. Close spaces to traffic or other Work until tile is firmly set. Protect from damage until acceptance. Repair damaged Work at no additional cost to Owner.
- B. Prohibit foot and wheel traffic from using newly tiled floors for at least 7 days. Place large, flat boards in walkways and wheel-ways where use of newly tiled floor is unavoidable.

END OF SECTION

SECTION 09 54 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.01 SUBMITTALS

- A. Shop Drawings: Submit Drawings showing complete layout of systems including attachments, intersections of members and edge conditions.
- B. Product Data: Provide data on metal grid system components and acoustical units.
- C. Samples:
 - 1. Submit 2 samples of each type of unit specified, including color selection when applicable.
 - 2. Submit samples of Manufacturer's full color selection for selection by Architect.

1.02 QUALITY ASSURANCE

- A. Qualifications: Installer shall be approved by Manufacturer of material or system.
- B. Standards: Comply with the following:
 - 1. ASTM C635, "Standard Specification for Acoustical Tile and Lay -In Panel Ceilings."
 - 2. ASTM C636, "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay -In Panels."
 - 3. Ceilings and Interior Systems Construction Association (CISCA)
"Recommendations for Direct-Hung Acoustical tile and Lay -in Panel Ceilings."

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

1.04 MAINTENANCE

- A. Extra Materials: Provide an additional 5 percent of each type of acoustical unit installed, in unopened labeled cartons, to the Owner at completion of Work, for his maintenance use, at no additional cost. Provide, at minimum, one full carton of each type of acoustical unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of the following Manufacturers, except as approved otherwise by the Architect, subject to compliance with Specification requirements.
1. Armstrong World Industries www.ceiling.com
 2. Chicago Metallic Corporation (for suspension system) www.chicago-metallic.com
 3. USG Interiors, Inc. www.usg.com
 4. Celotex Building Products Division www.bpb-celotex.com

2.02 SUSPENSION SYSTEM

- A. **Heavy duty** with components formed from commercial quality cold rolled steel electro-zinc coated.
1. Main-Runners: Minimum of **1-1/2** inch in height with an exposed capped face of **15/16** inch in width, nominally 12 feet long.
 2. Cross-Tees: Minimum of **1-1/2** inch in height with an exposed capped face in a width to match main runners.
 3. Finish: Exposed faces of main and cross runners shall be a baked enamel paint finish, **white color**.
- B. Hanger Wire: Galvanized steel conforming to Federal Specification FF-QQ-W-461, Finish 5, Class 1 annealed, and not less than 12 gage).
- C. Suspension system shall support the ceiling system specified with a maximum deflection of 1/360 of the span.
- D. Wall and Penetration Moldings: 24 MSG painted steel with a minimum one inch wide lower flange, finish and configuration to match grid. For circular penetrations provide edge molding manufactured to exact diameter of circular penetration.

2.03 CEILING PANELS

- A. Acoustical Ceiling Panels (1):
1. Model/Style: Optima 3352 **as manufactured by Armstrong**
 2. Size: **24 inch x 24 inch x 1 inch**.
 3. Surface Finish: Factory applied, washable, vinyl latex paint finish, **white color**.
 4. Light reflectance: 0.86, per Fed. Spec. SS-S-118B and ASTM E1264.
 5. Surface Burning Characteristics: Class A per ASTM E1264 and Fed. Spec. SS-S- 118B, Flame Spread 25 or under, per ASTM E-84 (UL Label).
 6. NRC: 0.55 in suspended mounting.
 7. CAC: 35 (continuous ceiling).
 8. Edge Detail: **Beveled Tegralar (Reveal edge)**.

2.04 ACCESSORIES

- A. Acoustical Batt Insulation: 09 81 00

- B. Paint: Specified in Section 09 90 00.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing, with a copy to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Verify, before proceeding with this Work, that required inspections of existing conditions have been completed.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance the following:
 - 1. ASTM C636 and as supplemented in this Section.
 - 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical tile and Lay -in Panel Ceilings - Seismic Zones 1-2" [as modified by IBC Section 1621.2.5](#).
- B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.
- C. Locate system on room axis according to reflected ceiling plan.
- D. Install after major above-ceiling Work is complete. Coordinate the location of hangers with other Work.
- E. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.
- F. Hang suspension system independent of walls, columns, ducts, pipes, and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
- I. Do not eccentrically load system, or produce rotation of runners.
- J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

- K. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

3.03 INSTALLATION - ACOUSTICAL LAY-IN UNITS

- A. Install acoustical units in accordance with Manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling Work is complete.
- E. Install acoustical units level in uniform plane, and free from twist, warp, and dents.
- F. Cut panels to fit irregular grid and perimeter edge trim. Field rabbett panel edge. Double cut and field paint exposed edges of reveal edge units.
- G. Where round obstructions occur, provide preformed closers to match edge molding.
- H. Install hold-down clips to retain panels tight to grid system where required for fire-rated system.

3.04 ERECTION TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/4 inch in 10 feet.

3.05 ADJUSTING

- A. Remove damaged or soiled panels and replace with new units, as directed by Architect.

3.06 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Rubber base and resilient accessories.

1.02 SUBMITTALS

- A. Product Data: Submit product data and samples in accordance with Section 01 33 00.
 - 1. Complete description of products and installation instructions.
- B. Samples: 12-inch by full height or width sections of base and accessories in colors selected.

1.03 QUALITY ASSURANCE

- A. Standards: Prepare substrate and install products in accordance with product manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Wall Base and Flooring Accessories: Furnish products of one of the specified manufacturers, except as approved by the architect, subject to compliance with specification requirements.
 - 1. Type TP – Thermoplastic Rubber
 - a. Roppe
 - b. Burke/Mercer
 - c. Johnsonite
- B. Other manufacturers acceptable upon approval by Design Professional.
- C. Color as selected by Architect.

2.02 MATERIALS

- A. Resilient Base: ASTM F1861
 - 1. Material: Type TP – Thermoplastic Rubber
 - 2. Height: 2-1/2" or as scheduled on drawings
 - 3. Thickness: 1/8" thick
 - 4. Length: Coils in manufacturer's standard lengths. Cut lengths are not acceptable.

- 5. Type: Top set, coved typical, toe-less at carpet unless otherwise indicated on drawings.
- 6. Color: Roppe 700 Series 193 Black Brown – Pinnacle – Type TS – 1/8”.

- B. Subfloor Filler, Adhesives and Wax: Types recommended by resilient flooring manufacturer for material types and location.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Ensure substrate surfaces have solid backing, and are smooth and flat with maximum variation of 1/8-inch in 10-feet.
- B. Ensure concrete substrates are dry (maximum 7% moisture content) and exhibit negative alkalinity, carbonization, or dusting.

3.02 PROTECTION

- A. Maintain minimum 70°F air temperature at flooring installation area for three (3) days prior to, during and for 24 hours after installation.
- B. Store materials in area of application. Allow three (3) days for material to reach equal temperature as area.
- C. Extra Stock: Deliver base equaling at least 2%, but not less than 48 lineal feet of base installed to Owner when and where directed.

3.03 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Clean floor and apply, trowel and float filler to leave smooth, flat hard surface. Prohibit traffic until filler is cured.

3.04 INSTALLATION

- A. Clean substrate. Spread cement evenly in quantity recommended by manufacturer to ensure adhesion over entire area of installation. Spread only enough adhesive to permit installation of products before initial set.
- B. Fit base joints tight and vertical. Maintain minimum measurement of 18-inches between joints. Miter internal corners. Use pre-molded sections with minimum 2-inch returns for external corners and exposed ends. Adhere tightly to wall surfaces. Scribe and fit base to door frames and other obstructions. Install base straight and level to variation of $\pm 1/8$ inch over 10-feet.
- C. Install edge strips at unprotected or exposed edges where flooring terminates.

3.05 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.

END OF SECTION

SECTION 09 65 19
LVT FLOORING AND BASE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Luxury Vinyl Tile (LVT) plank flooring
 - 2. Rubber base and accessories

1.2 SUBMITTALS

- A. Product Data: Submit data on specific products, describing physical and performance characteristics, sizes, patterns and colors available.
- B. Samples: Submit 2 samples of each material specified illustrating color and pattern.
- C. Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.3 REFERENCES

- A. ASTM D 2047
- B. ASTM F710
- C. ASTM F1303
- D. ASTM F2170

1.4 QUALITY ASSURANCE

- A. Qualifications: Installation shall be by qualified installer approved by Manufacturer of the materials.
- B. Regulatory Requirements:
 - 1. Critical Radiant Flux Classification: Class I (Not less than 0.45 Watts per sq./cm per ASTM E648).
 - 2. Slip resistance of floor surfaces and changes in level shall be in accordance with applicable law.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with manufacturer's instructions

1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: Installation shall not begin until Work of other Trades is substantially completed and the area or rooms where flooring is to be installed has been maintained at a minimum temperature of 70 degrees F. for at least 48 hours.
- B. Moisture content and bondability of concrete sub-floors shall be determined by a field testing method recommended by the flooring manufacturer.
- C. Maintain ambient temperature required by Adhesive Manufacturer three days prior to, during, and 24 hours after installation of materials.

1.7 MAINTENANCE

- A. Extra Materials: Provide 100 square feet of flooring and 60 lineal feet of base of each material specified.

1.8 WARRANTY

- A. Warranty period shall be 10 years commencing on date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-test Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E684 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq.cm.

2.2 MANUFACTURERS

- A. LVT Manufacturers:
 - 1. Mannington www.manningtoncommercial.com . Mannington Spacia Wood
 - a. Thickness: 2.5mm (beveled edge).
 - b. Design and Color: [SS5W2507 – Antique Oak](#).
 - c. Nominal Size: 4" x 36".
 - 2. Other: As approved by Architect/Owner.

- B. Accessories:
 - 1. Subfloor filler: Types recommended by resilient flooring manufacturer for material types and location.
 - 2. Adhesives:
 - a. Suitable for the underfloor substrate conditions involved as recommended by the Manufacturer of the flooring materials.
 - b. QuickStix by Mannington Commercial.
 - c. As approved by Architect.
 - 3. Base Sheet (Acoustical)
 - a. As recommended by the Manufacturer of the flooring materials.

- C. Crack and Joint Filler: Waterproof type as recommended by Manufacturer.

- D. Edge and Transition Strips as shown on plan:
 - 1. Mannington Commercial; colorways – Mat edge Molding 3/16”
 - 2. Material to match flooring

- E. Sealer:
 - 1. Type recommended by Flooring Manufacturer.

2.3 BASE

- A. Wall Base Manufacturers: Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 - 1. Burke/Mercer www.burkemerger.com
 - 2. Johnsonite www.johnsonite.com
 - 3. Roppe www.roppe.com

- B. Base: ASTM F 1861.
 - 1. Material: Type TP thermoplastic rubber
 - 2. Height: 4 inch
 - 3. Thickness: 1/8 inch thick
 - 4. Type: Top set with toe(coved) throughout.
 - 5. Color: To match existing or as selected by Architect/Owner.
 - 6. Provide continuous rolls. “Stick” base shall not be provided.

- C. Base Accessories: Premolded end stops and external corners of same material, size, and color as base.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine subsurface to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurface.

- B. Inspect the sub-floor to receive resilient flooring in accordance with ASTM F710. Do not lay floor covering until sub-floors are in proper condition to receive same. Sub-floors shall be broom clean, free of foreign matter and thoroughly clean before installation.
- C. Verify concrete floors and dry and bondable.

3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Apply, trowel, and float filler to leave a smooth, flat, hard surface.
- C. Prohibit traffic from area until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to floor surfaces as recommended by Flooring Manufacturer.

3.3 INSTALLATION – LVT

- A. Install in accordance with Manufacturers' instructions and in accordance with "Recommended Work Procedures for Resilient Floor Coverings" of the Resilient Floor Covering Institute.

3.4 INSTALLATION – BASE

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. At external corner, use premolded units. At exposed ends use premolded units.
- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

3.5 CLEANING

- A. After flooring has become well seated, minimum 72 hours, and just prior to opening it to traffic, thoroughly clean in accordance with Manufacturer's recommendations.
 - 1. Apply two coats of manufacturer's recommended wax to cleaned resilient flooring in accordance with manufacturer's published recommendations.
- B. Remove dirt, debris and adhesive from floor covering and adjacent surfaces using Manufacturers recommended methods and leave installation in a clean, undamaged condition.
- C. During the course of Work and on completion, remove excess materials, equipment and debris and dispose of away from premises. Leave Work in clean condition.

3.6 PROTECTION

- A. Minimize traffic until flooring has become well seated, at least 72 hours, at a maintained temperature of not less than 70 degrees F., and do not permit fixtures, equipment, trucks, or similar items on flooring.
 - 1. Provide temporary protection materials of underlayment board or other suitable protection sheets over flooring where it is necessary to move heavy or sharp loads across the floor within 72 hours after installation.
 - 2. Protect installed flooring by providing protective coverings or other protection as recommended by manufacturer until time of final completion of Project.

END OF SECTION

SECTION 09 68 16

CARPET TILE

PART 1 - GENERAL

1.1 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications and recommended procedures for installing carpet tile, adhesive and accessories. Submit manufacturer's printed data on physical characteristics and properties
- B. Shop Drawings: Submit Drawings indicating pattern type and direction, pile direction, cutouts, type and location of edge strips, transition details, type of sub-floor and installation, etc. in accordance with manufacturer's recommendations.
- C. Samples: Full size sample of each type of carpet tile required and 6-inch (150mm) sample of edge strip in manufacturer's selected colors.
- D. Certification:
 - 1. At least 30 days prior to scheduled installation, submit manufacturer's anticipated shipping date, including certification that carpet tile will conform to Specifications and approved samples.
 - 2. Provide certification from manufacturer that carpet tile will not display or evidence a significant change in color due to exposure to atmospheric contaminants (Ozone or Oxides of Nitrogen) for 5 years.
- E. Test Reports: Submit reports for flammability, smoke density and static propensity from independent laboratory no more than 2 years old.
- F. Quality Control Submittals:
 - 1. Manufacturer shall furnish dye lot numbers and other information, which will enable identification of certified carpet tile. Inspect carpet tile after manufacture for manufacturing defects.
 - 2. Certificates: Certification that submitted samples conform with Specification requirements.
 - 3. Installer to meet Class 1 flooring installation requirement per NFPA 101
- G. Contract Closeout Submittals:
 - 1. Minimum of 5 years commercial installation experience.
 - 2. Review manufacturer's recommendations and recommend in writing to Architect variations required to assure installation guarantee.

1.2 QUALITY ASSURANCE

- A. Carpet Installer Qualifications:
 - 1. Minimum of 5 years commercial installation experience.
 - 2. Review manufacturer's recommendations and recommend in writing to Architect variations required to assure installation guarantee.

- B. Standards: Comply with the following:
 - 1. Flammability: Passes (CPSC 16 CFR, Part 1630).
 - 2. Flame Spread: Critical Radiant Flux Class I, not less than 0.45 Watts per cm² (NFPA 253 or ASTM E-648, in direct glue-down application).
 - 3. Optical Smoke Density Requirements (ASTM 662-79): Less than 450 (NBS Smoke Density Chamber – NFPA – 258).
 - 4. Static Propensity: Under 3.0 KV (AATCC-134).
 - 5. Colorfastness: Carpet tile shall not display or evidence a significant change in color due to exposure to atmospheric contaminants (Ozone or Oxides of Nitrogen) for 5 years.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's original un-opened packaging with each roll having register number tags attached or register identification stenciled on mill wrappings and intact.
- B. Storage and Protection: Store in well ventilated spaces protected from damage, dirt, stains, moisture, and other adverse conditionings.

1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify installation dimensions by making field measurements

1.5 WARRANTY

- A. A. General: Special Project Warranty and Manufacturer's Warranty specified in this Article shall not deprive the Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with other warranties made by Contractor under requirements of Contract Documents.
- B. Special Project Warranty: Provide special project warranty, signed by Contractor, Installer and Manufacturer (Carpet Mill) agreeing to repair or replace defective materials and workmanship, during 10-year warranty period following Substantial Completion. Special project warranty includes, but is not limited to the following:
 - 1. Delamination of adhered carpet tile from substrate.
 - 2. More than 10% loss of face fiber.
 - 3. Tile curling.
 - 4. Edge raveling, snags or runs.
- C. Manufacturer's Warranty: In addition to Special Project Warranty, provide Manufacturer's Limited 10-Year Wear Warranty on form furnished following this section or on manufacturer's standard form of similar content subject to Architect's approval. Manufacturer's warranty shall include dimensional stability, wear and static resistance.

1.6 MAINTENANCE

- A. Extra Materials: Furnish quantity of full-size units equal to 5% of amount installed. Neatly package in small quantities and identify with labels clearly describing contents. Deliver to Owner at Project Closeout.

PART 2 - PRODUCTS

2.1 PRODUCT/MANUFACTURER

- A. Furnish products of one of the following manufacturers, except as otherwise approved by the Architect, subject to compliance with specification requirements:
 - 1. Mohawk Group
 - a. [Artisanal Collection – BT413/QB413. 7668 “Earth.”](#)
 - 2. Other: As approved by Architect.

2.2 ACCESSORIES

- A. Underlayment: Portland cement-latex concrete floor filler for leveling concrete floor as recommended by Carpet Manufacturer.
- B. Floor Primer: Manufacturer’s approved floor primer applied to all areas that are to receive glue-down carpet tile.
- C. Adhesive: Low VOC, pressure sensitive adhesive system)
- D. Edge Strip: Vinyl reducer strip for areas, doorways and other areas where edge of carpet is exposed.
- E. Rubber Base: Base shall be installed after carpet

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine sub-surfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of sub-surfaces.
 - 1. Test concrete for excessive moisture content or hydro-static moisture content. Excessive moisture is defined as no more than 2.5 lbs. per 1000 square feet in 24 hours.
 - 2. Test concrete for acidity/alkalinity, which shall test in the 6.0 to 8.0 range.
 - 3. Frequency of tests shall comply with manufacturer’s guidelines.
- B. Coordination: Coordinate with other Work that affects, connects with or will be concealed by this Work.

3.2 PREPARATION

- A. Surface Preparation:
 - 1. Inspect surfaces to receive carpet tile, make tests recommended by Carpet Manufacturer, take necessary corrective action.
 - 2. Sand or grind ridges, bumps or protrusions level and smooth.

3. Fill cracks, construction joints and other surface imperfections and level sub-floor with latex underlayment compound troweled level with adjacent surfaces to within 1/4-inch in 10-feet, non-cumulative, in all directions.
 4. Telegraphing of irregularities in sub-floor shall be sufficient cause for rejection.
 5. Remove foreign and incompatible materials and vacuum clean surfaces immediately prior to installation.
 6. Contractor shall provide written moisture and alkali test results pertaining to the concrete slab prior to installation.
- B. Existing Surface Preparation: At existing floors, remove existing floors in areas indicated to receive carpet tile, to provide an acceptable surface for application of carpet tile as follows:
1. Provide clean floor surfaces.
 2. Floods apply full strength floor stripping solution. Allow to stand for several minutes and prior to drying scrub with disc scrubber with screen mesh or stiff bristle brush.
 3. Flood rinse with hot water and completely remove rinse water with squeegee and/or wet-vac.
 4. Repeat any or all of above steps as required to insure complete removal of wax and stripper.
 5. Allow floor to dry completely.
 6. Repair floor as required by Carpet Manufacturer prior to installing carpet.

3.3 INSTALLATION

- A. Install carpeting material and adhesive in strict accordance with manufacturer's recommendations and CRI 104, Section 13: "Carpet Modules", as published by the Carpet and Rug Institute.
- B. Lay carpet tile pattern parallel to walls and partitions to comply with approved Shop Drawings for pattern and pile direction.
- C. Lay carpet tile tight and free of irregularities. Cut and fit carpeting accurately and smoothly on wall and floor surfaces, permanent fixtures and furniture including cabinets, around projections and into trim strips or binding bars. Make installation continuous under removable portable and/or accordion partitions.
- D. Extend carpet tile into alcoves, closets and other similar concealed openings.
- E. Edge Strips:
 1. Install where carpet tile terminates and it abuts a dissimilar floor material.
 2. Securely fasten edge strips with concealed fasteners. Center under doors at doorways.
- F. Provide grounding for static dissipative carpet in accordance with manufacturer's printed instructions.

3.4 CLEANING

- A. Remove and replace individual carpet tile units with spots, smears, stains and similar defects that cannot be cleaned to an acceptable condition. Thoroughly vacuum and clean carpet tile after other Trades have been completed. Installed carpet tile shall be left free from adhesives, scraps, carpet ripples, scallop and puckers.

- B. Carpet spots shall be cleaned with spot remover approved by Carpet Manufacturer and loose threads removed with sharp scissors. Installed carpet tile shall be free from defects at time of final acceptance by Owner.
- C. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises.

3.5 PROTECTION

- A. Protect installed carpet tile against soiling abuse or damage by other Trades, and cover completed Work as necessary to ensure protection.
- B. Repair or replace damaged Work.

END OF SECTION

SECTION 09 81 00
ACOUSTICAL INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Acoustical insulation within partitions as shown on Drawings and as specified.

1.02 SUBMITTALS

- A. Product data: Submit Manufacturer's data, installation instructions, limitations, and recommendations. Include certification and test data substantiating combustibility of each type of insulation.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the specified Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements.
 1. Manville Building Products Group www.johnsmanville.com
 2. Owens Corning Fiberglas www.owenscorning.com
 3. U.S. Gypsum Company www.usg.com

2.02 MATERIALS

- A. Sound Attenuation Blankets:
 1. ASTM C665, Type 1 (unfaced), glass or mineral fiber batts, with a Fire Hazard Classification of less than 50 when tested in accordance with ASTM E-84.
 2. Combustion Characteristics: Passes ASTM E 136 test.
 3. Fire Resistance Ratings: Passes ASTM E 119 test.
 4. Thickness: [As indicated on Drawings.](#)
 5. Sound Transmission Class of the assembly: STC 48

6. Provide black colored batts or scrim cover as directed by Architect where exposed to view in final work.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Comply with manufacturer's instructions for particular conditions of installation in each case.
- B. Batts may be friction-fit in place until the interior finish is applied. Install batts to fill entire stud cavity. If stud cavity is less than 96" in height, cut lengths to friction-fit against floor and ceiling tracks. Walls with penetrations require that insulation be carefully cut to fit around outlets, junction boxes and other irregularities.
- C. Where insulation must extend higher than 8 feet, supplementary support is to be provided to hold product in place until the interior finish is applied.
- D. Butt ends of batts closely together and fill all voids.

3.02 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Painting as specified and as noted on Drawings. Surfaces requiring finishing and left un-finished by the requirements of other Sections shall be painted or finished as part of the Work of this Section.

1.2 DEFINITIONS

- A. Touch-Up: Painting of items missed by painter at no additional cost to Owner.
- B. Re-Paint: Repairs to paint work for damages caused by other Trades
- C. Block Resistance (Non-Blocking): the capability of a coating to resist sticking to itself when used on 2 surfaces that comes in contact with each other (e.g. door and jamb, window sash and sill).

1.3 SUBMITTALS

- A. Product Data: Submit schedule of manufacturers of products required for the Work, together with specifications recommended by each manufacturer. Provide manufacturer's technical information, including paint label analysis and VOC content.
- B. Samples: Submit samples of each type of finished specified.
 - 1. Architect will furnish Contractor a color schedule of colors selected either from manufacturer's stock colors or specially requested color mixes before Work is begun.
 - 2. Submit two 8-inch x 10-inch samples of each color, including the correct sheen and texture, on heavy cardboard or masonry. Submit sealer and stain finishes on material of the same quality and species of wood on which that particular finish shall be used. Rejected samples shall be re-submitted until approved.
 - 3. Samples shall be submitted at least 30 days prior to the start of painting work. Label and identify each sample as to location and application. Upon submittal of color samples, minor variations or changes in color selection may be requested by the Architect and new samples ordered, until final color approval.

1.4 QUALITY ASSURANCE

- A. Standards: Materials, preparation, application and workmanship shall be in accordance with manufacturer's recommendations and applicable provisions of the following:
 - 1. Painting and Decorating Contractors of America (PDCA) "Painting Specification Manual" and "Standards".
 - 2. Gypsum Association – GA210, "Gypsum Board for Walls and Ceilings".

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in manufacturer's sealed containers, legends and labels intact.
- B. Storage:
 - 1. Adequately protect against damage while stored at site.
 - 2. In no case shall the amount or method of materials stored exceed the amount permitted or the manner allowed by local ordinances, state laws or fire underwriter regulations.

1.6 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. Do not apply varnish or paint when temperature is below 50°F. Avoid painting surfaces exposed to hot sunlight.
 - 2. During interior application, maintain minimum temperature of 65°F unless otherwise directed by Architect or manufacturer's printed instructions. Hold temperature as constant as possible.
 - 3. Provide adequate ventilation at all times so the humidity cannot rise above the dew point of the coldest surface to be painted.
 - 4. Moisture-containing surfaces, such as concrete, stucco and cement plaster shall have a moisture content of less than 8% as measured by moisture meter. Remove surface salt deposits prior to painting. Verify that pH is neutral, or within acceptable limits of Paint Manufacturer. Paint after thoroughly cured.

1.7 MAINTENANCE

- A. Extra Materials: Upon completion of the Work, furnish Owner with one fresh gallon of each type and color of paint and finish used on this Project. Label containers with manufacturer's name, batch, color, shelf life, instructions and cautions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Furnish products of one of the following manufacturers, except as otherwise approved by Architect, subject to compliance with specification requirements.
 - 1. Dunn-Edwards Corporation www.dunnedwards.com
 - 2. Color (Interior): [DE6226 – Foggy Day](#).

2.2 MATERIALS

- A. Water-borne Latex (Acrylic) Emulsion Paint: Shall not be formulated or manufactured with formaldehyde, halogenated solvents, aromatic hydrocarbons, mercury or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI and their oxides.
 - 1. Zero-VOC Paint: Flat and eggshell, VOC content less than 10g/l.
 - 2. Low-VOC Paint: Semi-gloss and gloss, VOC content less than 100 g/l

- B. Oil-Based Paint: Low-VOC paint; VOC content shall not exceed 380 g/l. Generally avoid when acceptable acrylic alternatives are available. Shall not contain halogenated solvents. Shall not be formulated or manufactured with formaldehyde, mercury or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI and their oxides. Shall not be formulated or manufactured with aromatic hydrocarbons in excess of 10%. For increased resistance to yellowing, specify high quality, soy-based oil paints.
- C. Recycled Latex Paint: Unused paint that is filtered and re-blended for use – typically as a primer; minimum 90% post-consumer recycled content (50% for whites), VOC content unknown, available in pastel colors only.
- D. Low-Biocide Paint: Interior use. Shall not contain formaldehyde. Shall not contain fungicides or bactericides that are classified as mercury acetates, phenol phenates or phenol formaldehyde.
- E. Natural Plant and Mineral-Based Finishes: Contain extracts from plant sources and minimally processed earth minerals, such as chalk or iron oxides. Solvents include citrus oils and small amounts of low-odor petroleum solvents (de-aromatized isoparaffinics).
- F. Milk-Based Paint: Contains lime, milk protein, clay and earth pigments; interior use only; not suitable for damp conditions.
- G. Transparent Finishes:
 - 1. Urethane Finishes: Water emulsion urethane.
 - 2. Penetrating Oil-Based, Waterborne Finishes: Shall not contain lead acetate or cobalt manganese (drying agents).
 - 3. Stain: Vegetable oil-based, waterborne stain for exterior use with UV Protection.
 - 4. Acrylic: Waterborne, urethane; VOC less than 100 g/l.
 - 5. Plant-Based Oil Finish: Low odor, water reducible, interior use.
 - 6. Polymerized Linseed Oil: Interior use.
 - 7. Polymerized Tung Oil: Interior use.
- H. Paint Strippers – Low-Emitting: Shall not contain methylene chloride. Avoid products containing methanol and trichloroethane.
- I. Clay and Mineral-Based Pigments:
 - 1. Native Earths: Ochre, raw umber, raw sienna.
 - 2. Calcined Earths: Burnt umber, burnt sienna.
 - 3. Iron Oxides: Mars black, Mars yellow, Mars violet.
- J. Conventional Pigments: Pigments used in conventional paint contain the following toxic compounds:
 - 1. White: Antimony oxide, rutile titanium dioxide.
 - 2. Yellow-orange-red: Cadmium, cadmium, lithopone, chrome yellow, molybdate orange, strontium chromate, zinc chromate.
 - 3. Blue: Phthalocyanine blue.
 - 4. Green: Chrome green, chromium oxide, hydrated chromium oxide, phthalocyanine green.
- K. Biocides: Provide paint with levels below 0.025%.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine sub-surfaces to receive Work and report in writing with a copy to Architect, conditions detrimental to Work. Commencement of Work will be construed as acceptance of sub-surfaces.

3.2 PROTECTION

- A. Before painting, remove hardware, accessories, electrical plates, lighting fixtures and similar items and protect.
 - 1. Provide "Wet Paint" signs and other barricades and protections as required to protect adjacent surfaces and work of other Trades, whether being painted or not.
 - 2. Mask permanent labels.
 - 3. Provide, distribute and maintain a sufficient supply of clean drop clothes and other protective coverings.
 - 4. Protect foliage and other exterior finished surfaces from contact with cleaning materials and thoroughly flush with water after contact.
 - 5. On completion of each space, replace above items.

3.3 SURFACE PREPARATION

- A. General:
 - 1. Surfaces requiring painting or finishing shall be thoroughly dry and cured, free of dirt, dust, rust, stains, scale, mildew, wax, grease, oil, deteriorated substrates, bond-breakers, efflorescence and other foreign matter detrimental to the coating's adhesion and performance. Repair voids, cracks, nicks and other surface defects with appropriate patching material. Finish flush with surrounding surfaces and match adjacent finish texture.
 - 2. Spot prime marred or damaged shop coats on metal surfaces with appropriate metal primer.
 - 3. Determine moisture content of plaster, stucco, cementitious materials, wood and other moisture-holding materials by use of a reliable electronic moisture meter.
 - 4. Determine alkalinity of plaster, stucco and other cementitious materials by performing appropriate tests.
 - 5. Do not paint surfaces where moisture content or alkalinity exceeds that which is allowed by paint manufacturer.
- B. Wood:
 - 1. Sandpaper to smooth and even surface and then dust off. After primer or stain coat has been applied, thoroughly fill nail holes and other surface imperfections with putty tinted with primer or stain to match wood color. Sand woodwork between coats to a smooth surface. Cover knots and sap streaks with a thin coat of shellac, or seal with a suitable stain blocking sealer.
 - 2. Finish door and window edges after final fitting. Finish interior of cabinets in the same manner as the exterior unless otherwise specified. Seal interior of drawers unless otherwise specified.
 - 3. Back-priming:
 - a. Back-prime interior woodwork, which is to receive paint or enamel finish, with enamel under-coater paint.
 - b. Back-prime interior woodwork, which is to receive stain and/or varnish finish with VOC compliant varnish acceptable to the Architect.
 - c. Back-prime wood trim before installation.

