

# **NEVADA STATE PUBLIC WORKS DIVISION**

## **ADOPTED STANDARDS**

These Adopted Standards are issued by the Nevada State Public Works Division for the purpose of establishing design standards for State construction projects. These standards are intended to augment the referenced codes and regulations, to provide clarification and emphasis to certain issues, and in some cases to supersede or require more stringent standards than the referenced codes and regulations. Should any discrepancies exist between these Adopted Standards and the referenced codes and regulations, the more stringent requirements shall be followed unless specific written clarification is obtained from the Nevada State Public Works Division.

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**SECTION 1      DEFINITIONS**

- 1.1 "Adopted Standards" shall mean these standards adopted by the Nevada State Public Works Division.
- 1.2 "State" shall mean the Nevada State Public Works Division, or its authorized representative.
- 1.3 "Consultant" shall mean an architect or engineer hired by the Nevada State Public Works Division, or other contracting agency.
- 1.4 "Using Agency" shall mean the state agency having custody or use of the project upon completion of construction.

## **SECTION 2      ADOPTED CODES & REGULATIONS**

### **2.1      General**

- 2.1.1 The design and construction of all projects under the jurisdiction of the State shall comply with the latest adopted edition of the following codes and regulations. The adopted codes and regulations are subject to interpretation by the State and other appropriate governmental agencies.
- 2.1.2 All standards, regulations, and other reference documents identified in the State Public Works Division Adopted Standards as "the most current edition" shall be understood to be the most current edition on the execution date of the Professional Services Agreement.
- 2.1.3 In cases where standards, regulations, or other reference documents are specifically listed in one of the adopted codes, then the edition of that standard, regulation, or other reference document shall be as required in the adopted code.

### **2.2      Adopted Codes**

- 2.2.1 2018 International Building Code (IBC) published by the International Code Council (ICC). Any references to the 2018 International Mechanical Code contained in the 2018 International Building Code shall be interpreted as being references to the 2018 Uniform Mechanical Code. Any references to the 2018 International Plumbing Code contained in the 2018 International Building Code shall be interpreted as being references to the 2018 Uniform Plumbing Code.

In addition to complying with the requirements of the 2018 International Building Code, projects constructed on state-owned land shall comply with the requirements of Nevada Administrative Code Section 341.045 Section 2 which is excerpted here as follows:

In addition to the standards contained in the 2018 International Building Code adopted pursuant to subsection 1, all buildings and structures of the State and any parts thereof must be designed using the structural standards for seismic zones, basic wind speed, wind exposure, frost line and the live loads and snow loads for roofs adopted by the political subdivision in which the building or structure is being constructed. In the absence of such structural standards adopted by the political subdivision, the Deputy Administrator for Compliance and Code Enforcement may use structural standards that the Deputy Administrator for Compliance and Code Enforcement determines are appropriate for the geographic location at which the building or structure is being constructed.

- 2.2.2 2018 Uniform Mechanical Code (UMC) published by the International Association of Plumbing and Mechanical Officials (IAPMO).
- 2.2.3 2018 Uniform Plumbing Code (UPC) published by the International Association of Plumbing and Mechanical Officials (IAPMO).
- 2.2.4 2017 National Electrical Code (NEC) published by the National Fire Protection Association (NFPA).
- 2.2.5 2018 International Fire Code (IFC) published by the International Code Council.
- 2.2.6 NFPA Standards published by the National Fire Protection Association (NFPA) as referenced in the 2018 International Fire Code and/or the 2018 International Building Code.
- 2.2.7 2018 International Energy Conservation Code (IECC) published by the International Code Council. ASHRAE/IESNA Standard 90.1-2016 is incorporated by reference.
- 2.2.8 2018 International Existing Building Code (IEBC) published by the International Code Council.
- 2.2.9 2018 International Residential Code (IRC) published by the International Code Council.

## 2.3 Regulations

- 2.3.1 All applicable provisions of the Nevada Revised Statutes (NRS) and the Nevada Administrative Code (NAC), including those listed below.
- 2.3.2 The most current regulations of the State Fire Marshal, Nevada Department of Public Safety, Carson City, Nevada (NAC Chapter 477, State Fire Marshal).
- 2.3.3 The most current regulations of the Division of Industrial Relations, Nevada Department of Business and Industry, Carson City, Nevada (NAC Chapter 455C; Boilers, Elevators, and Pressure Vessels).
- 2.3.4 The most current regulations of the Health Division, Nevada Department of Health and Human Services, Carson City, Nevada (NAC Chapter 446, Food Establishments).
- 2.3.5 The most current regulations of the Division of Environmental Protection, Nevada Department of Conservation and Natural Resources, Carson City, Nevada.
- 2.3.6 The most current edition of the Americans with Disabilities Act (ADA) published by the United States Department of Justice including the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- 2.3.7 The American National Standard for Accessible and Usable Buildings and Facilities (ICC/ANSI A117.1) published by the International Code Council (edition as listed in the 2018 International Building Code).
- 2.3.8 Current versions of other codes, regulations, and standards referenced in the body of this document.
- 2.3.9 Local codes and ordinances do not apply to projects constructed on state-owned land, except for zoning requirements pursuant to Nevada Revised Statutes Section 278.580.

## **SECTION 3            GENERAL STANDARDS**

### **3.1     General**

- 3.1.1 Any conflict between the adopted codes and standards shall be resolved by using the more conservative or stringent requirement unless specifically directed otherwise by the State.
- 3.1.2 No plan check or approval shall relieve the Consultant of the responsibility for developing a project in full compliance with these Adopted Standards, the adopted codes and regulations, and applicable federal, state, and local laws.
- 3.1.3 Base bids shall provide for a building that is complete and ready to be utilized for its intended purpose.
- 3.1.4 Building projects shall include all site development and utilities, designed to comply with appropriate city, county, and state requirements as necessary to provide a complete and usable facility.
- 3.1.5 State projects shall be connected to public utility systems wherever economically feasible.
- 3.1.6 All building materials and systems shall be selected and designed for durability, performance, and energy conservation.

### **3.2     Dedication Plaques**

- 3.2.1 When requested by the State, the Consultant shall include a standardized building dedication plaque in the design documents. The Consultant shall include a detail depicting the exact format of the plaque, conforming to the following guidelines:
  - A. Plaque shall be one piece, cast bronze, and shall be wall-mounted at or near the main entrance to the building.
  - B. Plaque shall not exceed 24" x 36" and shall include the following information:
    - 1. Building name.
    - 2. Date of building completion.
    - 3. Name of Governor (in the year completed).
    - 4. Name of Using Agency.
    - 5. Name of Using Agency administrator (in the year completed).
    - 6. Optional message (an appropriate 3 to 4 line statement about the building and its purpose).
    - 7. State Public Works Board members (in the year completed).
    - 8. State Public Works Division administrator (in the year completed).
    - 9. Board of Regents members for Nevada System of Higher Education projects.
    - 10. Name of Consultant.
    - 11. Names of Sub-Consultants (optional).
    - 12. Name of General Contractor.

### **3.3     Alternative Materials, Design, and Methods**

- 3.3.1 Variances from the requirements of the referenced codes, these Adopted Standards, or from the requirements of other reviewing authorities shall only be granted by the State. Requests for such variances shall be made in writing to the State in a timely manner.
- 3.3.2 Requests for the use of alternative materials, design, and methods shall comply with the requirements of International Building Code Section 104.11 and shall be submitted to the State prior to inclusion in the design documents. Requests shall include all associated supporting data, engineering judgments, etc., as necessary for the State to clearly understand and properly assess the request. Requests shall be submitted to the State in a timely manner.

### 3.4 Asbestos Surveys

- 3.4.1 The Consultant shall assist the State in identifying renovation and/or demolition work that may require a survey of suspect building materials for asbestos content. The Consultant shall coordinate any required asbestos abatement work facilitated by the State with the other construction activities in the project.
- 3.4.2 Prior to commencement of a renovation or demolition project that will disturb building material that may contain asbestos, a sample of each suspect material must be collected and analyzed for asbestos content in accordance with Nevada Administrative Code (NAC) Sections 618.960 and 618.961. If any substance is found to contain asbestos, the removal of that material is then subject to NAC Sections 618.850 thru 618.961.

