Introduction

Purpose

The intent of Chapter 7 is to provide standards and guidelines necessary to plan, design and construct school facilities throughout the state of Arkansas. The focus is on building systems and materials that will provide buildings that are economical and reflect quality construction, along with mandatory performance standards, additional options and available choices. All items and systems, such as loose furnishings, casework, technology, etc., should be integrated early in the planning phase of the project.

Definitions

The planning and design of school facilities shall be based upon criteria described in Chapter 7 in accordance with the following definitions:

"Standards" - Performance or construction required items for which there is mandatory adherence.

"Guidelines" – Performance or construction items which are recommended, but NOT required.

"Components", "Examples" – Typical element(s) of standards or guidelines.

Codes and Standards

Applicable local, state, and international building codes and standards are not repeated in this chapter. It is the responsibility of the design professionals to conform to the current codes in their design process. Should the standards contained in this manual be in conflict with international, state, or local codes, the established codes shall prevail. The requirements of ADAAG (Americans with Disabilities Act Accessibility Guidelines) should be consulted.

No attempt has been made to provide detailed specifications in Chapter 7. Standards and guidelines are available that allow architects and engineers the flexibility to design to fit the School District needs.

Applicability

The construction and performance standards and guidelines contained herein are applicable to both new construction of public school facilities and renovation of existing public school facilities. Every attempt should be made to apply these standards and guidelines to existing buildings, in gradual steps as funding and other influences allow (refer to Chapter 1). It may be recognized that some standards may not be compatible with existing facilities in renovation projects nor may it be possible to completely conform a performance or construction standard to a new facility. In those instances, variances to those standards, upon request, may be granted by the Division.

Civil Sitework

Components

- Building placement
- Ingress, Egress Routing
- Sidewalk
- Trash Enclosure
- Curbing
- Signage and Striping
- Pavement
- Subgrade, Building Pad
- Grading and Drainage
- Water, Sewer, other Utilities

General Standards

1. This section establishes the minimum design and construction requirements for civil sitework for new construction and expansions of school facilities.
2. All drawings including surveys and civil plans shall be prepared in AutoCAD DWG or .pdf format.
3. Site design shall be performed under the supervision of a Registered Civil Engineer and all civil related plans, reports and construction documents shall be signed and sealed in accordance with state statutes.
4. All site design shall conform to the applicable codes and to Federal, State, and local requirements of the Authorities Having Jurisdiction (AHJ).
5. A subsurface geotechnical analysis shall be performed by a Registered Geotechnical Engineer to determine soil properties and provide recommendations for design of footings, foundations, pavements and construction techniques.
6. The following publications (latest edition) shall be consulted by the design professional and are hereby included for reference:
   - Americans with Disabilities Act (ADA)
   - American Association of State Highway and Transportation Officials (AASHTO) Design Greenbook
   - Institute of Transportation Engineers (ITE Manual)
   - Manual on Uniform Traffic Control Devices (MUTCD)
   - Arkansas Highway and Transportation Department (AHTD) Materials Specifications

Site Design Standards

1. Site planning and building placement – The placement of the building shall be closely coordinated with the architect to make good use of the property and ancillary facilities. The various modes of travel (pedestrian, bicycle, cars, buses, delivery vehicles) shall be separated as much as possible to provide safe and efficient access. Special attention shall be given to ingress and egress of pedestrians, passenger vehicles, and buses, and short

term and long term parking locations for each. Pedestrian and vehicular conflicts shall be minimized, as much as possible. Consideration shall also be given for proper drainage of the site during site planning design.

2. Parking – Parking stalls for cars shall be designed at 30°, 45° or 90° angle to the traffic flow direction and shall be a minimum of 9' by 18' in size or per the authorities having jurisdiction (AHJ) requirements, whichever is greater. See Chapter 4 of this manual for number of spaces required for each type of school. All accessible parking shall be designed per the latest edition of the Americans with Disabilities Act (ADA) Federal Guidelines and/or the local codes, whichever is more stringent. Drive aisles between car parking shall be a minimum of 24' for two-way traffic and a minimum of 16' for one-way traffic. Bus parking is recommended at 30° angle to traffic flow direction and oriented so the bus exit door allows students to exit in front of adjacent buses. Bus spaces shall be a minimum of 12' by 40'. Buses should not be required to back up. Drive aisles for buses are recommended to be a minimum of 20'. A parking summary shall be included on the site plan.
3. Sidewalks - Sidewalks shall be designed for access from the parking areas to all entry doors, as well as an accessible path from the street frontage, per ADA guidelines. Sidewalks shall be a minimum of 5' in width and shall be constructed of a minimum of 4" thick Portland cement concrete and minimum strength of 2500 psi.
4. Trash Enclosure – Trash enclosure shall be provided in a location accessible to trash trucks without conflicting with pedestrian routes or bus pick-up/drop-off point. The size of the enclosure may vary by size and number of dumpsters available from the provider. Where practical, recycling may also be staged in the trash enclosure area. The standard enclosure shall have three sides constructed of durable wood, synthetic, or masonry to a minimum height of 6' and capable of screening the dumpster(s) from view. The enclosure will be gated on the "open" side to screen the dumpster interior and provide access. The enclosure shall be positioned so that the "open" side faces a drive entrance with a minimum of 35' direct approach to the enclosure. The trash enclosure shall be constructed on an 8" concrete slab and slab shall extend at least 15' in front of dumpster for the entire opening.
5. Curbing –Curbing shall be provided around the entire pavement perimeter and at all pavement edges. All curbing shall be defined on the site work drawings as to type of curb, size and general location. All permanent curbing shall be concrete. Extruded concrete curbing epoxied to the pavement surface is not permitted. Asphalt curbing shall only be allowed along pavement edges when it is adjacent to a future development area.
6. Traffic Signage and Striping– Traffic signage shall conform to the Manual on Uniform Traffic Control Devices (MUTCD), and at a minimum shall include stop signs where traffic leaves the school property and/or enters a public thoroughfare. The school shall defer to local authorities

Pick-up/drop-off area Sidewalks
Consideration for wider sidewalks in pick-up/drop-off areas and areas leading to main entries are recommended.

Bollards at Trash Enclosure
Bollards are recommended at each corner of the enclosure, where exposed to traffic.

Curbing
Special care should be taken to ensure that all curb radii at entrances, around islands and around curves are sufficiently large enough to accommodate bus turning movements.

for proper off-site signage of public rights-of-ways.