- C. Steel and Iron:
 1. Remove grease, oil, mill scale, rust and rust scale and touch-up chipped or abraded places on items that have been shop coated. Remove and re-prime incompatible or damaged shop applied primers. Comply with the Steel Structures Painting Council's (SSPC) recommendations for cleaning of un-coated steel and iron surfaces.
 2. When area will be exposed to view, sandpaper the entire primed area smooth, feather the edge of surrounding un-damaged prime coat and spot prime in a manner to eliminate evidence of repair.

- D. Galvanized Metal and Aluminum:
 1. Thoroughly clean by wiping surfaces with a non-hydrocarbon, low VOC solvent that will not leave an oily residue. Apply surface conditioner or vinyl-wash pre-treatment as required for proper adhesion if required by paint manufacturer. Prime galvanized metal with galvanized iron primer as recommended by paint manufacturer. A test sample of the complete painting system should be applied and checked for adhesion before final painting begins.
 2. Clean visible portions of throats of galvanized steel ductwork with low VOC solvent; wipe dry with clean rags and paint flat black.

- E. Concrete:
 1. The method of surface preparation shall be at Contractor's discretion, provided the results are satisfactory to the Architect, and the method is in compliance with applicable codes and requirements.
 2. Clean and prepare surfaces of tilt-up pre-cast concrete wall panels to be painted by power washing surface to remove all efflorescence, chalk, dust, dirt, grease, oils and release agents.
 3. Repair surfaces to be painted prior to application of prime and finish coat(s). Apply a tinted primer to the substrate to help identify surface imperfections. After the primer has thoroughly dried, patch, fill and repair surface imperfections to match and flush-out with adjacent finish texture and profile.
 4. Before first paint coat is applied, spot prime nails and other exposed metal occurring in the surfaces with a rust inhibitive primer as recommended by paint manufacturer.

- F. Gypsum Board Surfaces:
 1. Fill cracks, holes, or imperfections with compatible patching material and smooth off to match adjoining surfaces. Before painting, surfaces shall be first tested for dryness with a moisture-testing device.
 2. Apply no paint or sealer on gypsum board when the moisture content exceeds 8%. Test sufficient areas in each space and as often as necessary to determine if the surface has the proper moisture content for painting. If the moisture content is between 8% and 12%, prime the alkali resistant primer.
 3. If 8% or less, prime with specified primer. Remove the dry salt deposits from plaster surfaces by brushing with a stiff brush before painting.

3.4 WORKMANSHIP

- A. Apply products to achieve paint manufacturer's printed specifications for dry mil thickness.
- B. Apply each coat of paint evenly and comply with manufacturer's drying time before applying subsequent coats.
- C. Finished work shall be uniform, match approved color, texture and coverage, and free from runs, sags, clogging or excessive flooding. Make edges of paint adjoining other materials or

colors sharp and clean, without overlapping. Where varnishes or enamel is used, lightly sand, dust, and clean undercoats to obtain a smooth finish coat. Sand carefully between each coat of finish on smooth surfaces for good adhesion of subsequent coats.

- D. Where clear finishes are required, ensure tinted fillers match wood. Work fillers well into the grain before set. Wipe excess from the surface.
- E. Where specific mil thicknesses are required, check thickness by the following methods:
 - 1. Over ferrous metal – Elecometer Film Gauge
 - 2. Other surfaces – Tooke Dry Mil Inspection Gauge

3.5 APPLICATION

- A. Painting and finishing as required to be provided for un-finished surfaces.
 - 1. Paint shall be applied over proper primer, filler, or pre-treatment for each type of surface as required holding surface finish.
 - 2. Two coats of finish and additional coats are required to provide adequate coverage will be provided.
 - 3. High, overhead spaces to have dryfall paint finish.
 - 4. Transformer boxes, meter panels and electrical equipment, backflow valves and other utility equipment located on the site shall be painted to match the building color.
 - 5. Hollow metal frames.
 - 6. Stairs, ladders and miscellaneous metals.
- B. The number of coats scheduled is the minimum number of coats required. Additional coat(s) shall be applied, at no additional cost to the Owner, to completely hide base material, provide uniform color and to produce satisfactory finish results.
- C. Apply coatings without thinning except as specifically required by label directions, or required by these specifications. In such cases, thinning shall be the minimum reduction permitted.
- D. Priming will not be required on items delivered with prime or shop coats, unless otherwise specified. Touch-up prime coats applied by others as required to ensure an even primed surface before applying finish coat.
- E. Plumbing, Mechanical and Electrical:
 - 1. Interior exposed water, gas, waste piping, sprinkler piping, conduit, lighting and electrical panels, telephone terminal boxes, galvanized ducts and insulated ducts, shall be painted in areas other than mechanical rooms, unless otherwise scheduled.
 - 2. Paint exposed un-finished fixtures, metal ducts, switch boxes, control panels, devices, starters, junction boxes, vents, drains and other similar items as directed by Architect.
- F. Spray paint prime coated (not pre-finished) grilles and registers with enamel or lacquer to match walls and ceilings. Paint materials shall not sag, run or bind movable parts of grilles, registers, louvers, baffles and other similar items.
 - 1. Throats of ducts shall be given one coat of flat black paint wherever visibility of the interior of the duct is allowed through registers or other similar items. At fiber lined duct, use black latex paint.
 - 2. Examine the Mechanical and Electrical Drawings and Specifications to determine the amount of exposed work to be painted.
- G. Paint exposed surfaces of every member, paint items inaccessible after installation before installation, if required to be painted. Edges, tops and bottoms of wood doors shall be sealed

and finished with the same finish as the door faces, to meet door manufacturer's warranty requirements. Verify edge color with Architect as different colors may be selected for each face.

- H. Paint items fitted with finish hardware after hardware has been temporarily removed.
- I. Heating and other equipment on or adjacent to walls or surfaces scheduled for painting, shall be disconnected, using workmen skilled in appropriate trades and moved temporarily to permit painting of surface. Following completion of painting, replace and reconnect items.
- J. Each succeeding pigmented coat shall be distinguishably lighter than the previous coat. Tint prime and undercoats to a color similar to finish coat. Each coat of material applied must be inspected and approved by the Architect before the application of the succeeding specified coat; otherwise no credit for the concealed coat will be given, and the Contractor shall assume the responsibility to re-coat work in question. Contractor shall notify the Architect when each coat is completed.
- K. Brush, wipe, or roll stain in two-coat application. Avoid lap marks by maintaining "wet-edge" continually being merged with existing liquid coverage and stop only at natural edges, turns and breaking places.
- L. Do not paint over Underwriters' Laboratory labels, fusible links, exposed sprinkler heads and other similar items.
- M. Paint piping, electrical or other equipment, conduit, vents and other similar items as directed by Architect.
- N. Finish closets and the interior of cabinets with same color as adjoining rooms, unless otherwise specified. Finish other surfaces same as nearest or adjoining surfaces, unless otherwise shown or scheduled.
- O. Paint surface of walls, which will be concealed by cabinets, chalkboards and other items attached to wall.

3.6 ADJUSTING

- A. At completion, do touch-up and re-paint work and leave finish surfaces in good condition.

3.7 CLEANING

- A. During the course of the Work, remove misplaced paint and stain spots or spills. Leave Work in clean condition acceptable to Architect.
- B. Remove oily rags and waste daily, taking precaution to prevent fire.

3.8 SCHEDULES

- A. Color Schedule: As listed on Interior Finishes Schedule or provided by Architect.

- B. Schedule of Finishes: Low sheen eggshell paint shall be used in all areas. The only exceptions would be utility rooms, break rooms, kitchens and rest rooms where a semi-gloss finish is to be installed, and the interior soffits which are to be painted with flat.
- C. Finishing of the following listed items and materials will not be required and shall be protected:
 - 1. Stainless Steel, brass, bronze, copper, monel, chromium, anodized aluminum; specially finished articles such as porcelain enamel, plastic coated fabrics and baked enamel, unless otherwise indicated.
 - 2. Finished products such as ceramic tile, glass, brick, resilient flooring and acoustical tiles, board and metal tees.
 - 3. Pre-finished products such as wood folding partitions and doors, wood classroom and laboratory casework, bleachers and elevator cabs.

3.9 INTERIOR PAINT FINISHES

- A. System 201 (Ferrous Metals): Apply to exposed metals such as steel doors, hollow metal frames, metal beam saddles, columns, grilles and registers, stair and hand railings, ladders and other exposed miscellaneous metals.
 - 1. First Coat: Ferrous Metal Primer (Red or White color as applicable to finish coats).
 - 2. Second Coat: Same material as Third Coat as recommended by manufacturer.
 - 3. Third Coat: Enamel, Eggshell.
- B. System 202 (Interior Wood Finishes – Enamel): Apply to wood door frames, columns, exposed and concealed casework and millwork, wood-window wall construction, medium density plywood surfaces, shelving, roll-up wood doors, perforated and plain type hardboard, particleboard and other exposed miscellaneous wood and trim, except wood specified for a transparent or stain finish
 - 1. First Coat: Enamel Undercoater.
 - 2. Second and Third Coats: Enamel, Eggshell.
- C. System 203 (Interior Wood Finish – Flat): Apply to plywood telephone backing boards and other miscellaneous softwood as noted, specified, or scheduled.
 - 1. First Coat: Enamel Undercoater/Primer.
 - 2. Second and Third Coats: Flat Paint – Waterborne (Vinyl Acrylic).
- D. System 204 (Galvanized Metals): Apply to exposed galvanized metal.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pre-Treatment (if required by paint manufacturer).
 - 2. First Coat: Galvanized Metal Primer.
 - 3. Second and Third Coats: Enamel, Eggshell
- E. System 205 (Aluminum): Apply to interior louvers and other miscellaneous exposed unfinished aluminum surfaces.
 - 1. Clean metal to remove foreign matter or any coating applied by the metal manufacturer. Apply Surface Conditioner or Vinyl Wash Pre-Treatment.
 - 2. First Coat: Aluminum Primer.
 - 3. Second and Third Coats: Enamel, Eggshell.
- F. System 206 (Gypsum Board, Plaster and Concrete – Wet Areas): Apply to gypsum board, plaster and concrete surfaces in toilet rooms, janitor rooms, kitchens and other areas as scheduled.

1. First Coat: Enamel Undercoater.
 2. Second and Third Coats: Enamel, Semi-Gloss.
- G. System 207 (Gypsum Board, Plaster, and Concrete – Non-Wet Areas): Apply to gypsum board, plaster, and concrete except for wet areas.
1. First Coat: Waterborne Primer/Sealer.
 2. Second and Third Coats: Enamel, Eggshell.
 - 1) Gloss: Varnish, Gloss – Polyurethane (Waterborne).

END OF SECTION

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Exterior cast or fabricated metal building signage. (Not Applicable for Sedona PD)
 - 2. Interior identification signage: All rooms in scope of work to receive signage, to include name of office occupant, room names, ADA compliant signs, Fire and Safety signs per code.

1.02 SUBMITTALS

- A. Product Data: Submit Manufacturer's brochures indicating materials and finishes.
- B. Shop Drawings: Show sizes of members, method of construction, copy layout, and mounting details for proper mounting. Furnish template for mounting metal letters.
- C. Samples: Furnish full size rubbing prior to casting plaque. Submit sample letter and anchoring device. Submit selection of aluminum plaque finishes for Architect's approval.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 2003 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 - 3. ADA Accessibility Guidelines (ADAAG).

1.04 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage and Protection: Store items in dry, protected areas. Adequately protect against damage while stored at the site. Keep free of corrosion or other damage.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Furnish products of one of the following Manufacturers, except as approved by the Design Professional, subject to compliance with Specification requirements:
1. Plastic Signage:
 - a. ASI-Modulex www.asimodulex.com
 - b. Best Manufacturing Company www.bestsigns.com
 - c. Vomar Products, Inc. www.vomarproducts.com
 - d. Signsource
 - e. Mountain States Specialties
 2. Metal Signage: Not Applicable.
 - a. ASI-Modulex www.asimodulex.com
 - b. ARK Ramos Manufacturing Co., Inc. www.arkramos.com
 - c. Matthews. www.matthewsbronze.com
 - d. Southwell. www.southwellco.com
 - e. Spanjer Brothers, Inc.
 - f. Metallic Arts. www.metallicarts.com
 - g. Hardman Signs www.hardmansigns.com

2.02 MATERIALS

- A. Materials shall be new stock, free from defects, imperfections strength, durability, and appearance. Provide materials as shown and detailed on drawings and as specified herein.
- B. Metals - General:
1. For fabrication of exposed metal work, use only materials which are smooth and free of surface blemishes including pitting, roughness, seam marks, roller marks, and trade names.
 2. Do not use materials which have stains and discolorations.
 3. For exposed items of work which include plain flat surfaces in width of more than 50 times the metal thickness, provide sheet stock from mill which has been stretcher leveled to highest standard of flatness commercially available.
- C. Cast Acrylic Sheet: Provide cast (not extruded or continuous cast) methyl methacrylate monomer plastic sheet, in sizes and thicknesses indicated, with a minimum flexural strength of 16,000 psi when tested in accordance with ASTM D 790, a minimum allowable continuous service temperature of 176 deg F (80 deg C), and of the following general types:
1. Colored Coatings for Acrylic Plastic Sheet: Use colored coatings, for background colors, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are nonfading for the application intended.
 2. Transparent Sheet: Where sheet material is indicated as "clear," provide colorless sheet in matte finish, with light transmittance of 92 percent, when tested in accordance with the requirements of ASTM D 1003.
 3. Opaque Sheet: Where sheet material is indicated as "opaque," provide colored opaque acrylic sheet in colors and finishes as selected from the manufacturer's standards.
- D. Aluminum Sheet: Provide aluminum sheet of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15.

- E. Vinyl Film: Opaque reflectorized vinyl film, 0.0035-inch minimum thickness, with pressure-sensitive adhesive backing, suitable for exterior as well as interior applications.
- F. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- G. Tape: VHB (very high bond) double-stick foam tape as manufactured by 3M.
- H. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.03 EXTERIOR SIGNAGE

- A. Letters:
 - 1. Lettering: As indicated on Drawings.
 - 2. Finish: As indicated on Drawings.
 - 3. Color: To match approved sample and as approved by Architect.
 - 4. Mounting: Threaded studs set in adhesive, flush mounted or projected with spacers, as indicated.

2.04 PLASTIC SIGNAGE

- A. Interior Signage: All interior signage shall comply with applicable ADA requirements.
 - 1. Base: Melamine plastic laminate, 1/8 inch thick, rated non-static, fire retardant and self-extinguishing.
 - a. Colors: As selected by Architect and in accordance with local and Federal requirements
 - b. Mounting: Screw attach to wall or door or door frame as indicated by Architect. Minimum 2 screws per sign. Height shall be 60 inches above finish floor to centerline of sign at wall mounted signs.
 - c. Finish and contrast:
 - 1) Matte finish.
 - 2) Characters shall contrast with background by at least 20 percent.
 - 2. Letters and Braille characters:
 - a. Raised 1/32 inch upper case, sans serif or simple serif, and accompanied with Grade 2 Braille. Raised characters shall be at least 5/8 inch high, but not higher than 2 inches.
 - b. Letters and numbers: Width-to-height ratio from 3:5 to 1:1, and stroke width-to-height ratio from 1:5 to 1:10.
 - c. Text: Required quantity of each sign shall be as directed by Architect.

- B. Self-Adhesive Vinyl: Self-adhesive vinyl letters and numbers as indicated on Drawings. Font and size as indicated on Drawings, or as selected by Architect.
 - 1. Color: As selected by Architect.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions. Drawings and approved Shop Drawings.
- B. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.
- C. Install plumb and level in accordance with Manufacturer's instructions.
- D. Do not field cut any signage members.
- E. Install engraved signs after surfaces are finished, in locations indicated.
- F. Securely fasten wall mounted items to solid backing.
- G. All exterior wall penetrations shown on Drawings or otherwise required for signage installation shall be located by using full-size installation templates furnished by the signage fabricator.
- H. Seal, patch and paint all penetrations.
- I. Self-Adhesive Vinyl Letters: Clean glass as recommended by manufacturer and apply letters level and at proper spacing at locations indicated.
- J. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
 - 1. Silicone-Adhesive Mounting: Use liquid silicone adhesive recommended by the sign manufacturer to attach sign units. Use double-sided vinyl tape where recommended by the sign manufacturer to hold the sign in place until the adhesive has fully cured.
 - 2. Double-Stick Tape Mounting: Clean surfaces to be joined and apply double stick tape to back of wall mounted signage in continuous strips at approximate 2 inch center to center

spacing between strips. Apply sign to wall surface taking care to properly align and plumb signage before removing release paper.

3.03 CLEANING

- A. Clean and polish exposed surfaces.
- B. Construction Waste: In accordance with Section 01 74 00.

END OF SECTION

SECTION 10 21 13
TOILET PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Stainless steel textured toilet compartments, privacy screens, and urinal screens as shown on Drawings and as specified of the following type:
 - 1. Compartment Style: Overhead braced, floor mounted.
 - 2. Screen Style: Wall hung.

1.2 SYSTEM DESCRIPTION

- A. Performance Requirements
 - 1. Graffiti Resistance: Partition material shall have the following graffiti removal characteristics when tested in accordance with ASTM D6578-00 Standard Practice for Determination of Graffiti Resistance in accordance with Section 9, "Graffiti Removal Procedure Using Manual Solvent Rubs".
 - a. Cleanability: Five (5) required staining agents shall be cleaned off material.
 - 2. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2197-98(2002) Standard Test Method for Adhesion of Organic coating by Scrape Adhesion, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester:
 - a. Scratch Resistance: Maximum Load Value shall exceed 10 kilograms.
 - 3. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2794-93(1999)e1 Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact), using .625: hemispherical indenter with 2-lb impact weight:
 - a. Impact Resistance: Maximum Impact Force value shall exceed 30 inch-lbs.
 - 4. Fire Resistance: Partition material shall comply with the following requirements, when tested in accordance with ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
 - a. Smoke Developed Index: Not to exceed 450.
 - b. Flame Spread Index: Not to exceed 75.
 - c. Material Fire Ratings:
 - 1) National Fire Protection Association (NFPA): Class B
 - 2) International Code Council (ICC): Class B.

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing plans, elevations, details of construction, finish color, hardware fittings and fastenings. Indicate locations of blocking or materials by others for proper attachment to supporting finished Work.
- B. Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities.
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. ADA Accessibility Guidelines (ADAAG).
- B. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.
- C. Source Limitations: Obtain toilet compartment components and hardware from single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at the site.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements; proper fit and attachment of parts is required.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Drawings and specifications are based upon Bradley Mills Partitions.
- B. Global Partitions SS Diamond Finish.

2.2 MATERIALS

- A. Finish
 - 1. 5WL Stainless textured.
- B. Hardware – General
 - 1. Heavy Duty: Manufacturer's heavy duty stainless steel castings, including stainless steel, tamper-resistant fasteners
 - a. Hinges: Self-closing continuous spring-loaded type adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door.
 - b. Latch and Keeper; Surface mounted side latch with rubber-faced combination door strike and keeper, with provision for emergency access, meeting requirements for accessibility at accessible compartments.

- c. Coat Hook: combination hook and rubber-tipped stop, sized to prevent door from hitting compartment mounted accessories. Provide wall bumper where door abuts wall.
 - d. Door Pull: Provide pulls on both sides of outswing doors.
 - e. Mounting Brackets
 - 1) Minimum 18 g-gauge stainless steel and extend full height of panel
 - 2) U-channels shall be furnished to secure panels to stiles.
 - 3) Angle brackets shall be furnished to secure stiles to walls and panels to walls.
 - 4) Fasteners shall utilize through bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1.500 lbs. per fastener
 - 5) Wall mounted urinal screen brackets shall be 11 gauge double thickness.
 - f. Overhead Brace headrail shall be satin finish anodized aluminum
 - g. Shoes at to be 304 Series stainless steel with #4 satin brushed finish.
- C. Accessibility Provisions: Where shown on the Drawings, provide accessible compartments, interior space as required by ADA, with outswinging doors, size as indicated.
- 1. Door opening size minimum 2 feet 10 inches clear, or greater where required by applicable codes.
 - 2. At outswinging doors, install an additional bumper on the outside of the door.
- D. Urinal Partitions.
- 1. Same material and construction used for toilet partitions.
 - 2. Size: Approximately 58 inches high, 24 inches deep, mounted 12 inches above the floor.
- E. Privacy Screens.
- 1. Same material and construction used for toilet partitions.
 - 2. Size: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other work which affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Install toilet compartments in strict accordance with Manufacturer's printed instructions, at locations indicated. Erect straight and plumb, with horizontal lines level.
- B. Floor Mounted: Provide structural support in accordance with manufacturer requirements.
- C. Installed Clearances:

1. Provide clearance at the wall of approximately 1 inch or less for panels and 1 inch or less for pilasters. Conceal evidence of drilling, cutting, and fitting to room finish in the finish Work.
2. Provide uniform clearance at vertical edges of doors from top to bottom not to exceed 3/16 inch.

3.3 FIELD QUALITY CONTROL

- A. Adjust hardware for satisfactory operation. Adjust door hinges to hold door open at approximately 30 degrees. Upon completion of the installation, put each operating component through at least ten operating cycles. Adjust to achieve optimum operation.
- B. Upon completion of the installation, visually check exposed surfaces, and touch up scratches and abrasives to be completely invisible to the unaided eye from a distance of five feet.

3.4 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

PART 1 - GENERAL

1.01 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with the following:
 - 1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. ADA Accessibility Guidelines (ADAAG).

1.02 SUBMITTALS

- A. Product Data: Submit Drawings and brochures of toilet accessory items showing sizes, construction and mounting techniques.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact. Protect finished surfaces with removable wrapping or coating which will not bond when exposed to sunlight.
- B. Storage: Adequately protect against damage while stored at site.
- C. Handling: Comply with Manufacturer's instructions.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. One of the following Manufacturers may be provided, as selected by Owner and approved by the Architect, subject to compliance with Specification requirements.
 - 1. Bobrick Washroom Equipment Co., Inc.
 - 2. Georgia Pacific.
 - 3. Bradley Corporation
 - 4. ASI Group
 - 5. ULINE
 - 6. VONDREHLE
- B. All Accessories to be field located as noted in Drawings.

2.02 MATERIALS

- A. Stainless Steel: AISI, Type 302/304, with satin No. 4 finish. Unless specified or indicated, the use of other stainless steel alloys shall not be allowed.
- B. Sheet Steel: Cold rolled, commercial quality, ASTM A1008. Surface preparation and metal pretreatment as required for applied finish.
- C. Chromium Plating: Nickel and chromium electro-deposited on metal, ASTM B456, Type SC 2.
- D. Mirror Glass: FS DD-G-451, Type I, Class 1, Quality 1, 1/4 inch (thick, with silver coating, copper protective coating, and non-metallic paint covering).
- E. Galvanized Steel Mounting Devices: ASTM A123, hot-dip galvanized after fabrication.
- F. Locks: Tumbler type, keyed alike unless specified otherwise.
- G. Fasteners: Theft-proof screws. Use no adhesive mountings.
- H. Backing Plates: 16 gage cold-rolled steel for mounting grab bars in stud partitions.

2.03 TOILET ACCESSORIES

- A. Grab Bars: Bobrick B6806 series, stainless steel, 1-1/2 inches diameter, concealed mounting with snap-flange covers, satin finish, in sizes and locations as shown on drawings. Grab bars shall support at least 900 pounds. Furnish with concealed anchors and anchor plates suited to grab bar location.
- B. Mirrors: As specified in Section 08 80 00 - Glazing
- C. Soap Dispenser: ULINE foam dispenser model #H-3476
 - a. No Substitutions
- D. Hat and Coat Hook: Bobrick B-682 (Locate as shown on Drawings).
- E. Toilet Paper Dispenser: ASI Model No. 0030 Surface Mounted Twin Hide-A-Roll Toilet Tissue Dispenser.
- F. Toilet Seat Cover Dispenser: ASI Model No. 9477-SM Profile Collection Surface Mounted Toilet Seat Cover Dispenser.
- G. Paper Towel Dispenser: VONDREHLE #46KDDI
 - a. No Substitutions
- H. Sanitary Disposal: ASI Model No. 0473-1A Surface Mounted End Stall Sanitary Napkin Disposal.
- I. Trash Receptacle: NIC
- J. Utility Shelf
 - 1. ASI Model No. 1315 Utility Shelf with Mop Holders, Drying Rod, and Rag Hooks.
 - a. 36" length or as shown on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination with other Work: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.02 INSTALLATION

- A. Install items in accordance with Manufacturer's published instructions and approved installation drawings in locations as shown on Drawings, and in compliance with ANSI A117.1 as applicable.
- B. Secure toilet room accessories to adjacent walls and partitions in accordance with the Manufacturer's instructions for each item and each type of substrate construction and as follows:
 - 1. Attachments of Recessed Accessories: Place shims between framing and cabinet at screw attachment points.
 - 2. Attachment of Surface Mounted Accessories: At stud walls, provide concealed blocking or backing at screw points to allow attachments with No. 18 x 1-1/2 inch sheet metal screws. At solid walls, wall plugs, expansion shields or toggle bolts shall be provided. Mirrors shall be locked to wall hangers by tightening locking screws concealed in lower frame. Soap dispensers shall be mounted with 4 inch clearance from filler top to underside of any horizontal projection.
- C. Grab Bars:
 - 1. Framed wall construction: Install concealed anchor plates to studs. Attachment to studs must be sufficient to withstand a horizontal pull of 300 pounds. Accurately position and fasten before wall finish is applied. After wall surface is finished, secure concealed mounting plate to anchor plate using stainless steel machine screws furnished by the Manufacturer.
 - 2. Toilet Compartments: Through-bolted connection to anchors.
- D. Seal wall penetrations with sealant as specified in Section 07 92 00 to prevent moisture penetration through joints around fixtures.

3.03 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment, and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 10 44 00

FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUBMITTALS

- A. Product Data: Submit Manufacturer's data and installation instructions for each item, including dimensions and anchorage details.

1.2 QUALITY ASSURANCE

- A. Standards: Comply with ANSI/UL 92 and 711.
- B. Regulatory Requirements: Conform to ANSI/NFPA 10 and the following:
 - 1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA).
 - 3. ADA Accessibility Guidelines (ADAAG).
 - 4. The Arizonans with Disabilities Act of 1992 Administrative Rules (AzDAAG)

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Furnish DuPont™ FE-36™ in hand-held extinguishers in all areas considered to be high-value or essential operations with electronic equipment. See Drawings for locations.
- B. Furnish products of one of the following Manufacturers, except as approved by the Architect, subject to compliance with Specification requirements:
 - 1. Fire Extinguishers:
 - a. Amerex
 - b. Ansul
 - c. Buckeye
 - d. General
 - e. Kidde.
 - f. Any manufacturer that can meet all requirements in this section and can be serviced with the equipment, adapters, and parts that the Owner currently uses and will accept.
 - 2. Fire Extinguisher Cabinet:
 - a. Larsen's Manufacturing Co. www.larsensmfg.com
 - b. J.L. Industries www.jlindustries.com
 - c. General
 - d. Knox
 - e. Supra Products Co.

2.2 MATERIALS AND ACCESSORIES – GENERAL

- A. Fire suppression equipment shall not contain HCFC's or Halons.

2.3 EQUIPMENT

- A. Extinguishers and Cabinets:
 - 1. Mechanical rooms, electrical rooms and commercial kitchens:
 - a. Minimum rating: 20-B:C.
 - b. Extinguishing agent: Sodium bicarbonate base or potassium bicarbonate base. Carbon dioxide or halon agents are not acceptable.
 - c. No cabinet required.
 - 2. Corridors and other areas requiring fire extinguishers (or are considered light hazard to ordinary hazard areas):
 - a. Provide fire extinguisher cabinet, semi-recessed
 - b. Minimum rating of 4-A:20-B:C.
 - c. Extinguishing agent: Ammonium phosphate.
 - 3. Fire extinguishers must be UL approved and bear an individual identification on the fire extinguisher.
 - 4. The cylinder head and internal parts must be constructed of steel or aluminum.
 - 5. Stainless steel cylinders or any other cylinders requiring normal hydrostatic testing less than every twelve years are not acceptable.
 - 6. Fire extinguisher cabinets, if provided with locks, must be key operated by the standard Larsen LL24 key.
- B. Wall Bracket: Manufacturer's standard J-type for wall hung extinguishers.
- C. Fire Extinguisher Cabinets: As manufactured by Larsen Manufacturing Co., Architectural Series with solid clear anodized aluminum door in a rolled edge, semi recessed cabinet, and black vertical die-cut lettering "Fire Extinguisher".

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Install items in accordance with Manufacturer's directions. Install cabinets plumb and level at heights shown on Drawings.
- B. Comply with regulatory requirements and anchor securely.

- C. Travel distance:
 - 1. Mechanical rooms, electrical rooms and commercial kitchens: Not to exceed 50 feet. Fire extinguishers outside the room/area of protection cannot be included in the travel distance requirements.
 - 2. Corridors and other areas requiring fire extinguishers (or are considered light hazard to ordinary hazard areas): Not to exceed 75 feet.
- D. Verify that extinguishers are charged and tagged.
- E. Place extinguishers in cabinets and on wall brackets.

3.3 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

PERSONAL STORAGE LOCKER WITH BUILT-IN BENCH DRAWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
Personal Storage Lockers with built-in bench drawers
- B. Related Work:
 - 1. Finish floor covering material and installation.

1.3 REFERENCES

- A. American National Standards Institute (ANSI) Standards:
Applicable standards for fasteners used for assembly.
- B. American Society for Testing and Materials (ASTM) Standards:
Applicable standards for steel sheet materials used for fabrication
Applicable standards for the testing of electrostatically applied Powder Coat Paint
- C. American Institute Of Steel Construction (AISC) Standards:
Applicable standards for steel materials used for fabrication.

1.4 DESCRIPTION

- A. General: Welded Metal Lockers only with end-user reconfigurable interior. Specialized lances to provide the flexibility of on-site, end-user reconfiguration/addition of internal components anytime, anywhere, now or in the future.
- B. Finishes:
Fabricated Metal Components and Assemblies: All components to be painted with an electrostatically applied Powder Coat paint that can meet or exceed test requirements set out by ASTM standard D3451-06 Standard Guide for Testing Coating Powders and Powder Coatings.
- C. Sizes:
Personal Storage Lockers with built-in bench drawers: nominal heights of 72 inches. Built-in bench drawer nominal height is 18 inches and nominal depth is 36 inches.
Personal Storage Lockers with built-in bench drawers, nominal widths of 15 inches.