### 3.5 Green Building Standards

- 3.5.1 Buildings with a gross floor area greater than 20,000 square feet shall comply with the green building design goals defined by the State for each project. The green building design goals for projects involving a building with a gross floor area greater than 20,000 square feet shall include compliance with ASHRAE/IESNA Standard 90.1 with regard to energy efficiency, a focused intent to minimize water consumption (targeting both plumbing fixture selection and landscape design), and recycling of at least 50% of all construction waste material.



## **SECTION 4 LANDSCAPING & SITE DEVELOPMENT STANDARDS**

### **4.1 General**

- 4.1.1 Grading, dust control, weed control, curbs, gutters, streets, off-street parking and sidewalks shall conform to local ordinances and local design and site construction standards.
- 4.1.2 Site development shall give full consideration to established flood plains, and existing easements and right-of-ways.
- 4.1.3 Site lighting shall be restricted to that required for safety and function, and shall be shielded from adjacent properties and from the sky. Site lighting shall incorporate appropriately selected cut-off light fixtures.

### **4.2 Landscaping**

- 4.2.1 Landscaping design shall be appropriate for the type of building, the environmental setting, and the needs of the Using Agency.
- 4.2.2 Landscaping design shall comply with local government zoning requirements.
- 4.2.3 Drought-tolerant plants shall be considered in all landscaping designs.
- 4.2.4 Existing trees shall be preserved where practical.

### **4.3 Water Conservation**

- 4.3.1 Landscaping design shall minimize water use and maintenance.
- 4.3.2 Water conserving native plant materials shall be utilized to the greatest extent possible.
- 4.3.3 Irrigation systems shall be automatically controlled and drip irrigation shall be provided in tree and shrub areas.
- 4.3.4 Lawn sprinkler designs shall provide for head-to-head coverage.

### **4.4 Site Design and Improvements**

- 4.4.1 Site design shall ensure positive drainage and minimum erosion.
- 4.4.2 Structural sections for access roads and parking areas shall be designed in accordance with the recommendations of the geotechnical report for the project.
- 4.4.3 Site design shall include appropriate consideration for on-site parking, traffic circulation, and site ingress and egress.
- 4.4.4 Traffic control, pavement markings, and exterior signage shall comply with the guidelines listed in the most current edition of the Manual on Uniform Traffic Control Devices (published by the U.S. Department of Transportation).
- 4.4.5 Trash receptacles, emergency generators, cooling towers and other similar equipment shall be enclosed or screened.
- 4.4.6 Site furnishings, guardrails and handrails shall be designed to discourage the use of skateboards and/or roller skates.

### **4.5 Exterior Accessibility**

- 4.5.1 Accessible routes shall comply with the requirements of ADA, ADAAG, and ICC/ANSI regulations.
- 4.5.2 Walkways, steps, ramps, and accessible routes shall be designed with slip-resistant surfaces as required by ADA, ADAAG, and ICC/ANSI regulations.

**SECTION 5 ARCHITECTURAL STANDARDS**

**5.1 General**

- 5.1.1 Data equipment rooms shall be located on each floor and all data drops shall be less than 300 feet from face plate to the point of termination. Distances shall be measured along the actual cable path including service loops.
- 5.1.2 Mechanical and electrical equipment rooms shall be designed to facilitate installation, maintenance, and removal of equipment. Where feasible, direct access to the outside shall be provided. Chiller room and boiler room ceiling heights shall be at least 9'-0" (or higher as required to specify and achieve a minimum clear headroom of 6'-8" below all piping and equipment).
- 5.1.3 Classroom and office buildings shall be furnished with an adequate number of bicycle stands where locations are suitable for access by bicycles.
- 5.1.4 Vestibules shall be included in the design of main entrances to all buildings (unless the entrance is connected to an interior space with an area of less than 3,000 square feet) as required by the International Energy Conservation Code (and/or ASHRAE/IESNA Standard 90.1).
- 5.1.5 Reflected ceiling plans shall be coordinated with mechanical and electrical drawings to show all required diffusers, grilles, light fixtures, and access panels for all equipment located above ceilings.
- 5.1.6 Where appropriate, office buildings shall include space for vending machines or snack bar facilities to be operated by the Bureau of Services to the Blind and Visually Impaired, Nevada Department of Employment, Training & Rehabilitation, Carson City, Nevada (see Nevada Revised Statutes Section 426.660).

**5.2 Space Allocation**

5.2.1 The following table shall be used as a guideline in assigning office space to Using Agency personnel:

<u>Classification</u>	<u>Allowable Space (Square Feet)</u>
Director of Department	300
Division Head	200
Section Chief	140
Middle Supervisor	120
Professional Support	120
First Line Supervisor (open office setting)	80
Clerical Support (open office setting)	60
Custodial Closets	60

**5.3 Accessibility**

- 5.3.1 Public buildings and their related sites which are accessible to the public and/or offer employment to individuals with disabilities shall comply with all requirements of the latest adopted edition of the building code and with ADA, ADAAG, and ICC/ANSI regulations.
- 5.3.2 All door hardware shall comply with the requirements of the latest adopted edition of the building code and with ADA, ADAAG, and ICC/ANSI regulations.
- 5.3.3 Accessible designs shall list mounting heights, widths, slopes, and dimensions such that the specified value allows for reasonable construction tolerances without exceeding the required value or limit.
- 5.3.4 Interior graphics and signage complying with the adopted barrier-free design standards (ADA, ADAAG, and ICC/ANSI regulations) shall be included in all buildings.
- 5.3.5 Building accessible routes shall extend from building entrances to public streets, public transportation, accessible parking, other buildings within a campus setting, and on-site elements or facilities including picnic tables, outdoor seating, plazas, and other areas designated to be used by the public and/or employees.

- 5.3.6 Yellow shall be utilized as the standard color for warning uses in the pedestrian environment.
- 5.3.7 Design documents shall incorporate the following signage requirements:
  - A. "Restroom" signage shall be provided to comply with NRS Section 338.180(4).
  - B. "No Parking" signage shall be provided to comply with NRS Section 484B.467(3).
- 5.4 Interior Requirements
- 5.4.1 The minimum number of plumbing fixtures shall be determined in accordance with International Building Code Chapter 29.
- 5.4.2 Window coverings and draperies shall be fade-resistant and shall be specified to have the appropriate flame spread and smoke developed rating.
- 5.4.3 "Occupant Load" signs shall be provided in every room or space that is classified as an assembly occupancy.
- 5.4.4 "Maximum Load" signs shall be provided to indicate the maximum live loads for storage rooms on elevated floors, mezzanines, and other portions of the building as required by International Building Code Section 106.
- 5.4.5 Toilet partitions, fixtures, and accessories shall be adequately detailed on the associated drawings to ensure satisfactory anchorage to a rigid/solid backing.
- 5.4.6 A painted finish shall not be used to comply with the requirements for a hard, smooth, non-absorbent surface for toilet room walls and/or floors.
- 5.4.7 Design documents shall include appropriate provisions for furniture, fixtures and equipment (FF&E) that may be purchased with project funds or provided by the Using Agency.
- 5.4.8 Casework shall be designed and specified to meet the most current requirements of the Woodwork Institute and/or the Architectural Woodwork Institute (AWI) Custom Grade.
- 5.4.9 Ceramic tile shall be designed and specified to be installed in conformance with the most current requirements of the Tile Council of America (TCA).
- 5.4.10 Interior wall tile shall be installed over cement backer board, including a vapor barrier at all wet areas to include but not limited to showers, sinks, and tub enclosures.
- 5.4.11 Hydraulic elevators shall be specified in all cases unless the vertical travel distance exceeds approximately 40 feet.
- 5.4.12 Each building with an elevator or elevators shall be designed with at least one oversized elevator capable of accommodating a gurney or stretcher and move-in of office furniture.
- 5.5 Doors
- 5.5.1 Door locks shall have changeable cylinders. Lock cylinders shall be adaptable to master keying.
- 5.5.2 Wood doors shall be solid core and either stain or paint grade as applicable. Hollow metal doors shall be 16 gauge minimum.
- 5.5.3 Ball bearing hinges shall be specified on all doors.
- 5.5.4 Storefront entrance doors shall not be specified with floor mounted closers, floor mounted hinges, or narrow style doors. Hinges shall be full length continuous gear type.
- 5.5.5 Pneumatic door openers/operators shall not be specified (except in correctional facilities).
- 5.6 Windows
- 5.6.1 Exterior windows shall, as a minimum, be dual pane, low-E, insulated glazing in thermal break frames.
- 5.6.2 Exterior windows shall be inoperable, fixed pane window units, unless otherwise required by code.
- 5.6.3 Glass block shall not be used in exterior wall construction, unless specifically approved by the State in writing.