Pavement Design Standards

1. Pavement design shall be based on a minimum design period of twenty (20) years.
2. Pavement design shall be as recommended by the geotechnical engineer and shall consider such variables as the California Bearing Ratio (CBR) of the soil, anticipated traffic volume and vehicle mix (i.e. automobiles, buses, single axle trucks, double axle trucks, etc.) The design professional shall consult the ITE Manual, as well as Chapter 4 of this manual, for determination of anticipated traffic loads for various school types and sizes. The design shall also be based on sound geotechnical practices, existing soil conditions, knowledge of local conditions, and availability of material and pavement performance.
3. Pavement design shall include, at a minimum, the following paving design sections:
   - Standard Duty Asphalt Paving – for use in areas of car traffic and car parking
   - Heavy Duty Asphalt Paving – for use in bus lanes, bus parking, delivery vehicle access, trash truck access, and extreme high use vehicular areas
   - Standard Duty Concrete Paving - for use in areas of car traffic and car parking and/or areas of mixed use traffic
   - Heavy Duty Concrete Paving – for use in bus lanes, bus parking, delivery vehicle access, trash truck access, and extreme high use vehicular areas
   - Heavy Duty Reinforced Concrete Paving – for use in trash enclosure areas, loading docks, truck wells, delivery doors or other areas of extreme loading
4. Pavement and base materials shall conform to the Arkansas Highway and Transportation Department specifications for materials and pavement design.
5. Asphalt pavement design shall conform to Superpave specifications and consist of three layers: surface course, binder course, and crushed aggregate base course, resting on a properly prepared subgrade.
6. Concrete paving shall have a minimum strength of 3000 psi.

Subgrade and Building Pad Preparation Standards

1. Site specific recommendations by the geotechnical engineer shall supersede this section.
2. Topsoil shall be stripped from the site and stockpiled (on-site if possible) per the geotechnical recommendations. Topsoil removal shall be to a sufficient depth to remove the layers containing organics. Topsoil may be reused for top dressing of landscape areas or other non-structural fill areas, where applicable.
3. Preparation of the site subgrade shall be per the recommendations of the geotechnical engineer, and may include scarifying and re-compaction, over-excavation, cut, fill, lime stabilization, cement stabilization, dewatering, moisture conditioning, or compaction.
4. Subgrade must be properly shaped to the desired sections

Signage and Striping

Additional interior signage, including pedestrian crossings, stop signs, directional arrows, and informational signage may be necessary.

Striping and pavement markings should be considered to aid in the sage and efficient movement of vehicles through the site.

and elevation and shall be compacted so that it is firm, hard and unyielding. The subgrade shall be at least 12" thick and free of organic and other deleterious materials. Subgrade under paved areas shall be compacted to 95% maximum dry density Modified Proctor per ASTM D-1557.

5. Subgrade for the "building pad" shall extend 5' beyond the perimeter walls of the building and at least 4' below the floor slab and base layer. Subgrade for the building pad shall have a maximum plasticity index of 20 and a maximum liquid limit of 40.
6. The "building pad" subgrade soils shall have a minimum allowable bearing capacity of 3,000 psf.
7. Structural fill placed in the "building pad" area shall be placed in 8" lifts (max) and shall be compacted to 95% maximum dry density Modified Proctor per ASTM D-1557.

Grading and Drainage Design Standards

1. The site shall be graded to safely and efficiently convey stormwater through and around the site.
2. The site shall be designed to safely convey the 100 year storm event. When stormwater piping is used, piping shall be designed to convey the 25 year storm event, or per the AHJ, whichever is greater. The site shall conform to the AHJ requirements for stormwater detention/retention, if required.
3. The design professional shall set the finish floor elevation of the building at an elevation at least 1' above base flood elevation (BFE), or per the AHJ requirements, whichever is greater.
4. Grading around the building shall slope away from the building at a minimum of 2% slope for at least 10' from the building walls. Care should be taken to ensure that landscaping, mulch, topsoil, sod or other materials do not inhibit proper drainage around the base of the building. Where possible, foundation plantings and irrigation close to the foundation walls should be avoided, in order to reduce the effects of moisture under the footings and slabs.
5. Surface drainage swales through playgrounds and play areas shall be prohibited. Inlets and/or pipe openings in playgrounds and play area shall be avoided, and if unavoidable, shall be adequately designed to prohibit students from access.
6. All paved areas, unless otherwise required by code, shall be designed between a 5% maximum and a 1% minimum slope.
7. All landscape areas shall have a maximum slope of three (3) horizontal to one (1) vertical (3:1) and a minimum slope of 1%.
8. Ponding around drainage inlets in paved areas shall be limited to a maximum of 6" depth.
9. Stormwater detention/retention areas shall be adequately fenced to prohibit accidental student access. Detention areas should be placed away from play areas and playgrounds. Slopes in and around stormwater detention/retention area shall have a maximum slope of four (4) horizontal to one (1) vertical (4:1) for ease of maintenance.

Grading at Play Areas
Play areas generally should be sloped at 2% to promote positive drainage and eliminate ponding and puddles.

Stormwater Quality Initiatives
The design professional should consider stormwater quality initiatives, such as filtration strips, bio-swales, and other water quality devices, where applicable.

10. All drainage inlets on school sites shall be designed as "child safe" to reasonably prohibit student access into inlets and drainage boxes.
11. All grated inlets shall use "bicycle safe" grates.

Water and Sewer Design Standards

1. Domestic water and sanitary sewer shall conform to the requirements of the Arkansas Department of Health.
2. Domestic water main lines shall maintain at least 10' horizontal separation from sanitary sewer mains. Water and sewer lines shall maintain 18" vertical separation.
3. Design of the water system shall include the necessary domestic and fire protection needs for the site. The civil engineer shall coordinate with the plumbing engineer to ensure the system has the adequate capacity for the needs of the site.
4. Civil design documents shall include design of water and sewer commencing 5' outside the building and continuing to the point of connection at the public main.
5. Water system design shall include all main lines, service lines, and fire lines outside the building, as well as fire hydrants, meter locations, valves and other appurtenances.
6. Water pipe materials may include copper, PVC, and ductile iron conforming to American Water Works Association specifications.
7. Water lines shall be designed for burial below frost depth and of adequate depth to avoid damage during construction.
8. Sanitary service lines shall be a minimum of 4" diameter PVC, and mainlines shall be minimum 8" PVC.
9. All facilities with food preparation shall have a grease trap (minimum 1000 gallon capacity).
10. Utility easements shall be provided where public mains cross private property.
11. Proper trenching and bedding of water and sewer lines shall be required
    - Bedding Material: Provide Class I-A or I-B granular material in accordance with ASTM D 2321 which is free from clay lumps, organic, or other deleterious material.
    - Haunching Material: Provide Class I-A, I-B or Class II granular material in accordance with ASTM D 2321 which is free from clay lumps, organic, or other deleterious material. Haunching is considered the zone from the bottom of the pipe to the spring line of the pipe.
12. Trenching and construction shall comply with all OSHA requirements. The site shall be graded to safely and efficiently convey stormwater through and around the site.