1.5 PERFORMANCE REQUIREMENTS

A. Design Requirements:

Limit overall width not to exceed specified nominal width; locker width designed for zero growth.

B. Seismic Performance: Provide Welded Metal Lockers capable of withstanding the effects of earthquake movement when required by applicable building codes.

C. ADA Requirements: Personal Storage Lockers with nominal height of [72] inches or [1828.8] millimeters meet ADA requirements.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of welded metal locker required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. Shop Drawings: Show fabrication, assembly, and installation details, including descriptions of procedures and diagrams. Show complete locker installation layout, including quantities, locations and types of accessory units required. Include notations and descriptions of all installation items and components.

Show installation details at non-standard conditions, if any.

Provide layout, dimensions, and identification of each unit, corresponding to sequence of installation procedures.

Provide installation schedule and procedures to ensure proper installation.

C. Samples: Provide minimum [3] inches or [76] millimeters square example of each color and texture on actual substrate for each component to remain exposed after installation.

D. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts, consisting of actual product pieces, showing full range of colors and textures available.

E. Warranty: Submit draft copy of proposed warranty for review by the Architect.

F. Maintenance Data: Provide written documentation of the manufacturer's statement, claiming the maintenance free nature of the product.

G. Reference List: Provide a list of recently installed welded metal lockers to be visited by owner, architect, and contractor. Intent of list is to aid in verifying the suitability of manufacturer's products and comparison with materials and product specified in this section. Include contact name, address, and phone numbers.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001:2015 certified for the design, production, installation and service of welded metal lockers. Furnish certification attesting ISO 9001:2015 quality system registration.

B. Installer Qualifications: Engage an experienced installer who is the manufacturer's authorized representative for the specified products for installing welded metal lockers.

Minimum Qualifications: 1-year experience installing welded metal lockers of comparable size and complexity to specified project requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Follow manufacturer's instructions and recommendations for delivery, storage and handling requirements.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify quantities of welded metal locker units before fabrication. Indicate verified measurements on shop drawings. Coordinate fabrication and delivery to ensure no delay in progress of the work.
- B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating welded metal lockers units without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence welded metal lockers with other work to minimize possibility of damage and soiling, during remainder of construction period.
- B. Schedule installation of specified welded metal lockers after finishing operations, including painting, have been completed.
- C. Provide components, which must be built in at a time, which causes no delays in the general progress of the work.
- D. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing welded Metal Lockers including, but not limited to, the following:

Recommended attendees include:

1. Owner's Representative.
2. Prime Contractor or representative.
3. The Architect/Owner.
4. Manufacturer's representative.
5. Subcontractors or installers whose work may affect, or be affected by, the work of this section.

1.11 WARRANTY

- A. Provide a written warranty, executed by Contractor, Installer, and Manufacturer, agreeing to repair or replace units, which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have under General Condition's provisions of the Contract Documents.
- B. Limited Lifetime Warranty: Subject to the terms in the written warranty, warrant the original purchaser exclusively that the locker frames manufactured by it will be free from defects in materials and workmanship for the lifetime of the locker.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Spacesaver Free**Style**™ Personal Storage with built-in bench drawers; based upon welded metal lockers manufactured by Spacesaver Corporation, 1450 Janesville Avenue, Fort Atkinson, Wisconsin 53538-2798. Telephone: 800-492-3434.

2.2 BASIC MATERIALS

- A. General: Provide materials and quality of workmanship, which meets or exceeds established industry standards for products specified. Use furniture grade sheet metal, solid hardwood benches and fasteners for component fabrication unless indicated otherwise. Material thicknesses/gauges are manufacturer's option unless indicated otherwise.

2.3 LOCKER TYPES

- A. Personal Storage Lockers. Provide personal storage lockers with built-in bench drawers by Spacesaver Corporation.
- B. Components:
 - 1. Lockers to be equipped with environmental ventilation functionality for applications where Mechanical Air Extraction is desired to remove unpleasant odors from the locker.
 - 2. Lockers to be equipped with the functionality of attaching a modular electrical system as required.
 - 3. All locker types to be equipped a continuous sloped top.

2.4 MANUFACTURED COMPONENTS

- A. Welded Frame:
 - 1. The welded frame must consist of top, bottom, back, and sides constructed of a minimum of 18-gauge or [1.214] millimeters steel. All frame components shall be joined using resistance welding. Riveting of structural members will not be permitted.
 - 2. Horizontal front flanges will be a minimum of [2] inches or [50.8] millimeters. Vertical front flanges will be a minimum of [1] inch or [25.4] millimeters. Horizontal and vertical flanges will overlap and be secured with a minimum two (2) resistance welds per corner.
 - 3. Corner gussets shall be MIG and spot welded in each of the four front corners of the locker for increased stiffness and rigidity.
 - 4. Provide side panel lances evenly spaced on [3] inch or [76.2] millimeter centers. Lances to provide the flexibility of on-site, end-user reconfiguration/addition of internal components anytime, anywhere, now or in the future.
 - 5. Bench Housing for built-in bench drawer
 - a. Welded frame construction shall consist of top, bottom, and side components joined by using resistance welding. Riveting of bench housing structural members will not be permitted.
 - b. Corner gussets shall be welded in the two (2) front bottom corners of the bench housing for increased stiffness and rigidity.
 - c. Horizontal front flanges will be a minimum of [1] inch or [25.4] millimeters

- d. Vertical front flanges will be a minimum of [1] inch or [25.4] millimeters
 - e. Horizontal and Vertical front flanges will overlap and shall be secured with minimum of one (1) resistance weld per corner.
 - f. Side panels – Lances symmetric and evenly spaced to provide optimum component locations (standard based on [3] inch or [76.2] millimeter on center vertical placement to match mating locker lance design).
 - g. Return flanges on housing to securely fasten housing to welded frame of locker.
 - h. Base of bench housing shall include four (4) 3/8"-16 UNC threaded weld-nuts and corresponding leveling feet.
 - i. Top of bench housing shall include hole pattern for mating bench seat.
 - j. Sides of bench housing shall include mounting holes in the event lockers are ganged together.
6. Lockers with built-in bench drawer and built-in external access drawer shall have intermediate base shelf with interlocking mechanism for securing drawer when locker door is closed.
 7. Provide one (4) [0.875] inch or [22.23] millimeter diameter electrical knock-outs per locker, two (2) located on top of the locker in both right and left rear corners, and two (2) located in the back of locker centered at a distance no greater than [24] inches or [609.6] millimeters from the top and bottom. Knock-outs allow end-user flexibility of adding electrical capability to lockers.
 8. Provide a minimum of one (1) duplex receptacle electrical knock-outs per locker; to be used with a UL listed manufactured electrical wiring system as required.
 9. Lockers shall be prepared with mounting holes for use with the continuous sloped top system.
 10. Lockers shall be prepared with mounting holes for attaching necessary trim components
 11. Locker shall be prepared with mounting holes for ganging lockers back-to-back or side-by-side
 12. Base of lockers shall include four (4) 3/8"-16 UNC threaded weld-nuts and corresponding leveling feet.
 13. Base shelf for lockers with built-in external access drawers and bench drawers shall have holes to accommodate double-door lock rod and door stop bracket. (Only on [24] inch or [609.6] millimeters wide and larger)
 14. End Panels: End Panels with no exposed fasteners shall be provided on the end of each locker run; thus, providing a clean and aesthetically pleasing appearance.
 15. All locker sizes and types to be specified by architect.
 - a. Width:
 - 1) Personal Storage Locker with built-in bench drawer or external access drawer: [15] inches.
 - b. Height:
 - 1) Personal Storage Locker with built in bench drawer or external access drawer: [72] inches, [8] inches Slop Top, Overall height [80] inches
 - c. Depth:
 - 1) All lockers [24] inches or [609.6] millimeters
 - 2) Bench drawers: [37-1/8] inches or [936.625] millimeters

- c) Bench seat depth [9.5] [13.0] inches or [241.3] [330.2] millimeters
- 3) External access drawer: [24] inches or [609.6] millimeters

B. Ventilation:

1. Provide ventilation holes in top of locker to allow mechanically extracted air to be pulled up through the locker system as required. Ventilation shall be controlled by eight (8) evenly spaced [0.625] inch or [15.875] millimeter diameter holes. Proper ventilation system ensures odors are removed from locker system.
2. Provide louvered air vents in bottom of the main locker door/s to allow mechanically extracted air to be pulled up through the locker system.
3. Provide louvered air vents in drawer front when built-in bench drawer or built-in external access drawer models are required.
4. Minimum [0.500] inch or [12.7] millimeter gap between back of shelving components and back of locker to provide uninterrupted air flow up the rear of the locker system.
5. Minimum [2.00] inches or [558.8] millimeter gap between front of shelving and locker door to provide uninterrupted air flow up the front of the locker system.

C. Electrical

1. Shall provide four (4) electrical knock-outs per locker as described in section 2.4-A item 7. This feature provides the end-user the opportunity for hard wire electrical connection points for each locker. End-user or General Contractor is responsible for final electrical installation.
2. Shall provide a minimum of four (4) duplex receptacle electrical knock-outs per locker as described in section 2.4-A item 8.
3. Shall provide UL Listed manufactured electrical wiring system as required. This manufactured electrical wiring system provides connection for a maximum of 78 receptacles per hardwired power in-feed (Note: total number of receptacles is dependent on load requirements). This manufactured electrical wiring system is a modular, unique, flexible, and cost-effective method of providing electrical capability to the lockers. This electrical system can be added in the future.
4. Provide 1 Duplex Receptacle Per locker.
5. 8"H Slop tops to be added to conceal electrical components.

D. Drawers (for bench drawer):

1. Drawer body wrapper shall be formed from single piece consisting of sides and bottom, with backs secured using structural locking lances.
2. Drawers for locker with built-in bench drawers and built-in external access drawers shall have box-formed drawer front.
3. Provide interlock system for securing drawer when main locker doors are closed and provide access only when main locker door/s is opened.
4. Built-in bench drawer shall have a nominal [36] inches or [914.4] millimeters depth.
5. Provide a flush mounted pull handle.
6. Drawer Slides: Provide [200] lbs or [90.72] kilograms maximum load capacity and pass 50,000 cycle performance testing (Max. load, uniform distribution) (Test data to be provided by manufacturer upon request)

7. Drawer base minimum [21] inches [533.4] millimeter drawer extension
8. Bench drawer minimum [26.5] inches [673.1] millimeter drawer extension
9. Provide louvered air vents in drawer front when built-in bench drawer or built-in external access drawer models are required.
10. Provide capability of attaching glides for Body Armored Drying Rack, as requested.

E. Bench Seat:

1. Provide [9.5] inches or [241.3] millimeter deep laminated kiln dried maple bench seat; material thickness [1.25] inches or [31.8] millimeters.
2. Front (leading edge) of bench seat to have [.625] inch or [15.88] millimeter radius bull nose.
3. Finish of bench seat shall be sanded smooth and have two (2) coats of catalyzed varnish applied.

F. Single-Piece Welded Doors:

1. Shall be formed from two (2) pieces of minimum 18-gauge [1.2] millimeter cold rolled steel box formed and welded together using modern GMAW techniques. Single-piece door with inner and outer door panels shall have a combined steel thickness of no less than [0.096] inches or [2.4] millimeters thick. Welded door design with inner panel optimizes structural integrity of locker door system over and above any single frame door design.
2. Exterior door panel shall be constructed with formed flanges and return flanges to add stiffness.
3. Internal door panel shall be constructed with formed flanges for added stiffness.
4. All inner door panel (except Multi-Tier) heights shall be minimum 70% of external door height.
5. Single-piece welded door frame shall consist of internal door panel nested inside exterior door panel and welded per the following requirements:
 - a. Top / bottom. Exterior and Interior panels to be welded in a minimum of three (3) places with weld spacing not to exceed [6] inches or [152.4] millimeters between adjacent welds and [1] inch or [25.4] millimeters from any corner.
 - b. Sides. Exterior and interior panels to be welded with spacing not to exceed [12] inches or [304.8] millimeters between adjacent welds and [1] inch or [25.4] millimeters from any corner.
6. Inner door panel to have peg board style hole pattern, allowing the attachment of Document Holder and any standard peg board accessory.
7. Inner door panel to have [4] inch or [101.6] millimeter rectangular slot centered towards the top of the locker.
8. External door panel shall have louvers to provide adequate air circulation throughout locker system.
 - a. Louvered air vents shall be located at the bottom of the locker door to enhance circulation of mechanically extracted air from the bottom of the locker out of the top.
 - b. Louvered air vents shall be approximately [3] inches or [76.2] millimeters in width and [0.75] inches or [19.05] millimeters in height and spaced on [1] inch or [25.4] millimeter centers.

9. All doors shall have neoprene silencers on each door for noise reduction
10. Hinge:
 - a. Provide 16-gauge full length hinge for increased strength and security of locker system.
 - b. Hinges to be welded to door frame with spot welds not to exceed [6] inch or [152.4] millimeter separation.
11. Door assembly to be riveted to door frame on factory pre-established hole pattern.
12. Locking Mechanism.
 - a. Provide Padlock hasp locking option (all locking options have protective stainless steel cover plate for durability and scratch resistance):

G. Interior/Accessory components:

1. All interior components must be constructed of minimum 18-gauge or [1.214] millimeter steel (unless otherwise clarified in specification).
2. For added security, internal component can be secured utilizing blind rivets, threaded fasteners, or bending specially designed tab.
3. All interior components available at time of order and as post-installation upgrades in the future.
4. Shelves:
 - a. Shelf with integral hanger bracket
 - 1) Size specified by locker width
 - 2) Hanger bracket designed with perforations on approximately [3] inch or [76.2] millimeter centers to insure clothing separation for optimum ventilation
 - 3) Performance: Uniform load rating [300] lbs or [136.08] kilograms
 - b. All performance test data shall be provided by manufacturer upon request.
5. Boot Tray
 - a. Material – Rubber
 - b. Dimensions:
 - 1) Width – [12.90] inches or [327.7] millimeters
 - 2) Depth – [19.90] inches or [505.5] millimeters
 - 3) Height – [1.25] inches or [34.75] millimeters
 - c. Manufactured from Natural rubber compounds, environmentally friendly, durable, water repellant easily cleaned with soap and water, resistant to alkalis and weak acids, mold, mildew, and dust mites.
6. Hooks
 - a. Hook Bracket Hanger Assembly – shall have the ability to attach a three-hook bracket assembly to any lanced location on the side panels of the locker.

H. Electrical system

1. UL listed manufactured electrical wiring system with plug-in-play component design
2. Receptacles – standard 20 amp duplex receptacles and 20 amp GFCI duplex receptacles

- I. Locker Tag Numbers
 - 1. Shall provide locker numbers on each locker per customer requirement
- J. ACCESSORIES:
 - 1. Trim and Fillers: Provide manufacturer's standard.
 - 2. Continuous Sloped Top. Provide manufacturers standard.

2.5 FABRICATION

- A. General: Coordinate fabrication and delivery to ensure no delay in progress of the work.

2.6 FINISHES

- A. Colors: Selected from manufacturer's standard available colors.
- B. Paint Finish: Textured (Standard) – Provide factory applied electrostatic powder coat paint. Meet or exceed specifications of the American Society for Testing and Materials (ASTM) Standards:

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine Lockers scheduled to receive accessories [with Installer present] for compliance with requirements for installation tolerances and other conditions affecting performance of specified accessory items.
- B. Proceed with accessory installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Follow manufacturer's written instructions for installation of each type of accessory item specified.

3.3 FIELD QUALITY CONTROL

- A. Verify accessory unit alignment and plumb after installation. Correct if required, following manufacturer's instructions.
- B. Remove components that are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminate evidence of replacement.

3.4 ADJUSTING

- A. Adjust all accessories to provide smoothly operating, visually acceptable installation.

3.5 CLEANING

- A. Immediately upon completion of installation, clean components and surfaces. Remove surplus materials, rubbish and debris, resulting from installation, upon completion of work and leave areas of installation in neat, clean condition.

3.6 DEMONSTRATION/TRAINING

- A. Schedule and conduct demonstration of installed accessory items and features with Owner's personnel.
- B. Schedule and conduct maintenance training with Owner's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end-user personnel would normally perform.

3.7 PROTECTION

- A. Protect system against damage during remainder of construction period. Advise owner of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

END OF SECTION

SECTION 10 51 26
PLASTIC LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Solid plastic lockers.

1.2 SUBMITTALS

- A. Product data and installation instructions for locker units.
- B. Shop drawings showing individual locker construction, materials, dimensions, room layout, overall dimensions for installation and installation details including end and filler panels, crown molding, trim, and accessories. Include locker numbering sequence information.
- C. Samples: Color chip samples and manufacturer color chart selection.

1.3 QUALITY ASSURANCE

- A. Uniformity: Provide lockers that are standard products of single manufacturer with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
- B. Regulatory Requirements:
 - 1. ANSI A117.1, 1998 "Accessible and Usable Buildings and Facilities."
 - 2. Public Law 101-336 "The Americans with Disabilities Act of 1990 (ADA)."
 - 3. ADA Accessibility Guidelines (ADAAG).
- C. Designated ADA compliant units shall be affixed with "handicap accessible" label on door.
- D. Shelf location and hook arrangements shall comply with ANSI standards.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Do not deliver lockers until building is enclosed and ready for locker installation.
- C. Storage and Protection: Adequately protect against damage during delivery, handling, storage, and installation.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions shown on Drawings by taking field measurements.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. The Mills Company, a subsidiary of Bradley Corporation.
- B. Scranton Products.

2.2 MATERIALS AND ACCESSORIES – GENERAL

- A. Provide recycled materials in accordance with Recycled Content provisions of Section 01 60 00.

2.3 LOCKERS

- A. Locker Style: Model LENOXZLOCKER, 18 inches wide by 18 inches deep by 72 inches tall overall.
- B. Components:
 - 1. Locker material: Sides, backs, shelves, tops, bottoms, doors, door frames and continuous latch constructed from high-density polyethylene (HDPE).
 - a. Sides, shelves, tops, bottoms, and backs fabricated from 3/8 inch (10 mm) HDPE.
 - b. Doors, door frames and continuous latch fabricated from ½ inch (13 mm) HDPE.
 - c. End panels and flat top fabricated from ½ inch (13mm) HDPE.
 - 2. Door Hinge: Continuous piano hinge fabricated from 16 gauge type 304 stainless steel.
 - 3. [Color\(s\): MT Medium Tone \(27\) Textured powder coat.](#)
- C. Hardware and accessories
 - 1. Provide one double coat hook for each opening in one, two tier and Z lockers
 - 2. Provide one number plate for each opening, consecutively numbered as directed by Architect
 - 3. Provide screws, anchors and angle brackets for locker base installation.
- D. Ends and Fillers: Locker end, filler and back panels matching locker door cover exposed sides, backs and intersections.
- E. Fabrication
 - 1. Locker box fabricated from a single sheet of HDPE with corners fused together. Weld frame and shelves to box assembly.
 - 2. Attach hinge to door and frame with vandal-resistant double threaded stainless steel screws.
 - 3. Continuous latch securely attached to the entire length of the door with stainless steel screws, providing a full length latching mechanism capable of accepting several lock types.
 - 4. Locking device: Provide latching device with recessed handle with padlock attachments.
 - 5. Base: Steel tube support with bench top attachment as shown in drawings
 - 6. Provide openings at top and bottom of each door for ventilation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
 - 2. Verify that prepared bases are in correct position and properly sized. Lockers shall be installed on a 2"x4" or 2"x6" base per design drawing. Base shall extend from the wall 2" less than the locker depth.

3.2 INSTALLATION

- A. Install lockers and accessories per approved plans and manufacturer's instructions for a plumb, rigid and flush installation.
- B. Locker connector hardware and installation instructions shall be provided by manufacturer.
- C. Anchor lockers to wall studs or furring strips attached to wall through locker back and to the base through the locker floor.
- D. Adjust doors and hinges to accommodate uniform spacing after installation of lockers. Verify all working parts of locker including hinge and lock function.
- E. Attach number disks in specified sequence using adhesive compliant with low-emitting material requirements specified in Section 01 60 00.
- F. Clean lockers.
- G. Verify that doors and latches operate easily and properly.

3.3 CLEANING

- A. During the course of the Work and on completion, remove and dispose of excess materials, equipment and debris away from premises. Leave Work in clean condition.

END OF SECTION

SECTION 11 30 13

APPLIANCES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Refrigeration appliances.
 - 3. Cleaning appliances.
- B. Dimensions as shown on Drawings. Field measure and coordinate with architectural woodwork to provide clearance for doors and maintenance access.

1.03 SUBMITTALS

- A. Product Data: For each Type of product.
 - 1. Include installation details, material descriptions, dimensions of individual components, and finishes for each appliance.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard [insert dimension] size.
- C. Product Schedule: For appliances [as designated on Drawings].
- D. Qualification Data: For manufacturer.
- E. Product certificates: For each type of appliance
- F. Sample Warranties: For manufacturer's special warranties.

1.04 CLOSE OUT SUBMITTALS

- A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.

1.05 QUALITY ASSURANCE

- A. Manufacture Qualifications: Maintains, within 50 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

1.06 WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.

- A. Special Warranties: Manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.
- B. Microwave Oven: Provide standard manufacturer warranty.
- C. Commercial Refrigerator: Sealed System: Full warranty, including parts and labor for first year.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

- A. Electrical Appliances: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Gas-Fueled Appliances: Not applicable
- C. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with applicable provisions in the [2010 ADA Standards for Accessible Design].

2.02 MICROWAVE OVENS

- A. Microwave Oven:
 - 1. Acceptable Manufacturers:
 - a. GE
 - b. Breville
 - c. Panasonic
 - d. As approved by Architect/Owner.
 - 2. Mounting: Overhead attached.
 - 3. Dimensions: As submitted for approval
 - 4. Capacity: 1.5 cu. ft. minimum.
 - 5. Oven Door: Door with observation window and pull handle release.
 - 6. Exhaust Fan: Two speed fan, recirculating type with charcoal filter.
 - 7. Power Rating: Manufacturer's standard
 - 8. Electric Power Supply: As approved
 - 9. Controls: Digital panel controls and timer display

10. Material: Stainless steel
 - a. Color/Finish: Stainless

2.03 REFRIDGERATOR/FREEZER

- B. Refrigerator: Two door, with freezer
 1. Acceptable Manufacturers:
 - a. LG
 - b. GE
 - c. Kenmore
 - d. Samsung
 - e. As approved by Architect/Owner
 2. Dimensions: 36" width
 3. Front Panel(s): Stainless Steel
 - a. Panel Color: Stainless.

2.04 Dishwasher:

1. Acceptable Manufacturers:
 - a. KitchenAid
 - b. LG
 - c. Kenmore
 - d. GE
2. Dimensions: 24" x 24" x 34.5"
3. Front Panel(s): Stainless Steel

2.05 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
- B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

- C. Examine walls, ceilings, and roofs for suitable conditions where [overhead exhaust hoods] [and] [microwave ovens with vented exhaust fans] will be installed.
- D. Prepare written report, endorsed by installer, listing conditions detrimental to performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install appliances according to manufacturer's written instructions.
- B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- D. Range Ani-Tip Device: Install at each range according to manufacturer's written instructions.

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturer's written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- B. An appliance will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.04 DEMONSTRATION

- A. [If required by Owner] Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain residential appliances.

END OF SECTION

SECTION 11 52 00

AUDIO VISUAL EQUIPMENT

PART 1 GENERAL

1.1 SUBMITTALS

- A. Product Data: Submit Manufacturer's descriptive brochure for each item.
- B. Shop Drawings: Submit Drawings showing construction and installation details for projection screens.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: Deliver materials to site in Manufacturer's original unopened packaging with labels intact.
- B. Storage: Adequately protect against damage while stored at the site.
- C. Handling: Comply with Manufacturer's directions.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Whiteboard Projection Screen: Epson 100-inch.
 - 1. Size: 54.6 inches x 96.6 inches. Wall mounted
 - 2. Screen surface to be Matt White, Porcelain surface
 - 3. 50-year warranty
 - 4. Location and Size: Conference Room 101 East Wall: 54.6" x 86.6"
- B. Magnetic Whiteboard: Quartet Magnetic White Board
 - 1. Size: 6 x 4 (TEM548A).
 - 2. Manufacturer's standard warranty.
 - 3. Location: Break Room 111: South Wall.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine subsurfaces to receive Work and report detrimental conditions in writing to Architect. Commencement of Work will be construed as acceptance of subsurfaces.
- B. Coordination: Coordinate with other Work which affects, connects with, or will be concealed by this Work.

3.2 INSTALLATION

- A. Install items in accordance with details on Drawings and Manufacturer's installation instructions.

- B. Securely fasten wall and ceiling mounted items to solid backings, blocking, or supports.

- C. Bracket and mounting plate to be firmly supported by and attached to two 16 ga. structural steel studs running from the floor to the structure above.

END OF SECTION

SECTION 211000 - FIRE PROTECTION SYSTEMS

PART I - GENERAL

1.1 GENERAL SCOPE OF WORK DESCRIPTION AND SPECIFICATION

- A. This section describes requirements necessary to install an automatic fire sprinkler system per the latest version of NFPA13 in the Police Expansion. See Record Fire Protection plans (Schwimmer Engineering 10/28/96 available from Project Manager) for approximate location of existing risers, partial water calculations, and other available information etc. See Architectural plan set for location of new additional building area, structural, mechanical, electrical and plumbing systems. Work in this section includes, but is not limited to, the following principal items:
1. The design, permitting, and installation of a complete steel-piped automatic fire sprinkler system as required by national and local codes that meets the requirements and gains the approval of all authorities having jurisdiction. Securing and payment for all necessary permits and inspections as required to complete the installation per the Plans and City requirements.
 2. Field verification of all dimensions. No extra charges or compensation will be allowed for any differences between actual dimensions and measurements indicated or for re-routing to avoid structure or other impedances as these are to be expected. This project has building systems co-located in very tight confined spaces and will require substantial coordination with other contractors prior to and during installation to avoid conflicts.
 3. Provide a new water flow test if required.
 4. Provide a letter of acceptance from the owner's fire protection insurer and complete printed instructions on operation and maintenance of the completed system to the owner.
 5. Furnishing miscellaneous materials such as brackets, hangers, steel supports for equipment, expansion joints, inspectors test connection, signage, valves, necessary communication devices, etc. as required to deliver a complete and functional system.
 6. Provide alarm valves, zone valves, pumper connection, alarm gong, and miscellaneous equipment as required to deliver a complete and functional system.
 7. Provide heads for proper hazard classification. Provide baskets on all heads in gymnasium and other locations where physical abuse of the heads may occur.
 8. Coordinate design and installation of fire sprinkler system such that it does not interfere with any architectural, structural, mechanical or plumbing elements. Set height of fire protection piping per architect to avoid interference with ceilings. Route fire lines through structure. Coordinate with mechanical contractor to set pipe locations to avoid duct interference. Coordinate with all trades and project manager to assure compatibility of system installation.

1.2 QUALITY ASSURANCE REQUIREMENTS

- A. Provide review of the fire protection system by an Arizona Registered Professional Engineer who shall act as the Engineer of Record on the Fire Protection system. This engineer shall seal the plans and calculations and shall review all fire protection equipment submittals prior to purchase.
- B. Provide submittals listed below in Section 1.3
- C. Provide a contractor's material and test certificate to the Architect stating that the system has been designed and installed according to the national standards, state and local codes including the edition of NFPA 13 adopted by the Authority Having Jurisdiction.
- D. Prior to connecting the overhead sprinkler piping, flush underground main in the presence of representatives of the regulatory agencies, Architect and owner and meet with their approval.
- E. After completion of the installation, test entire system for acceptance by the Authority Having Jurisdiction.

1.3 SUBMITTALS REQUIRED

- A. Design Team Review Submittal 1: Coordination and checking with the Architect will occur before the fire protection plans are submitted to the Authority Having Jurisdiction for City review and Permit as follows: A complete FP design including depiction of all sprinkler pipes and heads shall be created in AutoCAD. This design shall include a minimum of four sections of the building adequate to convey the intended pipe routing and mechanical ductwork in all general areas of the building and especially in any congested or challenging portions of the building. The FP designer shall obtain the AutoCAD schematic plans of the mechanical system from the design engineer, shall then coordinate locations of ducts with the mechanical contractor, and shall clearly depict ductwork and FP systems in the FP plan. In areas with exposed structural trusses, all FP piping is to be run high in trusses parallel to ductwork mains so as not to interfere with ductwork or force ductwork or FP systems to be run below the bottom chords of trusses. Coordinate closely with the Architect when designing FP especially in exposed areas. An electronic AutoCAD copy of the designed FP plans including mechanical duct systems shown will be provided in AutoCAD to the Architect and Design Team for confirmation that this coordination has occurred prior to permitting and installing of the FP system. Architect or design team may request additional sections be created or additional coordination occur if FP coordination with mechanical systems is not clearly complete and acceptable to the design team. FP contractor shall coordinate with the Architect and design team to place all pipes and heads so as not to interfere with the Architect's design or mechanical design at no additional design or installation cost. *This coordination and checking with the Architect will occur **BEFORE** the FP plans are submitted to the Authority Having Jurisdiction for City review and Permit.*
- B. Authority Having Jurisdiction Submittal 2: Following Submittal 1 with the Design Team and only after obtaining approval from the Architect provide a complete design submittal to the Authority Having Jurisdiction of the fire protection system including all hydraulic calculations sealed by a licensed Arizona Mechanical Engineer who shall act as Engineer of Record on the Fire Protection System.
- C. Conformance Certificate Submittal 3: Submit a letter of conformance for fire sprinkler system in accordance with national fire codes published by NFPA.
- D. Project Records/Close Out Submittal 4: Following inspection and approval of the fire protection system furnish all records including Conformance Certificate, Record Plans, Test Records, Inspection Records, Material Submittals and associated documents in both a 3-Ring Binder hard copy and electronic PDF files.

1.4 DESIGN REFERENCE STANDARDS

- A. Provide automatic sprinkler system in accordance with the following NFPA standards:
 - 1. NFPA, Chapter 13, entitled, "Sprinkler Systems, Installation."
 - 2. NFPA, Chapter 25, entitled, "Inspection and Testing of Fire Protection Systems."
 - 3. NFPA, Chapter 24, entitled, "Installation of Private Fire Service Mains and Their Appurtenances."
 - 4. NFPA, Chapter 291, entitled, "Flow Test Procedures."
- B. Provide compliance with local codes and ordinances as required by Authority Having Jurisdiction.