## 5.7 Exterior Requirements

- 5.7.1 The tops of exposed masonry walls shall be provided with metal architectural coping. Masonry caps or sloped grout shall not be used, unless specifically approved by the State in writing.
- 5.7.2 Exterior masonry construction shall be sealed with an ultraviolet resistant, acrylic or siloxane based sealer.
- 5.7.3 Designs including exterior tile shall include specifications requiring appropriate special inspection of the exterior tile installation.
- 5.7.4 Buildings shall be designed such that finishes are integral with the material and do not require periodic maintenance. The use of exposed wood or other high maintenance materials for exterior finishes shall be avoided.
- 5.7.5 The project shall be analyzed by the Consultant to determine both current and projected future parking requirements for the building, and to determine the appropriate parking area design configuration. Adjacent agency parking areas shall only be considered as available parking for the project when specifically authorized by the State.
- 5.7.6 "No Smoking" signs shall be provided at each building entrance as required by NRS Section 202.2483.

## 5.8 Roofing

- 5.8.1 Membrane roofing systems shall be specified to be constructed of 60 mil minimum thickness ( $\pm$  a maximum allowable tolerance of 3%) polyvinyl chloride (PVC) membrane material. Thermoplastic polyolefin (TPO) membrane material will not be considered equivalent to PVC membrane material. Membrane roofing systems other than PVC membrane material shall be specified only when specifically approved by the State.
- 5.8.2 Membrane roofing specifications shall include verbiage stating that patches shall be limited to a maximum of three patches on any 100 square foot area. Excessive patching or damage to the finished roof membrane shall be grounds for the State to require the replacement of the entire roofing membrane at the Contractor's expense.
- 5.8.3 Membrane roofing systems shall be designed with an integral white or light-reflecting finish that will not require re-coating for the expected life of the roof.
- 5.8.4 The roof membrane manufacturer shall have a proven and consistent membrane formulation that they have manufactured for a minimum of 15 years. Privately labeled PVC membranes will not be allowed.
- 5.8.5 Roof slope, including crickets, for new roof construction shall be a minimum of ½ inch per foot. Re-roofing projects shall follow the same slope standards as new roofing systems. To the greatest extent possible, the roof slope shall be achieved by sloping the structural members. Slope variances will be considered by the State only for re-roofing projects where existing conditions necessitate a lesser slope.
- 5.8.6 Ductwork, piping, and conduit shall be routed in the attic/ceiling space below the roof and the roof insulation on all new construction projects and to the best extent possible on all remodel projects. Exposed ductwork, piping, or conduit attached to sleepers or laid directly on the top of the roof will not be allowed. This requirement applies to all roof types (single ply membrane, built-up, and metal roofs).
- 5.8.7 Roofing insulation shall be installed on the top side of the structural deck where practical.
- 5.8.8 Mechanical equipment shall be set on roof curbs. No wood sleepers will be allowed.
- 5.8.9 The top of roof curbs, including curbs for skylights, shall be a minimum of eight inches above the finished roof, including crickets.
- 5.8.10 Roof membranes shall be permanently protected with appropriate walk pads or wearing surfaces in high traffic or service areas.
- 5.8.11 Wood nailers and architectural metal coping (or other approved metal system) shall be used at the top of all parapet walls. Any alternative parapet top detail must be approved by the State in writing.
- 5.8.12 Where the roofing membrane terminates on masonry or concrete walls, the flashing system shall be set into the wall. Surface-mounted systems that rely solely on a sealant shall not be specified.

- 5.8.13 Where lightweight, insulating, or non-structural concrete is used under roofing, the deck shall be vented at not less than 1-½ percent of the roof area.
- 5.8.14 Roofing systems shall be designed and specified to meet the most stringent requirements of the following:
- A. FM 1-75 requirements using systems which meet FM certifications.
  - B. Roofing systems shall be designed to provide a UL Class A rated roof assembly.
  - C. The roofing manufacturer's minimum requirements to ensure that a warranty can be provided on the State's Roofing System Warranty Form.
- 5.8.15 Plans and specifications shall include notation that restricts work on the finished membrane. Notation shall include:
- A. No work including staging or access to other portions of the work shall be permitted on the finished membrane.
  - B. All roofing work shall commence at the furthest point from worker access and progress back towards the access point.
  - C. If staging, access, or work is required on the finished membrane, the Contractor shall provide protection along the access path and under the work extending 48" beyond the required work area. Protection shall consist of ¾" plywood over a heavy canvas tarp with sand bag ballasts as required to prevent the plywood from becoming airborne during strong winds.
- 5.8.16 Roofing systems shall be designed and specified to limit roof penetrations to single penetrations that are a minimum of 12" away from any other roof penetration, curb or base flashing.
- 5.8.17 Supports for roof-mounted mechanical equipment, piping, and ductwork shall be designed and specified to ensure that the vertical supports penetrating the roof membrane are round (to facilitate the use of standard membrane roof flashings secured with stainless steel hose clamps).
- 5.8.18 The use of pitch pockets will not be allowed.
- 5.8.19 The Consultant's specifications shall require the Contractor to schedule and attend roofing coordination meetings and inspections as described below. The meetings shall require the attendance of the general contractor, roofing contractor, sub-contractors scheduled to perform any work on the roof, the roofing manufacturer's representative, the Consultant, and the State's representative.
- A. A pre-roofing coordination meeting at the job site prior to installation of any roofing. The purpose of the coordination meeting is to review requirements of the contract documents, review all roofing details, review application procedures, coordinate related work, determine surface readiness, and discuss material storage and protection. The meeting shall be scheduled at least two weeks prior to the start of any roofing work, after submittals and shop drawings have been reviewed and approved by the Consultant, and the decks to receive roofing can be walked to review the condition of all surfaces to receive roofing.
  - B. A finished roof inspection at the completion of the installation of the roofing membrane.
  - C. A final roof inspection at the completion of the project.
- 5.8.20 Metal roofs shall be 24 gauge galvanized metal material or better and shall be designed to keep exposed fasteners to a minimum.
- 5.8.21 Metal roofs shall include a minimum underlayment of 30" wide ice and water shield at the full perimeter of the roof as well as 30" each way at all hip, valley, and ridge transitions.
- 5.8.22 Metal roofs shall have a continuous cleat at the bottom of each panel.
- 5.8.23 Specifications for metal roofs shall require a 20 year non-prorated manufacturer's panel finish warranty, and a 20 year non-prorated installation and weather-tightness warranty covering both materials and labor.
- 5.8.24 Composition shingle roof designs shall require a minimum underlayment of 30 lb felt.