Utility Design Standards

1. Civil engineer shall be responsible for design of site routing of utilities from 5' outside of the building to the point of connection. These may include electric, telephone, gas, and fiber optic routing. The civil engineer

shall coordinate with the design team and the utility providers for connection points, service demarcation points, building entry points and load requirements.
2. Utility services shall be placed underground, where possible.
3. Electrical transformers and other utility appurtenances shall be placed away from playgrounds, play areas, and pedestrian walkways, or fenced to adequately prohibit student access.
4. All vaults, meter boxes, and pull boxes in traffic areas shall be “traffic rated H-20”.
5. Utility easements should be provided for primary electric service runs to and including the transformer location. Secondary electric service runs typically do not require easements.
6. Empty conduits for future use should be provided under paved entrances and driveways.
7. Proper trenching and bedding of utility lines shall be required.
   - Bedding Material: Provide Class I-A or I-B granular material in accordance with ASTM D 2321 which is free from clay lumps, organic, or other deleterious material.
8. Trenching and construction shall comply with all OSHA requirements.

Foundations and Floor Slabs at Grade

Components

- Spread footings and wall footings
- Trenched footings/turned down footings
- Drilled piers
- Reinforced concrete foundation walls
- Reinforced concrete masonry walls utilizing normal weight masonry units with all cores grouted and reinforced
- Concrete grade beams
- Driven piles and pile caps
- Auger cast piles and pile caps
- Other systems if recommended and acceptable to the geotechnical engineer and the structural engineer
- Where expansive clays are present on the site, the geotechnical investigation is to address such and special foundation and floor slab systems and/or undercutting and backfilling shall be utilized as recommended by the geotechnical engineering investigation.

Standards

1. Foundations shall be designed by a structural engineer to meet the recommendations given by a geotechnical engineer based upon his geotechnical investigation and report and in accordance with the current state building code.
2. Structurally sound
3. Deflections and differential movement to be limited to magnitudes compatible with other building components
4. Compatible with soil type
5. Water Barrier
6. Long life expectancy
7. Do not use calcium chloride in concrete.
8. Sub-slab ventilation in areas with radon or potential soil gas submissions. Requirement for such is to be determined by qualified testing agency.
9. Concrete minimum compressive strength at 28 days to be as required by structural engineer's design, but shall be no less than the following:
   - Foundations – 3,000 psi
   - Floor slabs – 3,000 psi
   - Precast systems – 5,000 psi Strength of concrete provided is to be tested by independent testing lab, during construction
10. Concrete reinforcing steel shall be a minimum grade 60 and meet the requirements of the current state building code and structural engineer's design.
11. Project site concrete mixing shall not be used, unless otherwise approved by an independent testing agency.

Fly-Ash
Concrete materials may use 10%-20% fly-ash as replacement, but not addition. Mix design to be done by qualified independent testing agency.

Form Release
Use low- and non-toxic form releases.

12. For classrooms and corridor areas, use no less .than a 4” thick concrete slab with 6x6 - W1.4 x W1.4 welded wire fabric.
13. Under concrete building slabs, place a minimum 10 mil vapor barrier and compact a minimum of 4” of drainage fill material unless geotechnical engineering investigation recommends otherwise.

Framing Systems

Examples

- Steel roof deck on open web steel joists or steel beams
- Cementitious deck on open web joists
- Composite action concrete slabs and steel beams
- Pre-engineered building systems
- Concrete on steel form deck floor
- Cast-in-place floor slabs (*1-way or 2-way*)
- Steel and/or reinforced concrete columns and beams
- Load bearing masonry walls
- Wood Frame systems or Heavy Timber Frame Systems
- Engineered wood products including engineered wood joists and beams, pre-engineered wood trusses, OSB and plywood
- Other systems if recommended and acceptable to the structural engineer and Owner and in accordance with the applicable Fire Prevention and/or Building Codes

Standards

1. Structurally sound
2. Structural systems and members shall be designed by a licensed structural engineer to meet current state fire prevention and building codes and to have adequate stiffness to limit deflections and lateral drift to the requirements of these codes.
3. Steel roof deck: as designed by structural engineer
4. For cementitious decks, use galvanized sub-purlins.
5. For roof slopes greater than 1:12, metal joists shall span parallel to the slope.
6. Do not use calcium chloride in concrete.
7. For structural steel, comply with the American Institute of Steel Construction (AISC) specifications and current state building codes.
8. Steel joist manufacturer shall be certified by the Steel Joist Institute (SJI).
9. Non-painted steel roof deck, if galvanized, to be ASTM A924, G90 (90 oz. per sq. ft.) zinc coating. Steel floor deck shall be galvanized and to be ASTM A924 G60.
10. Concrete deck fill: minimum compressive strength of 3,000 psi or greater at 28 days.
11. Structural steel fabrication must be in accordance with standards.
12. Rolled steel columns and beams: ASTM A572, grade 50 or others if recommended and approved by the structural engineer; Square or rectangular hollow structural steel sections shall be ASTM Grade B, Fy = 46 ksi; Round hollow structural steel sections shall be ASTM A 500, Grade B, Fy = 42 ksi.
13. Concrete columns: minimum compressive strength of 3,000 psi or greater at 28 days.

14. Steel form deck shall comply with the Steel Deck Institute (SDI) design manual (publication no. 27).
15. Structural masonry columns shall be filled and reinforced.
16. Load bearing masonry walls shall comply with current state building codes.
17. Steel lintels in exterior walls: if 8" or less in depth and 12" or less in length, use hot-dipped galvanized, grade 65. For lintels greater in size, use ASTM A123M-02.
18. Steel lintels, other than angles, supporting masonry shall have rigid masonry anchors at 32" maximum spacing to secure masonry to steel.
19. Reinforced masonry lintels shall be used in exterior walls wherever possible.
20. Concrete mix design to be designed and strength tested by qualified independent testing agency to meet these requirements and any others from the design professional.
21. All lumber used for wood trusses shall be #2 grade, kiln dried, Southern Pine; #2 grade, kiln dried, Spruce-Pine-Fir; or #2 grade Hem-Fir or better. #3 grade lumber shall not be allowed for chords or web members.

Exterior Walls

Examples – Exterior Walls

- Masonry veneer cavity walls
- Masonry veneer and metal framing walls
- Masonry veneer and wood framing walls
- Pre-cast concrete insulated panels
- Metal panel on concrete masonry walls
- Metal panel on metal framing walls

- NOTE: Other types of exterior wall construction may be acceptable if type meets or exceeds the above performance standards criteria. More stringent requirements shall be used when required by the current state building codes and fire prevention codes.

Standards – Exterior Walls

1. Exterior Insulation Finish System shall use impact resistant mesh – must resist breakdown from projectiles.
2. Moisture resistant – provide vapor retarder to inside of insulation.
3. Thermal resistant – minimum R-value of R-13.5. Consider long-term performance.
4. Required Air Barrier System shall be one of the following:
   - Self-adhering sheets
   - Fluid applied membranes
   - Closed-cell polyurethane insulation
   - Building wrap
5. Air barrier transition tape required at masonry control joints.
6. Minimum maintenance – no routine applied maintenance.
7. Detail roof/wall intersection to provide a continuous air barrier system.