PART 2 - PRODUCTS

2.1 SUPPLY CONNECTIONS

- A. Sprinkler contractor shall coordinate with the utility contractor on final location and connection to water mains serving the sprinkler system.

2.2 PIPING

- A. Interior Piping: Shall be steel pipe conforming to NFPA 13 standards.

2.3 SPRINKLER HEADS

- A. All sprinkler heads submitted by contractor shall be equal, UL listed and FM approved.

2.4 FIRE DEPARTMENT CONNECTION

- A. Provide brass polyester coated ductile iron angle body, double clapper checks, plugs and chains, and all required hardware. Provide red brass plate lettered, "Auto Spkr" and building designation(s) and signage as required by local codes.

2.5 ESCUTCHEONS

- A. Provide floor, wall and ceiling escutcheon flanges on all exposed places where pipe runs through finished walls, finished ceilings or floor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install sprinklers for total coverage of building in accordance with above referenced standards, latest edition. After completion of the installation, the entire system shall be tested for acceptance by the authority having jurisdiction, as required by NFPA 13. Provide suitable spare sprinkler cabinet with extra sprinklers with same rating as those installed and one sprinkler head wrench, all of which shall be installed at the location approved by the authority having jurisdiction.
- B. Provide excavation and backfilling necessary for installation of underground piping in conformance with NFPA 24, "Standard for Installation of Private Fire Service Mains." Include all pipe and material to connect to fire line per the Civil plans and running to the building's intended fire riser location. Contractor verify location of existing fire line stub and intended fire riser with Architect prior to submitting quotation.
- C. All overhead piping shall be installed concealed behind finished walls or ceiling, unless plans indicate otherwise and shall be coordinated with other trades to avoid conflicts. Occupied portions of the building with exposed structural trusses shall not have fire protection piping installed below the bottom chord of the truss. Fire protection designer shall overlay mechanical ductwork plans on fire protection plans as a background lightly shaded element to verify that no conflicts with HVAC exist in the FP design.
- D. Fire sprinkler lines shall be concealed within the structure in exposed area. Elsewhere, conceal lines with installation above suspended ceilings.
- E. Provide and install pipe sleeves when penetrating floors and walls. Fill the space between sleeve and pipe with an approved sealant to maintain a fire rating equal to the wall or floor. Sealant must be approved by the authority having jurisdiction and Architect.
- F. After work has been installed, carefully fit around, close up, repair, patch and paint all chases, holes or openings as directed, to the entire satisfaction of the Architect.
- G. Acceptance: Provide letter of guarantee stating compliance with the required national standards, state and local codes.
- H. Provide next to the sprinkler riser a printed sheet, protected by glass or transparent plastic cover, giving brief instructions regarding control, emergency procedures and other data for the fire sprinkler system.
- I. After completion of installation and tests and prior to the building's acceptance, instruct the Owner of his/her designated representative in the operation of the sprinkler system.
- J. Provide (2) copies in 3-ring binders of all sprinkler system components, operating procedures, maintenance procedures, warrantee information and instructions. Install a red metal box with hinged front face next to the fire riser, label the box in white letters "Fire Protection System Information" and locate (1) copy in the 3-ring binder in the metal box. Provide the second copy to the owner for locating in an office.

SECTION 28 31 00

**FIRE DETECTION AND ALARM
(Modifications and Additions to existing systems)**

PART 1 GENERAL

1.1 SCOPE

- A. This specification provides the requirements for modifications and/or additions to an existing fire alarm system. The system shall include, but not be limited to: automatic and manually activated alarm initiating and indicating peripheral devices and appliances, conduit, wire, accessories, programming, engineered calculations (battery and NAC voltage drop minimum), and permitted plans (sealed by a professional engineer in the same state as the project) required to furnish a complete and operational fire alarm system as shown on the drawings, as specified, and as directed by the Architect/Engineer.
- B. The work covered by this section of the specification is to be coordinated with the related work as specified elsewhere under the project specifications.
- C. The fire alarm system shall consist of all necessary hardware, equipment, devices, and software programming. Provide all fire alarm devices, conduit, wire, boosters, initiating, and notification devices as indicated and as required by the AHJ as part of the deferred fire alarm submittal.
- D. The fire alarm wiring Class, conduit / free air, and other system characteristics shall be as indicated on the electrical plans.

1.1 REFERENCES

- A. The equipment and installation shall comply with the current provisions of the following standards:

National Electric Code, Article 760.
National Fire Protection Association Standards:
NFPA72 National Fire Alarm Code
NFPA101 Life Safety Code
Local and State Building Codes.
Local Authorities Having Jurisdiction.
Underwriters Laboratories Inc.

28 31 00 1

3/31/2021

The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system.

1.2 SYSTEM DESCRIPTION

- A. The fire alarm system is existing and is to be modified under this specification. All control panel assemblies and connected field appliances shall be compatible with the existing fire alarm system(s) in place.
- B. The scope of work may include demolition or relocation of existing devices when present.
- C. Install and / or relocate initiating and / or notification devices as required by the AHJ and codes in force, which may be additional from any conceptual fire alarm system design included in the electrical plan set.
- D. Only conduit, wiring, and devices in like new condition may be reused.

1.3 QUALITY ASSURANCE

Qualifications

- 1. The installing fire alarm contractor shall provide proof of their qualifications or shall engage a factory authorization and factory training personnel for the existing fire alarm system(s).

Warranty

- 2. Warranty all materials, installation and workmanship for three (3) years from date of acceptance, unless otherwise specified.
- 3. A copy of the manufacturers' warranty shall be provided with close-out documentation and included with the operation and installation manuals.

1.4 SYSTEM STARTUP, OWNERS' INSTRUCTIONS, COMMISSIONING SYSTEM

- A. Programming of the fire alarm control panel shall be performed by a factory trained and authorized manufacturer's representative.
- B. Certain functions of the systems startup procedure may be performed by a contractor under the direction of the factory trained and authorized manufacturer's representative.

- C. Owners' Instructions and Operation Manuals, specific for this project, shall be supplied to the Building Operations Staff by the contractor. A "Generic" or "Typical" Owners' Instruction and Operation Manual shall not be acceptable to fulfill this requirement.
- D. Commissioning of the installed system shall be performed by the contractor and / or factory trained and authorized manufacturer's representative in the presence of the Local AHJ, the Building Owners' Representative, and a Representative of the General Contractor, if deemed appropriate.
- E. A System Generated device map, which will serve as an "as-built" drawing shall be provided to the Local AHJ and the Building Owners' Representative.

PART 2 DESIGN STANDARDS

- 2.1 This fire alarm system must be conformed to in its entirety to ensure that the installed and programmed fire alarm system will accommodate all of the future requirements and operations required by the building owner. Any specified item or operational feature not specifically addressed prior to bid date will be required to be met without exception.
- 2.2 Submission of product purported to be equal to those specified herein will be considered as possible substitutes only when all of the specification requirements have been met.
- 2.3 The contractor or substitute bidder shall functionally demonstrate that the proposed substituted products are, in fact, equal in quality and performance to those specified herein. Because the decision to specify the fire alarm system and equipment detailed herein was made by an Architect and/or Consulting Engineer on behalf of their client(s) (the Building Owners), such evidence of the applicability of any substitute materials must be submitted to, and accepted by, the Architect and/or Consulting Engineer, not less than ten (15) calendar days prior to the scheduled date for opening bids for this project. Substitute equipment will be accepted only on the discretion of the Architect and/or Consulting Engineer on behalf of the Building Owner.

2.4 EQUIPMENT AND MATERIAL GENERAL REQUIREMENTS

- A. All equipment furnished for this project shall be new and unused. All components and systems shall be designed for uninterrupted duty. All equipment, materials, accessories, devices, and other facilities covered by this specification or noted on contract drawings and installation specifications shall be the best suited for the intended use and shall be provided by a single manufacturer. If any of the equipment provided under this Specification is provided by different manufacturers, then that equipment shall be recognized as compatible by both manufacturers, and "Listed" as such by Underwriters' Laboratories.

28 31 00 3

3/31/2021

- B. System installation and operations shall be verified by the manufacturer's representative and a verification certificate presented upon completion. The manufacturer's representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training as required by the Architect and/or Consulting Engineer.
- C. In addition, "As-Built" riser and wiring diagrams reflecting all T-Taps, each programmed device characteristic including detector type, base type, serial number, sensitivity setting and wire configurations will be provided to the Architect/Engineer, based on the information gathered during the verification process described above.

2.5 PRODUCTS

- A. Equipment and materials shall be provided to ensure proper Specification Adherence, final connection, test, turnover, warranty compliance, and service.
- B. Service availability: The supplier shall have sufficient stock on hand and have a fully equipped service organization capable of guaranteeing response time within 8 hours of service calls, 24 hours a day, 7 days a week to service completed systems.
- C. Conventional Fire Alarm Initiating Devices – General
 - 1. All initiating devices shall be UL Listed for Fire Protective Service. All initiating devices shall be of the same manufacturer as the fire alarm control panel specified to assure absolute compatibility between the devices and the control panels, and to assure that the application of the initiating devices is done in accordance with the single manufacturer's instructions.
 - 2. Any devices that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.
- D. Heat Detectors
 - 1. Combination Fixed Temperature/Rate-of-Rise Heat Detectors, 281B, 282B. Provide low profile heat detectors rated for a maximum smooth ceiling rating of 2500 sq. ft. The detector shall be finished pure white and have a positive identification for the operation of

the fixed temperature element. The detectors shall be rated at 15°F per minute rate-of-rise and 135°F fixed temperature.

2. Fixed Temperature Heat Detectors. Provide low profile heat detectors rated for a maximum smooth ceiling rating of 2500 sq. ft. The detector shall be finished pure white and have a positive identification for the operation of the fixed temperature element. The detectors shall be rated at 135°F (57°C) fixed temperature.

E. Smoke Detectors

1. Ionization Smoke Detectors. Provide stable, solid state, unipolar ionization detectors capable of detecting visible and invisible products of combustion. Provide the detectors with a measuring chamber and a protected reference chamber sensitive to changes in temperature and humidity only. Protect the measuring chamber from damage and insects. Provide a built-in five second delay to minimize alarms due to transient smoke. Safeguard radioactive parts and protect circuitry against electrical transients, electromagnetic interference, and polarity reversal. Factory set the detector sensitivity and provide for field adjustment within the range of ULI defined sensitivity. <Connect remote LED Alarm Indicators where shown on the plans.> The detector shall be tamper resistant plug mounted to a separate base. A built-in shorting device shall permit checking of the installation wiring before detector installation. Provide a concealed test switch to allow full logical testing without the use of smoke or aerosol spays.
2. Photoelectric Smoke Detectors. Provide stable, solid state, photoelectric detectors capable of detecting visible products of combustion. Provide the detectors with self-compensating circuitry to protect its stability against the effects of aging, dust and film accumulation. Protect the measuring chamber from damage and insects. Provide a built-in five second delay to minimize alarms due to transient smoke. Safeguard and protect circuitry against electrical transients, electromagnetic interference, and polarity reversal. Factory set the detector sensitivity. The detector shall be tamper resistant plug mounted to a separate base. A built-in shorting device shall permit checking of the installation wiring before detector installation. Provide a concealed test switch to allow full logical testing without the use of smoke or aerosol spays. Provide an auxiliary 135°F (57°C) fixed temperature heat detector.
3. Beam Type Smoke Detectors. Provide projected beam type smoke detectors. The beam detectors shall be four wire 24 Vdc and powered from the control panel 4 wire smoke power source. This unit shall consist of a separate transmitter and receiver capable of being powered separately or together. This unit shall operate in either a short range of

28 31 00 5

3/31/2021

30 to 100 ft. (9.14 to 30.4 m) or a long range of 100 to 300 ft. (30.4 to 91.4 m). The detector shall feature a bank of four alignment LEDs on both the receiver and transmitter that are used to ensure proper alignment without the use of special tools. The beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses. Ceiling or wall mount as shown on the plans. Testing shall be carried out using calibrated test filters.

F. Notification Appliances – General

4. All appliances shall be UL Listed for Fire Protective Service. All strobe appliances or combination appliances with strobes shall be capable of providing the "Equivalent Facilitation" which is allowed under the Americans with Disabilities Act Accessibilities Guidelines (ADA(AG)), and shall be UL 1971, and ULC S526 Listed. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to insure absolute compatibility between the appliances and the control panels, and to insure that the application of the appliances are done in accordance with the single manufacturers' instructions. Any appliances which do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers which clearly states that their equipment (as submitted) are 100% compatible with each other for the purposes intended.

G. Self-Synchronized Strobes.

5. 1-Gang Strobes. In - Out screw terminals shall be provided for wiring. The strobes shall have a (red or white to match existing) plastic face plate. They shall provide <15 cd> <15/75 cd> <30 cd> <60 cd> <110 cd> synchronized flash outputs. Strobes shall mount in a North American 1-gang box. The strobe shall have lens markings oriented for <wall> <ceiling> mounting. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits. Ceiling mounted strobes shall have lens markings with correctly oriented lettering. Removal of a installed strobe to change the lens markings shall not be acceptable. Provide weatherproof wall boxes for outdoor mounting.
6. Strobes. In - Out screw terminals shall be provided for wiring. The strobes shall have a (red or white to match existing) metal face plate. They shall provide <15 cd> <15/75 cd> <30 cd> <60 cd> <110 cd> synchronized flash outputs. Strobes shall mount in a North American 4" square box. The strobe shall have lens markings oriented for (wall or ceiling) mounting. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits. Ceiling mounted strobes shall have lens markings with correctly oriented lettering. Removal of a installed strobe to change the lens markings shall not be acceptable. Provide weatherproof wall boxes for outdoor mounting.

28 31 00 6

3/31/2021

H. Horns

7. Mini-Horns. In - Out screw terminals shall be provided for wiring. The horn shall have a (red or white to match existing) plastic housing. A sound output level of 91 dBA shall be provided. Horn shall mount to a North American 1-gang masonry electrical box (2-1/2" deep).
8. Temporal Horns. In - Out screw terminals shall be provided for wiring. The horn shall have a (red or white to match existing) plastic housing. Horns shall be selectable for high or low dBA output. Selection of low or high output shall be reversible. Horns shall be selectable for steady or temporal output. Selection of steady or temporal output shall be reversible. <A synchronized temporal pattern sound output level of 100 dBA shall be provided.> Horn shall mount to a North American 4" electrical box (2-1/8" deep) using the 2 screws provided with box or to a 2-gang (2-3/4" deep) electric box. <Provide weatherproof wall boxes for outdoor mounting.>

I. Horn/Strobes

9. Mini-Horn/Strobes. The horn/strobe shall have a (red or white to match existing) plastic housing. A sound output level of 91 dBA average shall be provided. The strobe shall provide <15 cd> <15/75 cd> <30 cd> <110 cd> synchronized flash outputs. The strobe shall have lens markings oriented for <wall> <ceiling> mounting. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits. <Ceiling mounted strobes shall have lens markings with correctly oriented lettering.> Removal of a installed Horn/Strobe to change the lens markings shall not be acceptable. Horn/strobe shall mount to a North American 1-gang masonry electrical box (2-1/2" deep).
10. Temporal Horn/Strobes. In - Out screw terminals shall be provided for wiring. The horn/strobe shall have a (red or white to match existing) plastic housing. Horn/strobes shall be selectable for high or low dBA output. Selection of low or high output shall be reversible. Horns shall be selectable for steady or temporal output. Selection of steady or temporal output shall be reversible. A synchronized temporal pattern sound output level of 97 dBA average shall be provided. The strobe shall provide <15 cd> <15/75 cd> <30 cd> <110 cd> synchronized flash outputs. The strobe shall have lens markings oriented for (wall or ceiling) mounting. It shall be possible to replace the lens markings with LKW series or LKC series lens marking kits. Ceiling mounted strobes shall have lens markings with correctly oriented lettering. Removal of a installed Horn/Strobe to change the lens markings shall not be acceptable. Horn/strobe shall mount to a North American 4" electrical box (2-1/8" deep) using the 2 screws provided with box or to a 2-gang (2-3/4" deep) electric box. Provide weatherproof wall boxes for outdoor mounting.

J. Remote Relays

11. Multi-Voltage Control Relays. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.
12. Multi-Voltage Control Relays. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, 24 Vac, 115 Vac, or 230 Vac. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.
13. Multi-Voltage Control Relays. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 12 Vdc, 12 Vac, 24 Vdc, or 24 Vac. A red LED shall indicate the relay is energized.
14. Multi-Voltage Control Relays. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 Vdc, or 24 Vac, or 115 Vac. A red LED shall indicate the relay is energized.
15. Manual Override Control Relays. Provide remote control relays each with manual override feature connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be SPDT and rated for 10 amperes at 115 Vac or 24 Vdc. A single relay may be energized from a voltage source of 24 Vdc or 24 Vac. A red LED shall indicate the relay is energized.
16. Heavy Duty Power Relays. Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings shall be DPDT and rated for 30 amperes at 300 Vac or 2 HP motor load. A single relay may be energized from a voltage source of <24 Vac> <115 Vac>. <A metal enclosure shall be provided.>

K. Electromagnetic Doorholders – General

17. Electromagnetic doorholders submitted for use must have written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

28 31 00 8

3/31/2021

L. Electromagnetic Doorholders

18. Floor Mounted. Provide (single or double door) floor mounted electromagnetic doorholder/releases rated at <12 Vdc> <24 Vac/dc> <120 Vac> input. Finish shall be brushed zinc.
19. Wall Mounted. Provide (flush, semi-flush, or surface) wall mounted electromagnetic doorholder/releases rated at <12 Vdc> <24 Vac/dc> <120 Vac>. Finish shall be brushed zinc.
20. Telephone Devices – General. All telephone devices shall be UL Listed for Fire Protective Service.
21. All telephone devices shall be of the same manufacturer as the fire alarm control panel specified to assure absolute compatibility between the telephone devices and the control panels, and to assure that the application of the appliances is done in accordance with the single manufacturer's instructions.
22. Any telephone devices that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.

END OF SECTION

**SECTION 22 05 00
PLUMBING GENERAL REQUIREMENTS**

1. SPECIAL NOTICE

1.1 The Architectural Plans and Specifications, including the GENERAL CONDITIONS, SUPPLEMENTAL GENERAL CONDITIONS, SPECIAL CONDITIONS, including all supplements issued thereto, INSTRUCTIONS TO BIDDERS and other pertinent documents issued by the Architect are a part of these Specifications and the accompanying Plumbing Drawings.

2. CODES, ORDINANCES AND REGULATIONS

2.1 All work of this section including materials and workmanship shall be done in the strict accord with City of Sedona Building Standards and Review Process Guidelines and all applicable city, county, state and national codes, ordinances and regulations, and in accord with all local utility company regulations.

3. INDUSTRY STANDARDS

3.1 The following industry standards shall apply, as applicable to the work of this section except that where the requirements of these specifications are more stringent than standards listed, these specifications shall take precedence.

3.1.1	City of Sedona Building Standards and Review Process Guidelines
.1 AMCA	Air Moving and Conditioning Association
.2 ANSI	American National Standards Institute
.3 ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
.4 ASME	American Society of Mechanical Engineers
.5 ASTM	American Society of Testing Materials
.7 NEC	National Electrical Code
.8 NEMA	National Electrical Manufacturer's Associations
.9 NFPA	National Fire Protection Association
.10 OSHA	Occupational Safety and Health Administration
.11 UL	Underwriters' Laboratories

4. SHOP DRAWINGS

4.1 Shop drawings submittals are required under this Division for the following:

- 4.1.1 Plumbing Fixtures: Lavs, etc.
- 4.1.2 Valves and Miscellaneous Accessories
- 4.1.3 Plumbing piping

5. MATERIALS

5.1 Requirements:

All materials shall be new and of the quality specified, free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the jobsite, but shall be replaced with new materials.

6. SPACE AND EQUIPMENT ARRANGEMENT AND ACCESS

6.1 Size and Fit:

The size of plumbing equipment shown on the drawings is based on the dimensions of a particular manufacturer (the first named). While other manufacturers may be acceptable, it is the responsibility of each trade to determine if the equipment he proposes to furnish will fit the allotted space and to obtain prior approval from owner of such substituted equipment prior to ordering.

.2 Service Access:

All equipment shall be installed in a manner to permit access to all surfaces as required by the manufacturer. All valves, motors, drives, lubrication devices, filters and other accessory items shall be installed in a position to allow removal for service without disassembly of another part. This requirement includes equipment installed above ceilings.

7. CONSTRUCTION REQUIREMENTS

7.1 General:

All trades shall be responsible for fitting the material and apparatus into the building and shall carefully layout work at the site to conform to the structural conditions, to provide proper grading of condensate and refrigerant lines, to avoid all obstructions and to conform to the details of the installation supplied by the manufacturer of the equipment to be installed and thereby provide an integrated, satisfactory operating installation, furnishing all necessary pilot lines and control lines.

.2 Piping:

In general, piping shall be run concealed in chases, furrings and above suspended ceilings, unless noted and directed otherwise on plans. All pipe and ductwork shall be square to the building and securely supported. Runs of piping shall be grouped wherever it is feasible to do so, to include grouping with all Mechanical, Plumbing, Fire and Electrical Trades. Piping and Plumbing Systems shown on plans are schematic only and do not specify all turns, offsets or other fittings which will be necessary in the construction of this project. Contractor shall not charge owner, engineer, architect or others for such fittings or offsets and shall visit site prior to construction to include such items in contractor's fee. Contractor shall coordinate with other trades prior to construction to agree to routing of all improvements with consideration given to the Architect's intended ceiling height. Contractor shall adjust piping, etc as required to provide required clearance for building structure, ceiling height as specified by architect, and other field conditions.

.3 OWNER FURNISHED ITEMS

Affected trades shall familiarize themselves with all the Owner Furnished items and make proper connection to such items. Contractor shall request of Owner or Architect

manufacturer's cut sheets specifying the connection locations and sizes as necessary to assure a complete and properly functioning installation of Owner Furnished items.

9. ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

9.1 Power and Control Wiring:

Except for such items that are normally wired at their point of manufacture and so delivered and unless specifically noted to the contrary herein, all electric wiring for power is part of the work of DIVISION 26.

.2 Controls Installation:

Installation of all automatic controls, temperature controls, temperature indication and all interconnecting conduit, wiring, and junction boxes for the installation of Plumbing equipment shall be part of the work of DIVISION 22. If plans show specific details of controls hardware or interlocks on electrical plans, such control conduit will only then be the responsibility of DIVISION 26.

10. IDENTIFICATION

10.1 Equipment Nameplates:

All equipment including water heaters shall be identified by the attachment of 3/4" high nameplates, constructed from laminated, phenolic, engraved plastic, 3-ply with black surface and white interior core, at least 1/16" thick. Letters and numbers shall be used for actual identification and shall be identical to designations used on the Contract Drawings. Engraved letters and numbers shall be 1/2" high, upper case, condensed Gothic. Nameplates shall be permanently attached to equipment/devices by chromium-plated screws. Unit number per plans and space served by the unit shall be stated on nameplate.

.2 Piping:

10.2.1 Requirement:

Each and every piping system shall be identified by means of colored, waterproof, all temperature, self-adhering labels, complete with directional flow arrows. Letters shall be 3/4" high and labels shall be placed near each valve, each branch connection and whenever piping emerges or disappears from view (when viewed from the floor of the space in which it is installed) and labels shall be placed not more than twenty (20') feet apart on all horizontal piping systems above ceilings.

10.2.2 Color Code:

Color code and identifying descriptions for labeling piping systems shall be as follows:

10.2.2.1	Fire Protection System	Red
.2	120°F. Hot Water Supply	Orange

.3	140°F Hot Water Supply	Yellow
.4	Cold Water-General Use	Gray or Black
.5	Cold Water-Conditioned	Aluminum
.6	Condensate Drain Piping	Green

10.2.3 Letter Code:

Letter Codes for piping system nameplates shall be as follows:

10.2.3.1	Fire Protection	"F"
.2	120°F Hot Water Supply	"H"
.3	180°F Hot Water Supply	"180 FHW"
.4	Cold Water-General Use	"P"
.5	Cold Water-Conditioned	"C"
.6	Condensate Drain Piping	"D"

10.2.3.2 Alternate:

Piping identification may be accomplished with neatly stenciled lettering, complying with above requirements.

10.3 Valves:

10.3.1 Charts

Furnish three (3) neatly typed valve charts which show the valve letter and number, the valve manufacturer and model number, the valve service and normal position (N.O.) or (N.C.), and the location where the valve may be found and three (3) reduced size photocopies of a blue-line print of the system flow diagram on which the identical valve identification designations have been incorporated. One (1) reduced size photocopying of flow diagram shall be neatly framed in black wood frame under glass and screw mounted on wall of maintenance office. The other charts and diagrams shall be delivered to the Engineer for approval. Approval shall be received by the installing trade prior to mounting.

.2 Tags

All valves on each piping system with the exception of those normally found exposed in toilet rooms, shall be identified by color coding the valve handle and attaching a valve tag. Valve tags shall be at least 1-1/2" in diameter and of the same material as specified above for nameplates or brass with stamped black enamel filled letters and numbers. Letters shall be used on each tag to identify the valve. Each tag shall be securely fastened to the valve by means of a brass "S" hook. Color codes valve handles shall have the same color as their companion pipe labeling colors. Pipes shall be labeled with direction arrows at each valve.

Applied Engineering, Inc.
Tempe, AZ

11. FINAL INSPECTIONS

- 11.1 It shall be the duty of each trade to personally make a detailed and careful inspection trip of the entire project, assuring himself that his work on the project is ready for final acceptance prior to informing the General Contractor of same.

END OF SECTION

SECTION 22 05 23

VALVES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. All work of this section including materials and workmanship shall be done in the strict accord with City of Sedona Building Standards and Review Process Guidelines and all applicable city, county, state and national codes, ordinances and regulations, and in accord with all local utility company regulations.
- B. Valves shall be utilized on main branches from Risers, at main taps from main horizontal runs. In taps to plumbing groups, at inlet and outlet of all equipment, on runouts to exterior hose bibbs and as needed to prevent shutdown of significant portions of the building for repairs, service or expansion.

1.2 QUALITY ASSURANCE

- A. Valve Types: All valves shall be of the same manufacturer unless otherwise specified.

PART 2 DESIGN STANDARD

2.1 GENERAL

- A. All valves shall be supplied with stamped brass identification tags supplied by the contractor. All valve ports shall be full size same size as connected piping. Install valves on all hot and cold branch lines. Provide access panel at valves locations.

2.2 DOMESTIC HOT AND COLD WATER SERVICE

- A. Valves 2" and Smaller:
 - 1. Ball Valves: Valves shall be rated 150 PSI SWP and 600 PSI non-shock WOG and will have two-piece cast bronze bodies, TFE seats, full port, separate packnut with adjustable stem packing, anti-blowout stems, 316 stainless steel trim and 316 stainless steel ball. Valve ends shall have full depth ANSI threads or extended solder connections and be manufactured to comply with MSS-SP110.
 - a. Acceptable Valves, Full Port: NIBCO T-585-70-66 or Hammond 8901/8503/8301 (threaded); NIBCO S-585-70-66 or Hammond 8911/8513/8311 (solder).
 - b. NOTE: Where piping is insulated, ball valves shall be equipped with 2" extended handles of non-thermal conductive material. Also, provide a protective sleeve that allows operation of the valve without breaking the vapor seal or disturbing the insulation. Memory stops, which are fully adjustable after insulation is applied, shall be included.
- B. Valves 2-1/2" and Larger:
 - 1. Gate Valves: Valves to be Class 125, malleable iron hand wheel, rising stem, flanged, bolted bonnet, OS&Y, bronze body, bronze trimmed, with body and

bonnet conforming to ASTM standards. Packing and gaskets to be non-asbestos.

C. Check Valves:

1. Check valves 2-1/2" and smaller shall be Y-pattern swing-type manufactured in accordance with MSS-SP80, Class 125, bronze ASTM B-62 body with TFE seat disc. Where higher operating pressures approach 150 PSI, Class 150 valves of like construction shall be used. Valve ends may be threaded or solder-type.
 - a. Acceptable Valves - Horizontal Installation:
 - 1) Class 125: NIBCO T-413-Y or Hammond IB904 (threaded); NIBCO S-413-Y or Hammond IB912 (solder).
 - 2) Class 150: NIBCO T-433-Y or Hammond IB946 (threaded); NIBCO S-433-Y or Hammond IB945 (solder).
 - b. Acceptable Valves - Vertical and Horizontal Installation:
 - 1) Class 125: NIBCO T-480-Y or Hammond 943 (threaded).
2. Check valves 2-1/2" and larger shall either be swing-type, Class 125, flanged bronze body with bronze trim, non-asbestos gasket, or wafer style with stainless steel spring, bronze disc plates, rubber seat, body of bronze for use with Class 125/150 flanges. Spring-actuated valve to be used on pump discharge. Wing check with outside lever and spring to be used on storm drain lines. Sump pump and sewage ejector discharge shall be ball or swing type check valve.
 - a. Acceptable Valve Manufacturers:
 - 1) NIBCO or Hammond

D. Valve Actuators:

1. On valves specified to be provided with actuators furnish compact electric actuators, 115VAC.

END OF SECTION

SECTION 22 05 49

PLUMBING & ELECTRICAL INSTALLATION COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

1.2 RELATED DIVISIONS AND SECTIONS

- A. See Section 22 05 00, for Common Work Results for Plumbing.
- B. See Division 26, for Electrical.
- C. See Division 28, for building fire alarm.

1.3 SCOPE

- A. It is the intention of this section to summarize the coordination of effort defined in the related sections and divisions of this specification.
- B. If there is a conflict between this Section and other Sections and Divisions of this specification, this Section shall be the governing and decisive Section.
- C. Make all connections to motors and controls for equipment supplied and/or installed under Division 15 according to Table 1 on the following page.

PART 2 - PRODUCTS

- A. Not Applicable

PART 3 - EXECUTION

A. INSTALLATION

- 1. No work shall be performed until the reviewed and marked submittal data have been reissued to the Contractor, unless written permission is obtained from the Architect.