## **SECTION 6            STRUCTURAL STANDARDS**

### **6.1     General**

- 6.1.1 Structural analysis and design shall comply with the requirements of the adopted codes and regulations listed in Section 2, and with the most current edition of the following reference standards as applicable to each specific project:
- A. Minimum Design Loads for Buildings and Other Structures (ASCE 7)
  - B. Codes and standards of the American Concrete Institute (ACI)
  - C. Codes and standards of the American Institute of Steel Construction (AISC)
  - D. National Design Specification for Wood Construction (NDS)
  - E. Timber Construction Manual, published by the American Institute of Timber Construction (AITC)
  - F. Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS 402)
  - G. Specification for Masonry Structures (ACI 530.1/ASCE 6/TMS 602)
  - H. North American Specification for the Design of Cold-Formed Steel Structural Members (AISI Standard)
- 6.1.2 The Structural Engineer of Record shall be responsible for all aspects of the structural design. Where standard connections or components are specified to be designed by a fabricator or manufacturer, the Structural Engineer of Record shall review and approve such designs. For pre-engineered structures or components which are specified to be stamped by another engineer, the Structural Engineer of Record shall review and approve such designs for compliance with the structural design criteria for the project.
- 6.1.3 Consideration shall be given in the design of roof framing systems to support the original roofing dead load plus any future re-roofing dead load, should such be likely to occur during the life of the structure.
- 6.1.4 Supports and anchors for mechanical and electrical equipment shall be capable of resisting appropriate vertical and lateral loads.
- 6.1.5 Structures shall be designed for the loading requirements of the building code as established by the jurisdiction where the facility is located. These loads shall include but may not be limited to the following load types:
- A. Dead loads.
  - B. Live loads.
  - C. Snow loads.
  - D. Equipment loads.
  - E. Wind loads.
  - F. Seismic loads.
  - G. Earth pressures.
  - H. Ponding water on roofs.
  - I. Special load allowances.
- 6.1.6 Every structural component shall be provided with strength adequate to resist the most critical effect resulting from a combination of loads as required by the building code. Consideration shall be given for adequate stiffness in floor systems to ensure occupant comfort with regard to vibration and deflection.
- 6.1.7 Footings and foundations shall extend below the frost line, or to depths recommended in the soils report. The minimum bearing depth for footings shall be 18 inches below finished grade.

- 6.1.8 Foundations, pavements, slabs or any structures which interface with the soil shall be designed in accordance with the project geotechnical report. The recommendations included in the geotechnical report (including requirements for excavation, fill, backfill, compaction, dewatering, under-slab and under-footing preparation, vapor barriers, retaining structures, soil stabilization, drilled piers, material specifications, and all other items delineated in the geotechnical report) shall be incorporated into the Contract Documents in written and/or graphical format as is necessary to adequately convey the requirements to the Contractor for the purposes of bidding and construction. On projects where a soil investigation is not performed, foundations shall be designed using the guidelines of the building code.
- 6.1.9 Roof slope, including crickets, for new roof construction shall be a minimum of ½ inch per foot. Re-roofing projects shall follow the same slope standards as new roofing systems. To the greatest extent possible, the roof slope shall be achieved by sloping the structural members.
- 6.2 Concrete
- 6.2.1 Concrete shall be proportioned, mixed and placed in accordance with the provisions of the building code and the American Concrete Institute (ACI 318).
- 6.2.2 The minimum compressive strength for concrete used in structural applications, including slabs-on-grade, shall be 3,000 psi at 28 days. To avoid special inspection requirements, footings and slabs may be designed for an assumed compressive strength of 2,500 psi, provided that 3,000 psi or greater is specified in the design documents.
- 6.2.3 Portland cement shall be an approved American (USA) brand conforming to ASTM C150, Type II or Type V, as recommended by the project geotechnical report. Different types of cement shall not be used in the same pour or structural member.
- 6.2.4 Admixtures containing calcium chloride shall not be specified.
- 6.2.5 Fine and coarse aggregates for normal weight concrete shall conform to the requirements of ASTM C33.
- 6.2.6 Lightweight aggregate shall conform to ASTM C330.
- 6.2.7 Water used for concrete mixing shall be clean and free from oil, acid, alkalies, organic matter, or other deleterious substances and shall conform to the requirements of ASTM C94. Potable water is acceptable for this purpose.
- 6.2.8 Concrete mixes shall be designed and proportioned by a qualified testing laboratory and be submitted to the Consultant for approval prior to any production of concrete for structures. Water-cement ratios, curing methods, and finishing requirements shall be specified to reduce cracking in the placed concrete.
- 6.2.9 A water-reducing admixture shall be specified for all concrete.
- 6.2.10 An air-entraining admixture, resulting in 5% to 7% entrainment, shall be used for all concrete exposed to the effects of weather or freezing and thawing.
- 6.2.11 Structural concrete shall be reinforced with deformed bars conforming to ASTM A615, Grade 60, except No. 3 and No. 4 Grade 40 bars may be used in non-structural applications or slabs-on-grade. Elevated structural slabs and structural slabs-on-grade shall be reinforced with rebar or welded wire fabric. Synthetic fiber reinforcement may be used in non-structural applications, or in combination with steel reinforcing for structural applications, to control shrinkage cracking.
- 6.2.12 Reinforcing steel shall be detailed and fabricated in accordance with the Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315) and the Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
- 6.2.13 Concrete slabs-on-grade shall be specified to have an effective minimum flatness of ¼" in ten feet.

### 6.3 Steel

- 6.3.1 Structural steel and steel connections shall be designed, fabricated and erected in accordance with the building code and the latest specifications of the American Institute of Steel Construction.
- 6.3.2 The Structural Engineer of Record shall either design and detail all connections on the structural drawings, or shall review and approve connections designed and detailed by the steel fabricator. For connections to be designed by the steel fabricator, the Structural Engineer of Record shall clearly indicate all connection loads on the design drawings.
- 6.3.3 The allowable type and grade of all structural steel, plate, bar, pipe, tubes, and bolts shall be specified in the design documents.
- 6.3.4 Welding, welding procedures and welder qualifications shall be in accordance with the American Welding Society, AWS D1.1.

### 6.4 Masonry

- 6.4.1 Masonry design and construction, and requirements for special inspection or periodic special inspection, shall comply with the building code, Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS 402), and Specifications for Masonry Structures (ACI 530.1/ASCE 6/TMS 602).
- 6.4.2 Masonry construction shall be reinforced with vertical and horizontal deformed bar reinforcing. Joint reinforcing may be used in lieu of horizontal bars. Un-reinforced structural masonry shall not be allowed.
- 6.4.3 The specified requirements for continuous or periodic special inspection of masonry and prism testing shall be approved by the State.
- 6.4.4 Where prism testing is required, the minimum strength of masonry, grout, and mortar shall be specified.
- 6.4.5 Exposed exterior masonry shall receive two coats of a non-staining sealer prior to completion of construction.

### 6.5 Wood

- 6.5.1 Timber design and construction shall be in accordance with the building code and the National Design Specification for Wood Construction (NDS).
- 6.5.2 Specifications shall establish the species, grade and allowable moisture content of all wood and wood products used.
- 6.5.3 Specifications for engineered wood products and wood connectors may be based on a single manufacturer, but shall allow for substitution of equivalent products.

### 6.6 Special Provisions

- 6.6.1 Materials testing and special inspections, as required by the building code, are to be provided by an approved materials testing/inspection firm hired by the State. Project specifications and drawings shall clearly identify all materials testing and special inspection requirements.



## **SECTION 7 MECHANICAL STANDARDS**

### **7.1. General**

- 7.1.1 HVAC, plumbing, and fire sprinkler systems shall be designed to comply with the requirements of the adopted codes and regulations listed in Section 2, and with the most current edition of following reference standards as applicable to each specific project:
- A. ASHRAE Handbooks
  - B. ASHRAE Standards
  - C. International Energy Conservation Code and/or ASHRAE/IESNA Standard 90.1
  - D. SMACNA Duct Construction Standards
  - E. ASPE Data Books
  - F. Nevada Administrative Code Chapter 455C (Boilers, Elevators, and Pressure Vessels)

### **7.2 Energy Conservation**

- 7.2.1 Mechanical and plumbing systems shall be designed and documented to comply with the requirements of the International Energy Conservation Code and/or ASHRAE/IESNA Standard 90.1.
- 7.2.2 For each building with a gross floor area greater than 20,000 square feet, a detailed analysis of the cost of operation and maintenance of the building shall be completed to identify and evaluate measures for the conservation of energy. The analysis shall include operation and maintenance cost comparisons of at least three different HVAC system types. The three different system types to be evaluated shall be reviewed and approved by the State prior to beginning the analysis.
- 7.2.3 All motors one horsepower and larger shall be specified to be premium/high efficiency type with full load efficiencies equal to or greater than those recommended by ASHRAE/IESNA Standard 90.1.