Guidelines – Exterior Walls:

- Economical – consider life cycle evaluation
- Light-colored exterior walls
- Preference given to non-combustible materials

Masonry Veneer Cavity Walls

Components

- Exterior finish
  - Exterior stone, clay, or concrete masonry units
- One-inch air cavity
- Cavity insulation
  - Rigid insulation or closed cell polyurethane insulation
- Air barrier system
- Back-up material
  - Concrete masonry units (normal weight)

Standards – Masonry Veneer Cavity Walls

1. Impact, moisture, and thermal resistant
2. Fire resistant
3. In-wall flashing – copper fabric laminate; elastomeric thermoplastic; sheet metal
4. Drain cavity with weep holes, 4'0" o.c.
5. Steel reinforcement to meet the requirements of the current state building code, including the seismic provisions where applicable.
6. Rebar shall be minimum grade 60.
7. Face brick veneer: grade SW
8. Concrete masonry: unit compressive strength 1900 psi (13.1 MPa)
9. Use CMU's containing fly ash
10. Insulation: extruded polystyrene board or spray polyurethane foam. Minimum R-value of R-13.5
11. For exterior CMU veneer: provide water repellent.

Component – Air Cavity

- Two-inch air cavity recommended

Guidelines – Masonry Veneer Cavity Walls:

- Use mortar dropping control product to prevent blocking of weep holes
- For exterior CMU, provide normal weight (CMU)
- Thorocoat or equal acceptable for required water repellant.

Masonry Veneer on Metal Framing Walls

Components

- Exterior finish
  - Exterior stone, clay, or concrete masonry units
- One-inch air cavity
- Cavity air infiltration barrier
  - Rigid insulation or closed cell extruded polyurethane insulation
  - Exterior sheathing
  - Air barrier membrane
- Batt/blanket insulation with faced membrane
- Back-up material
  - Cold formed steel framing system
- 5/8 inch gypsum wallboard

Component – Air Cavity
- Two-inch air cavity recommended

Standards – Masonry Veneer on Metal Framing Walls

1. Impact, moisture, and thermal resistant
2. In-wall flashing
3. Drain cavity with weep holes, 4'0" o.c.
4. Mill galvanized wall ties
5. Face brick veneer: grade SW
6. Concrete masonry veneer: unit compressive strength 1900 psi (13.1Mpa). Provide color and water repellent.
7. Steel framing system
   - Light gauge steel studs (minimum 20 gauge) or as designed by structural engineer
   - Pre-engineered steel framing system as designed by structural engineer
8. Use minimum R-value of R-13.5 fiberglass insulation.
9. Insulation shall be soybean oil-based polyurethane, open- cell, semi-rigid foam or equal.

Guidelines – Masonry Veneer Cavity Walls:
- Optional use of CMU's containing fly ash
- Maximize recycled content
- Thorocoat or equal acceptable for required water repellant
- The paper or foil vapor barrier of required insulation should be anchored to the face of the studs.

Pre-Cast Concrete – Insulated Sandwich

Components

- Exterior architectural concrete with smooth or exposed aggregate texture finish or thin brick facing
- Rigid cavity insulation
- Structural concrete backup
- Interior finish, if exposed to be smooth concrete or exposed aggregate concrete or a surface applied smooth or textured finish

Standards – Pre-Cast Concrete – Insulated Sandwich Walls

1. Impact, moisture, and thermal resistant
2. Low maintenance
3. Meet ASHRAE 90.1-2007 (or later) and current state energy code requirements.
4. Use extruded polystyrene or polyisocyanurate insulation.
5. Use fiber composite or plastic connectors – no metal connectors.
6. Concrete materials: Portland cement ASTM C-180, Type I or III
7. Concrete mix: 28 day compressive strength, 5,000 psi minimum
8. Minimum R-value is R-13.5

Guidelines - Pre-Cast Concrete - Insulated Sandwich Walls:

- Fly ash, ASTM C-618, Class C or F, may be substituted for up to 20% of total cementitious materials.

Metal Panel on Metal Framing

Components

- Exterior finish
  - Exterior metal wall panel system
- Weather barrier
- Air barrier system (required)
- Batt insulation with vapor barrier
- Backup materials
  - Cold formed metal framing
- 5/8 inch gypsum wallboard

Standards – Metal Panel on Metal Framing

1. Metal wall panel: 26 gauge minimum thickness zinc-coated (galvanized) or aluminum-zinc alloy-coated sheet steel; fluoropolymer exterior finish with minimum 20 year finish warranty
2. Low maintenance
3. Moisture and thermal resistant
4. Weather barrier: composite, self-adhesive, rubberized-asphalt compound flashing product
5. Steel framing system:
   - Steel studs as designed by structural engineer
   - Pre-engineered steel framing system as designed by structural engineer
6. Provide ASTM C665, Type 1, faced mineral fiber insulation blankets
7. Interior surface: painted, 5/8 inch, gypsum wallboard. Use Type X where required.
8. Insulation could be soybean oil-based polyurethane, open-cell, semi-rigid foam or equal.
9. Minimum R13.5

Guidelines - Metal Panel on Metal Framing:

- Maximize recycled content

Masonry Veneer on Wood Framing Walls

Components

- Exterior finish
- Exterior stone, clay, or concrete masonry units
- One inch air cavity
- Cavity insulation extruded polystyrene sheathing
  - Closed cell
  - Rigid insulation
- Batt/blanket insulation with vapor barrier
- Backup materials
  - Wood frame system
  - Heavy timber system
- 5/8 inch abuse/moisture/mold resistant gypsum wallboard

Standards – Masonry Veneer on Wood Framing Walls

1. Impact, moisture, and thermal resistant
2. In-wall flashing
3. Drain cavity with weep holes, 4'0" o.c.
4. Mill galvanized wall ties
5. Face brick veneer: grade SW
6. Concrete masonry veneer: unit compressive strength 1900 psi (13.1Mpa). Provide color and water repellant.
7. Wood frame systems or heavy timber systems:
   - Engineered in strict compliance with requirements of Arkansas State Fire Prevention Code and Building Code
   - All lumber used for wood framed wall systems shall be #2 grade, kiln dried Southern Pine; #2 grade, kiln dried, Spruce-Pine-Fir; or #2 grade, Hem-Fir or better.
8. Use minimum R-value R-13.5 fiberglass insulation. The paper or foil vapor barrier should be anchored to the face of the studs.
9. Insulation could be soybean oil-based polyurethane, open-cell, semi-rigid foam or equal.