TABLE 1

Item or System	Note	Supplied By (3)	Installed By (3)	Powered By	Control Field Wiring By
Equipment Motors		Div. 22	Div. 22	Div. 26	N/A
Motor Control Center Including Starters, Pilot Lights, Heater, Switches, Auxiliary Contacts, and Internal Control Wiring		Div. 26	Div. 26	Div. 26	Div. 23
Stand Alone Motor Starters (outside motor control centers)	(1)	Div. 26	Div. 26	Div. 26	Div. 23
Variable Frequency Drives (VFD's)		Div. 22	Div. 22	Div. 26	Div. 23
Fused and Non-Fused Disconnects	(1)	Div. 26	Div. 26	Div. 26	N/A
Control Relays & Control Transformers	(1)	Div. 22	Div. 22	Div. 26	Div. 23
Boilers & Domestic Water Heaters		Div. 22	Div. 22	Div. 26	Div. 23
Pressure Booster Pump Systems		Div. 22	Div. 22	Div. 26	Div. 23
Water Softeners & Other Process Water Equipment		Div. 22	Div. 22	Div. 22	N/A
Facility Management System (FMS) for Automatic Control and/or Monitoring of Plumbing System & Equipment	(2)	Div. 23	Div. 23	Div. 26	Div. 23
Medical Gas System - Alarm Panels, Sensors, Pressure Switches	(3)	Div. 22	Div. 22	Div. 26	Div. 22

TABLE NOTES:

1. Unless specified to be supplied with the equipment
2. Division 26 shall coordinate with Division 23, FMS Contractor as required to provide 120 VAC power to each mechanical space and the central plant as necessary for the FMS and as shown on the drawings. Any additional power, transformers, and distribution shall be provided by the Section or Division indicated.
3. Division 22 indicates the plumbing contractor or their designated representative including equipment suppliers, sub-contractors, etc.

END OF SECTION

**SECTION 22 10 00
PIPING SYSTEM**

PART I - GENERAL

1.1 SCOPE OF WORK

1.1.1 Furnish all labor, materials, services, equipment and appliances required for piping system work indicated on the drawings and specified and City of Sedona Building Standards and Review Process Guidelines.

1.2 WORK INCLUDED, BUT NOT INCLUSIVE

1.2.1 Complete potable hot and cold water, sanitary, soil, waste and vent and roof drain piping systems.

.2 All condensate piping from AC units and kitchen equipment to the drain points shown in the drawings.

.3 Installation and connection of equipment furnished by other trades, or the Owner, where indicated on the plans and by the specifications.

1.3 DESIGN AND FABRICATION

1.3.1 All work shall be performed in strict accord with governing codes, as minimum requirements. Should any requirements of the plans and specifications for materials and installation be less than the requirements of the governing codes, the codes shall govern. All costs for conforming to codes shall be part of the base bid. Should drawings and specifications exceed code requirements, then the drawings and specifications shall govern.

1.4 REFERENCE STANDARDS

1.4.1 "Industry Standards" as specified in SECTION 22 05 00.

1.5 TESTING

1.5.1 Perform all test required by governing codes, regulations and ordinances in complete compliance with most stringent requirements.

PART II – PRODUCTS

2.1 Potable Water Piping System

2.1.1 Above Grade Piping

2.1.2.1 Type "L" hard drawn copper tubing, ASTM B88.

.2 Fittings

Wrought copper, sweat solder-joint type.

.3 Fittings - Option:

Soldered wrought copper tee fittings.

.4 Ferrules and Nipples

Best quality red brass.

.5 Fixture and Equipment Connections

Red brass nipples, chrome-plated where exposed to view in finished areas, except Mechanical Rooms, screwed into copper IPS adaptor fittings. Ferrous piping of any kind shall not be used in the various water systems.

.3 Shock Absorbers:

Josam "Absorbotron", Watts, or approval equal.

.4 Valves

Crane, Nibco, Walworth or approved equal, chrome plated Brasscraft at fixtures, full size unless otherwise noted. Ends match pipe jointing.

.5 Solder and Flux

Lead-free "Silvabrite" or Silfos solder or approved equal and suitable non-corrosive flux paste.

2.2 Sanitary Drainage System

2.2.1 Piping and Fittings

See section 22 13 16.

2.5 EQUIPMENT DRAIN AND CONDENSATE DRAIN PIPING SYSTEM

2.5.1 Piping

Type "DWV", copper tubing. Insulate copper tubing and p trap for 10' from cooling coil connections.

.2 Fittings

Wrought copper, sweat solder-joint type.

.3 Solder

95/5 tin-antimony.

2.8 Plumbing Fixtures

2.8.1 Shall be per Plumbing Fixture Schedule on plans. Equal equipment by other manufacturers may be permissible substitutes with approval of submittals.

PART III – EXECUTION

3.1 GENERAL

3.1.1 Routing and Distribution

Install the various piping systems as shown and/or specified, adhering to the general routing and methods of distribution shown on the drawings. The various installing trades shall familiarize themselves with all the Owner-furnished items in order that proper connections can be made to such items. Include all items as may be required for the satisfactory operation of the various systems.

.2 Workmanship

Install all work in neat and workmanlike manner, employing only mechanics skilled in each respective trade.

.3 Running and Grouping Pipe:

Run piping parallel with or perpendicular to building lines and wherever possible, group together for ease of service and identification. Lines which require definite grade for draining shall take precedence in routing over all other lines. Wherever possible, hold horizontal and vertical lines close as possible to walls, ceilings, struts, members, etc., so as to occupy minimum space, consistent with the proper requirements for insulation, expansion, removal of pipe and access to valves, etc. Concealed work shall finish off within the limit permitted by the vertical or horizontal chases.

.4 Vibration

Connections to rotating equipment shall be made in such a manner as to prevent transmission of vibration into the piping system.

.5 Reaming:

All pipe shall be properly reamed after cutting and threading and shall be cleaned before installation.

.6 Nipples:

Nipples shall be of the same material and composition as the pipe on which they are installed and shall be extra heavy when unthreaded shoulder is less than one (1) inch. No running thread nipples will be permitted.

3.2 Potable Water Piping Systems

3.2.1 General

Various hot and cold water supply running to the various risers, items of equipment and fixtures shall be made up as shown on the drawings. All connections on hot water lines shall be made with adequate provisions for expansion. The line shall be free of traps and shall drain completely by gravity.

.3 Jointing

All piping joints shall be made with solder type fittings. Clean ends of pipe thoroughly inside and out and remove all burrs before soldering. "Sweat" solder joints as recommended by the manufacturer of the tubing and fittings. Surfaces to be soldered shall be cleaned bright. Heat copper tubing larger than 1" with ring torch. Wrap copper tubing with electrical tape whenever tubing touches a dissimilar metal. The use of joints below concrete slab will not be permitted.

.4 Mechanically Formed Copper Connection:

Shall not be allowed

.5 Valves

Valves shall be placed in all main hot and cold water lines as indicted on the drawings and at each branch take-off from the main or elsewhere as required.

.6 Shock Absorbers

Provide shock absorbers on both cold and hot-water supply at each group of fixtures and where quick-acting shut-off valves are used. Shock absorbers shall be located and of the size recommended by the PDI Standard WH-201. Install all shock absorbers above the ceiling.

.7 Pressure

Piping is sized with a pressure of up to 80 psi at the main. Should pressure exceed this, then a pressure reducing valve should be installed at no additional cost to reduce the pressure to maximum of 78 psi.

3.3 SANITARY DRAINAGE SYSTEM

3.3.1 General

Install a complete soil, waste and vent system for all water closets, urinals, lavatories sinks, floor drains, etc., as shown on the drawings and/or as hereinafter specified. Waste and vent piping to fixtures shall be sized as shown on the drawings and in case of location changes, shall be so arranged as to give proper

changes, shall be so arranged as to give proper drainage and venting for each fixture.

.2 Jointing

3.3.2.1 General

.1 Threaded Pipe

Threads use in the assembly of pipe shall conform to ASA dimensional standards B2 and shall be cut true and clean. Pipe ends shall be securely squared and reamed to remove all burrs and made tight with an approved pipe lubricant applied to the male threads only.

.3 Traps

Equip fixtures and each piece of equipment requiring connection to the sanitary drainage system, except fixtures with integral traps, with a trap. Each trap shall be placed as near to the fixture as possible and no fixture shall be double-trapped.

.4 Vents

Provide each vent with an extension piece extending the vent above the roof to the top of the parapet when one exists. Vents shall be properly flashed as detailed on the drawings.

.5 Cleanouts

Provide soil, waste, condensate, and vent piping with cleanouts to make all sections of the system accessible. Install cleanouts on 50 ft. centers and at ends of mains and at points of change in directions of all drains, soil and waster pipe and branches and at the base of each main stack, other points indicated on the plans or where required by governing codes. Cleanouts, except trap and fittings, shall be of same size as pipe up to 4" and 4" for all larger pipe. Should piping installation and building construction conflict so as to prohibit the use of the flush type cleanouts called for, secure the Architect's approval of another type of cleanout. Cleanouts in sanitary mains outside of building shall be a maximum of 50 ft. on center for straight runs.

3.9 KITCHEN PIPING

3.9.1 Rough-In and Connections:

Make all rough-in and final connections to all equipment.

.2 Waste Pipe:

Provide waste pipe as shown on the drawings and in accordance with the section on sanitary drainage system as previously described.

3.10 ISOLATING COUPLINGS

3.10.1 Furnish and install approved isolating couplings at all connections between brass or copper pipe and steel pipe.

3.11 VALVES

- 3.11.1 Furnish and install valves and cocks where shown on the drawings or as necessary to make all the systems complete, including but not limited to the following.
- .2 Valves at inlet and outlet connections of all equipment as close to equipment as possible.
 - .3 Valves at all by-passes.
 - .4 Hose end, drain valves at low points in systems to drain all piping systems.
 - .5 Install valves in a manner consistent with the best workmanship practices, neat in appearance and grouped so that all parts are easily accessible through a minimum of access doors.
 - .6 All valves shall be installed in accessible locations and pipe shall be so arranged that control valves can be operated through access panels which are furnished and installed by the Contractor.
 - .7 Set tops of all valve boxes flush with finished grade. Furnish and install suitable box with 12" washed pea gravel.

3.13 EQUIPMENT LEVELING, HANGERS AND SUPPORTS

3.13.1 General:

Each piece of equipment set in place under this Division shall be installed true and level.

.2 Piping

3.13.2.1 General

Pipes throughout the building, both horizontal and vertical, shall be supported with riser clamps sized to fit and adequately support their weight. At the bases of all pipes 4" in size and larger and elsewhere as shown and/or where required for proper support, furnish and install anchor base fittings. Piping systems shall be completely self-supporting without stress to any piece of equipment.

.2 Hanger Shields

Hangers for piping shall be placed around the outside of the insulation and protective shields shall be installed at every hanger location. Shield shall not less than 2/3 the circumference of the insulation and where speed clips are used, the metal shield shall be continuous around the circumference of the pipe insulation. Shields shall be fabricated of the following gauges:

<u>Nominal Pipe Size</u>	<u>Metal Gauge</u>
0" - 1-1/2"	20
2" - 3"	16

3-1/2" and up 14

.3 Hanger Spacing

Hangers shall be spaced so as to properly support piping; cast iron pipes and 1/2" copper tubing shall be supported on hangers not more than 5'-0" on centers; hangers for all other copper or steel pipe shall be spaced according to the following schedules:

<u>Pipe Size</u>	<u>Hanger Spacing</u>	<u>Rod Sizes</u>
0 - 1-1/2"	* 7'-0"	1/2"
2" - 3"	*10'-0"	5/8"
4" and up	*12'-0"	3/4"

*Any horizontal run must have a minimum of one (1) hanger.

.4 Coordination with Electrical

The intent of the above ceiling supports is to combine as many pipes, conduit, etc., as is possible within safe structural limits, on each horizontal section of a trapeze hanger. Prior to selecting the horizontal member, all trades, Mechanical and Electrical, shall coordinate actual number of pipes, conduit, etc., such that final selection results in a neatly grouped, disciplined and accessible installation.

3.14 FLOOR, CEILING AND WALL ESCUTCHEONS

3.14.1 Furnish and install chromium plated section escutcheon on each pipe or hanger rod penetrating a wall or ceiling. Escutcheons shall be sized to fit snugly to all lines. Set crews shall be used where needed so that they fit snugly against the finished surface.

3.15 CLEAN-UP

3.15.1 Upon completion of the work of this section, remove all debris relating to the conduct of this portion of the work from the premises.

END OF SECTION

22 13 16
SANITARY WASTE AND VENT SYSTEM

PART 1 GENERAL

1.1 SCOPE

- A. All work of this section including materials and workmanship shall be done in the strict accord with City of Sedona Building Standards and Review Process Guidelines and all applicable city, county, state and national codes, ordinances and regulations, and in accord with all local utility company regulations.
- B. All waste and vent pipe shall be solid core PVC schedule 40 pipe. Pipe routed in air plenum areas shall be no-hub cast iron marked DWV or where noted on plans. Use approved pattern drainage type cast iron fittings on all waste and vent piping.

PART 2 DESIGN STANDARD

2.1 CI PIPING

No-hub cast iron, shall conform to CISPI #301-04a and ASTM A-888-04a. CI piping shall be marked with collective trademark of the Cast Iron Soil Pipe Institute. Offshore pipe is not acceptable. All pipe shall be manufactured in the USA.

2.2 CI FITTINGS

- A. No-hub cast iron drainage pattern fittings, conforming to CISPI #301-04a. Fittings shall be marked with collective trademark of the Cast Iron Soil Pipe Institute. All fittings shall be manufactured in the USA.
- B. Threaded cast iron fittings conforming to ANSI B16.4.
- C. Threaded malleable iron fittings conforming to ANSI B16.3.

2.3 PIPE HANGERS AND SUPPORTS

- A. Vertical and horizontal piping shall be supported per code and per manufacturer.

2.4 CI NEOPRENE GASKETS

- A. Ty-Seal neoprene gasket conforming to ASTM C-5.

2.5 NO-HUB COUPLINGS FOR PIPE ABOVE GRADE

- A. Stainless steel shield-clamp assembly with neoprene gasket conforming to CISPI 310. Screened stainless steel is not acceptable.

2.6 INSTALLATION

- A. Pitch waste and drain lines at a uniform slope of 1/4" per foot minimum unless noted otherwise on the drawings.
- B. Install wall cleanouts wherever possible for cleanout of stoppages.
- C. Install cleanouts on waste lines at all change of directions, 100'-0" O.C. on straight runs and as required by local plumbing code. Make all cleanouts accessible by either being accessible within 6" of ceiling access panel, extended to floor or grade, or located in wall with removable plate. Provide 24" clearance all around cleanout.

END OF SECTION

**SECTION 22 33 00
DOMESTIC WATER HEATER**

PART I - GENERAL

1.2 SCOPE OF WORK

1.1.1 Furnish all labor, materials, services, equipment and appliances required for conventional electric domestic water heater work specified herein. Refer to Plumbing Fixture Schedule.

1.2 WORK INCLUDED, BUT NOT INCLUSIVE

1.2.1 Water heaters.

.2 Temperature - pressure relieve valve and fittings.

1.3 REFERENCE PUBLICATIONS AND STANDARDS

1.3.1 Water heaters shall be manufactured and installed in accordance with local and state ordinances and shall be in compliance with the requirements of the Plumbing Code.

1.4 MANUFACTURER

1.4.1 The drawings were prepared and this specification written on the basis of using the products of a specific manufacturer.

1.5 WARRANTY

1.5.1 Water heaters shall carry a three (3) year tank warranty and one (1) year parts warranty from the date of Substantial Completion.

PART II - PRODUCTS

2.1 GENERAL

2.1.1 Water heaters shall be type vessels as scheduled and installed in accordance with the equipment's listing. The water heater storage and heating recovery capacities shall be as indicated on the drawings.

2.1.2 A listed expansion tank shall be provided and supported directly to structure to serve all tank type water heaters. Expansion tank shall be located on the cold water supply pipe.

2.1.3 Furnish a drain pan beneath tank type water heaters with dedicated drain routed per plans.

2.2 MATERIALS

2.2.1 Tank type water heaters to have ASME temperature and pressure relief valve; factory set high limit control, heavy fiberglass insulation. Water heater support shall be included if required per plans. A drain pan below unit with drain pipe to indirect waste such as floor sink or mop sink shall be provided with gap per code.

PART III - EXECUTION

3.1 INSTALLATION

3.1.1 Install water heaters as indicated by the drawings. The piping arrangement of the heaters shall be as schematically shown on the drawings.

3.2 RELIEF DRAINS

3.2.1 Provide each tank type water heater with a full-sized relief drain line, extending from safety relief valve to floor drain or approved location per plans.

3.3 CLEAN-UP

3.3.1 Upon completion of the work of this section, remove all debris relating to the conduct of this portion of the work from the premises.

Applied Engineering, Inc.
Tempe, AZ

END OF SECTION

Gabor Lorant Architects, Inc.
Buckeye Pool
201921-1

22 33 00- 2

6/11/2021
100% Construction Documents
Domestic Water Heater

**SECTION 22 40 00
PLUMBING FIXTURES**

PART I - GENERAL

1.1 SCOPE OF WORK

1.1.1 Furnish all labor, materials, services, equipment and appliances required for plumbing fixture work specified herein. All work and materials shall conform to the specifications listed in the City of Sedona Building Standards and Review Process Guidelines.

1.2 WORK INCLUDED, BUT NOT INCLUSIVE

1.2.1 All plumbing fixtures including seats and miscellaneous parts.

.2 Carriers and hangers.

.3 Flush valves, sink and lavatory trim, faucets, stops, etc.

.4 Traps, tailpieces, wastes, etc.

.5 Escutcheons and miscellaneous trim items.

1.3 MANUFACTURER

1.3.1 The drawings were prepared and this specification written on the basis of using the products and specifications on plans. It is not the intent to limit competitive bidding. Equivalent products with equal construction as manufactured by other manufacturers may be substituted provided submittals are accepted.

PART II - PRODUCTS

2.1 GENERAL

2.1.1 All fixtures shall be new, non-absorbent throughout and free from waves, kiln marks or discoloration. All exposed finished metal parts shall be chromium-plated, rough bodies parts shall be heavily nickel plated. All enameled ironware shall be acid resisting. All wall mounted water closet carriers shall be capable of withstanding a 500lb load and a letter of certification will accompany the submittal for approval.

2.2 MATERIALS

2.2.1 All materials shall be per specifications on plans. All plumbing equipment shall be per Plumbing Equipment Schedule on plans.

PART III - EXECUTION

3.1 PROTECTION

3.1.1 Protect all fixtures with not less than two (2) thicknesses of tough building paper, pasted on and fully covering all surfaces. All fixtures must be turned over to the Owner clean and free from defects.

3.2 INSTALLATION

3.2.1 Install all fixtures, trim, fittings, etc., in complete accordance with manufacturer's written specifications and recommendations for materials used. Connection to fixtures shall be per plans. Sizes are for short branches only; main line sizes are as indicated on the drawings.

3.3 SHUT-OFF VALVES

3.3.1 Provide and install shut-off valves at each fixture.

3.4 CLEAN-UP

Applied Engineering, Inc.
Tempe, AZ

3.4.1 Upon completion of the work of this section, remove all debris relating to the conduct of this portion of the work from the premises.

END OF SECTION

SECTION 23 05 00
HVAC GENERAL REQUIREMENTS

1. SPECIAL NOTICE

1.1 The Architectural Plans and Specifications, including the GENERAL CONDITIONS, SUPPLEMENTAL GENERAL CONDITIONS, SPECIAL CONDITIONS, including all supplements issued thereto, INSTRUCTIONS TO BIDDERS and other pertinent documents issued by the Architect are a part of these Specifications and the accompanying Mechanical Drawings.

2. CODES, ORDINANCES AND REGULATIONS

2.1 All work of this section including materials and workmanship shall be done in the strict accord with all applicable city, county, state and national codes, ordinances and regulations, and in accord with all local utility company regulations.

3. INDUSTRY STANDARDS

3.1 The following industry standards shall apply, as applicable to the work of this section except that where the requirements of these specifications are more stringent than standards listed, these specifications shall take precedence.

3.1.1

- .1 AMCA Air Moving and Conditioning Association
- .2 ANSI American National Standards Institute
- .3 ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
- .4 ASME American Society of Mechanical Engineers
- .5 ASTM American Society of Testing Materials
- .7 NEC National Electrical Code
- .8 NEMA National Electrical Manufacturer's Associations
- .9 NFPA National Fire Protection Association
- .10 OSHA Occupational Safety and Health Administration
- .11 UL Underwriters' Laboratories
- .12 SMACNA Sheet Metal and Air Conditioning Contractors National Association, Inc.

4. SHOP DRAWINGS

4.1 Shop drawings submittals are required under this Division for the following:

- 4.1.1 HVAC Units Including: Packaged Roof top Units, Air Handlers, Heat Pumps, Split system units, Electric Heaters, Exhaust Fans, and Relief Fans.
 - .2 Valves and Miscellaneous Accessories
 - .3 Dampers, Damper Regulators, Damper Actuators
 - .4 Grilles, Registers and Diffusers
 - .5 Insulation for Ducts and Piping
 - .6 HVAC Temperature Control

4.1.2 Submittal Process Specification:

Prior to ordering equipment, submittals reviewed by the engineer are required for all items listed on the mechanical schedules, and as follows:

All submittals and re-submittals: shall use the following format or shall be returned for corrections until formatted as follows:

1. Submitted as a single electronic pdf file identified as a first submittal, or as revised submittal with the corresponding submittal number identified as "resubmittal #"; beginning with "resubmittal 1" and continuing with sequential numbering on any resubmittals.
2. All equipment on the mechanical schedules shall be submitted combined into a single pdf file (partial submittals will be returned).
3. Submittal product data shall be labeled in red boldface text in the top right hand corner of the first page with the equipment identification tag as labeled on plan schedules (unidentified cut sheets and product data will be returned).
4. Required options listed on the construction document schedules shall be clearly identified with each option on the submittal marked with a red box, circle, check, or other similar conspicuous indication that the submitted device's options match the plan schedule notes (generic equipment data that has unidentified options will be returned).
5. Contractor / supplier submittal is a presentation to the engineer that the equipment submitted is equivalent to that specified on the construction documents. Equipment substitutions which include or require deviations from the construction document's requirements shall be clearly identified by the contractor / supplier directly on the first page of the cut sheet with a clear explanation of the reason(s) for non-compliance or equivalence with equipment schedules. Failure of substituted equipment to perform to the level specified in the equipment schedule may require replacement of substituted equipment if deviations are not clearly identified.
6. All resubmittals of equipment or materials previously rejected by the engineer shall be resubmitted as a single electronic pdf file. All resubmittals shall include cut sheets of only the items that have been returned / rejected by the engineer on the first submittal (complete resubmittals of all project equipment will be returned to be reduced down to resubmittal items only).
7. All resubmittals shall include cut sheet and product data updates to show conformance to construction document requirements and as indicated and required by the engineer in the previous submittal reviews.
8. On all resubmittals clearly identify any changes made other than those requested by the engineer in the previously returned/rejected submittal. Provide a statement explaining any changes which were not prompted by the engineer's previous review.

5. MATERIALS

5.1 Requirements:

All materials shall be new and of the quality specified, free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged prior to installation shall not be repaired at the jobsite, but shall be replaced with new materials.

6. SPACE AND EQUIPMENT ARRANGEMENT AND ACCESS

6.1 Size and Fit:

The size of mechanical and plumbing equipment shown on the drawings is based on the dimensions of a particular manufacturer (the first named). While other manufacturers may be acceptable, it is the responsibility of each trade to determine if the equipment that is proposed to be furnish will fit the allotted space and to obtain prior approval from owner of such substituted equipment prior to ordering.

6.2 Service Access:

All equipment shall be installed in a manner to permit access to all surfaces as required by the manufacturer. All valves, motors, drives, lubrication devices, filters and other accessory items shall be installed in a position to allow removal for service without disassembly of another part. This requirement includes equipment installed above ceilings.

7. CONSTRUCTION REQUIREMENTS

7.1 General:

All trades shall be responsible for fitting the material and apparatus into the building and shall carefully layout work at the site to conform to the structural conditions, to provide proper grading of condensate and refrigerant lines, to avoid all obstructions and to conform to the details of the installation supplied by the manufacturer of the equipment to be installed and thereby provide an integrated, satisfactory operating installation, furnishing all necessary pilot lines and control lines. Refrigerant piping plan shall be provided to manufacturer for approval prior to installation to assure the manufacturer's Warrantee for split systems are not voided by an improper installation.

7.2 Piping and Ductwork:

In general, piping and ductwork shall be run concealed in chases, furrings and above suspended ceilings, unless noted and directed otherwise on plans. All pipe and ductwork shall be square to the building and securely supported. Runs of piping shall be grouped wherever it is feasible to do so, to include grouping with all Mechanical, Plumbing, Fire and Electrical Trades. Ductwork and piping shown on plans are schematic only and do not specify all turns, offsets or other fittings which will be necessary in the construction of this project. Contractor shall not charge owner, engineer, architect or others for such fittings or offsets and shall visit site prior to construction to include such items in contractor's fee. Contractor shall coordinate with other trades prior to construction to agree to routing of all improvements with consideration given to the Architect's intended ceiling height. Contractor shall adjust ducts, piping, etc as required to provide required clearance for building structure, ceiling height as specified by architect, and other field conditions.

7.3 OWNER FURNISHED ITEMS

Affected trades shall familiarize themselves with all the Owner Furnished items and make proper connection to such items. Contractor shall request of Owner or Architect

manufacturer's cut sheets specifying the connection locations and sizes as necessary to assure a complete and properly functioning installation of Owner Furnished items.

8. ELECTRICAL WIRING OF MOTORS AND EQUIPMENT

8.1 Power and Control Wiring:

Except for such items that are normally wired at their point of manufacture and so delivered and unless specifically noted to the contrary herein, all electric wiring for power is part of the work of DIVISION 26. Connection of power to air conditioning units, fans, motorized dampers, and duct smoke detectors shall be the work of DIVISION 23.

8.2 Controls Installation:

Installation of all automatic controls, temperature controls, temperature indication and all interconnecting conduit, wiring, and junction boxes for the installation of the HVAC, fans, duct smoke detectors, motorized dampers, and exhaust controls systems including interlocks as specified on the mechanical plans shall be part of the work of DIVISION 23. If plans show specific details of controls hardware or interlocks on electrical plans, such control conduit will only then be the responsibility of DIVISION 26.

9. IDENTIFICATION

9.1 Equipment Nameplates:

All HVAC equipment, exhaust fans, relief fans, all control devices, motor starters, condensing units etc., shall be identified by the attachment of 3/4" high nameplates, constructed from laminated, phenolic, engraved plastic, 3-ply with black surface and white interior core, at least 1/16" thick. Letters and numbers shall be used for actual identification and shall be identical to designations used on the Contract Drawings. Engraved letters and numbers shall be 1/2" high, upper case, condensed Gothic. Nameplates shall be permanently attached to equipment/devices by chromium-plated screws. Unit number per plans and space served by the unit shall be stated on nameplate.

9.2 Piping:

9.2.1 Requirement:

Each and every piping system shall be identified by means of colored, waterproof, all temperature, self-adhering labels, complete with directional flow arrows. Letters shall be 3/4" high and labels shall be placed near each valve, each branch connection and whenever piping emerges or disappears from view (when viewed from the floor of the space in which it is installed) and labels shall be placed not more than twenty (20') feet apart on all horizontal piping systems above ceilings.

9.2.2 Color Code:

Color code and identifying descriptions for labeling piping systems shall be as follows:

10.2.2.1	Condensate Drain Piping	Green
----------	-------------------------	-------

.2	Refrigerant Suction	Blue
.3	Refrigerant Liquid	Blue

9.2.3 Letter Code:

Letter Codes for piping system nameplates shall be as follows:

9.2.3.1	Condensate Drain Piping	"D"
.2	Refrigerant Suction	"S"
.3	Refrigerant Liquid	"L"

.4 Alternate:

Piping identification may be accomplished with neatly stenciled lettering, complying with above requirements.

10.3 Valves:

10.3.1 Tags

All valves on each piping system shall be identified by color coding the valve handle and attaching a valve tag. Valve tags shall be at least 1-1/2" in diameter and of the same material as specified above for nameplates or brass with stamped black enamel filled letters and numbers. Letters shall be used on each tag to identify the valve. Each tag shall be securely fastened to the valve by means of a brass "S" hook. Color codes valve handles shall have the same color as their companion pipe labeling colors. Pipes shall be labeled with direction arrows at each valve.

11. FINAL INSPECTIONS

- 11.1 It shall be the duty of each trade to personally make a detailed and careful inspection trip of the entire project, assuring himself that his work on the project is ready for final acceptance prior to informing the General Contractor of same.

END OF SECTION

SECTION 23 05 29
HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes hangers and supports for piping systems and equipment.
- B. Size all hangers on insulated piping to fit outside covering.
- C. All hangers, rods, and fastener materials shall be galvanized or stainless steel.
- D. Hanger Rod Sizes:

<u>Pipe Size</u>	<u>Rod Diameter (Inches)</u>
2" and smaller	3/8
2-1/2" and 3"	1/2
4" and 5"	5/8
6"	3/4
8" through 14"	7/8

- E. Hanger Rod Spacing (Horizontal Piping):

<u>Pipe</u>	<u>Max. Hanger Spacing (Ft. O.C.)</u>
Steel pipe 3/4" and smaller	6
Steel pipe 1"	8
Steel pipe 1-1/4" through 12"	10
Steel pipe 14" and larger	12
Copper tubing 1-1/4" and smaller	6
Copper tubing 1-1/2" and larger	8
Special piping materials	As recommended by manufacturer

PART 2 DESIGN STANDARD

2.1 HANGER AND SUPPORT INSTALLATION

- A. Provide hangers at all offsets, tees, within 12" of all horizontal elbows, and elsewhere as herein described.
- B. Sleeve and seal air and watertight all piping passing through exterior walls, through plenum or fire walls above ceilings. All sealers shall be waterproof and fireproof.
- C. Insulated Piping: Comply with the following:

1. Thermal-hanger shield inserts shall be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.
2. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.

SECTION 23 05 49

HVAC & ELECTRICAL INSTALLATION COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. Conform with applicable provisions of the General Conditions, Supplementary Conditions and General Requirements.

1.2 RELATED DIVISIONS AND SECTIONS

See Section 23 05 00, for Common Work Requirements for HVAC
See Division 26, for Electrical
See Division 28, for Building Fire Alarm

1.3 SCOPE

- A. It is the intention of this section to summarize the coordination of effort defined in the related sections and divisions of this specification.
- B. If there is a conflict between this Section and other Sections and Divisions of this specification, this Section shall be the governing and decisive Section.
- C. Make all connections to motors and controls for equipment supplied and/or installed under Division 23 according to Table 1 on the following page.

PART 2 - PRODUCTS

- A. Not Applicable

PART 3 - EXECUTION

A. INSTALLATION

- 1. No work shall be performed until the reviewed and marked submittal data have been reissued to the Contractor, unless written permission is obtained from the Architect.