### **7.3 HVAC Systems and Equipment**

- 7.3.1 HVAC systems and equipment shall be designed in conformance with all applicable sections of the ASHRAE Handbooks and ASHRAE Standards (e.g., ASHRAE Standards No. 15, 55, 62, 90.1, etc.). The most current edition of all ASHRAE Handbooks and Standards shall be utilized.
- 7.3.2 Heating and air conditioning load calculations shall be completed utilizing the following criteria:
- | <u>Indoor</u> | <u>Outdoor</u>                       |
|---------------|--------------------------------------|
| Heating 72°F  | ASHRAE 99.6% Winter Value            |
| Cooling 75°F  | ASHRAE 0.4% Summer Coincident Values |
- 7.3.3 Heating and air conditioning load calculations shall not incorporate safety factors. Any safety factors deemed appropriate shall be applied in equipment selections and/or in coil selections, but in no case shall the applied safety factors exceed those allowed by ASHRAE/IESNA Standard 90.1.
- 7.3.4 Minimum outside air calculations shall be based on the anticipated maximum occupant load as determined by the Consultant in cooperation with the Using Agency. Minimum outside air calculations shall not be based on the life safety exiting occupant load.
- 7.3.5 All equipment and equipment rooms shall be designed to ensure adequate provisions for service, maintenance, and removal/replacement of equipment, filters, controls, etc. Special consideration shall be given to ensure proper clearances for maintenance and removal of chiller and boiler tubes, fan housings, fan shafts, and filters.
- 7.3.6 Access to equipment for service and maintenance shall be thoroughly coordinated with the Using Agency and the State. Required clearance areas shall be specifically identified on the drawings (for equipment such as fan coils, variable air volume boxes, indoor air handling units, etc.). Coordinate with other disciplines to ensure that other trades (electrical, fire sprinkler, etc.) are made aware of the required clearances.

- 7.3.7 Pump-mounted variable frequency drives should not be specified for pumps that are not floor mounted (due to associated problems with accessibility for service and maintenance).
- 7.3.8 Boilers for critical use and/or emergency response facilities shall be configured to allow for a loss of the primary fuel source. The most practical and cost-effective approach may be to provide natural gas boilers with a back-up boiler that utilizes propane gas. Secondary options may be to provide natural gas boilers with a back-up boiler that utilizes fuel oil or to provide dual fuel boilers (natural gas and fuel oil). Fuel oil shall be stored in a double wall day tank located in the boiler room (unless project conditions require exterior concrete vault oil storage). Dual fuel boilers shall be equipped with electronic spark ignition for firing on fuel oil. Boiler flues for dual fuel boilers shall include a barometric damper at each boiler.
- 7.3.9 The specifications for projects that include a boiler, chiller, or other pressure vessel shall require that the Contractor apply for and obtain all required inspections and operating permits (as required by the Nevada Department of Business and Industry, Division of Industrial Relations, Occupational Safety and Health Enforcement Section).
- 7.3.10 Rooms containing electrical equipment (transformers, switchgear, telephone, data equipment, etc.) shall be thoroughly reviewed and coordinated with the architect, the electrical engineer, and the Using Agency to ensure that service clearances and cooling requirements are appropriately defined and addressed.
- 7.3.11 Project specifications shall limit the length of flexible ducts to a maximum of 5 feet.
- 7.3.12 Air handling units located above the roof shall be specified with integral disconnects, integral receptacle outlets, and integral chases designed to accept all required piping and conduit.
- 7.4 Plumbing Systems and Equipment
- 7.4.1 The minimum number of plumbing fixtures shall be determined in accordance with International Building Code Chapter 29.
- 7.4.2 In cases where plastic piping is utilized below a floor slab the piping shall be schedule 80 and the requirements for bedding depth, bedding width, and bedding material shall be carefully evaluated, and clearly specified. The piping system installation shall be inspected and approved prior to covering. The transition from plastic to cast iron shall be made approximately three inches above the floor slab utilizing a flexible coupling.
- 7.4.3 Wherever a plumbing pipe penetrates a concrete slab-on-grade the pipe shall be protected with a minimum of ½" thick insulation (typically closed cell elastomeric type insulation). Where site water table conditions warrant, pipe sleeves and water-tight seals shall be specified at each penetration of a floor slab or foundation wall.
- 7.4.4 Plastic piping that is not flame retardant polypropylene may be utilized only in limited amounts inside a building (100 linear feet of piping or less). Plastic piping that is flame retardant polypropylene may be utilized in unlimited lengths inside a building, but not inside a return air plenum. Any plastic piping routed inside a return air plenum shall be polyvinylidene fluoride (PVDF) having a flame spread and smoke developed rating of 25/50 or less (as is required by Uniform Mechanical Code Section 602). Alternative piping materials that have the same or better characteristics as the piping listed herein may be acceptable upon review and approval by the State. The transition from 'plenum-rated' piping to flame retardant piping shall occur a minimum of six inches outside of the return air plenum.
- 7.4.5 Plastic piping utilized for laboratory acid waste and/or deionized water piping applications inside a building shall be flame retardant polypropylene, except in cases where the plastic piping is routed inside a return air plenum. Plastic piping routed inside a return air plenum shall be polyvinylidene fluoride (PVDF) having a flame spread and smoke developed rating of 25/50 or less (as is required by Uniform Mechanical Code Section 602). Alternative piping materials that have the same or better characteristics as the piping listed herein may be acceptable upon review and approval by the State. The transition from 'plenum-rated' piping to flame retardant piping shall occur a minimum of six inches outside of the return air plenum.

7.4.6 All plumbing fixtures shall be specifically designed to conserve water. Maximum water usage by specific fixture type shall be as follows:

Water Closets	1.28 gallons per flush
Urinals	0.125 gallons per flush
Restroom lavatories	0.5 gallons per minute (automatic shut-off)
Showers	1.5 gallons per minute

7.4.7 Water closets shall be wall-mounted type (except in remodel construction where existing wall or chase space does not allow for wall-mounted type) unless written authorization is obtained from the State allowing floor-mounted water closets.

7.4.8 Accessible shut-off valves shall be installed to allow for isolation of groups of plumbing fixtures (such as at restrooms, kitchens, laboratories, and at each floor of a multi-story building).

7.4.9 A shut-off valve and pressure reducing valve with full size bypass and pressure gauges shall be installed on the domestic cold water riser in each building.

7.4.10 Water hammer arrestors shall be provided as required to protect against noise and damage from water hammer (sizes and locations shall be in accordance with the ASPE Data Book or other recognized standard).

7.4.11 Provide a seismic gas shut-off valve on the main gas service piping just prior to entering each building. Seismic gas valve shall be as manufactured by Pacific Seismic Products, or approved equal, equipped with optional Model MS remote monitoring switch (to be interfaced with the direct digital control system and/or with an audible alarm). Gas piping immediately adjacent to the seismic gas valve shall be secured to the building utilizing a unistrut channel brace.

## 7.5 Backflow Protection

7.5.1 The domestic cold water service to each building shall incorporate a reduced pressure backflow preventer to protect the water supply from backflow. The reduced pressure backflow preventer shall be located inside the building whenever possible (to maximize access for service and maintenance and to minimize the potential for freezing). Confirm required/acceptable location with the local water utility.

7.5.2 The fire sprinkler water service to each building shall incorporate a double check detector assembly or a reduced pressure backflow preventer to protect the water supply from backflow. The selected device shall be located inside the building whenever possible (to maximize access for service and maintenance and to minimize the potential for freezing). Confirm required/acceptable location with the local water utility.

7.5.3 When the water service configuration requires a reduced pressure backflow preventer located inside the building the design shall incorporate an adequately sized receptor and drain piping to ensure that a full discharge (from backflow preventer failure) of water will be directed to the exterior of the building. Typically a curb should be incorporated to contain any spillage that may occur (with a separate drain to the building exterior).