Guidelines – Masonry Veneer on Wood Framing Walls:

- Optional use of CMU's containing fly ash
- Maximize recycled content

Roofing Systems

Examples – Roofing Systems

- Shingle roof system
- Metal roof with blanket insulation
- Metal roof with rigid insulation
- Built-up asphalt roof system
- Single-ply roof system
- Modified bitumen roofing system

- NOTE
  - All roof system and products shall be designed in accordance with state fire prevention code and state building code

Other Roofing Systems
- Other types of roof systems may be acceptable if system meets or exceeds the "Performance Standards - Roofing Systems"

Performance Standards – Roofing Systems

1. Roofing and flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. Minimum R-factor for low-slope roof is R-26.0 and steep roof is R-19.0
3. Impact resistant: Class 4 per Underwriters Laboratories (UL) 2218 impact test
4. Fire resistive – meet UL Class "A"
5. Positive slope – minimum slope ¼:12, unless specified otherwise; 1/8:12 for existing buildings
6. Positive drainage to interior drains or exterior collection systems
7. "ENERGY STAR" compliant ratings for surface treatments
8. Minimum 20 year manufacturer's warrantee on materials and system performance
9. Minimum 2 year Contractor guarantee on all materials and workmanship of all system components and accessories
10. Sheet metal flashings shall conform to SMACNA's "Architectural Sheet Metal Manual."

Roofing System Guidelines
- Consider installing "radiant barriers," such as aluminum foil above attic spaces

"SMACNA"
Sheet Metal and Air Conditioning Contractors' National Association

Construction Standards – Roofing Systems

1. Provide pre-roofing conference prior to field installation of Roofing System to comply with the manufacturer's requirements. Provide post installation inspection to comply with manufacturer's requirements.

Shingle Roof Systems

Components

- Asphalt Shingles, UL Class "A", ASTM B108 or UL790
- Roofing accessories
  - Felt Underlayment
  - Self-adhering sheet underlayment
  - Sheet metal drip edge and flashing
- Oriented strand board (OSB) or plywood
- Rigid insulation: extruded polystyrene or polyisocyanurate board
- Vapor barrier, on underside of rigid insulation
- Structural support: steel deck or cementitious deck; or wood deck (lumber, plywood or oriented strand board, OSB) permitted in accordance with Arkansas State Fire Prevention Code and Building Code

Performance Standards – Shingle Roofing Systems

1. Roofing and flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatments
5. Minimum 20 year material and weather tightness warranty by manufacturer
6. Contractor furnish 2 year guarantee on materials and workmanship for all system components and accessories

Construction Standards – Shingle Roofing Systems

1. Minimum 3:12 slope
2. Fasten shingles to roof sheathing with nails – not staple fasteners. Staples shall not be used on decking.
3. Metal drip edge: brake formed sheet metal with at least a 2 inch roof deck flange
4. Laminated-Strip Asphalt Shingles: ASTM D3462 laminated, multi-ply overlay construction glass-fiber reinforced, mineral-granule surfaced, self-sealing shingles
5. Felt underlayment 30 pound asphalt-saturated organic felts, non-perforated. Use ice & water shield for slopes less than 4:12.
6. Sheet metal flashings conform to SMACNA's "Architectural Sheet Metal" manual. Includes perimeter edge metal; penetration flashings; valley construction; and apron, step, cricket, or back

flashings.

7. Provide pre-roofing conference prior to field installation of Roofing System to comply with the manufacturer's requirements. Provide post installation inspection to comply with manufacturer's requirements.

Metal Roof with Blanket Insulation

Components

- Standing seam metal roof panels, minimum 26 gauge
  - Profile: vertical, rib, seamed joint
  - Material: aluminum zinc alloy coated steel sheet
  - Exterior finish: fluoropolymer two-coat finish system, 70% PDFY resin
- Insulation: glass fiber blanket (Minimum R-value R-19) with vapor tight edge tabs and faced on under side
- Factory primed or galvanized steel purlins
- Structural support:
  - Steel joist or truss joists
  - Pre-engineered structural framing system
- Sheet metal drip edge and flashing
- Snow guards

Performance Standards – Metal Roof with Blanket Insulation

1. Roofing and flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. System shall have ASTM E1592-94 wind uplift classification
5. No water penetration when tested according to ASTM E1646
6. Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E1680
7. "ENERGY STAR" compliant surface treatments
8. Special warranty on panel finishes by manufacturer: 20 years
9. Special weather tightness warranty by manufacturer for standing seam metal roof panels: 20 years
10. Contractor furnish 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of required manufacturer's warranties)

Construction Standards – Metal Roof with Blanket Insulation

1. Minimum 1:12 slope
2. Provide break where panels attach directly to purlins
3. Standing seam assembly: factory formed, cap seam assembly designed for concealed mechanical attachment of panels to roof purlins or deck

4. Provide pre-roofing conference prior to field installation of roofing system to comply with the manufacturer's requirements. Provide post installation inspection to comply with manufacturer's requirements.

Metal Roof with Rigid Insulation

Components

- Standing seam metal roof panels, minimum 26 gauge
  - Profile: vertical, rib, seamed joint
  - Material: aluminum zinc alloy coated steel sheet
  - Exterior finish: fluoropolymer two-coat finish system, 70% PDFY resin
- Underlayment (ice and water shield)
- Nail base rigid roof insulation
- Structural support: steel deck or cementitious deck; wood deck (lumber, plywood, or oriented strand board – OSB) permitted in accordance with Arkansas State Fire Prevention Code and Building Code
- Sheet metal drip edge and flashing
- Snow guards

Component – rigid roof insulation

- Required nail base rigid roof insulation may be installed using one or two layers.
  - Recommend that insulation be installed in two layers with joints offset in each direction, to reduce thermal bridging and make the roofing system more energy efficient

Performance Standards – Metal Roof with Rigid Insulation

1. Roofing and flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. System shall have ASTM E1592-94 wind uplift classification
5. No water penetration when tested according to ASTM E1646
6. Air leakage through assembly of not more than 0.06 CFM/sq. ft. of roof area when tested to ASTM E1680
7. "ENERGY STAR" compliant surface treatments
8. Special warranty by manufacturer on panel finishes: 20 years
9. Special weather tightness warranty by manufacturer for standing seam metal roof panels: 20 years
10. Contractor furnish 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)

Construction Standards – Metal Roof with Rigid Insulation

1. Minimum 1:12 slope
2. Underlayment: self-adhering high temperature sheet, 30 to 40 mils thick
3. Standing seam assembly: factory formed, cap seam assembly designed for concealed mechanical

attachment of panels to roof purlins or deck

4. Provide pre-roofing conference prior to field installation of roofing system to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.