TABLE 1

Item or System	Note	Supplied By (3)	Installed By (3)	Powered By	Control Field Wiring By
Equipment Motors		Div. 23	Div. 23	Div. 26	N/A
Motor Control Center, including Starters, Pilot Lights, Heater, Switches, Auxiliary Contacts, and Internal Control Wiring		Div. 26	Div. 26	Div. 26	Div. 23
Stand Alone Motor Starters (outside motor control centers)	(1)	Div. 26	Div. 26	Div. 26	Div. 23
Fused and Non-Fused Disconnects	(1)	Div.26	Div. 26	Div. 26	N/A
Control Relays & Control Transformers	(1)	Div. 23	Div. 23	Div. 26	Div. 23
A/C Units including Mixing Dampers		Div.23	Div. 23	Div. 26	Div. 23
HVAC Unit Smoke Detectors		Div. 28	Div. 23	Div. 28	Div. 28
Fan Coil Unit Condensate Float Switches		Div.23	Div. 23	N/A	Div. 23
Supply, Return & Exhaust Fan with unit mounted 115 VAC 2-position damper actuators interlock with fan motor/starter		Div. 23	Div. 23	Div. 26	N/A
Non-FMS Control Devices Including Wall Switches, Timers, Thermostats		Div.23	Div. 23	Div. 26	Div. 26
Building Automation System (BAS)	(2)	Div. 23	Div. 23	Div. 23	Div. 23
Facility Management System – Light Controls		Div. 26	Div. 26	Div. 26	Div. 26
Fire Alarm System & Interface w/HVAC System		Div. 28	Div. 28	Div. 28	N/A

TABLE NOTES:

1. Unless specified to be supplied with the equipment
2. Division 26 shall provide 120 VAC power to each mechanical space and the central plant (if applicable) as indicated on the drawings. Any additional power, transformers, and distribution shall be provided by the Section or Division indicated.
3. Division 23 indicates the HVAC contractor or their designated representative including equipment suppliers, sub-contractors, etc.

END OF SECTION

SECTION 23 05 93

HVAC SYSTEM TESTING, ADJUSTING, AND BALANCING

PART 1 GENERAL

1.1 QUALIFICATIONS

- A. Agency Qualifications: The independent TAB Agency shall be a current member of the Associated Air Balance Council (AABC) or a National Environmental Balancing Bureau (NEBB) certified contractor.

PART 2 DESIGN STANDARD

2.1 GENERAL

- A. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC or NEBB National Standards. Adjustment tolerances shall be within 10% unless otherwise stated.
- B. Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed controls, motorized dampers, and similar controls and devices, shall be marked to show final settings.
- C. Submit TAB trade subcontractor's qualifications and equipment certifications prior to awarding contract to TAB. Owner reserves the right to review and require updating or request alternate TAB contractors should qualifications or equipment be found insufficient in the owner's sole discretion.
- D. Submit a TAB plan including project specific TAB procedures, forms, and drawings to be used. TAB plan and procedures shall be performed per AABC or NEBB standard protocols.
- E. Submit the TAB Preliminary Field Reports to the Engineer for review and approval prior to the Final Report.

2.2 ADDITIONAL TAB AGENCY SERVICES

- A. The TAB Agency shall provide the following additional services:
 - 1. Fire and Smoke Testing: The TAB Agency shall test fire/smoke dampers to assure operation, and verify that an access door has been installed for each fire and smoke damper.
 - 2. Life Safety Controls: The TAB Agency shall test and record life safety control operation on the HVAC equipment. The Agency shall verify the installation of required smoke detectors in air handling equipment (AHE), and shall verify operation of the smoke detector by activating the smoke detector and observing air handler shutdown.

END OF SECTION

SECTION 23 08 39

AIR HANDLING AND AIR DISTRIBUTION SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

- A. Furnish and install all air outlets, dampers, etc., as shown on the drawings and herein specified. Each unit must be designed for the service intended, of the size and capacities indicated and complete with all accessories as noted.

PART 2 DESIGN STANDARD

2.1 GRILLES, REGISTERS, DIFFUSERS

- A. All grilles, registers, and diffusers in shall be all aluminum construction.
- B. Ceiling Damper Operators: Provide a Young #315 or equal concealed damper operator for all dampers located in inaccessible locations. Provide cover plate at ceiling.

2.2 LOUVERS & ROOF VENTS

- A. Furnish and install louvers and or roof vents as indicated on the drawing and herein specified. Louvers and roof vents shall be installed in accordance with the Manufacturer's instructions.
- B. Construction:
 - 1. Louvers shall be extruded aluminum construction, frame depth, drainable, expanded, flatted aluminum bird (exhaust and relief) or insect screen (intake) in removable frame on interior face and *equal to that specified on plans*. Finish as directed by the Architect. Provide free area guide with submittal.
 - 2. Roof vents shall be low silhouette constructed of aluminum, internal components may be galvanized. Exhaust and relief vents shall include an aluminum bird screen. Intake vents shall include an insect screen. Roof vents shall include flashing flange, pitched roof curb, curb seal, stainless steel mounting fasteners.

2.3 BACKDRAFT DAMPERS

- A. Furnish and install counter-balanced backdraft dampers as indicated on the drawings and herein specified.
- B. Construction: Dampers shall be aluminum with .090" thick channel frame and .025" thick blades with extruded vinyl edge seals. Linkage shall be aluminum concealed in the frame and bearings shall be nylon. Leakage shall not exceed 15 CFM per square foot at 1" WG. Damper shall be equal to *as specified on plans*.

Applied Engineering, Inc
Tempe, AZ

- C. Operation: Damper shall be capable to operate in the range of 0.01" w.g. to 0.05" w.g. over the entire range of airflow (0.01"w.g. start open to 0.05"w.g. full open *unless specified otherwise on plans*). Dampers that are not capable of operating within this range are not acceptable.

END OF SECTION

SECTION 23 31 10
SHEET METAL DUCTWORK (LOW PRESSURE)

PART 1 GENERAL

1.1 SUMMARY

- A. Use low pressure duct for all discharge ductwork from air handling or air conditioning units scheduled with 2" external static pressure and lower. This shall be without regard to actual air velocities involved. All material, equipment, construction and testing for all low pressure ductwork and apparatus casing shall conform to the latest SMACNA Duct Construction Standards Manual.

<u>Pressure Class</u>	<u>System</u>	<u>Seal Class Required</u>
<i>Less than 2" w.c. (Low)</i>	<i>Ducts to each air device inlet</i>	<i>A</i>

- B. Ductwork Handling and Storage:
1. Ductwork shall arrive on the project site with polyethylene film or other waterproof covering over the open ends which will prevent the entrance of dust, debris and moisture. Ductwork shall be stored in a clean and dry location. Any ductwork which is observed with interior dust and/or debris shall be cleaned and not re-installed until approval is received from the Architect/Engineer. Any ductwork which is observed to have wet interior insulation shall be removed from the jobsite and new ductwork furnished at the Contractor's expense.
 2. At ends of ducts which are not connected to equipment or air distribution devices at the time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until the time that connections are to be completed.
- C. Fabricate ductwork and fittings according to SMACNA's "HVAC Duct Construction Standards" unless noted otherwise.

PART 2 DESIGN STANDARD

2.1 GALVANIZED SHEET STEEL

- A. Galvanized, prime grade, lock forming quality steel having a G60 galvanized coating. All ducts with any dimension greater than 16" shall be flanged type duct construction.

2.2 MANUAL DAMPERS

- A. Minimum of 16 gauge galvanized steel, maximum of 8" blade, opposed blade type, with manual quadrant. See plans for additional requirements.

2.3 MANUAL QUADRANTS

- A. On all low pressure manual dampers, Young #453G in insulated ducts or inaccessible ducts, #433G in uninsulated ducts, or approved equal. In inaccessible locations (above plaster ceilings, etc.), provide Young #617 damper, 3/8" rod, and extend to Young #325 flush mounted damper regulator, cadmium-plated, suitable for painting, complete with indicator to show position of damper and operating wrench.

2.4 TURNING VANES

- A. Sheet Metal Vanes: Provide large radius, double thickness turning vanes in all 90 degree square elbows. Shop fabricated duct turns shall be submitted for approval prior to progressing any work on project.

2.5 ACCESS PANELS AND DOORS

- A. Uninsulated Ductwork: Install with 1" x 1" x 1/8" thick reinforced angle frames and make airtight with felt strips of neoprene gasketing. Latches to be Ventlock #333 as manufactured by Ventfabrics, Inc., or approved equal.
- B. Access Panels and Access Openings in Ducts: Galvanized sheet steel two gauges heavier than the duct and provided with a rolled steel metal edge, sealed airtight to the duct with felt strips or neoprene gasketing and attached to duct with sheet metal screws a maximum of 6" on center.
- C. Insulated Ductwork: Double thickness galvanized sheet metal of same gauge as duct (minimum 20 gauge), with a minimum of 1-1/2" thick fiberglass, 3-pound density insulation between sheet metal, rolled edges, hinges, and Ventfabrics, Inc. Ventlock #333 latches.
- D. See drawings and verify with architectural drawings for location of smoke partitions. Provide combination fire and smoke dampers in all smoke partitions.

2.6 DUCT SUPPORTS

- A. Support all ducts from hanger straps or hanger rods as specified herein, on plans, or in the SMACNA Manual. Ducts with a maximum dimension of 60" shall be supported on not lighter than 1" wide, 22 gauge galvanized steel strap or 3/8" diameter steel rods, a maximum of 8 feet on center. Support ducts 61" to 120" with 2" x 2" x 1/4" thick galvanized steel angle trapeze and 3/8" diameter steel rods. Support ducts 121" to 240" maximum dimension with 2-1/2" x 2-1/2" x 3/16" thick galvanized steel angles and 3/8" diameter steel rods supports. See additional details on the drawings.
- B. For ducts exposed and visible to occupants, support as indicated and specified on plans.

2.7 DUCT CONSTRUCTION (ROUND DUCT)

- A. General: Use galvanized sheet metal as hereinbefore described for all round and oval ductwork, complete with all fittings, reinforcing, bracing, etc., as required and specified herein. See drawings for sizes and locations of ductwork.
- B. Fabrication: Carefully plan and coordinate with other trades to assure straight, unbroken runs of ducts with a minimum of offsets and transitions. Do not fabricate and erect ductwork that varies substantially from that indicated without prior written approval.
- C. Joints: All joints and seams in fabricated ducts and fittings must be carefully cut and trimmed to form a tight joint. No portion of the duct or fittings shall protrude into the airstream. All factory fabricated fittings and joints must be brazed with Everdur rod. Field fabricated transverse joints may be brazed with Everdur rod or make up with a slip joint using sheet metal screws and duct sealing compound. Duct made up with duct sealer shall have a minimum of 2" overlap and be sealed with duct sealing compound (as hereinbefore described), applied to both parts for the full length of the overlap. Secure joints with drive screws spaced not more than 6" on center around the ducts using a minimum of three screws. Tape all joints with three overlap layers of approved industrial tape, each applied over a fresh layer of duct adhesive.
- D. Gauges: Sheet metal gauges for round ductwork, girth reinforcing, girth joints, etc., shall be as described in the SMACNA Manual.

2.8 DUCT CONSTRUCTION (SQUARE AND RECTANGULAR DUCT)

- A. General: Construct all rectangular ducts of galvanized sheet steel (as hereinbefore described). All sides of ducts shall be cross-broken and reinforced as hereinafter described. Ducts shall be complete with all fittings, reinforcing, bracing, etc., as specified herein and required for proper assembly.

- B. All ductwork joints, seams, and duct penetrations shall be sealed to reduce leakage and improve efficiency using mastic sealing compound.
- C. Longitudinal Seams: Pittsburgh lock, hammered flat and welded or made up with sealing compound as follows:
 - 1. Longitudinal seams may be made up with duct sealing compound (as hereinbefore described) applied to a Pittsburgh lock and hammered flat. In addition, coat the inside seam with the duct sealing compound in combination with a polyvinyl coated, open weave fiberglass tape, 2" wide. Submit details for fabrication before progressing with any work.
- D. Transverse joints may be welded flange joints, gasketed flanged connections, or other joints as recommended in Section 2 of the SMACNA Manual, with suitable reinforcement at the joint and between joints as required.
- E. Joints in factory-made ducts and fittings may be brazed with an Everdur rod or may be made as follows:
 - 1. All joints shall have a minimum overlap of 2" and shall be sealed with adhesive, applied to both parts for the full length of the overlap. The joints shall be secured with drive screws spaced not over 6" apart, around the duct, with not less than three screws. Joints shall then be taped with three layers of approved industrial tape applied over a fresh layer of the adhesive.
 - 2. At the option of the Contractor, the sealing of duct joint and fitting connections of low pressure air conditioning duct systems where round duct and fitting connections are used may be sealed by using the Thermofit air conditioning duct sealing band (TCB) as manufactured by Rayclad Tubes, Inc. The duct band shall be made in a one-piece unit for each duct diameter and supplied in its expanded form. It shall be internally coated with a heat-activated adhesive. When exposed to heat in excess of 250°F the duct band shall shrink and the adhesive melt. Pressure of the shrinking band shall force the molten adhesive into the void areas of the connection. As the duct band cools, it shall provide permanent mechanical strength and positive seal against loss of internal pressure and of external ingress of moisture.
- F. All sides of ducts shall be cross-broken and shall be brazed with girth angles brazed to duct at not over 24" on center.
- G. Elbows: Square elbows shall be used only where shown and shall have double radius acoustical turning vanes installed in strict conformance with manufacturer's recommendations.

2.9 FLEXIBLE DUCT

- A. The use of flexible duct shall be limited to minor offsets and to final connections to air devices where concealed above ceiling or construction only. The length of flexible duct shall be as short as possible, but no bends shall have a throat radius less than 1-1/2 times the radius of the duct. Flexible duct length shall not exceed eight (8) feet. The major portion of the branch takeoffs to air devices shall be made with rigid duct and fittings and the total "bend" of the flexible portion shall not exceed 90 degrees. See plans for additional requirements.

END OF SECTION

SECTION 23 34 16

EXHAUST AIR

PART 1 GENERAL

1.1 GENERAL BUILDING EXHAUSTS

- A. Roof mounted fans are to be factory curb mounted.
- B. All belt-drive exhaust fans shall have adjustable motor pulleys for fan speed control.
- C. All fans (except toilet exhaust fans 150 CFM and below) must be AMCA certified and approved.
- D. Motor Requirements:
 - 1. Motors on all fans installed on roof or exposed to exterior must have Class B or superior insulation.
 - 2. Motors scheduled for VFD service shall be inverter duty rated, have class F or higher insulation, and shall include shaft grounding brushes.
 - 3. Electronically Commutated Motors (EC) motor shall be specifically designed for fan applications. AC induction type motors are not acceptable where EC motors are scheduled on plans. EC Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted on the motor, remote dial located at the equipment if mounted indoors or if indicated on plans, or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.
- E. Provide a factory installed disconnect switch for all 120 volt, single phase fans.
- F. Provide multi-speed switches for all multi-speed fan motors.

PART 2 DESIGN STANDARD

2.1 ROOF EXHAUST FANS

- A. All exhaust fans less than 1 HP shall be direct drive (unless specifically specified otherwise on plans). All belt-drive exhaust fans shall have spring loaded idler pulleys. All pulleys (except idler) must be steel – no aluminum or pot metal. The

fan wheel shall be centrifugal backward inclined, constructed of aluminum, and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall be constructed of heavy gauge aluminum with a rigid internal support structure. The fan shroud shall have a rolled bead for added strength.

- B. Motors shall be heavy duty ball bearing type, carefully matched to the fan load, and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted on vibration isolators. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance.
- C. A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment.
- D. A fan conduit chase shall be provided through the curb cap to the motor compartment for ease of installation.
- E. Required Accessories:
 - 1. Provide pre-fabricated roof curbs to ensure compatibility between the fan, the curb, and the roof opening. All curbs to be insulated with fiberglass and provided with a rubber seal between fan and curb to assure proper sealing when attached to a curb. Curbs are to be pitched to match the as-built roof slope to allow the fan to set level.
 - 2. Provide backdraft dampers to prevent outside air from entering back into the building when fan is off.
 - 3. If indicated on the plans, provide a hinge kit mounted to the curb cap to allow entire fan to tilt away from curb for access to wheel and ductwork. Include restraint cables.

2.2 IN-LINE FANS

- A. In-line exhaust fans shall be of the centrifugal belt-driven in-line or direct drive as specified on the plans. The fan housing shall be constructed of heavy gauge galvanized steel, and shall include square duct mounting collars.
- B. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
- C. Motors shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the air stream. Motors shall be readily accessible for maintenance.

Applied Engineering, Inc.
Tempe, AZ

- D. Drives shall be sized for a minimum of 150% of driven horsepower.
- E. Motor pulleys shall be adjustable for final system balancing. A NEMA 1 disconnect switch shall be provided and wired to motor.

END OF SECTION

SECTION 23 80 00
HVAC EQUIPMENT

PART I - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, services, equipment and appliances required for heating, ventilating and air conditioning equipment work specified herein.

1.02 WORK INCLUDED, BUT NOT INCLUSIVE

- A. Roof Top Gas / Electric Packaged Units and ducts
- B. Installation of new exhaust fans.
- C. Inspection, testing and balancing of HVAC Systems.
- D. Instrument test ports.

1.03 RELATED WORK

- A. Controls for HVAC equipment shall be as indicated on the plans. See Control specifications on plans.

1.04 INSPECTION, TESTING AND BALANCING

A. General

Equipment shall be adjusted and all systems balanced to perform as specified and as required to give satisfactory operation to the complete satisfaction of the Architect. Balancing agency shall be certified by NEBB or AABC approved balancing agency. Agency shall be an Arizona licensed and based company.

B. Temperature Control:

Thermostat/zone sensors shall be programmed, adjusted, and placed in operation by the installing trade per plan specifications. All thermostats / zone sensors shall match and shall be from one manufacturer. Thermostats / Zone sensors shall include after-hour occupant override and have a local set-point adjustment. See Control specification on plans for additional requirements.

C. Balancing Air Distribution Systems:

Balanced to air quantities indicated on the drawings. Air quantities at each grille or outlet shall be recorded. Instruments and procedure shall be in accord with the grille manufacturer's recommendations and as set forth in the latest edition of the Sheet Metal and Air Conditioning contractor's National Association Manual. Air balancing shall be performed on forms furnished by the Owner completed and approved by the Owner's representative before the system will be accepted.

D. Rotating Parts:

All systems shall be calibrated and all fans and other rotating parts shall be properly lubricated, checked for correct alignment, proper rotation, proper belt tensions, etc.

E. Reports and Records:

Prior to acceptance, submit written report stating that all safety devices have been checked and are operating properly; that all equipment has been installed, checked and is operating per the manufacturer's recommendations; that temperature controls have been calibrated, programmed, and are operating properly. Submit record of air balance with report including all items listed on the air balance forms.

1.05 MANUFACTURER

The drawings were prepared and this specification written on the basis of using the products of specific manufacturers.

1.06 WARRANTY (HEATING/COOLING EQUIPMENT)

Minimum warranties are listed below. Refer to specific warranty requirements which may exceed those listed below.

A. Parts:

One (1) year warranty, including free labor for installing parts and one (1) year warranty on replacement of refrigerant, including labor, all from the date of Substantial Completion.

B. Refrigerant Circuit:

Manufacturer's full one (1) year warranty on refrigeration machine and Manufacturer's extended four (5) year warranty on the compressor, all from the date of Substantial Completion.

PART II - PRODUCTS

2.01 HEATING/COOLING UNITS

A. Requirements:

Units shall be factory packaged units as specified on the plans complete with all necessary controls and dampers as specified on plans and specifications. Minimum efficiency and staging requirements for equipment shall be as scheduled on the plans and shall meet IECC requirements.

All DX units shall be configured for use with R-410A refrigerants.

B. Units:

1. HVAC Equipment

Units as specified on plans.

2. Approved Alternate

Submit data to engineer for equal alternative manufacturers.

C. Filters:

Furnish each unit with two sets of new MERV 8 pleated throw away filters which shall remain installed until after final clean and prior to test and balance and occupancy. After final clean and before test and balance and occupancy the temporary air filters shall be removed and replaced with new MERV 8 pleated filters.

2.02 EXHAUST FANS

- A. Furnished by the Contractor and installed under this SECTION.

PART III - EXECUTION

3.01 COORDINATION AND INSTALLATION

- A. Exhaust Fans: Install all equipment in accordance with manufacturer's instructions and connect to ductwork.

3.02 VIBRATION ISOLATION FOR EXHAUST FANS

- A. Furnish, mount and install all equipment on approved vibration isolators which are appropriate to the type of installation.
- B. Connections to rotating equipment shall be made in such a manner as to prevent transmission of vibration into duct and piping systems. Provide flex connections at unit inlet and outlet connections, see plans for specific requirements.

3.03 CLEAN-UP

- A. Upon completion of the work of this section, remove from the premises all debris relating to the conduct of this portion of the work.

END OF SECTION

SECTION 26 05 10

GENERAL PROVISIONS

PART 1 GENERAL

1.1 SUMMARY

- A. The drawings and specifications do not specify exact installation means and methods or Contractor safety procedures. Installation means and methods and safety procedures are, and shall remain, the responsibility of the Contractor. No instruction or statement made on the drawings, specifications, future addenda, or change orders shall be interpreted to shift this responsibility away from the Contractor.
- B. These specifications contain statements which are more definitive or more restrictive than those contained in the General Conditions. Where these statements occur, they shall take precedence over the General Conditions. Where the word "provide" or "provision" is used, it shall be definitely interpreted as "furnishing and installing complete in operating condition." Where the words "as indicated" or "as shown" are used, they shall mean "as shown on contract drawings." Where items are specified in the singular, this Division shall provide the quantity as shown on the drawings, plus any spares or extras mentioned on drawings or in specifications. All specified and supplied equipment shall be new.

1.2 CODES, PERMITS AND FEES

- A. Comply with all applicable laws, ordinances, rules, regulations, codes or rulings of governmental units having jurisdiction, as well as standards of the National Fire Protection Association and serving utility requirements.
- B. Obtain and pay for permits, fees, inspections, meters, utility connections and extensions and the like associated with work in each section of this Division.
- C. Installation procedures, methods, and conditions shall comply with the latest requirements of the Federal Occupational Safety and Health Act (OSHA).

1.3 STANDARDS

- A. The following standard publications of the latest editions and supplements thereto shall form a part of these specifications. All electrical work shall, at a minimum, be in accordance with the applicable sections of these standards.

National Fire Protection Association Standards (NFPA).

Underwriters' Laboratories, Inc. (UL).

Certified Ballast Manufacturers Association (CBM).

National Electrical Manufacturers Association (NEMA).

Institute of Electrical and Electronic Engineers (IEEE).

American Society for Testing and Materials (ASTM).

26 05 10 1

3/31/2021

National Board of Fire Underwriters (NBFU).

American National Standards Institute (ANSI).

National Electrical Testing Association (NETA).

Insulated Power Cable Engineers Association (IPCEA).

Maricopa Association of Governments Uniform Standard Specifications for Public Works Construction (MAG).

Electrical Testing Laboratories (ETL).

Local Building Codes.

1.4 WORK AND MATERIALS

- A. All electrical materials and equipment shall be new and of the type and quality specified, and shall be listed by UL and bear their label where standards have been established, in compliance with the applicable standards of NEC (NFPA 70), NFPA, ANSI, IEEE, IPCEA and NEMA. Replace or repair any nonconforming, damaged, or defective items at no extra cost to the Owner.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Alcan Products Corporation; Alcan Cable Division.

2. [Houston Wire and Cable](#)
 3. [Belden Inc.](#)
 4. [Encore Wire Corporation.](#)

 5. [General Cable Technologies Corporation.](#)
 6. [Southwire Incorporated.](#)
- C. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- D. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2, Type XHHW-2, Type UF, Type USE, and Type SO.
- E. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable, Type AC, metal-clad cable, Type MC, mineral-insulated, metal-sheathed cable, Type MI, Type SO and Type USE with ground wire.
- F. Metal-clad (MC) cable shall be steel corrugated interlocking type and shall include an equipment ground conductor, AFC, AmerCable, or as accepted. Metal-clad (MC) cable shall not be permitted to be used in this project unless indicated on the drawings or as noted in PART 3 of this Section. Non-metallic, residential wire (such as Romex) are not acceptable.
- G. Mineral insulated cable shall be AmerCable, M.I. Cable Company (MICC), or as accepted.
- H. Armor-clad (AC) cable shall not be permitted to be used in this project.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. [AFC Cable Systems, Inc.](#)
 2. [Gardner Bender.](#)
 3. [Hubbell Power Systems, Inc.](#)
 4. [Ideal Industries, Inc.](#)
 5. [IlSCO](#); a branch of Bardes Corporation.
 6. [NSi Industries LLC.](#)
 7. [O-Z/Gedney](#); a brand of the EGS Electrical Group.
 8. [3M](#); Electrical Markets Division.
 9. [Tyco Electronics.](#)
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper for feeders rated smaller than 100A; copper or aluminum (where specifically indicated on plans) for feeders rated 100A and larger. Stranded for all sizes.
- B. Branch Circuits: Copper. Solid for No. 14 AWG and smaller; stranded for No. 12 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW-2, single conductors in raceway.
- B. Exposed Feeders: Type XHHW-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type XHHW-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- E. Feeders Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.
- F. Feeders in Cable Tray: Type XHHW-2, single conductors larger than No. 1/0 AWG.
- G. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway for #6 and smaller, type XHHW-2 for sizes #4 and larger.
- H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2-THWN-2, single conductors in raceway for #6 and smaller, type XHHW-2 for sizes #4 and larger.
- I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway for #6 and smaller, type XHHW-2 for sizes #4 and larger.
- J. Branch Circuits Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway for #6 and smaller, type XHHW-2 for sizes #4 and larger.

- K. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Wire Pulling Lubricant: Richards "Gel Lube 7/5"; American Polywater A, C, G&J; Quelcor "Quelube"; American Colloid "Slip X-300"; Thomas/Jet Line "Slipry Loob"; Ideal "Wire Lube"; Mac "Wirepull"; Minerallac "Wire-Wax"; or Electro "Y-er Eas."

- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables per NEC.
- G. Complete cable tray systems installation prior to installing conductors and cables.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Record values in the field.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 **inches** of slack.
- D. Terminations at Circuit Breakers and Switches:
 - 1. #10 and #8 AWG wire, locking tongue lug, Buchanan "Termend," or as accepted.
 - 2. #6 AWG and larger wire, round flange solderless lug, Burndy "Quick-Lug" type QDA, or as accepted.

- E. Fixture Connections: Pressure-type solderless connectors, Buchanan, Scotchlok, Wing Nut, or accepted equal.
- F. Motor Connections: Solderless lug with RayChem GelCap, or as accepted.
- G. Wire Splices:
 - 1. Joints in Wire: #8 AWG and smaller wire, pressure-type solderless connectors, Buchanan, Scotchlok, Wing Nut, or as accepted. #6 AWG and larger wire, irreversible compression type, Burndy, IlSCO, or as accepted.
 - 2. Wire Taps: Solderless lug, solderless compression lug, each with Raychem Gtap, IlSCO GTA, or GTT with insulating cover, or as accepted.
 - 3. Exterior Below Grade Joints in Wire: Solderless lug, solderless compression lug, each with Raychem GelCap or as accepted.
- H. Applied Insulation: Insulating materials shall be listed for the application. Voltage rating shall be equal to or greater than the factory-applied wire insulation. Raychem, 3M, IlSCO, or as accepted.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables.
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.
- C. Markers and Tags: Plastic Wire Markers: T&B or Brady.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements.
 - a. All emergency feeders.
 - b. All normal powered feeders rated 100A and larger.
 - c. 10% of branch circuits and feeders rated 60 – 100A.
 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 2 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- D. Test and Inspection Reports: Prepare a written report to record the following:
1. Procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- E. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment, plus the following special applications:
 - 1. Underground distribution grounding.
 - 2. Ground bonding common with lightning protection system.
 - 3. Copper building ground.
 - 4. Foundation steel electrodes.
 - 5. Signal Reference Grid

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Test wells.
 - 2. Ground rods.
 - 3. Ground rings.
 - 4. Ground bus bars.
 - 5. Grounding arrangements and connections for separately derived systems.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.
 - 1. Include the following:
 - a. Instructions for periodic testing and inspection of grounding features at test wells ground rings based on NETA MTS.

26 05 26 1

3/31/2021

- 1) Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
- 2) Include recommended testing intervals.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Burndy; Part of Hubbell Electrical Systems.
 2. Dossert; AFL Telecommunications LLC.
 3. ERICO International Corporation.
 4. Fushi Copperweld Inc.
 5. Galvan Industries, Inc.; Electrical Products Division, LLC.
 6. Harger Lightning and Grounding.
 7. ILSCO.
 8. O-Z/Gedney; A Brand of the EGS Electrical Group.
 9. Robbins Lightning, Inc.
 10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (24" U.N.O.) in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless irreversible compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 5/8 by 96 inches.
- B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least **48 inches** long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, #4/0 AWG minimum.
 1. Bury at least **24 inches** below grade.
 2. Duct-Bank Grounding Conductor: Bury **12 inches** above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 1. Install bus horizontally, on insulated spacers **2 inches** minimum from wall, **6 inches** above finished floor unless otherwise indicated.
 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
- E. Conductor Terminations and Connections:
 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

- A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so **4 inches** will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from **2 inches** above to **6 inches** below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than **6 inches** from the foundation.

3.5 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
- H. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.6 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are **2 inches** below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems," and shall be at least **12 inches** deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than **60 feet** apart.
- I. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each steel column, extending around the perimeter of building.
1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than **24 inches** from building's foundation.
- J. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use a minimum of **20 feet** of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than **20 feet** long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

- K. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least **20 feet** long. If reinforcing is in multiple pieces, connect together by the usual steel tie wires or exothermic welding to create the required length.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Grounding system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.
- G. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).

VoltaUS Consulting
Phoenix, AZ

5. Substations and Pad-Mounted Equipment: 5 ohms.
 6. Manhole Grounds: 10 ohms.
- H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION

26 05 26 9

3/31/2021

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Provide and install concrete pads for all pad mounted electrical equipment.
- C. Provide and install all supports for wall mounted and ceiling hung electrical equipment.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

26 05 29 1

3/31/2021

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:

- a. [Allied Tube & Conduit.](#)
 - b. [Cooper B-Line, Inc.; a division of Cooper Industries.](#)
 - c. [ERICO International Corporation.](#)
 - d. [GS Metals Corp.](#)
 - e. [Thomas & Betts Corporation.](#)
 - f. [Unistrut; Tyco International, Ltd.](#)
 - g. [Wesanco, Inc.](#)
3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 6. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with **9/16-inch** diameter holes at a maximum of **8 inches** o.c., in at least 1 surface.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. [Manufacturers](#): Subject to compliance with requirements, provide products by one of the following:
 - a. [Allied Tube & Conduit.](#)
 - b. [Cooper B-Line, Inc.; a division of Cooper Industries.](#)
 - c. [Fabco Plastics Wholesale Limited.](#)
 - d. [Seasafe, Inc.](#)
 3. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
 4. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
 5. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be **1/4 inch** in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for **1-1/2-inch** and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus **200 lb.**
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete **4 inches** thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than **4 inches** thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than **4 inches** larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use **3000-psi**, 28-day compressive-strength concrete.
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of **2.0 mils**.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 05 33

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets. (Including floor boxes for concrete and raised floor installations)
7. Handholes and boxes for exterior underground cabling.