## 7.6 Seismic Bracing for Mechanical Systems

7.6.1 All equipment, ductwork, and piping shall be appropriately braced for the seismic conditions at the project location. Seismic bracing specifications shall require compliance with all applicable portions of the International Building Code (Chapter 16) and shall require compliance with the means and methods outlined in the International Seismic Application Technology (ISAT) manual, or an approved equivalent manual. Specifications shall require that a copy of the specific bracing instructions for all equipment, ductwork, and piping be maintained by the Contractor at the project site and that the bracing instructions shall be available at all times for use by the State.

7.7 Mechanical/Roofing Coordination

- 7.7.1 Ductwork, piping, and conduit shall be routed below the roof on all new construction projects and to the best extent possible on all remodel projects. Any design requiring ductwork, piping, or conduit to be exposed above a roof requires written approval from the State.
- 7.7.2 Supports for roof-mounted mechanical equipment, piping, and ductwork shall be coordinated with the Structural Engineer and the Architect to ensure that the vertical supports penetrating the roof membrane are round (to facilitate the use of standard membrane roof flashings secured with stainless steel hose clamps).
- 7.7.3 Mechanical design drawings shall incorporate the applicable details from the current State Public Works Division Mechanical Roofing Coordination Details (current details are to be acquired from the State and are to be modified and incorporated into the design drawings as necessary for each particular project). The applicable mechanical roofing coordination details shall be reviewed with the Architect prior to incorporation into the design documents to confirm that the details are suitable for the project and to ensure conformance with the Architect's roofing system design requirements.

## **SECTION 8            ELECTRICAL STANDARDS**

### **8.1        General**

- 8.1.1 Electrical and lighting systems shall be designed to comply with the requirements of the adopted codes and regulations listed in Section 2, and with the most current edition of the following reference standards, as applicable to each specific project:
- A. NFPA 70E (Standard for Electrical Safety in the Workplace)
  - B. NFPA 70B (Recommended Practice for Electrical Equipment Maintenance)
  - C. Lighting Handbook published by the Illuminating Engineering Society (IES)
  - D. IEEE Recommended Practice Color Book Series published by the Institute of Electrical and Electronics Engineers (IEEE)
  - E. EIA/TIA-568, Commercial Building Telecommunications Wiring Standard, published by the Electronics Industry Association (EIA) and the Telecommunications Industry Association (TIA)
  - F. EIA/TIA-569, Commercial Building Standard for Telecommunications Pathways and Spaces
  - G. EIA/TIA-606, Administration for Telecommunications Infrastructure for Commercial Buildings
  - H. EIA/TIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications
- 8.1.2 Electrical equipment and equipment rooms shall be designed to ensure adequate provisions for service, maintenance, and removal/replacement of electrical equipment, panels, switchboards, transformers, and generators.
- 8.1.3 Electrical equipment, distribution systems, and light fixtures shall be securely anchored to resist earthquake loads. Seismic bracing specifications shall require compliance with all applicable portions of the International Building Code (Chapter 16).

### **8.2        Energy Conservation**

- 8.2.1 Electrical and lighting systems shall be designed and documented to comply with the requirements of the International Energy Conservation Code and/or ASHRAE/IESNA Standard 90.1.
- 8.2.2 Buildings with a gross floor area greater than 20,000 square feet shall comply with the minimum green building design standards as defined by the State for each project.

### **8.3        Electrical Systems and Equipment**

- 8.3.1 Voltage and distribution systems shall be selected based on a study of the requirements of the building to determine which is the most economical from a life cycle cost perspective.
- 8.3.2 Generally, building electrical power service shall be 208Y/120 volt, 3 phase, 4 wire, or 480Y/277 volt, 3 phase, 4 wire, except in cases where the local power company will not provide this type of service.
- 8.3.3 Electrical switchboards shall be located indoors unless an exterior location is specifically approved by the State in writing.
- 8.3.4 Specifications for all electrical switchboards and panelboards shall require copper buses.
- 8.3.5 Each interior building switchboard main circuit breaker shall be provided with a trip coil and an exterior shunt-trip switch. Shunt-trip switch location shall be coordinated with the fire authority.
- 8.3.6 Main service transformers shall be located outdoors, be located at least 10 feet from combustible walls, shall be pad mounted, and shall have full range overload protection coordinated with the primary circuit protection. Transformers shall be protected with bollards where necessary to prevent potential damage by vehicles.
- 8.3.7 Indoor dry-type transformers shall be specified to conform to Department of Energy Efficiency Standard 10 CFR 431.196 for low voltage distribution transformers manufactured after 2016. Indoor transformers shall be specified for a maximum 80°C temperature rise.

- 8.3.8 Outdoor oil-filled and dry-type transformers shall be specified to conform to Department of Energy Efficiency Standard 10 CFR 431.196 for medium voltage distribution transformers manufactured after 2016. Outdoor dry-type transformers shall be specified for a maximum 115°C temperature rise.
- 8.3.9 All distribution boards, motor control centers, and branch circuit panels shall have a minimum of 10% spare positions, but in no case less than 6 poles.
- 8.3.10 When feasible, separate panels shall be utilized to separate lighting, receptacle, and equipment loads, to allow for installation of measurement and verification metering.
- 8.3.11 Where a panel is installed flush with a wall, empty conduits shall be extended from the panel to an accessible space above or below. A minimum of one ¾ inch conduit shall be installed for every three single pole spare circuit breakers or spaces, or fraction thereof, but not less than two empty conduits.
- 8.3.12 Where under floor space is accessible, spare conduits shall be extended there in addition to the ceiling space.
- 8.3.13 Panels shall have a typewritten directory, formatted with multiple columns that match the circuit breaker configuration, with left/right alternating circuit numbers, and a complete description of all loads controlled by each breaker. Directories shall include the panel designation, the upstream panel or switchboard that it is fed from, voltage rating, and current rating.
- 8.3.14 Provide means for harmonic suppression in all areas that are likely to have significant harmonic content. Coordinate specific means of harmonic suppression with the State Public Works Division and the Using Agency prior to commencing with the design.
- 8.3.15 Emergency generators shall be specified for a combined mechanical and electrical efficiency of 80% or greater.
- 8.3.16 Emergency generators shall be specified with the capability for recovery to 90% of the rated voltage and 90 % of the rated frequency within two seconds (120 cycles) at site conditions.
- 8.3.17 Electrical equipment rooms and data equipment rooms in multi-story buildings shall be vertically stacked.
- 8.3.18 Whenever electrical panels or switchboards are placed on a wall that adjoins an office or other occupied space, the wall shall be shielded to prevent transference of electromagnetic fields into the occupied space.
- 8.3.19 Photovoltaic system inverters shall be designed and installed with the capability to control or correct the system power factor. Project specifications shall require assessment and adjustment of the power factor while the photovoltaic system is operating at or near capacity.
- 8.4 Conduits and Raceways
- 8.4.1 Flexible conduit shall be limited to connections between equipment and other raceway systems, and shall not exceed six feet in length.
- 8.4.2 Metal-clad cable (MC cable) shall not be specified.
- 8.4.3 Fittings for electrical metallic tubing shall be steel, watertight, gland-ring type or steel set-screw type.
- 8.4.4 All metal conduit, couplings, elbows, and fittings buried below grade shall be coated with PVC or 2-lap wrapped with an approved tape (coating or wrapping shall be a minimum 20 mil thickness).
- 8.4.5 In lieu of rigid galvanized conduit for horizontal secondary service raceways and branch circuit wiring in or under a floor slab, schedule 40 PVC may be used with PVC-coated rigid steel conduit termination stub-ups out of the ground or slab and into the building.
- 8.4.6 To the greatest extent possible, conduits shall not be placed within concrete slabs and shall be designed and specified to be placed beneath concrete slabs-on-grade, or suspended beneath the structural floor or roof deck above. Conduits shall be placed a minimum of 3 inches below metal decks (rather than a minimum of 1.5 inches as required by the National Electrical Code). For slabs-on-grade, the conduits shall be placed at the bottom of the base or gravel course. Where known storage shelving or FF&E elements are to be installed into or onto the concrete slabs, these areas shall be graphically depicted and noted to not allow any electrical conduits in these concrete slabs.

- 8.4.7 Where necessary, conduits located in concrete slabs shall not exceed  $\frac{3}{4}$  inch and shall be spaced no closer than eight inches on center except at panel and junction boxes where they shall be spread as widely as possible. Provide for special framing when required where conduits enter a panel board. Where conduits larger than  $\frac{3}{4}$  inch are to be placed in a concrete slab, the structural engineer shall be notified for review and approval.
- 8.4.8 Conduits located vertically in a concrete slab shall be rigid galvanized steel coated with PVC or 2-lap wrapped with an approved tape (coating or wrapping shall be a minimum 20 mil thickness).
- 8.4.9 Low voltage wiring distribution systems (including j-supports) shall be installed in strict conformance with the most current edition of NECA/BICSI Standard 568 and with the cable manufacturer's written installation recommendations/requirements.
- 8.4.10 All low voltage wiring (whether plenum rated or not) shall be installed in raceways with the following conditions, clarifications, and exceptions:
- A. Fire alarm and security system wiring shall be installed in raceways with no exceptions.
  - B. Raceways shall be as defined in the National Electrical Code. Open cable trays shall not be construed as meeting the definition of a raceway.
  - C. Low voltage wiring for telephone, data, communications, intercom, temperature controls, and energy management systems may be routed utilizing open cable trays above accessible ceilings.
  - D. Where open cable trays are utilized above accessible ceilings the following conditions apply:
    - 1. Low voltage wiring routed in open cable trays shall be plenum-rated (whether or not the ceiling space is utilized as a return air plenum).
    - 2. Low voltage wiring concealed in walls, floors, and above inaccessible ceilings shall be routed in raceways.
    - 3. Low voltage wiring routed between conduit stubs and cable trays shall be secured with appropriately spaced j-supports.

## 8.5 Conductors

- 8.5.1 Conductor material shall be copper for all wire sizes.
- 8.5.2 Metal-clad cable (MC cable) shall not be specified.
- 8.5.3 Neutral conductors for 208Y/120 volt systems shall be white and neutral conductors for 480Y/277 volt systems shall be gray.
- 8.5.4 No wire smaller than #12 AWG shall be specified for light and power circuits.
- 8.5.5 Provide separate raceways and conductors for line side and load side wiring for all variable frequency drives.

## 8.6 Lighting

- 8.6.1 Lighting in all office and classroom areas shall be designed for a minimum maintained average lighting level of 40 foot-candles at the desk surface.
- 8.6.2 All light fixtures shall be LED type with a minimum efficiency of 100 lumens per watt, unless another fixture type is approved by the State in writing. LED light fixtures shall be specified with high frequency electronic drivers having a total harmonic distortion of 20% or less and a power factor of 90% or greater.
- 8.6.3 Lighting controls shall be provided for all building spaces except for small spaces served by a single fixture. Lighting shall be controlled by motion sensors, multi-level switching, or daylight dimming, as appropriate.
- 8.6.4 The proposed method of lighting control for each type of space in the building shall be reviewed and approved by the State during the early stages of design.
- 8.6.5 Special use areas or areas used for multiple purposes which may require unusual levels of illumination shall be reviewed and approved by the State during the early stages of design.
- 8.6.6 Lighting controls shall include photocell control of exterior lighting. Photocell location shall be reviewed and approved by the State.

- 8.6.7 Exterior doors and entries shall have illumination on the outside.
- 8.6.8 In-ground exterior light fixtures shall not be specified.
- 8.7 Switches and Receptacles
  - 8.7.1 Provide a fourplex receptacle at the desk location in each office and at each computer workstation.
  - 8.7.2 All corridors and hallways shall have duplex receptacles spaced at not more than 30 feet on center.
  - 8.7.3 Provide ground fault circuit interrupter protection for all electrical receptacles located within 6 feet of a wet bar sink (such as in break rooms, kitchenettes, etc.).
  - 8.7.4 Outlet boxes, covers, rings, and other similar fittings shall be galvanized steel.
  - 8.7.5 Wall switches near doors shall be mounted within 12 inches of the trim on the latch side of the door.
  - 8.7.6 Gang type plates shall be used for multiple gang boxes.
- 8.8 Grounding
  - 8.8.1 Proper grounding shall be provided for all electrical systems. Requirements for bonding connections at service entrances, metal piping, structures, panel boards, and transformers shall be clearly noted on the appropriate drawings.
  - 8.8.2 All circuit grounds shall be made up such that a continuous path is reliably maintained to a grounding electrode or system. The ground field (rods, grids, plates, etc.) shall have a maximum resistance of 5 ohms.
  - 8.8.3 Special consideration shall be given to grounding of sensitive office equipment (computers, servers, data circuits, etc.).
  - 8.8.4 Separate insulated equipment grounding conductors shall be installed within each feeder and branch circuit raceway. Insulation color for ground conductors shall be green. Terminate the ends of each ground conductor with a suitable lug, bus, or bushing. Insulated equipment grounding conductors for busway supply circuits shall be installed from the grounding bus in the switchgear, switchboard, or distribution panel to the equipment grounding terminal bar on the busway.
- 8.9 Testing of Electrical Systems
  - 8.9.1 Specifications shall include requirements for electrical systems testing, including documentation of test results, as appropriate for the electrical systems utilized in the project. Electrical systems testing and documentation requirements shall be in accordance with a recognized testing standard (such as those published by the International Electrical Testing Association (NETA)).
- 8.10 Telephone and Data Systems
  - 8.10.1 In all new buildings, and where required as part of the project scope of work, the design shall provide for communications pathways and spaces for the elements of the communications systems including, but not limited to, multi-service communication systems, twisted-pair systems, coaxial cable systems, and optical fiber systems.
  - 8.10.2 Data equipment rooms shall be located on each floor and all data drops shall be less than 300 feet from face plate to the point of termination. Distances shall be measured along the actual cable path including service loops.
  - 8.10.3 Coordinate the extent and layout of conduits, raceways, conductors, and cables with the Using Agency and allow for significant but reasonable changes in use of the spaces served.
  - 8.10.4 Wherever multiple data/voice connections are specified at a single location, each data/voice connection type shall be a different color (generally blue for data and white for voice).



8.11 Fire Alarm Systems

8.11.1 New buildings shall be equipped with a fire alarm system when required by the International Building Code. When a fire alarm system is required, the system shall be designed in conformance with the requirements of the International Building Code and the International Fire Code.

8.11.2 All initiating and indicating devices shall be specified to be tested for both "alarm" and "trouble" conditions in a test conducted by the installing contractor and witnessed by the appropriate fire authority and by the State's designated representative.

8.12 Seismic Bracing for Electrical Systems

8.12.1 All electrical equipment, cable trays, and conduit shall be appropriately braced for the seismic conditions at the project location. Seismic bracing specifications shall require compliance with all applicable portions of the International Building Code (Chapter 16) and shall require compliance with the means and methods outlined in the International Seismic Application Technology (ISAT) manual, or an approved equivalent manual. Specifications shall require that a copy of the specific bracing instructions for all equipment, ductwork, and piping be maintained by the Contractor at the project site and that the bracing instructions shall be available at all times for use by the State.

## **SECTION 9            DOCUMENT STANDARDS**

### **9.1        General**

9.1.1    The State requires a high standard of professionalism in the preparation of architectural and engineering drawings, specifications, and calculations and reserves the right to reject any work which does not meet that high standard.

9.1.2    Maximum drawing size shall not exceed 30" x 42" (E size).

9.1.3    Specifications on all projects shall comply with the requirements of Nevada Revised Statutes Section 338.140, which states in pertinent part that all specifications shall list at least two acceptable product manufacturers followed by the words "or equal", except in the following two circumstances:

- A.    Where a single product manufacturer or provider is specified in order to match other products in use at a facility, or
- B.    Where only one product is available to meet the intended application.

In cases involving a unique or novel product, the use of which is deemed to be in the best interest of the project, only one product or manufacturer need be listed. The use of such proprietary products shall be approved by the State prior to specifying.

### **9.2        Architectural Drawings and Specifications**

9.2.1    In addition to standard architectural plan sheets, the drawing set shall include building sections, roof plans, complete door and window schedules, and sufficient sections and details to fully describe the architectural portions of the work.

9.2.2    A title sheet shall be included for the entire drawing set containing the following information:

- A.    Name of project and State Public Works Division project number.
- B.    Location of project.
- C.    Name, address, and seal of designing architect and all professional engineering consultants.
- D.    Index of all drawings included in the set.
- E.    Basis of design information shall be clearly listed on the title sheet, heavily boxed in, and shall include the following:
  - 1.    Current adopted editions of the building, mechanical, plumbing, and electrical codes.
  - 2.    Site area
  - 3.    Floor area
  - 4.    Occupancy group(s)
  - 5.    Type of construction
  - 6.    Required separations
  - 7.    Fire sprinkler system requirements
  - 8.    Fire alarm system requirements
  - 9.    Number of stories
  - 10.    Maximum height
  - 11.    Zoning
  - 12.    Set-backs
  - 13.    Allowable live loadings for roofs and floors
  - 14.    Seismic design parameters
  - 15.    Wind speed and exposure
  - 16.    Allowable soil bearing
  - 17.    Design stresses for building materials
  - 18.    Insulation requirements

9.2.3    A "limit of work" area designating the area allowed the Contractor for storage, operation, and on-site dedicated construction parking shall be shown on the architectural site plan.

- 9.2.4 Where fire resistive construction, structural fire protection, or protection of openings is required, drawings and/or specifications shall include a fire resistive design schedule to include the following:
1. Identify where the fire resistive elements are required.
  2. Provide details depicting how the fire resistive assemblies are to be constructed, including all penetrations.
  3. Specify the source of the tested and listed fire resistive assemblies.
- 9.2.5 The design documents shall include a requirement (where applicable) for the Contractor to schedule and attend a meeting with the Consultant and the State to review and discuss materials and details to be utilized in construction of all fire resistive assemblies. The meeting shall be scheduled following preparation of the associated submittals and prior to beginning construction of any fire resistive assemblies.
- 9.2.6 Graphic illustrations with dimensional tolerance shall be provided on the drawings for all ADA and ICC/ANSI accessible elements.
- 9.3 Civil Drawings, Specifications, and Calculations
- 9.3.1 Civil drawings shall include as a minimum the following:
- A. Site plan with basis of bearing information and site boundary, site features, existing roads, streets, street names, north arrow and scale, new buildings, parking areas, ingress and egress points, site dimensions, fencing, and gates.
  - B. Building location tied to the site boundary. Division of State Lands certification is required for all new buildings and major building additions.
  - C. Grading plan with basis of elevations, existing site contour lines and finish grade contours, and a storm drainage plan to include all storm drainage improvements.
  - D. Storm water systems shall be designed in compliance with the Federal Clean Water Act and State of Nevada Division of Environmental Protection rules and regulations.
  - E. ADA parking area plans shall include spot elevations and shall conform to all applicable ADA and ICC/ANSI guidelines.
  - F. Utility plan shall indicate points of connection to existing water and sanitary sewer systems, shall locate domestic and irrigation water service, fire water service and hydrant locations, water system valves, sanitary sewer system including cleanouts and manholes, and electrical transformer pads.
  - G. Plan and profile drawings for water, sanitary sewer, and storm drainage systems, where applicable.
  - H. Site details related to site improvements. Typical details shall include roadway and parking structural sections, curbs and gutters, catch basins, drainage swales and channels, special storm drainage improvements, special grading (cuts/fills), slope protection, temporary silt fencing, retaining walls, valves, fire hydrant assemblies, manholes, clean-outs, ADA improvements, fencing, traffic markings and signage, and other details as appropriate.
- 9.3.2 Civil specifications shall describe all site improvement materials and products.
- A. Specifications shall include requirements for site preparation, clearing and grubbing, earthwork, aggregate base, paving, concrete, trenching and backfill, water piping, sanitary sewer piping, storm drainage system piping, manholes, valves, site concrete, signage, traffic markings, fencing and gates, and other specifications as appropriate.
  - B. Specifications shall conform to all federal, state, county, and municipal regulations as are applicable to the project.
  - C. Specifications may be incorporated on the drawings for smaller projects where appropriate.
- 9.3.3 Civil calculations shall be provided as required for:
- A. Earthwork (grading), hydrology, traffic, sewage and/or septic systems, water systems, hydraulic profiles, retaining walls, and where required by local municipalities and/or public utilities.

#### 9.4 Structural Drawings, Specifications, and Calculations

9.4.1 The structural drawings shall include, as a minimum, the following:

- A. General structural notes including a basis of design, loading information, allowable design stresses, and basic information regarding materials used on the project.
- B. A framing plan for each floor and roof, identifying structural connections and vertical support systems.
- C. Framing and wall elevations as necessary to show the complete structure.
- D. A foundation plan identifying footing types and dimensions.
- E. Sufficient sections and details to completely describe the structural portions of the work.

9.4.2 Structural calculations are required for all aspects of the structural design, including vertical and lateral load carrying systems. Calculations shall be neatly prepared and organized so that an independent peer reviewer can readily check the validity and completeness of the calculations. Computer programs used shall be clearly identified with input and results fully documented.

#### 9.5 Mechanical Drawings, Specifications, and Calculations

9.5.1 HVAC, plumbing, and fire sprinkler drawings shall adhere to the following criteria:

- A. Graphical symbols and abbreviations shall conform to those recommended by ASHRAE and/or ASPE.
- B. Chilled water and heating water systems shall be illustrated utilizing piping schematics (in addition to floor plan piping drawings).
- C. Mechanical equipment rooms shall be illustrated utilizing enlarged floor plan drawings (1/4" scale minimum) and sections.
- D. Temperature control wiring schematics and written control sequences shall be provided for all temperature control systems.
- E. Plumbing systems shall be illustrated utilizing one of the following two options to depict piping in restrooms, kitchens, and other areas containing groups of plumbing fixtures:
  - 1. Enlarged floor plans (1/4" scale minimum) with waste and vent piping on one plan and domestic hot and cold water on another plan.
  - 2. Isometric piping diagrams with waste and vent piping on one plan and domestic hot and cold water on another plan.
- F. Plumbing plans shall include the invert elevation at each location where waste piping exits the building.
- G. Fire sprinkler plans shall include locations and details for fire riser, anti-freeze loops, inspector's remote test station, and shall include requirements for interfacing with electrical and fire alarm systems.

9.5.2 Mechanical calculations are required for all aspects of the mechanical design, including heating and cooling loads, mechanical equipment and systems, and plumbing equipment and systems. Calculations shall be neatly prepared and organized so that an independent peer reviewer can check the validity and completeness of the calculations. Computer programs used shall be clearly identified with input and results fully documented.

9.6 Electrical Drawings, Specifications, and Calculations

9.6.1 Electrical drawings shall adhere to the following criteria:

- A. Graphical symbols shall conform to those recommended by the American National Standards Institute (ANSI).
- B. Buildings with extensive electrical systems shall be clearly illustrated with three separate floor plans for each floor. One floor plan shall show the lighting system, a second the power system, and a third the communications and signaling systems.
- C. Lighting and power panel schedules shall be included on the drawings.
- D. Separate enlarged ( $\frac{1}{4}$ " scale minimum) floor plans shall be included for building areas with extensive electrical equipment.
- E. Special fixture and equipment supports shall be fully detailed where necessary to clarify the designer's intent.
- F. Each electrical outlet and switch shall be identified with the circuit number(s) to which it is connected.
- G. Wiring diagrams shall be included as clarification for all special control systems.
- H. Electrical drawings shall clearly identify the dedicated electrical space at all electrical switchboards, distribution boards, motor control centers, etc.
- I. Electrical grounding drawings shall be provided, indicating required grounding methods and connections.

9.6.2 Electrical calculations are required for all aspects of the electrical design, including load, voltage drop, short circuit, and lighting systems calculations. Calculations shall be neatly prepared and organized so that an independent peer reviewer can check the validity and completeness of the calculations. Computer programs used shall be clearly identified with input and results fully documented.