Built-Up Asphalt Roof System

Components

- Alternating layers of bituminous sheets and viscous bituminous coatings over an insulated deck

Performance Standards – Built-Up Asphalt Roof System

1. Roofing membrane and base flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatment
5. Manufacturer to provide minimum ~~15~~ 20 year warranty on materials and system performance
6. Contractor to provide 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)

Construction Standards – Built-Up Asphalt Roof System

1. System description
   - BU-I-A-G (4) A (Built up membrane over insulated deck using asphalt with glass fiber ply sheets and aggregate surfacing
   - BU-I-L-G2 (coated base) (4) A (built up membrane over insulated deck using cold liquid applied asphalt with ply sheets and aggregate surfacing)
2. Base sheet (recommended by manufacturer)
3. Ply felt: asphalt impregnated, glass fiber felt, complying with ASTM D2178, Type VI or 28 lb. coated base sheets as required by manufacturer to meet warranty requirements
4. Flashing sheet
   - SB5 modified asphalt sheet, mineral granule surfaced, ASTM G162 (composite sheet) or ASTM G164 polyester
   - APP modified asphalt sheet, mineral granule surfaced, ASTM G223 (composite)
5. Asphalt materials
   - Roofing asphalt: recommended by built-up roofing manufacturer
   - Cold applied adhesive
6. Auxiliary membrane materials may include: aggregate surfacing, substrate board, vapor retarder, roof

coating, and/or protective walkways.

7. Polyisocyanurate board insulation with a minimum compressive strength of 20 psi and faced on both top and bottom
8. Provide pre-roofing conference prior to field installation of roofing system to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.
9. Minimum slope ¼:12. Reroofs may remain 1/8: 12 if current roof has 1/8:12 slope. Flat roofs are unacceptable.

Single Ply Roof System

Components

- Uniform elastomeric EPDM membrane, PVC or TPO
- ½ inch, rigid cover board
- Rigid insulation
- Vapor barrier
- ¼ inch substrate board
- Structural support: steel deck or cementitious deck or wood deck (lumber, plywood or oriented strand board, OSB)

Component – rigid insulation

- Required nail base rigid roof insulation may be installed using one or two layers
  - Recommend that insulation be installed in two layers with joints offset in each direction, to reduce thermal bridging and make the roofing system more energy efficient

Performance Standards – Single Ply Roof System

1. Roofing membrane and base flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatment
5. Manufacturer to provide 20 year warranty on materials and system performance
6. Contractor to provide 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)

Construction Standards – Single Ply Roof System

1. Minimum slope 1/4:12 for new construction. Reroofs may remain 1/8:12 if current roof has 1/8:12 slope. Flat roofs are unacceptable.
2. Loose laid/ballasted, fully adhered or mechanically fastened ethylene propylene diene monomers (EPDM), TPO, PVC membrane, 50 mils thick minimum
3. Cover board: ASTM C 1177, glass mat, water resistant gypsum substrate Type X, or ASTM C 272 gypsum wood fiber composite board
4. Insulation: extruded polystyrene board or polyisocyanurate board
5. Vapor barrier: polyethylene retarder, ASTM D 4397, 6 mils (0.15 mm) thick minimum
6. Substrate board: glass mat, water resistant gypsum board
7. Provide pre-roofing conference prior to field installation of roofing to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.

Modified Bituminous Membrane

Components

- Roofing system formed with modified bituminous membranes over an insulated deck

Performance Standards – Modified Bituminous Membrane

1. Roofing membrane and base flashings shall
   - remain watertight
   - not permit the passage of water
   - resist uplift pressure calculated according to current version(s) of applicable code(s)
   - resist thermally induced movement
   - not fail when exposed to weather
2. System shall meet Class 4 per UL 2218 impact test
3. System shall meet UL Class "A" for fire resistance
4. "ENERGY STAR" compliant surface treatments
5. Manufacturer to provide a minimum 20 year warranty on materials and system performance
6. Contractor to provide 2 year guarantee on materials and workmanship for all system components and accessories (in accordance with terms and conditions of manufacturer's warranties)

Construction Standards – Modified Bituminous Membrane

1. System description – provide one of the following:
   - MBA(1)-i-(T,M, or L)-G(2)-M or A (modified bitumen APP roofing membrane over insulated deck, mopped or set in cold, liquid-applied adhesive, with glass fiber ply sheet and mineral or aggregate surfacing)
   - MBS(1)-I-(TM, or L)-G(2)-M or A (modified bitumen SBS roofing membrane, over insulated deck, mopped or set in cold, liquid-applied adhesive, with glass fiber ply sheet and mineral or aggregate surfacing)
2. Cap sheet – provide one of the following:
   - SBS modified bituminous cap sheet: SBS modified asphalt sheet, smooth surfaced, dusted with fine parting agent on both sides or granular surfaced; suitable for application method specified; manufacturer's standard thickness and weight; for use of reinforcing type as follows:
     - Use: roof membrane and base flashing
     - Reinforcing: composite woven (ASTM G162) and glass fiber mat
   - APP-modified cap sheet, smooth surfaced: atactic polypropylene modified asphalt sheet, smooth surfaced; suitable for application method specified;

manufacturer's standard thickness and weight; for use and of reinforcing types as follows:
- Use: roof membrane and base flashing
- Reinforcing: composite woven (ASTM-G162) and glass fiber mat

3. Auxiliary membrane materials may include: protective surfacing (aggregate surfacing or roof granules); roofing asphalt (as recommended by system manufacturer); substrate board (if required by design professional or roof manufacturer); cold applied adhesive: vapor retarder (if required by project conditions by design professional or manufacturer; and protective walkway materials recommended by system manufacturer.
4. Base sheet: unperforated, asphalt impregnated and coated glass fiber sheet, dusted with fine mineral surfacing on both sides
5. Base ply felts: asphalt coated, glass fiber felt, complying with ASTM D2178, Type VI or 28 lb. coated base sheets as required by manufacturer to meet warranty requirements
6. Polyisocyanurate board insulation with a minimum compressive strength of 20 PSI and faced both top and bottom. Provide tapered insulation, preformed saddles, crickets, tapered edge strips and other insulation shapes as required for "positive drainage."
7. Insulation accessories as may be recommended by the insulation manufacturer and as compatible with membrane roofing including: fasteners; cold fluid applied adhesive; wood nailer strips; and cover board (perlite insulation board or cellulosic-fiber insulation board)
8. Provide pre-roofing conference prior to field installation of roofing to comply with the manufacturer's requirements. Provide post installation inspection per manufacturer's requirements.
9. Minimum slope ¼:12. Reroofs may remain 1/8:12 if current roof slope is 1/8:12. Flat roofs are unacceptable.

Openings

Examples – Openings

- View windows
- Clerestory windows
- Roof monitors, unit and tubular skylights
- Entrance assemblies
- Interior doors
- Exterior doors

Standards – Doors and Windows

1. Air infiltration rate of less than 0.4 CFM/ft performance class AW and grade 65 by the American Architectural Manufacturing Association (AAMA)
2. Testing for thermal performance according to AAMA 1503
3. Not less than 26 STC when tested for sound transmission loss according to ASTM A90
4. Operating window sash to be factory glazed.
5. Windows to be double glazed and have low emissive coating.
6. Glass for exterior doors and sidelights shall comply with state fire prevention codes. Provide vestibule at main entrance.
7. In un-rated assemblies, glass for interior doors shall be a minimum of ¼ inch clear tempered.
8. Interior doors to be solid-core wood and factory finished except in PE, Shop, Gyms, Labs and Locker rooms. Unfinished doors may be used for renovations and additions. 1 ¾" 16 ga. insulated hollow metal doors with 18 ga. frames may be used in lieu of wood.
9. For a high degree of sound isolation on both interior and exterior doors, provide full perimeter gaskets and automatic door bottoms with a neoprene element for acoustical doors and an STC rating appropriate for the intended use.
10. On exterior doors, provide full perimeter weather-stripping and thresholds.
11. Exterior hollow metal doors shall be insulated.

Performance Guidelines - Openings

- Provide uniform light distribution
- Provide low glare
- Reduce energy costs
- Mitigate safety / security concerns
- Low maintenance
- Provide day lighting that uses diffused or reflected sunlight
- Provide window views to help eye health and help reduce stress
- Encourage "top lighting" to provide best uniform illumination
- Consider natural daylight for all academic spaces
- Minimize east and west facing glass

Guidelines – Doors and Windows

- Consider selection of interior doors constructed with recycled or recovered content and low VOC (volatile organic compounds) if available
- Consider selection of interior doors with wood veneers harvested from sustainable forests if available

Interior Partitions

Examples – Interior Partitions

- Concrete masonry walls (CMU)
- Glazed tile and ceramic tile
- Metal or wood studs with gypsum wallboard
- Veneer plaster over gypsum wallboard
- Operable partitions
- Folding partitions
- Demountable partitions

Performance Standards – Interior Partitions

1. Easy to clean materials
2. Resistant to moisture and inhibits the growth of biological contaminants
3. Impact resistant materials in high traffic areas
4. Durable, long life materials
5. Dimensional planning to reduce waste (i.e. 4 ft. by 8 ft. wallboard)
6. Use materials that meet industry consensus standards for VOC emissions.

Guidelines – Interior Partitions

- Consider the design of a product for disassembly and its parts to be reused, remanufactured, or recycled
- Consider acoustical qualities
- Consider recycled/recyclable
- Local (within 500 miles) materials and products where possible
- Consider renewable materials

Concrete Masonry Walls
Structural Glazed Tile Walls
Ceramic Tile

Construction Standards – Concrete Masonry Walls, Structural Glazed Tile Walls, Ceramic Tile

1. CMU walls: ASTM C90, 1900 psi compressive strength, normal weight aggregate or FM 1500 psi.
2. Tooled or struck mortar joints for cleanability. Use Type "S" mortar for loadbearing walls and Type "N" for non-loadbearing walls.
3. Glazed structural clay tile: ASTM C 126, Type I (single-faced units) and Type II (double-faced units)
4. Ceramic tile: for materials ANSI A 137.1 "Specifications for Ceramic Tile"; for installation ANSI 108 series and TCA handbook
5. Glazed wall tile: 5/16 inch thick, flat tile with cushion edges
6. Grout tile using latex Portland cement grout. Exception: use chemical resistant epoxy grout in kitchens
7. Control joints required for CMU partition walls per design.

Performance and Benefits – Concrete Masonry Walls, Structural Glazed Tile Walls, Ceramic Tile

- Impact resistant
- Easily cleanable & maintainable
- Good acoustic qualities
- Daylight enhancement qualities

Metal or Wood Studs with Gypsum Wallboard Veneer Plaster over Gypsum Wallboard

Construction Standards – Metal or Wood Studs with Gypsum Wallboard, Veneer Plaster over Gypsum Wallboard

1. Sound transmission class: Minimum STC of 41 in academic areas
2. Steel framing: comply with ASTM C754 and G40 hot-dip galvanized zinc coating
3. Gypsum wallboard: ASTM C36, Type X 5/8 inch thick
4. Type X wallboard required at rated partitions
5. Moisture resistant wallboard to be used in high moisture areas
6. Metal studs: ASTM C645, 20 gauge sheet base metal
7. Provide control joints in partitions 30 feet maximum
8. Veneer plaster: ASTM C58T consisting of separate base coat and finish coat
9. Wood stud grade marked as required by the applicable building code
10. Abrasive and impact resistant materials in high traffic areas

Performance and Benefits – Metal or Wood Studs with Gypsum Wallboard, Veneer Plaster over Gypsum Wallboard

- Economical
- Relatively easy to move or remove
- Accommodates periodic finish color changes
- Good sound barrier when used with acoustical insulation

Operable Partitions, Folding Partitions, Demountable Partitions

Performance Standards – Operable Partitions, Folding Partitions, Demountable Partitions

1. Easily moved from opened to closed (stored) position by manual or electrical operating mechanism.
2. Sound transmission class (STC) as provided below in Construction Standards, or as required to meet the sound isolation requirements for the functional use of the rooms or spaces to be divided, whichever is greater.
3. Options for tack and marker-board surfaces.
4. Overhead structural support with minimal deflection as required for functional operation.
5. Demountable partitions convenient to disassemble and relocate.

Construction Standards – Operable Partitions, Folding Partitions, Demountable Partitions

1. Operable partitions: panels ½ inch gypsum board laminated with 3/16 inch natural cork (STC 47) or steel face sheet (STC 50); Panel finish-vinyl fabric, carpet, tack boards or marker boards; pedestrian pass doors as required.
2. Accordion folding partitions: steel or aluminum suspension tracks; manually operated; interior 22 gauge steel panels for sound isolation; vinyl coated fabric finish.
3. Demountable partitions; face panels of gypsum board painted or covered with vinyl; face panels of steel painted or covered with vinyl or plastic laminate; doors and windows available as required.
4. Non-combustible products that meet rated fire or smoke separation building code requirements.

Interior Floor Finishes

Performance Standards – Interior Floor Finishes

1. Water-based coatings and adhesives
2. Nontoxic and non-polluting materials (low VOC)
3. Resistant to moisture or inhibits the growth of biological contaminants
4. Can be cleaned with non-polluting maintenance products
5. Suitable for heavy use areas
6. Prior to finish flooring installation, provide moisture testing of concrete floors to meet finish flooring manufacturer's requirements

Examples – Interior Floor Finishes

- Soft Surface Flooring
  - Vinyl composition tile (VCT) and vinyl enhanced tile (VET)
  - Carpeting and carpet tiles
  - Rubber flooring
- Hard Surface Flooring
  - Porcelain ceramic tile (CT) with recycled content
  - Quarry tile (QT)
  - Terrazzo tile with recycled content
  - Concrete finish
  - Wood (athletic)
  - Resinous epoxy
  - Hardwood

Guidelines – Interior Floor Finishes

- Maximize recycled/recyclable content
- Minimize PVC content

Soft Surface Flooring

Examples

- Vinyl composition tile (VCT) and Vinyl enhanced tile (VET)
- Linoleum and Sheet vinyl
- Carpet (CAR) and carpet tiles
- Rubber flooring

Construction Standards – Soft Surface Flooring

1. Carpet: minimum recycled content guideline of 25%, minimum 17 ounce face weight
2. Low-VOC emitting materials. Resilient VOC content limited to 340 grams/liter or less
3. Maximum acceptable moisture emission rate for concrete sub floors:
   - Carpet and sheet vinyl – 3 lbs/1,000 sq. ft. per 24 hours or less
   - VCT – 5 lbs./1,000 sq.ft.
4. Use water-based low VOC adhesives, sealants, and cleaning products
5. Sheet vinyl with backing: 0.080 inch thick
6. Linoleum: 0.10 inch (2.5mm) minimum thickness

Performance Benefits - Soft Surface Flooring

- Easy to clean and maintain
- Acoustical benefits
- Physical comfort (cushion)
- Safety for small children

Performance Guidelines - Soft Surface Flooring

- Maximize recycled / recyclable content
- Consider meeting Carpet and Rug Institute Green Label Plus criteria
- Research and use carpet reclamation programs where available for disposal of existing carpet
- Minimize PVC content where possible
- Consider life cycle costs including materials, cleaning and maintenance

Hard Surface Flooring

Examples

- Porcelain ceramic tile (CT) with recycled content
- Quarry tile (QT)
- Terrazzo tile with recycled content
- Concrete finish
- Wood (athletic)
- Resinous Epoxy

Construction Standards – Hard Surface Flooring

1. Low-VOC emitting materials: flooring, adhesives, grouts, caulk, or sealants
2. Comply with ANSI ceramic tile standard
3. Mortars and grouts should be based upon the installation conditions and as recommended by the Tile Council of America
4. Use epoxy-modified grout mixture for high moisture areas
5. For concrete floors use two-component, water-based, low odor, dust proofing, color pigmented epoxy sealer, or stain
6. Wood gym floors:
   - maximum 4.5 pounds per 1,000 sq.ft. moisture emission in slab
   - two year guarantee
   - second and better grade, maple strip flooring

Performance Benefits - Hard Surface Flooring

- Easy to clean and stain resistant
- Highly durable
- Reasonably economical based on life-cycle cost analysis

Performance Guidelines - Hard Surface Flooring

- Consider finishes and/or materials suitable for use in high traffic areas
- Wood flooring: Use certified hardwood, salvaged wood and/or laminated or veneered wood products where possible

Wall and Ceiling Finishes

Examples – Wall and Ceiling Finishes

- Paints
- Stains and transparent finishes
- Multi-color coatings Rubber Flooring
- Vinyl-coated fabric wall covering-PVC free
- Suspended acoustic ceiling systems or acoustical panels
- Sprayed-on acoustical treatment
- Acoustical wall treatment
- Abuse resistant acoustical panels
- Metal Ceiling Panels
- Wood Ceilings

Performance Standards – Wall and Ceiling Finishes

1. Non-toxic and non-polluting materials (low-VOC)
2. Can be cleaned with non-polluting maintenance products
3. Specify only composite wood and agri fiber products, or products containing these as substrates, that are third-party certified to comply with formaldehyde emissions requirements in the product's ANSI standard, the Composite Panel Association Environmentally Preferable Product Standard, or that contain no added urea formaldehyde resins. Do not use in high humidity or wet areas.

Performance Guidelines – Wall and Ceiling Finishes

- Maximize use of recycled content products
- Consider initial costs and life cycle costs
- Consider products that can be repaired or replaced by local persons
- Consider ease of installation
- Consider sound absorbing qualities
- Consider use of locally available materials
- Consider reflectance values of walls and ceilings
- Consider wall and ceiling products or systems appropriate for specific functional spaces with and acoustical properties

Paints and Vinyl Wall Coverings

Examples – Paints and Vinyl Wall Coverings

- Paints
- Stains and transparent finishes
- Multi-color coatings Rubber flooring
- Vinyl-coated fabric wall coverings – PVC free

Construction Standards – Paints and Vinyl Wall Coverings

1. Use low-VOC emitting paints
2. Use Water-based Acrylic Latex paints in lieu of solvent-based paints on non-metal surfaces
3. Use Alkyd Enamel paints on metal surfaces
4. Apply water-based paints within a temperature range in accordance with the manufacturer's recommendations
5. Vinyl-coated fabric wall covering: total weight minimum 22 oz. / sq.yd.; adhesive VOC content of 50 grams/liter or less
6. Provide proper ventilation during application, curing and occupancy
7. Use water-based epoxy paints in interior areas with high humidity or subjected to surface moisture

Performance Benefits - Paints and Vinyl Wall Coverings

- Easy to clean

Performance Guidelines - Paints and Vinyl Wall Coverings

- Wall coverings: maximize use of recycled and recyclable materials
- Consider light value colors to enhance day-lighting
- Paints: Consider abrasion resistance; hide ability, odor, overall appearance and application method

Acoustical Ceilings and Panels

Examples – Acoustical Ceilings and Panels

- Suspended acoustic ceiling systems or acoustical panels
- Sprayed-on acoustical treatment
- Acoustical wall treatment
- Abuse resistant acoustical panels
- Metal Ceiling Panels
- Wood Ceilings

Construction Standards – Acoustical Ceilings and Panels

1. Ceiling suspension system: Conform to ASTM C 635; main and cross runners roll-formed from cold-rolled steel sheet, pre-painted; Hot-dip galvanized per ASTM A 653, G30 coating
2. Ceiling panels shall meet ASTM C 1264 for Class A materials
3. Acoustic ceiling panels shall have a minimum Noise Reduction Coefficient (NRC) 0.55 and Ceiling Attenuation Class (CAC) 35 rating
4. Spray-on acoustical treatment: minimum NRC of 0.65 per ASTM C423, and a maximum flame spread rating of 15, and smoke developed of 0 per ASTM E84; thickness as necessary to accomplish design R-value and STC values
5. Acoustical wall treatment: rigid glass-fiber board and fine-grain cork core faced with fabric
6. Abuse-resistant acoustical panels: flame spread rating less than 25; wood fibers and hydraulic cement binder composition
7. Specify low formaldehyde acoustical ceiling panels

Performance Benefits - Acoustical Ceilings and Panels

- Good sound absorption qualities
- Low cost ceiling application

Performance Guidelines - Acoustical Ceilings and Panels

- Consider ceiling tiles that contain a minimum recycled content of 20%
- Ceiling panels anti-microbial treatment is optional