1.2 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.3 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 1. Structural members in paths of conduit groups with common supports.
 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

- B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 - 4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
- C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Anamet Electrical, Inc.
 - 4. Electri-Flex Company.
 - 5. O-Z/Gedney.
 - 6. Picoma Industries.
 - 7. Republic Conduit.
 - 8. Robroy Industries.
 - 9. Southwire Company.
 - 10. Thomas & Betts Corporation.
 - 11. Western Tube and Conduit Corporation.
 - 12. Wheatland Tube Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.

- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: **0.040 inch**, minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of **0.040 inch**, with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. **AFC Cable Systems, Inc.**
 - 2. **Anamet Electrical, Inc.**
 - 3. **Arnco Corporation.**
 - 4. **CANTEX Inc.**
 - 5. **CertainTeed Corporation.**
 - 6. **Condux International, Inc.**

7. **Electri-Flex Company.**
 8. **Kraloy.**
 9. **Lamson & Sessions;** Carlon Electrical Products.
 10. **Niedax-Kleinhuis USA, Inc.**
 11. **RACO; Hubbell.**
 12. **Thomas & Betts Corporation.**
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Rigid HDPE: Comply with UL 651A.
- F. Continuous HDPE: Comply with UL 651B.
- G. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- H. RTRC: Comply with UL 1684A and NEMA TC 14.
- I. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- J. Fittings for LFNC: Comply with UL 514B.
- K. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
1. **Cooper B-Line, Inc.**
 2. **Hoffman.**
 3. **Mono-Systems, Inc.**
 4. **Square D.**
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. **Allied Moulded Products, Inc.**
 2. **Hoffman.**
 3. **Lamson & Sessions;** Carlon Electrical Products.
 4. **Niedax-Kleinhuis USA, Inc.**
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.
- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Architect.
1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. **Mono-Systems, Inc.**
 - b. **Panduit Corp.**
 - c. **Wiremold / Legrand, ALA4800 Series**
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. **Hubbell Incorporated.**
 - b. **Mono-Systems, Inc.**
 - c. **Panduit Corp.**
 - d. **Wiremold / Legrand, G4000 Series**
- D. Tele-Power Poles:
1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. **Mono-Systems, Inc.**
 - b. **Panduit Corp.**
 - c. **Wiremold / Legrand.**
 2. **Material:** Aluminum with clear anodized finish.
 3. **Fittings and Accessories:** Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
1. **Adalet.**

2. Cooper Technologies Company; Cooper Crouse-Hinds.
 3. EGS/Appleton Electric.
 4. Erickson Electrical Equipment Company.
 5. FSR Inc.
 6. Hoffman.
 7. Hubbell Incorporated.
 8. Kraloy.
 9. Milbank Manufacturing Co.
 10. Mono-Systems, Inc.
 11. O-Z/Gedney.
 12. RACO; Hubbell.
 13. Robroy Industries.
 14. Spring City Electrical Manufacturing Company.
 15. Stahlin Non-Metallic Enclosures.
 16. Thomas & Betts Corporation.
 17. Wiremold / Legrand.
 18. Panduit.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.

4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Floor boxes for installation in raised floors, suitable for plenum use, with power and data terminations, Panduit Panzone.
- H. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
 1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing **50 lb**. Outlet boxes designed for attachment of luminaires weighing more than **50 lb** shall be listed and marked for the maximum allowable weight.
- J. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing **70 lb**.
 1. Listing and Labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- K. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- L. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- M. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- N. Device Box Dimensions: **4 inches square by 2-1/8 inches deep**.
- O. Gangable boxes are prohibited.
- P. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 12 with continuous-hinge cover with flush latch unless otherwise indicated.
 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Fiberglass.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- Q. Cabinets:
 1. NEMA 250, Type 12 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. **Armorcast Products Company.**
 - b. **Carson Industries LLC.**
 - c. **NewBasis.**
 - d. **Oldcastle Precast, Inc.**
 - e. **Quazite: Hubbell Power System, Inc.**
 - f. **Synertech Moulded Products.**
3. Standard: Comply with SCTE 77.
4. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
7. Cover Legend: Molded lettering, "ELECTRIC".
8. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
9. Handholes **12 Inches Wide by 24 Inches Long** and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. **Armorcast Products Company.**
 - b. **Carson Industries LLC.**
 - c. **Nordic Fiberglass, Inc.**
 - d. **Oldcastle Precast, Inc;** Christy Concrete Products.
 - e. **Quazite: Hubbell Power System, Inc;** Hubbell Power Systems.
 - f. **Synertech Moulded Products.**
3. Standard: Comply with SCTE 77.
4. Color of Frame and Cover: Gray.
5. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
6. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
7. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
8. Cover Legend: Molded lettering, "ELECTRIC".
9. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
10. Handholes **12 Inches Wide by 24 Inches Long** and Larger: Have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.8 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

- A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.
 1. Tests of materials shall be performed by an independent testing agency.
 2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
 3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012 and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 1. Exposed Conduit (Subject to physical damage): GRC, IMC.

2. Exposed Conduit, Not Subject to Physical Damage: EMT (with weatherproof compression fittings)
3. Concealed Conduit, Aboveground: GRC, IMC, EMT.
4. Underground Conduit: RNC, schedule 40 minimum, concrete encased (as applicable).
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:

1. Encased in concrete decks: RNC, schedule 40 minimum, concrete encased
2. Exposed, (Subject to Physical Damage): GRC, IMC.
3. Exposed, (Not Subject to Severe Physical Damage): EMT.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 nonmetallic in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: **3/4-inch** trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use compression, cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds **120 deg F**.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits.

Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

- B. Keep raceways at least **6 inches** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within **12 inches** of changes in direction.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within **12 inches** of enclosures to which attached.
- I. Raceways Embedded in Slabs:
 - 1. Run conduit larger than **1-inch** trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum **10-foot** intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of **2 inches** of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- J. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to **1-1/4-inch** trade size and insulated throat metal

bushings on **1-1/2-inch** trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

- O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- Q. Cut conduit perpendicular to the length. For conduits **2-inch** trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than **200-lb** tensile strength. Leave at least **12 inches** of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- S. Surface Raceways:
 - 1. Install surface raceway with a minimum **2-inch** radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding **48 inches** and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- V. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- W. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed **30 deg F** and that has straight-run length that exceeds **25 feet**. Install in each run of aboveground RMC conduit that is located where environmental temperature change may exceed **100 deg F** and that has straight-run length that exceeds **100 feet**.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

- a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.00078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- X. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- Y. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Z. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- AA. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- BB. Locate boxes so that cover or plate will not span different building finishes.
- CC. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- DD. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
- 3.3 INSTALLATION OF UNDERGROUND CONDUIT
- A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than **6 inches** in nominal diameter.
2. Install backfill as specified in Section 31 20 00 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within **12 inches** of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with **3 inches** of concrete for a minimum of **12 inches** on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of **60 inches** from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately **12 inches** above direct-buried conduits but a minimum of **6 inches** below grade. Align planks along centerline of conduit.
7. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from **1/2-inch** sieve to **No. 4** sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures **1 inch** above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables but short enough to preserve adequate working clearances in enclosure.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 00 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
 - 1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
- E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- F. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than **50 inches** and with no side larger than **16 inches**, thickness shall be **0.052 inch**.
- b. For sleeve cross-section rectangle perimeter **50 inches** or more and one or more sides larger than **16 inches**, thickness shall be **0.138 inch**.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. **Advance Products & Systems, Inc.**
 - b. **CALPICO, Inc.**
 - c. **Metraflex Company (The).**
 - d. **Pipeline Seal and Insulator, Inc.**
 - e. **Proco Products, Inc.**
 3. Sealing Elements: EPDM Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 4. Pressure Plates: Carbon steel.
 5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. **Presealed Systems.**

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: **5000-psi**, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide **1/4-inch** annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors **2 inches** above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for **1-inch** annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Identification for conduit and raceways.
 2. Identification of power and control cables.
 3. Identification for conductors.
 4. Underground-line warning tape.
 5. Warning labels and signs.
 6. Instruction signs.
 7. Equipment identification nameplates.
 8. Labels
 9. Lockout Devices
 10. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Samples: For each type of label and sign submit (2) samples to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
- C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels. Submit electrical identification schedule including list of wording, symbols, letter size, color coding, tag number, location, and function.
- D. Manufacturer's installation instructions: Indicate installation instructions, special procedures, and installation.

1.3 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

- F. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.
- G. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 3 years experience.
- H. Installer: Company specializing in performing Work of this section with minimum 3 years experience.
- I. Delivery, Storage, and Handling: Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- J. Delivery, Storage, and Handling: Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.4 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER AND CONTROL CONDUIT AND RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Legend: Indicate voltage and system or service type including,
 - a. Normal source: black letters on white contrasting background color
 - b. Emergency source: red letters on white contrasting background color
 - c. High Voltage Systems (above 600V): black letters on yellow contrasting background color.
 - d. Communication Systems: black letters on orange contrasting background color.
 - e. UPS source: blue letters on white
 - 2. Conduits shall be color coded according to service. The color coding scheme (basis of design is as follows) shall be approved prior to installation or purchase of materials.
 - a. Normal power (208V and 480V): standard conduit
 - b. Fire alarm system: red
 - c. Emergency power (generator): yellow
 - d. UPS power (208V and 480V): blue

- e. Data, A/V: orange
- C. Colors for Raceways Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING."
- D. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway or duct and is 12 inches wide. Stop stripes at legends.
- H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- I. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Colors for Cables Carrying Circuits at 600 V and Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Colors for Cables Carrying Circuits at More Than 600 V:
 - 1. Black letters on an orange field.
 - 2. Legend: "DANGER HIGH VOLTAGE WIRING."
- D. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.

- E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.
- F. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each cable size.
- B. Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label.
- C. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.
- D. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around cable it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
- F. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.
- G. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.
- H. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.
- E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of **200 deg F**. Comply with UL 224.
- F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- G. Write-On Tags: Polyester tag, **0.015 inch** thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.
- H. Power and Lighting Circuits: Branch circuit or feeder number as indicated on Drawings.
- I. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams.

2.5 FLOOR MARKING TAPE

- A. **2-inch-** wide, **5-mil** pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes:
 - a. ELECTRIC LINE
 - b. HIGH VOLTAGE
 - 3. Inscriptions for Orange-Colored Tapes:
 - a. TELEPHONE CABLE
 - b. CATV CABLE
 - c. COMMUNICATIONS CABLE
 - d. OPTICAL FIBER CABLE

C. Tag: Type I:

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: **4 mils.**
3. Weight: **18.5 lb/1000 sq. ft..**
4. **3-Inch** Tensile According to ASTM D 882: **30 lbf**, and **2500 psi.**

D. Tag: Type II:

1. Multilayer laminate consisting of high-density polyethylene scrim coated with pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: **12 mils.**
3. Weight: **36.1 lb/1000 sq. ft..**
4. **3-Inch** Tensile According to ASTM D 882: **400 lbf**, and **11,500 psi.**

E. Tag: Type ID:

1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: **5 mils.**
3. Foil Core Thickness: **0.35 mil.**
4. Weight: **28 lb/1000 sq. ft..**
5. **3-Inch** Tensile According to ASTM D 882: **70 lbf**, and **4600 psi.**

F. Tag: Type IID:

1. Reinforced, detectable three-layer laminate, consisting of a printed pigmented woven scrim, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: **8 mils.**
3. Foil Core Thickness: **0.35 mil.**
4. Weight: **34 lb/1000 sq. ft..**
5. **3-Inch** Tensile According to ASTM D 882: **300 lbf**, and **12,500 psi.**

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. **1/4-inch** grommets in corners for mounting.

3. Nominal size, **7 by 10 inches**.

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with **0.0396-inch** galvanized-steel backing; and with colors, legend, and size required for application.
2. **1/4-inch** grommets in corners for mounting.
3. Nominal size, **10 by 14 inches**.

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR **36 INCHES**."

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum **1/16 inch** thick for signs up to **20 sq. inches** and **1/8 inch** thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/8 inch**.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/8 inch**. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved letters on contrasting background color.

1. Normal Systems: black letters on white contrasting background color.
2. Emergency Systems: red letters on white contrasting background color.
3. High Voltage Systems (above 600V): black letters on yellow contrasting background color.
4. Communication Systems: black letters on orange contrasting background color.

B. Letter Size:

1. 1/4inch high letters for identifying individual equipment and loads.
2. 1/4inch high letters for identifying grouped equipment and loads.

C. Minimum nameplate thickness: 1/8".

2.10 LABELS

- A. Adhesive Film Label (Plastic adhesive tape): Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/16 inch**.
 - 1. Normal Systems: black letters on white contrasting background color.
 - 2. Emergency Systems: red letters on white contrasting background color.
 - 3. High Voltage Systems (above 600V): black letters on yellow contrasting background color.
 - 4. Communication Systems: black letters on orange contrasting background color.
- B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be **3/16 inch**. Overlay shall provide a weatherproof and UV-resistant seal for label.
- C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be **1 inch**.

2.11 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: **3/16 inch**.
 - 2. Tensile Strength at **73 deg F**, According to ASTM D 638: **12,000 psi**.
 - 3. Temperature Range: **Minus 40 to plus 185 deg F**.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: **3/16 inch**.
 - 2. Tensile Strength at **73 deg F**, According to ASTM D 638: **12,000 psi**.
 - 3. Temperature Range: **Minus 40 to plus 185 deg F**.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: **3/16 inch**.
 - 2. Tensile Strength at **73 deg F**, According to ASTM D 638: **7000 psi**.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: **Minus 50 to plus 284 deg F**.
 - 5. Color: Black.

2.12 LOCKOUT DEVICES

- A. Lockout hasps: Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

2.13 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Identify branch circuit assignment on all wiring device cover plates using adhesive labels, black on clear or black on white labels.**
- C. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.
- F. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- G. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- H. Attach plastic raceway and cable labels that are not self-adhesive type with clear vinyl tape with adhesive appropriate to the location and substrate.
- I. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at **50-foot** maximum intervals in straight runs, and at **25-foot** maximum intervals in congested areas.
- J. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- K. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- L. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at **6 to 8 inches** below finished grade. Use

multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds **16 inches** overall.

- M. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil **4-inch-** wide black stripes on **10-inch** centers over orange background that extends full length of raceway or duct and is **12 inches** wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with **3-inch-** high black letters on **20-inch** centers. Stop stripes at legends. Apply to the following finished surfaces:
 - 1. Floor surface directly above conduits running beneath and within **12 inches** of a floor that is in contact with earth or is framed above unexcavated space.
 - 2. Wall surfaces directly external to raceways concealed within wall.
 - 3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.
- B. Underground conduit (power and telecomm) stub ups or penetrations within manholes and buildings (other than within gear) including stub ups within TRs and electrical rooms fed from within facility: Install brass tag each end identifying location fed from.
- C. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at **20-foot** maximum intervals.
- D. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at **20-foot** maximum intervals.
- E. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Normal source
 - 2. Emergency source
 - 3. UPS source
- F. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.

- 3) Phase C: Blue.
- c. Colors for 480/277-V Circuits:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of **6 inches** from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- G. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.
 - H. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
 - I. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive, self-laminating polyester labels with the conductor or cable designation, origin, and destination.
 - J. Control-Circuit Conductor Termination Identification: For identification at terminations provide heat-shrink preprinted tubes with the conductor designation.
 - K. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
 - L. Data wiring identification:
 1. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
 2. Install labels at data outlets identifying patch panel and port designation as indicated on drawings.
 - M. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
 - N. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
 1. Limit use of underground-line warning tape to direct-buried cables.
 2. Install underground-line warning tape for both direct-buried cables and cables in raceway.
 - O. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless

otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

- P. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- Q. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- R. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum **3/8-inch**- high letters for emergency instructions at equipment used for power transfer.
- S. Nameplate Installation:
1. Install nameplate parallel to equipment lines.
 2. Install nameplate for each electrical distribution and control equipment enclosure located inside with corrosive-resistant mechanical fasteners or adhesive.
 3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners or adhesive.
 4. Secure nameplate to equipment with screws or adhesive (indoors only).
 5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
- T. Label Installation:
1. Install label parallel to equipment lines.
 2. Install label on each control station and wiring device with panel and circuit assignment including,
 - a. Receptacles (per 262726.3.3.B)
 - b. Wall switches (including light switches, shade controls, and similar control devices)
- U. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic. Unless otherwise indicated, provide a single line of text with **1/2-inch**- high letters on **1-1/2-inch**- high label; where two lines of text are required, use labels **2 inches** high.
 - b. Outdoor Equipment: Stenciled legend **4 inches** high.

- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
2. Equipment to Be Labeled:
- a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Service disconnects – DISC
 - e. Automatic transfer switches - ATS
 - f. Switchgear.
 - g. Switchboards / Distribution Boards - DP.
 - h. Transformers - TX: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
 - i. Emergency system boxes and enclosures.
 - j. Motor-control centers - MCC.
 - k. Enclosed switches.
 - l. Enclosed circuit breakers.
 - m. Enclosed controllers.
 - n. Variable-speed controllers.
 - o. Push-button stations.
 - p. UPS systems.

END OF SECTION

SECTION 26 09 36

LIGHTING CONTROLS

PART 1 - GENERAL

SUMMARY

- A. The work covered in this section is subject to all of the requirements in the General Conditions of the specifications.
- B. Contractor shall coordinate all of the work in this section with all of the trades covered in other sections of the specification to provide a complete and operable system. Provide a complete central lighting system including interconnecting data cabling, power supplies, remote switches, relay panels, sensors, photosensors, addressable devices, wired and wireless devices, to accomplish the proposed sequence of operations as indicated on the plans.
- C. Section Includes:
 - 1. Lighting control system and associated devices.

REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) (www.ansi.org and www.ieee.org)
- B. ASTM International (ASTM) (www.astm.org)
 - 1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.
- C. Canadian Standards Association (CSA) (www.csa.ca)
 - 1. CSA C22.2 # 14 Industrial Control Equipment
 - 2. CSA C22.2 # 184 Solid-State Lighting Controls
 - 3. CSA C22.2 # 156 Solid-State Speed Controls
- D. International Electrotechnical Commission (www.iec.ch)
 - 1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
 - 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- E. International Organization for Standardization (ISO)
 - 1. 9001:2000 – Quality Management Systems.
- F. National Electrical Manufacturers Association (NEMA)
 - 1. WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. Underwriters Laboratories, Inc. (UL)www.ul.com
 - 1. 489 (2002) - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
 - 2. 508 (1999) - Standard for Industrial Control Equipment.
 - 3. 1472 (1996) - Solid-State Dimming Controls.

4. 924 (2003) - Emergency Lighting and Power Equipment
- H. Federal Communications Commission (FCC) rules – Part 15 (Class B): Radio Frequency Devices

SYSTEM DESCRIPTION

- A. The lighting control system shall be a distributed system containing communication gateways on each building floor and interconnected to form a complete system including software and licenses. All local devices shall connect to the control system via bridges and control wiring. Extent of lighting control system work is indicated by drawings and by the requirements of this section. It is defined to include, but not by way of limitation:
 1. Low voltage switching system with lighting automation relay panels/controllers and associated low voltage switches.
 2. Low voltage lighting automation relay panels and controllers.
 3. Low voltage wall stations, control interfaces, and sensors.
 4. Panel Master ON/OFF control capability.
 5. Programmable lighting controls for complete system via software with graphic interface specific to the project.
- B. The lighting control system supplier shall provide fully trained field personnel (based local to the project) to facilitate the programming and coordination with the BAS system integrator.
- C. Requirements are indicated elsewhere in these specifications for work including, but not limited to, raceways and electrical boxes and fitting required for installation on control equipment and wiring. Not work of this section.
- D. Conduit stubouts from switches and other devices shall be required to accessible ceilings. Where no ceilings are utilized, conduit must be routed back to the relay panel. Where applicable, wiring and devices shall be plenum rated.

SUBMITTALS (INCLUDING CLOSEOUT SUBMITTALS)

- A. Shop Drawings; include:
 1. Sequence of Operation: Submit the project specific sequence of operation, control functions and setpoints for each type of space or control strategy.
 2. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers, room names and numbers.
 3. Schematic of system.
 4. Submit dimensioned drawings (1/8" = 1'-0" AutoCAD Version 2012) of all lighting control system components and accessories with project name and address.
 5. Typical Wiring Diagrams: Submit typical wiring diagrams for all components including, but not limited to, relay panels, relays, low voltage switches, programmable panel master switches, programmable system switch panels, telephone override cards, global switching/annunciation and wire. Clearly delineate line voltage wiring connections.
 6. Submit interior photosensor locations in accordance with S.P.O.T.
 7. Cut sheet of gateways, bridges, wiring devices, and relay panels.
- B. Product Data: Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

26 09 36 2

3/31/2021

- C. Include all conduit requirements within the submittal. Where conduits are indicated on the Division 26 drawings, the quantity and size shall be a minimum. The vendor shall confirm all quantities and sizes on the submittal.
- D. Provide Operation and Maintenance Manuals:
 - 1. Including:
 - a. Warranty Information
 - b. System Start-up Information
 - c. Installation Guide
 - d. Set-up and Programming Guide
 - 2. Electronic format to be available on Lighting Control System manufacturer website.
- E. Sustainable Design Closeout Documentation
 - 1. Lighting Control System Manufacturer to provide Enhanced Start-up documentation that details the start-up procedure being performed including a process to follow, details on tests performed and an area that documents any test results.
- F. Submit commissioning plan per NEC Art. 708.8

QUALITY ASSURANCE

- A. Manufacturer: Minimum 10 years experience in manufacture of architectural lighting controls.
- B. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standard, including in-house engineering for product design activities.
- C. System Checkout: Factory-trained technicians shall be based locally and shall be available to functionally test each component in a programmable system after installation to verify proper operation and confirm that the panel wiring and addressing conform to the wiring documentation.
- D. Distributed lighting control system:
 - 1. Listed by UL specifically for the required loads. Provide evidence of compliance upon request.

PROJECT CONDITIONS

- E. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
 - 1. Ambient temperature: 0 degrees to 40 degrees C (32 degrees to 104 degrees F).
 - 2. Relative humidity: Maximum 90 percent, non-condensing.
 - 3. Lighting control system must be protected from dust during installation.

WARRANTY

- A. Provide Manufacturer's 5 Year Limited Parts Warranty and 2 Year Labor Coverage:
 - 1. 5-year limited parts warranty for the replacement of defective Lighting System Components from the date of system startup completion and 2-year 100 percent labor coverage from the date of the system startup completion.

MAINTENANCE MATERIAL SUBMITTALS

- A. Make ordering of new equipment for expansions, replacements, and spare parts available to end user.
- B. Make new replacement parts available for minimum of 10 years from date of manufacture.

PART 2 – PRODUCTS

MANUFACTURERS

- A. Basis of design product: subject to compliance and prior approval with specified requirements of this section, one of the following:
 - 1. Sensorswitch nLight
 - 2. Lutron QS
 - 3. Dynalite
 - 4. Encellium
- B. Substitutions:
 - 1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 - 2. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

GENERAL

- A. Provide system hardware that is designed, tested, manufactured, and warranted by a single manufacturer.
- B. Architectural Lighting Controls: Ten-year operational life while operating continually at any temperature in an ambient temperature range of 0 degrees C (32 degrees F) to 40 degrees C (104 degrees F) and 90 percent non-condensing relative humidity.
- C. Products: As scheduled on plans.
- D. Wiring devices: White device body, stainless steel faceplate unless noted otherwise.

PART 3 - EXECUTION

INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions.
- B. Provide complete installation of system in accordance with Contract Documents.
- C. Define each dimmer's load type, shade settings, and set control functions.

- D. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.
- E. Mount exterior daylight sensors to point due north with constant view of daylight.
- F. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted and fixture-mounted daylight sensors shall not have direct view of luminaries.
- G. Systems Integration:
 - 1. Equipment Integration Meeting Visit
 - a. Facility Representative to coordinate meeting between Facility Representative, Lighting Control System Manufacturer and other related equipment manufacturers to discuss equipment and integration procedures.

STARTUP AND PROGRAMMING

- A. Provide factory-certified field service engineer to a site visit to ensure proper system installation and operation under following parameters:
 - 1. Qualifications for factory-certified field service engineer:
 - a. Minimum experience of 2 years training in the electrical/electronic field.
 - b. Certified by the equipment manufacturer on the system installed.
 - 2. Make visits (minimum 1, and as necessary) upon completion of installation of lighting control system:
 - a. Verify connection of power feeds and load circuits.
 - b. Verify connection and location of controls.
 - c. Program system data.
 - d. Verify proper connection of digital control link.
 - e. Verify proper operation of manufacturers interfacing equipment.
 - f. Obtain sign-off on system functions.
 - g. User to be trained on system operation.
- B. After Hours Start-up
 - 1. Provide factory certified Field Service Engineer to perform manufacturer's start-up procedures outside normal working hours (Monday through Friday, 7a.m. to 5 p.m.)
- C. Tech Support
 - 1. Provide factory direct technical support hotline 24 hours per day, 7 days per week.
 - 2. Comply with NEC Art. 708.8 for Commissioning plan.

FIELD QUALITY CONTROL

- D. [Manufacturer Services
 - 1. Aim and Focus Visit
 - a. Facility Representative to coordinate on-site meeting with Lighting Control System Manufacturer and Lighting Design Consultant to make required lighting adjustments to the system for conformance with the Lighting Design Consultant's original design intent.]

CLOSEOUT ACTIVITIES

26 09 36 5

3/31/2021

- E. Training Visit
 - 1. Lighting Control System Manufacturer to provide 2 day additional on-site system training to site personnel.
- F. On-site Walkthrough
 - 1. Lighting Control System Manufacturer to provide a factory certified Field Service Engineer to demonstrate system functionality to the Commissioning Agent.

MAINTENANCE

- A. Capable of providing on-site service support within 24 hours anywhere in continental United States and within 72 hours worldwide except where special visas are required.
- B. Offer renewable service contract on yearly basis, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system startup.
- C. System Optimization Visit
 - 1. Lighting Control System Manufacturer to visit site 6 months after system start-up to evaluate system usage and discuss opportunities to make efficiency improvements that will fit with the current use of the facility.

END OF SECTION

SECTION 26 24 13

SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Transient voltage suppression devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.
7. Identification.
8. Mimic bus.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include diagram and details of proposed mimic bus.
11. Include schematic and wiring diagrams for power, signal, and control wiring.

- C. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems." Include the following:
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field Quality-Control Reports:
1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
1. Routine maintenance requirements for switchboards and all installed components.
 2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type, but no fewer than one of each size and type.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers qualified as defined in NEMA PB 2.1 and trained in electrical safety as required by NFPA 70E.
- B. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- C. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Comply with NEMA PB 2.
- G. Comply with NFPA 70.
- H. Comply with UL 891.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.
- B. Remove loose packing and flammable materials from inside switchboards and [install temporary electric heating (250 W per section)] [connect factory-installed space heaters to temporary electrical service] to prevent condensation.
- C. Handle and prepare switchboards for installation according to NEMA PB 2.1.

1.9 PROJECT CONDITIONS

- A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.
- B. Environmental Limitations:
 - 1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- C. Service Conditions: NEMA PB 2, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.
- D. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Construction Manager's written permission.
 - 4. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Square D; a brand of Schneider Electric.
 2. Eaton
 3. GE
 4. Siemens
- C. Front-Connected, Front-Accessible Switchboards:
 1. Main Devices: Fixed, individually mounted.
 2. Branch Devices: Panel mounted.
 3. Sections front and rear aligned.
- D. Front- and Side-Accessible Switchboards:
 1. Main Devices: Fixed, individually mounted.
 2. Branch Devices: Panel mounted.
 3. Sections front and rear aligned.
- E. Front- and Rear-Accessible Switchboards:
 1. Main Devices: Drawout mounted.
 2. Branch Devices: Individually compartmented and drawout mounted.
 3. Sections front and rear aligned.
- F. Nominal System Voltage: 480Y/277 V, 208Y/120 V.
- G. Main-Bus Continuous: A indicated on plans.
- H. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."
- I. Indoor Enclosures: Steel, NEMA 250, Type 1.
- J. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

- K. Outdoor Enclosures: Type 3R.
1. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.
 2. Enclosure: Flat roof; for each section, with provisions for padlocking.
 3. Doors: Personnel door at each end of aisle, minimum width of **30 inches**; opening outwards; with panic hardware and provisions for padlocking.
 4. Accessories: Fluorescent lighting fixtures, ceiling mounted; wired to a three-way light switch at each end of aisle; ground-fault circuit interrupter (GFCI) duplex receptacle; emergency battery pack lighting fixture installed on wall of aisle midway between personnel doors.
 5. Walk-in Aisle Heating and Ventilating:
 - a. Factory-installed electric unit heater(s), wall or ceiling mounted, with integral thermostat and disconnect and with capacities to maintain switchboard interior temperature of **40 deg F** with outside design temperature of.
 - b. Factory-installed exhaust fan with capacities to maintain switchboard interior temperature of **100 deg F** with outside design temperature of **23 deg F**.
 - c. Ventilating openings.
 - d. Thermostat: Single stage; wired to control heat and exhaust fan.
 6. Power for Space Heaters, Ventilation, Lighting, and Receptacle: Include a control-power transformer within the switchboard. Supply voltage shall be 120-V ac.
 7. Power for space heaters, ventilation, lighting, and receptacle provided by a remote source.
- L. Barriers: Between adjacent switchboard sections.
- M. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- N. Cubical Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.
1. Space-Heater Control: Thermostats to maintain temperature of each section above expected dew point.
 2. Space-Heater Power Source: Transformer, factory installed in switchboard.
- O. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.
- P. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.
- Q. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

- R. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.
- S. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.
- T. Pull Box on Top of Switchboard:
 - 1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
 - 2. Set back from front to clear circuit-breaker removal mechanism.
 - 3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
 - 4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
 - 5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.
- U. Buses and Connections: Three phase, four wire unless otherwise indicated.
 - 1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, with tin-plated aluminum or copper feeder circuit-breaker line connections.
 - 2. Phase- and Neutral-Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy with tin-plated aluminum circuit-breaker line connections.
 - 3. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity or tin-plated, high-strength, electrical-grade aluminum alloy.
 - 4. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
 - 5. Ground Bus: **1/4-by-2-inch** hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
 - 6. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
 - 7. Neutral Buses: 50 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
 - 8. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.
 - 9. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.
- V. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.
- W. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of .
- X. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components including instruments and instrument transformers.

2.2 SURGE PROTECTION DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
- a. Square D; a brand of Schneider Electric.
 - b. Eaton
 - c. GE
 - d. Siemens
- C. Surge Protection Device Description: IEEE C62.41-compliant, integrally mounted, wired-in, solid-state, parallel-connected, modular (with field-replaceable modules) type, with sine-wave tracking suppression and filtering modules, UL 1449, second edition, short-circuit current rating matching or exceeding the switchboard short-circuit rating, and with the following features and accessories:
1. Fuses, rated at 200-kA interrupting capacity.
 2. Fabrication using bolted compression lugs for internal wiring.
 3. Integral disconnect switch.
 4. Redundant suppression circuits.
 5. Redundant replaceable modules.
 6. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
 7. LED indicator lights for power and protection status.
 8. Audible alarm, with silencing switch, to indicate when protection has failed.
 9. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
 10. Six-digit, transient-event counter set to totalize transient surges.
- D. Peak Single-Impulse Surge Current Rating: [160 kA per mode/320 kA per phase] [120 kA per mode/240 kA per phase] [80 kA per mode/160 kA per phase].
- E. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20-mic.sec. surges with less than 5 percent change in clamping voltage.
- F. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277-V, three-phase, four-wire circuits shall be as follows:
1. Line to Neutral: 800 V for 480Y/277.
 2. Line to Ground: 800 V for 480Y/277.
 3. Neutral to Ground: 800 V for 480Y/277.
- G. Protection modes and UL 1449 SVR for 240/120-V, three-phase, four-wire circuits with high leg shall be as follows:
1. Line to Neutral: 400 V, 800 V from high leg.
 2. Line to Ground: 400 V.
 3. Neutral to Ground: 400 V.

- H. Protection modes and UL 1449 SVR for 240-, 480-, or 600-V, three-phase, three-wire, delta circuits shall be as follows:
1. Line to Line: 2000 V for 480 V.
 2. Line to Ground: 1500 V for 480 V.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
 6. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 - f. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 26 09 13 "Electrical Power Monitoring and Control."
 - g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at [55] [75] percent of rated voltage.
 - h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.

- i. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
- B. Insulated-Case Circuit Breaker (ICCB): 100 percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.
1. Fixed circuit-breaker mounting.
 2. Two-step, stored-energy closing.
 3. Full-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time time adjustments.
 - c. Ground-fault pickup level, time delay, and I²t response.
 4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
 5. Remote trip indication and control.
 6. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system specified in Section 26 09 13 "Electrical Power Monitoring and Control."
 7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 8. Control Voltage: 120-V ac.
- C. Bolted-Pressure Contact Switch: Operating mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on the switch blade after it engages the stationary contacts.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. Square D; a brand of Schneider Electric.
 - b. Eaton
 - c. GE
 - d. Siemens
 2. Main-Contact Interrupting Capability: Minimum of 12 times the switch current rating.
 3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.
 - a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
 - b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.
 4. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
 5. Service-Rated Switches: Labeled for use as service equipment.

6. Ground-Fault Relay: Comply with UL 1053; self-powered type with mechanical ground-fault indicator, test function, tripping relay with internal memory, and three-phase current transformer/sensor.
 - a. Configuration: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - b. Internal Memory: Integrates the cumulative value of intermittent arcing ground-fault currents and uses the effect to initiate tripping.
 - c. No-Trip Relay Test: Permits ground-fault simulation test without tripping switch.
 - d. Test Control: Simulates ground fault to test relay and switch (or relay only if "no-trip" mode is selected).
 7. Open-Fuse Trip Device: Arranged to trip switch open if a phase fuse opens.
- D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- E. Fuses are specified in Section 26 28 13 "Fuses."

2.4 INSTRUMENTATION

- A. Instrument Transformers: IEEE C57.13, NEMA EI 21.1, and the following:
1. Potential Transformers: IEEE C57.13; 120 V, 60 Hz, single secondary; disconnecting type with integral fuse mountings. Burden and accuracy shall be consistent with connected metering and relay devices.
 2. Current Transformers: IEEE C57.13; 5 A, 60 Hz, secondary; wound type; **[double]** secondary winding and secondary shorting device. Burden and accuracy shall be consistent with connected metering and relay devices.
 3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
 4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.
- B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:
1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:
 - a. Phase Currents, Each Phase: Plus or minus 1 percent.
 - b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
 - c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
 - d. Megawatts: Plus or minus 2 percent.
 - e. Megavars: Plus or minus 2 percent.
 - f. Power Factor: Plus or minus 2 percent.
 - g. Frequency: Plus or minus 0.5 percent.
 - h. Accumulated Energy, Megawatt Hours: Plus or minus 2 percent; accumulated values unaffected by power outages up to 72 hours.
 - i. Megawatt Demand: Plus or minus 2 percent; demand interval programmable from five to 60 minutes.

- j. Contact devices to operate remote impulse-totalizing demand meter.
 2. Mounting: Display and control unit flush or semiflush mounted in instrument compartment door.
- C. Ammeters, Voltmeters, and Power-Factor Meters: ANSI C39.1.
1. Meters: 4-inch diameter or 6 inches square, flush or semiflush, with antiparallax 250-degree scales and external zero adjustment.
 2. Voltmeters: Cover an expanded-scale range of nominal voltage plus 10 percent.
- D. Instrument Switches: Rotary type with off position.
1. Voltmeter Switches: Permit reading of all phase-to-phase voltages and, where a neutral is indicated, phase-to-neutral voltages.
 2. Ammeter Switches: Permit reading of current in each phase and maintain current-transformer secondaries in a closed-circuit condition at all times.
- E. Feeder Ammeters: 2-1/2-inch minimum size with 90- or 120-degree scale. Meter and transfer device with off position, located on overcurrent device door for indicated feeder circuits only.
- F. Watt-Hour Meters and Wattmeters:
1. Comply with ANSI C12.1.
 2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
 3. Suitable for connection to three- and four-wire circuits.
 4. Potential indicating lamps.
 5. Adjustments for light and full load, phase balance, and power factor.
 6. Four-dial clock register.
 7. Integral demand indicator.
 8. Contact devices to operate remote impulse-totalizing demand meter.
 9. Ratchets to prevent reverse rotation.
 10. Removable meter with drawout test plug.
 11. Semiflush mounted case with matching cover.
 12. Appropriate multiplier tag.
- G. Impulse-Totalizing Demand Meter:
1. Comply with ANSI C12.1.
 2. Suitable for use with switchboard watt-hour meter, including two-circuit totalizing relay.
 3. Cyclometer.
 4. Four-dial, totalizing kilowatt-hour register.
 5. Positive chart drive mechanism.
 6. Capillary pen holding a minimum of one month's ink supply.
 7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
 8. Capable of indicating and recording **[five] [15] [30] <Insert time period>**-minute integrated demand of totalized system.

2.5 CONTROL POWER

- A. Control Circuits: 120-V ac, supplied through secondary disconnecting devices from control-power transformer.
- B. Control Circuits: 120-V ac, supplied from remote branch circuit.
- C. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate compartments, with interlocking relays, connected to the primary side of each control-power transformer at the line side of the associated main circuit breaker. 120-V secondaries connected through automatic transfer relays to ensure a fail-safe automatic transfer scheme.
- D. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.
- E. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for No. 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from switchboard. Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.
- C. Portable Circuit-Breaker Lifting Device: Floor-supported, roller-based, elevating carriage arranged for movement of circuit breakers in and out of compartments for present and future circuit breakers.
- D. Overhead Circuit-Breaker Lifting Device: Mounted at top front of switchboard, with hoist and lifting yokes matching each drawout circuit breaker.
- E. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

2.7 IDENTIFICATION

- A. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on a photoengraved nameplate.
 - 1. Nameplate: At least **0.032-inch**- thick anodized aluminum, located at eye level on front cover of the switchboard incoming service section.
- B. Mimic Bus: Entire single-line switchboard bus work, as depicted on factory record drawing, on an engraved laminated-plastic (Gravoply) nameplate.
 - 1. Nameplate: At least **0.0625-inch**- thick laminated plastic (Gravoply), located at eye level on front cover of the switchboard incoming service section.

- C. Mimic Bus: Continuously integrated mimic bus factory applied to front of switchboard. Arrange in single-line diagram format, using symbols and letter designations consistent with final mimic-bus diagram.
- D. Coordinate mimic-bus segments with devices in switchboard sections to which they are applied. Produce a concise visual presentation of principal switchboard components and connections.
- E. Presentation Media: Painted graphics in color contrasting with background color to represent bus and components, complete with lettered designations.
- F. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store switchboards according to NEMA PB 2.1.
- B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.
- C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install switchboards and accessories according to NEMA PB 2.1.
- B. Equipment Mounting: Install switchboards on concrete base, **4-inch** nominal thickness. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete." Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch** centers around the full perimeter of concrete base.
 - 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to switchboards.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.
- D. Comply with mounting and anchoring requirements specified in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."

- E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
- F. Install filler plates in unused spaces of panel-mounted sections.
- G. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.
 - 1. Set field-adjustable switches and circuit-breaker trip ranges.
- H. Install spare-fuse cabinet.
- I. Comply with NECA 1.

3.3 CONNECTIONS

- A. Comply with requirements for terminating feeder bus specified in Section 26 25 00 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.
- B. Comply with requirements for terminating cable trays specified in Section 26 05 36 "Cable Trays for Electrical Systems." Drawings indicate general arrangement of cable trays, fittings, and specialties.

3.4 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- B. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Switchboard will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges [as indicated.] [as specified in Section 26 05 73.16 "Overcurrent Protective Device Coordination Study."]

3.7 PROTECTION

- A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

VoltaUS Consulting
Phoenix, AZ

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories, and to use and reprogram microprocessor-based trip, monitoring, and communication units.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.
4. Electronic-grade panelboards.

1.2 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. SPD: Surge Protective Device

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 3. Detail bus configuration, current, and voltage ratings.
 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 5. Include evidence of NRTL listing for series rating of installed devices.
 6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 7. Include wiring diagrams for power, signal, and control wiring.
 8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.

- B. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems." Include the following:
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Keys: Two spares for each type of panelboard cabinet lock.
 - 2. Circuit Breakers Including GFCI and Ground Fault Equipment Protection (GFEP) Types: Two spares for each panelboard.
 - 3. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 4. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
 - B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
 - C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
 - D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - E. Comply with NEMA PB 1.
 - F. Comply with NFPA 70.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
 - B. Handle and prepare panelboards for installation according to NEMA PB 1.
- 1.9 PROJECT CONDITIONS
- A. Environmental Limitations:
 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
 - B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 1. Ambient temperatures within limits specified.
 2. Altitude not exceeding 6600 feet.
 - C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electric service.

2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.
- B. Enclosures: Flush- and surface-mounted cabinets.
 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 6. Finishes:
 - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.
 7. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses:
1. Material: Tin-plated aluminum.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 3. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
 4. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
 5. Split Bus: Vertical buses divided into individual vertical sections.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Tin-plated aluminum.
 2. Main and Neutral Lugs: Mechanical type.
 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 7. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL.

- I. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
- B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Square D; a brand of Schneider Electric.
 2. Eaton
 3. GE
 4. Siemens
 - 5.
- C. Panelboards: NEMA PB 1, power and feeder distribution type.
- D. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 1. For doors more than **36 inches** high, provide two latches, keyed alike.
- E. Mains: As indicated on plans.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- G. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- H. Branch Overcurrent Protective Devices: Fused switches.
- I. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.

1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
2. External Control-Power Source: 120-V branch circuit.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Square D; a brand of Schneider Electric.
 2. Eaton
 3. GE
 4. Siemens
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: As indicated on plans.
- E. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Contactors in Main Bus: NEMA ICS 2, Class A, electrically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
 1. Internal Control-Power Source: Control-power transformer, with fused primary and secondary terminals, connected to main bus ahead of contactor connection.
 2. External Control-Power Source: 120-V branch circuit.
- G. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- H. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Square D; a brand of Schneider Electric.
 2. Eaton
 3. GE
 4. Siemens

- C. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and I^2t response.
 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 26 09 13 "Electrical Power Monitoring and Control."
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
 - h. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - i. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
 - j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - k. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
 - l. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

- m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- D. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."
 - 2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
 - 3. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Equipment Mounting: Install panelboards on concrete bases, **4-inch** nominal thickness. Comply with requirements for concrete base specified in Section 03 30 00 "Cast-in-Place Concrete." Section 03 30 53 "Miscellaneous Cast-in-Place Concrete."
 - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on **18-inch** centers around full perimeter of base.
 - 2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to panelboards.
 5. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- D. Comply with mounting and anchoring requirements specified in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."
- E. Mount top of trim **90 inches** above finished floor unless otherwise indicated.
- F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.
- H. Install filler plates in unused spaces.
- I. Stub four **1-inch** empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four **1-inch** empty conduits into raised floor space or below slab not on grade.
- J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- K. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- E. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- F. Panelboards will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as provided by Engineer of Supplier's time-current coordination study approved by the Engineer.

- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

- A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge-suppression units.
4. Isolated-ground receptacles.
5. Hospital-grade receptacles.
6. Tamper-resistant receptacles.
7. Weather-resistant receptacles.
8. Snap switches and wall-box dimmers.
9. Solid-state fan speed controls.
10. Wall-switch and exterior occupancy sensors.
11. Communications outlets.
12. Pendant cord-connector devices.
13. Cord and plug sets.
14. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.2 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Service/Power Poles: One for every 10, but no fewer than one.
 - 2. Floor Service-Outlet Assemblies: One for every 10, but no fewer than one.
 - 3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.
 - 4. TVSS Receptacles: One for every 10 of each type installed, but no fewer than two of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers'** Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. **Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).**
 - 2. **Hubbell Incorporated; Wiring Device-Kellems (Hubbell).**
 - 3. **Leviton Mfg. Company Inc. (Leviton).**
 - 4. **Pass & Seymour/Legrand (Pass & Seymour).**
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 8310 (single), 8300 (duplex).
 - b. Hubbell; HBL8310 (single), HBL8300 (duplex).
 - c. Leviton; 8310 (single), 8300 (duplex).
 - d. Pass & Seymour; 8301 (single), 8300H (duplex).
 - 2. **Description:** Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
- C. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; IG5362RN.

- b. **Hubbell; IG5362.**
 - c. **Leviton; 5362-IG.**
 - d. **Pass & Seymour; IG5362.**
2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; TR8300.**
 - b. **Hubbell; HBL8300SGA.**
 - c. **Leviton; 8300-SGG.**
 - d. **Pass & Seymour; TR63H.**

2.4 GFCI RECEPTACLES

- A. General Description:
1. Straight blade, feed-through type.
 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; VGF20.**
 - b. **Hubbell; GFR5352L.**
 - c. **Pass & Seymour; 2095.**
 - d. **Leviton; 7590.**
- C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Hubbell; GFTR20.**

- b. **Pass & Seymour; 2095TR.**
- D. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; VGFH20.**
 - b. **Hubbell; HFR8300HL.**
 - c. **Leviton; 7899-HG.**
 - d. **Pass & Seymour; 2095HG.**

2.5 TVSS RECEPTACLES

- A. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral TVSS in line to ground, line to neutral, and neutral to ground.
 - 1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.
 - 2. Active TVSS Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
- B. Duplex TVSS Convenience Receptacles:
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; 5362BLS.**
 - b. **Hubbell; HBL5362SA.**
 - c. **Leviton; 5380.**
 - d. **Pass & Seymour; 5362BLSP.**
 - 2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
- C. Isolated-Ground, Duplex Convenience Receptacles:
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; IG5362BLS.**
 - b. **Hubbell; IG5362SA.**
 - c. **Leviton; 5380-IG.**
 - d. **Pass & Seymour; IG5362BLSP.**

2. Description:
 - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

D. Hospital-Grade, Duplex Convenience Receptacles: Comply with UL 498 Supplement sd.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; 8300BLS.**
 - b. **Hubbell; HBL8362SA.**
 - c. **Leviton; 8380.**
 - d. **Pass & Seymour; 8300BLSP.**
2. Description: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
4. Comply with NFPA 70.

E. Isolated-Ground, Hospital-Grade, Duplex Convenience Receptacles:

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; IG8300HGBLS.**
 - b. **Hubbell; IG8362SA.**
 - c. **Leviton; 8380-IG.**
 - d. **Pass & Seymour; IG8300BLSP.**
2. Description:
 - a. Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R.
 - b. Comply with UL 498 Supplement sd.
 - c. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.6 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

- A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. **Cooper Crouse-Hinds.**
 - b. **EGS/Appleton Electric.**
 - c. **Killark; Division of Hubbell Inc.**

2.7 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; CWL520R.**
 - b. **Hubbell; HBL2310.**
 - c. **Leviton; 2310.**
 - d. **Pass & Seymour; L520-R.**
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; IGL520R.**
 - b. **Hubbell; IG2310.**
 - c. **Leviton; 2310-IG.**
 - d. **Pass & Seymour; IG4700.**
 2. Description:
 - a. Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.
 - b. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.8 PENDANT CORD-CONNECTOR DEVICES

- A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.9 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.10 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- 1) Single Pole:

Cooper; AH1221.
Hubbell; HBL1221.

Leviton; 1221-2.

- 2) Two Pole:

Cooper; AH1222.
Hubbell; HBL1222.

Leviton; 1222-2.

- 3) Three Way:

Cooper; AH1223.
Hubbell; HBL1223.

Leviton; 1223-2.

- 4) Pass & Seymour; CSB20AC3.
Four Way:

Cooper; AH1224.
Hubbell; HBL1224.

Leviton; 1224-2.

Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; AH1221PL for 120 and 277 V.
 - b. Hubbell; HBL1201PL for 120 and 277 V.
 - c. Leviton; 1221-LH1.
 - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
2. **Description:** Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; AH1221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.
 - d. Pass & Seymour; PS20AC1-L.
2. **Description:** Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.

- F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; 1995L.**
 - b. **Hubbell; HBL1557L.**
 - c. **Leviton; 1257L.**
 - d. **Pass & Seymour; 1251L.**

2.11 DECORATOR-STYLE DEVICES

- A. Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; 6252.**
 - b. **Hubbell; DR15.**
 - c. **Leviton; 16252.**
 - d. **Pass & Seymour; 26252.**

- B. Tamper-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; TR6252.**
 - b. **Hubbell; DR15TR.**
 - c. **Pass & Seymour; TR26252.**
2. **Description:** Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.

- C. Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, and UL 498.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; TWRBR15.**

- b. Hubbell; DR15TR.
 - c. LevitonTRW15.
 - d. Pass & Seymour; TRW26252.
2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section, when installed in wet and damp locations.
- D. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; VGF15.
 - b. Hubbell; GF15LA.
 - c. Leviton; 8599.
 - d. Pass & Seymour; 1594.
- E. GFCI, Tamper-Resistant and Weather-Resistant Convenience Receptacles: Square face, 125 V, 15 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-15R, UL 498, and UL 943 Class A.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; TWRVGF15.
 - b. Hubbell; GFTR15.
 - c. Pass & Seymour; 1594TRWR.
 2. Description: Labeled to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section.
- F. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 7621 (single pole), 7623 (three way).
 - b. Hubbell; DS115 (single pole), DS315 (three way).
 - c. Leviton; 5621-2 (single pole), 5623-2 (three way).
 - d. Pass & Seymour; 2621 (single pole), 2623 (three way).

G. Lighted Toggle Switches, Square Face, 120 V, 15 A: Comply with NEMA WD 1 and UL 20.

1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. **Cooper; 7631 (single pole), 7633 (three way).**
 - b. **Hubbell; DS120IL (single pole), DS320 (three way).**
 - c. **Leviton; 5631-2 (single pole), 5633-2 (three way).**
 - d. **Pass & Seymour; 2625 (single pole), 2626 (three way).**
2. **Description:** With neon-lighted handle, illuminated when switch is "off."

2.12 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: **0.035-inch-** thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Thermoplastic with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.13 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, solid brass with satin finish.

D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening

2.14 POKE-THROUGH ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. **Hubbell Incorporated; Wiring Device-Kellems.**

2. Pass & Seymour/Legrand.
3. Square D/Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold/Legrand.

C. Description:

1. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
2. Comply with UL 514 scrub water exclusion requirements.
3. Service-Outlet Assembly: Pedestal type with services indicated complying with requirements in Section 27 15 00 "Communications Horizontal Cabling."
4. Size: Selected to fit nominal 3-inch cored holes in floor and matched to floor thickness.
5. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
6. Closure Plug: Arranged to close unused 3-inch cored openings and reestablish fire rating of floor.
7. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, four-pair cables that comply with requirements in Section 27 15 00 "Communications Horizontal Cabling."

2.15 PREFABRICATED MULTIOUTLET ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Universal Electric Corp. (Starline)
 2. Mono-Systems SWA4800 Series 2 Compartment Aluminum Raceway, 6" x 2.3"
 3. Hubbell Incorporated; Wiring Device-Kellems.
 4. Wiremold/Legrand G3000 Series.
- C. Description:
1. Two-piece surface metal raceway, with factory-wired multioutlet harness.
 2. Components shall be products from single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- D. Raceway Material: Metal, with manufacturer's standard finish.
- E. Multioutlet Harness:

1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
2. Receptacle Spacing: **18 inches**.
3. Wiring: No. 12 AWG solid, Type THHN copper, single circuit.

2.16 SERVICE POLES

A. Description:

1. Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
2. Poles: Nominal **2.5-inch**- square cross section, with height adequate to extend from floor to at least **6 inches** above ceiling, and with separate channels for power wiring and voice and data communication cabling.
3. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
4. Finishes: Manufacturer's standard painted finish and trim combination.
5. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, four-pair, Category 3 or Category 5 voice and data communication cables.
6. Power Receptacles: Two duplex, 20-A, straight-blade receptacles complying with requirements in this Section.
7. Voice and Data Communication Outlets: Blank insert with bushed cable opening complying with requirements in Section 27 15 00 "Communications Horizontal Cabling."

2.17 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. TVSS Devices: Blue.
4. Isolated-Ground Receptacles: Orange.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than **6 inches** in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Identify each receptacle with panelboard identification and circuit number. Use machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. In healthcare facilities, prepare reports that comply with recommendations in NFPA 99.
2. Test Instruments: Use instruments that comply with UL 1436.
3. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Test straight-blade convenience outlets in patient-care areas for the retention force of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz..

D. Wiring device will be considered defective if it does not pass tests and inspections.

VoltaUS Consulting
Phoenix, AZ

- E. Prepare test and inspection reports.

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in enclosed switches, enclosed controllers, and motor-control centers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches fuseholders and panelboards.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. Spare-fuse cabinets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.
4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. Include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.

3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Comply with UL 248-11 for plug fuses.

1.6 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than **40 deg F** or more than **100 deg F**, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.7 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Bussmann, Inc.
 2. Edison Fuse, Inc.

3. [Ferraz Shawmut, Inc.](#)
4. [Littelfuse, Inc.](#)

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 PLUG FUSES

- A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4 PLUG-FUSE ADAPTERS

- A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

2.5 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 2. Finish: Gray, baked enamel.
 3. Identification: "SPARE FUSES" in 1-1/2-inch- high letters on exterior of door.
 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

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

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class RK1, time delay.
2. Feeders: Class RK1, time delay.
3. Motor Branch Circuits: Class RK5, time delay.
4. Other Branch Circuits: Class RK5, time delay.
5. Control Circuits: Class CC, fast acting.

B. Plug Fuses:

1. Motor Branch Circuits: Edison-base type, dual-element time delay.
2. Other Branch Circuits: Edison-base type, dual-element time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
- C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

- A. Install labels and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Fusible switches.
 2. Nonfusible switches.
 3. Receptacle switches.
 4. Shunt trip switches.
 5. Molded-case circuit breakers (MCCBs).
 6. Molded-case switches.
 7. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
1. Enclosure types and details for types other than NEMA 250, Type 1.
 2. Current and voltage ratings.
 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 4. Include evidence of NRTL listing for series rating of installed devices.
 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Field quality-control reports.

1. Test procedures used.

2. Test results that comply with requirements.

3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than **minus 22 deg F** and not exceeding **104 deg F**.
 2. Altitude: Not exceeding **6600 feet**.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
 2. Indicate method of providing temporary electric service.
 3. Do not proceed with interruption of electric service without Construction Manager's written permission.
 4. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit. (Basis of Design)
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 6. Hookstick Handle: Allows use of a hookstick to operate the handle.
 7. Lugs: Mechanical type, suitable for number, size, and conductor material.
 8. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit. (Basis of Design)
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 5. Hookstick Handle: Allows use of a hookstick to operate the handle.
 6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 RECEPTACLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. [Eaton Electrical Inc.; Cutler-Hammer Business Unit.](#)
 2. [General Electric Company; GE Consumer & Industrial - Electrical Distribution.](#)
 3. [Siemens Energy & Automation, Inc.](#)
 4. [Square D; a brand of Schneider Electric.](#)
- C. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 600-V ac, 30 60 100 A; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Type HD, Heavy-Duty, Single-Throw Nonfusible Switch: 600-V ac, 30 60 100 A; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- E. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- F. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).

2.4 SHUNT TRIP SWITCHES

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. [Basis-of-Design Product](#): Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. [Cooper Bussmann, Inc.](#)
 2. [Ferraz Shawmut, Inc.](#)
 3. [Littelfuse, Inc.](#)
- C. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.
- D. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- E. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.

F. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight green ON pilot light.
3. Isolated neutral lug; 100 percent rating.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Form C alarm contacts that change state when switch is tripped.
6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac coil voltage.
7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.5 MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- C. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- D. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- E. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
- F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I²t response.
- G. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

- H. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.
- I. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- J. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).
- K. Features and Accessories:
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system, specified in Section 26 09 13 "Electrical Power Monitoring and Control."
 - 6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 - 8. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 - 9. Alarm Switch: One NO NC contact that operates only when circuit breaker has tripped.
 - 10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - 11. Zone-Selective Interlocking: Integral with electronic ground-fault trip unit; for interlocking ground-fault protection function.
 - 12. Electrical Operator: Provide remote control for on, off, and reset operations.
 - 13. Accessory Control Power Voltage: Integrally mounted, self-powered;.

2.6 MOLDED-CASE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric.
- C. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.
- D. Features and Accessories:
 1. Standard frame sizes and number of poles.
 2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
 3. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 4. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
 6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
 7. Alarm Switch: One NO contact that operates only when switch has tripped.
 8. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
 9. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
 10. Electrical Operator: Provide remote control for on, off, and reset operations.
 11. Accessory Control Power Voltage: Integrally mounted, self-powered;.

2.7 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.
 3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
 6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7 Type 9.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Section 26 05 48 "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- E. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:

- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges[as specified in Section 26 05 73.16 "Overcurrent Protective Device Coordination Study."]

END OF SECTION

SECTION 26 51 00

LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. LER: Luminaire efficacy rating.
- D. Lumen: Measured output of lamp and luminaire, or both.
- E. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.
 - 3. Ballast, including BF.
 - 4. Energy-efficiency data.
 - 5. Air and Thermal Performance Data: For air-handling lighting fixtures.
 - 6. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
 - 7. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
 - a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.

- b. **Manufacturer Certified Data:** Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. **Shop Drawings:** For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. **Wiring Diagrams:** For power, signal, and control wiring.
- C. **Samples:** For each lighting fixture indicated in the Interior Lighting Fixture Schedule. Each Sample shall include the following:
 - 1. Lamps and ballasts, installed.
 - 2. Cords and plugs.
 - 3. Pendant support system.
- D. Installation instructions.

1.4 INFORMATIONAL SUBMITTALS

- A. **Coordination Drawings:** Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Lighting fixtures.
 - 2. Suspended ceiling components.
 - 3. Partitions and millwork that penetrate the ceiling or extends to within **12 inches** of the plane of the luminaires.
 - 4. Ceiling-mounted projectors.
 - 5. Structural members to which suspension systems for lighting fixtures will be attached.
 - 6. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.
 - 7. Perimeter moldings.
- B. **Qualification Data:** For qualified agencies providing photometric data for lighting fixtures.
- C. **Product Certificates:** For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.
- D. Field quality-control reports.
- E. **Warranty:** Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
 - 1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 - 2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 3. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 - 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.7 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.
- E. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
- F. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.
 - 1. Obtain Architect's approval of fixtures for mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 - 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Metal Parts: Free of burrs and sharp corners and edges.
- C. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least **0.125 inch** minimum unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.

- F. Air-Handling Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly.
 - 1. Air-Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
 - 2. Heat-Removal Units: Air path leads through lamp cavity.
 - 3. Combination Heat-Removal and Air-Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air-supply units.
 - 4. Dampers: Operable from outside fixture for control of return-air volume.
 - 5. Static Fixture: Air-supply slots are blanked off, and fixture appearance matches active units.

2.3 EMERGENCY POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
- B. External Type: Self-contained, modular, battery-inverter unit, remote mounted from lighting fixture. Comply with UL 924.

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 - g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is announced by an integral audible alarm and a flashing red LED.
 - 3. Master/Remote Sign Configurations:

- a. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.
 - b. Remote Unit: Comply with requirements above for self-powered exit signs, except omit power supply, battery, and test features. Arrange to receive full power requirements from master unit. Connect for testing concurrently with master unit as a unified system.
- C. Self-Luminous Signs: Powered by tritium gas, with universal bracket for flush-ceiling, wall, or end mounting. Signs shall be guaranteed by manufacturer to maintain the minimum brightness requirements in UL 924 for 20 years.
- D. Self-Luminous Signs: Using strontium oxide aluminate compound to store ambient light and release the stored energy when the light is removed. Provide with universal bracket for flush-ceiling, wall, or end mounting.

2.5 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
- 1. Battery: Sealed, maintenance-free.
 - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 - 6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
 - 7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
 - 8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
 - 9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 26 05 29 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: **1/2-inch** steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

- C. Twin-Stem Hangers: Two, **1/2-inch** steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, **12 gage**.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, **12 gage**.
- F. Rod Hangers: **3/16-inch** minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures:
 - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
 - 2. Install lamps in each luminaire.
- B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
- D. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
 - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than **6 inches** from lighting fixture corners.
 - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two **3/4-inch** metal channels spanning and secured to ceiling tees.
 - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- E. Suspended Lighting Fixture Support:
 - 1. Pendants and Rods: Where longer than **48 inches**, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Verify that self-luminous exit signs are installed according to their listing and the requirements in NFPA 101.

C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.3 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION