SECTION 00 90 00

SITE DESIGN GUIDELINES

PART 0 - PURPOSE

A. Describe broad guidelines for design of schools.

B. Establish materials qualities and applications.

C. Describe materials and conditions, which do not easily fit into specific specification sections.

D. See specific sections of Design of Construction Standards for additional requirements.

PART 1 - SAFETY

A. Site:

1. Retaining Walls: Use only if necessary and at minimum height.
    a. Provide guard rails if walls exceed 30 inches in height, and as required by Code.
    b. Provide ADA handrails if retaining walls are adjacent to walks.
2. Winter Ice: Site design to consider possible icing conditions at:
    a. Playgrounds
    b. Parking lots
    c. Sidewalks
    d. Service Drives and Docks
    e. Snow removal storage areas adjacent to paved areas or walks.
3. Curbing: areaways shall have curb at least 6 inches above surrounding grade.
4. Avoid use of areaways where possible.
    a. Grating :
        1) Areaways and site drains shall be covered with appropriate grating including padlock or bolt-down securing features.
        2) Gratings in playgrounds and other foot traffic areas must have pedestrian safe grating with closely spaced bars. Maximum clear spacing will be 1/4 inch.
        3) Access:
            a) If areaway gratings are large, provide at least one smaller section within the grate that can be opened manually by one person.
            b) If areaway is over 4 feet deep, provide fixed access ladder on interior of secured portion of areaway.
            c) Provide drainage piping or provisions for sump pumping from areaway floors.
    b. Floor:
        1) Areaway floor shall be minimum of 4-inch thick concrete slab.
5. Parking: Design parking and service drives so that there is a traffic separation between these areas and the playground surfaces. Provide direct access for students to go from buildings to playground areas. Students should not be required to cross through vehicle drives or parking areas to reach playgrounds.

PART 2 - SECURITY

A. Lighting: Provide security lighting:

1. At areas subject to vandalism.
2. At building entrances and exits.
3. At building recesses or yards screened from street lighting.
4. General security lighting shall be provided remotely located from building and directed toward building. Lighting shall illuminate all portions of the building.

B. Screening

1. Avoid designing building recesses or courtyards, which could provide hiding areas, which are not visible from the street.
2. Avoid low, thick shrubs, which could provide hiding areas.

PART 3 - LOADING DOCKS

A. Kitchen:

1. Elementary:
   a. Kitchen: Provide a 6 inch high concrete platform unless site conditions and budget allow for full height dock similar to Middle School and High School criteria.
2. Middle Schools And High Schools:
   a. Kitchen: 4'-0" high concrete with bumper protection
   b. General Service Locations: Review proposed service locations with DPS Engineering and DPS.

PART 4 - OTHER DELIVERY AREAS

A. Equipment and Supplies to be delivered at appropriate location(s) specified by DPS.

B. Boiler room and major mechanical equipment spaces may require vehicle access to adjacent doors or designated loading docks.

C. Delivery of books and educational supplies should be considered.

PART 5 - DUMPSTERS

A. DPS must approve location and material colors and types for dumpster enclosures.

B. Gates are prohibited at dumpster enclosures. A/E shall work with the City and County of Denver to design dumpster enclosures that will be accepted without gates.

C. Obtain trash truck configurations (front-loading or side-loading) and dimensions from the DPS. Design dumpster access drives and facilities to accommodate turning radius and loading configuration of trash trucks.

D. Heavy concrete pavement is required in areas of trash truck wheel loads adjacent to trash pads and enclosures.

E. Coordinate dumpster pad dimensions with A/E team and DPS.

F. Obtain dumpster container quantity and dimensions from the DPS.

G. Locate near kitchen or other designated building access points for custodial use.

H. Used by custodial staff for routine trash disposal.

I. Serviced by front-loading trash collection truck.

J. Pads for dumpster enclosures will be heavy duty concrete. Refer to Division 3, Concrete and Section 32 13 13, Concrete Paving.

1. Minimum depth: 6 inches, or as specified in geotechnical report.

2. Minimum reinforcement: #4 rebar, 18 inches on center, each way, or as recommended in geotechnical report.

K. Provide landscape screening where possible (no gates or other operable screening devices).

PART 6 - EXCAVATION AND FILL

A. Inspection by Owner's Testing Agency does not relieve A/E of contract responsibilities.

B. Soils report:

1. A report of subsurface investigations, completed by a DPS-employed Geotechnical Engineer, will be made available for inspection (by appointment only) at the office of the A/E, the Geotechnical Engineer and the Owner. A copy of this report will be provided to the Contractor upon request.

2. Geotechnical report to provide discussion of the following structural recommendations:

a) Allowable soil bearing capacity for soil-supported foundations or allowable rock bearing capacity for rock-supported foundations.

b) Deep foundation allowable design capacities and estimated embedment depth (if required by project).

c) Deep foundation requirements such as anticipated drilling/driving obstacles, whether casings are required and potential for groundwater.

d) Lateral soil design values including at-rest, active and passive pressures along with coefficient of friction.

e) Potential of collapsible or expansive soils.

f) Potential for sulfate attack.

C. Hazardous materials

1. Standards for hazardous materials are located in standard Section 01 35 43, Hazardous Material Proceedures.

2. Owner will test on-site soils for hazardous materials prior to export.

a) DPS will schedule testing with DPS Hazardous Materials Specialist.

b) DPS will consult with DPS Hazardous Materials Specialist to determine frequency of tests and optimal number of tests that will be required.

c) A/E shall assist the Owner in determining location and frequency of testing.

3. Contractor is responsible for testing of off-site soils for hazardous materials prior to import.

a) Contractor shall use DPS Hazardous Materials Specialist for testing of import materials.

b) Contractor shall consult with DPS and DPS Hazardous Materials Specialist to determine optimal frequency of tests.

D. Existing buried structures:

1. A/E shall coordinate with the DPS-employed Surveyor in the attempt to identify existing building foundations that may be present in excavation areas.

2. Indicate existing foundations in the construction drawings.

3. Removal of existing buried structures shall be included in the construction contract.

E. Work involving structural fill material shall not commence until the Geotechnical Engineer has issued written acceptance of proposed import material.

1. Contractor shall bear the cost for testing and verification of off-site materials to be used as structural fill.

2. The Contractor shall provide access to the borrow site to permit the Geotechnical Engineer to observe the site conditions and remove samples of the proposed structural borrow fill material as required by the A/E.

F. Contractor shall be responsible for locating all existing utilities (including depth), both public and private, that may conflict with the proposed construction.

1. Contractor shall physically verify location of all buried utilities within 20 feet of proposed excavations.
2. Physical location of utilities shall be accomplished by hand excavation and potholing until the utility is encountered. Restore existing pavements and other surfaces damaged by potholing in accorrdance with related Sections 01 73 29, Cutting and Patching and 02 41 00 Demolition.
3. If utility is reported to be within 20 feet of the excavation and is not found by potholing, the Contractor shall contact the Owner and A/E for instructions.
4. Utilities with uncertain location shall be brought to the attention of the A/E and the Owner.
5. Contractor shall stop excavation upon encountering unexpected subsurface utilities during excavation or trenching, and the A/E shall be notified immediately. Work shall not resume until the A/E has issued a directive.

PART 7 - CONCRETE FORMING AND ACCESSORIES

A. Inspection by Owner's Testing Agency does not relieve the A/E of contract responsibilities.

B. Indicate anticipated bottom and actual top elevation of each drilled pier on the foundation plan or other appropriate drawing within the Contract Documents. The bottom elevation shall be identified as ±10%. These anticipated lengths will be used to establish total length of all piers for bidding.

C. Cost Adjustments

1. NO EXTRA COST WILL BE ALLOWED NOR CREDIT EXPECTED FOR OVERRUN OR UNDERRUN OF DRILLED PIER LENGTH EXCEPT AS INDICATED BELOW.
2. Unit prices are not allowed in lieu of indicating anticipated lengths (see above).
3. Unit price should be included with bid to minimize future disputes regarding overrun/underrun of pier lengths.
4. The Owner's Testing Agency will determine the depth required to reach satisfactory bearing.
5. The Owner will not consider requests for additional payment for pier lengths unless the total installed length of all piers collectively exceeds 10% of the total length of all pier lengths indicated in the Contract Documents.
6. Owner reserves the right to request credit for pier lengths not installed when the total length of all piers is less than 10% of the total length of all pier lengths indicated in the Contract Documents.
7. Measurement of pier lengths shall be to the nearest 0.10 feet.

PART 8 - EXTERIOR IMPROVEMENTS

A. Accessibility: Coordinate site design, including playground areas, with ADA accessibility requirements.

B. Playground Areas:

1. Refer to Section 00 92 00 - Playground Standards.
2. Refer to Learning Landscapes Standards and website: http://www.activeenvironments.com/schoolyards/learning-landscapes/
3. Fixed playground equipment and furnishings shall be included in Construction Contract (backstops, basketball goals, tetherball posts, etc.).

C. Site Grading and Drainage:

1. Refer to other Division 32 standards for stormwater quality and detention requirements.
2. For safety reasons, standing water of any depth greater than ½-inch is not allowed on any area of the site.
3. Provide trench/chase drains across walks where concentrated stormwater runoff is likely to occur (i.e., roofdrain downspouts or grass swales).

4. Minimum Slopes (refer to these standards unless greater slope requirements are indicated by soils report or by ADA accesability requirements).
    a) The first 10 feet from buildings and other structures in landscaped or otherwise impervious areas: 10.0 percent minimum directed away from the building face.
    b) Sodded play fields: 2 percent minimum.
    c) Asphalt play area: 2 percent minimum.
    d) Concrete play area: 1.5 percent minimum.
    e) Concrete V-Pans: 1.5 percent minimum.
    f) Concrete walks and pavement: 0.5 percent minimum.
    g) Parking: 2 percent minimum.
        i) Design parking lots to drain toward curbs and away from building entries where possible.
        ii) Design so that drainage collects outside of pedestrian and vehicular traffic patterns.
    h) Channelized drainage: 1.5 percent minimum.
    i) Provide cross drainage on walks, steps, and ramps.

D. Lawns, trees, planting beds, and shrubs:
    1. Design lawns in shapes and dimensions that large (10') riding mowers can easily negotiate.
    2. Steep grades, sharp transitions, tight corners, and dead ends that are not likely to be mowable with a riding lawn mower or that will get scalped by the mower should be avoided.
    3. Keep site furnishings a minimum of 8 inches from lawn edges to prevent accidental damage from mowers.
    4. For security reasons trees and shrubs should be selected and placed to avoid screened or concealed areas.
    5. Locate and space trees and shrubs so that adjacent grass areas can be mowed with a 10' wide mower. Fences, curbs, buildings, and other obstructions to mowing and pruning operations shall be considered when placing trees.

E. Planted Berms:
    1. Use of berms is discouraged and is only allowed with the approval of DPS.
    2. Slope maximum is horizontal to vertical ratio of 3:1.
    3. Plant material should be selected to limit erosion and maximize slope retention.

F. Pads:
    1. Provide concrete pads at site fixtures and furnishings such as bleachers, tables, seating, bike racks, trash cans, etc. in minimum 6-inch thickness or other minimum thickness specified by the geotechnical report.
    2. Pads are to be sloped to drain.
    3. Pads shall extend a minimum of 12inches beyond the furnishing that will be placed on them.
    4. Trash cans are to be surface mounted on concrete pads in asphalt or on concrete pavement.

G. Mowing strips:
    1. Provide minimum 12-inch wide concrete apron adjacent to building at sodded areas.
    2. Provide 12-inch wide concrete mow strip beneath fencing located within lawn areas.
        a) Mow Strip shall be centered along the length of fence.
        b) Mow strip shall accommodate (not impede) drainage flowing beneath fence. Add drains or chases if necessary to ensure water does not accumulate or pond on or around the mow strip.

3. Provide concrete aprons around other site features that are located adjacent to or within lawn areas, including but not limited to, area drains, water system valve boxes, cleanouts, site monuments or marquis signs, [site specific examples], etc.
4. Provide 24-inch wide concrete "mow band" where vehicle overhang would otherwise extend over an irrigated landscape area.

H. Design exterior door stoops and subgrade to prevent frost heave and excess settlement. Refer to standard Section 32 13 13, Concrete Paving.

I. Ramps: Meet District Accessability Requirements.

J. Vehicle Parking: Refer to DPS Parking Standards for specific parking lot guidelines.
1. Coordinate quantities and types of parking with DPS Educational Specifications, the City and County of Denver, and DPS.
2. Standard stall size: 9' wide x 20' deep.
3. Aisles: 24' (for 90° parking).
4. Include paint striping in construction contract and engineering drawings.
5. Wheel Stops:
   a) Are only required in cases where the protection of adjacent site features is required.
   b) Maximum height of 6 inches.
   c) Pre-cast concrete having a minimum 4,000 psi at 28-day strength.
   d) Vertical gap on the underside to promote drainage.
   e) Secure in place with #5 rebar at either end to 18-inch minimum depth. Apply sealant to holes in pavement as specified in related pavement Sections.
6. Where vehicle parking abuts ECE (Early Childhood Education) playgrounds, protective bollards must be installed between the two areas.
7. When resurfacing a parking lot, evaluate the opportunity to meet the required accessible parking spaces required by the AHJ or ADA whichever is more stringent.

K. Bicycle parking:
1. Provide number of bicycle parking spaces required by Denver zoning.
2. Coordinate number of bicycle parking spaces and locations with DPS.

L. Curbing:
1. 6" high concrete with 18" to 24" pan
2. "Spill pans" and "Catch pans" shave have same gutter width.
3. Transitions between catch and spill pans will be maximum of 5 feet.
4. Specify depth of catch and spill, typically 1-1/2 inches to 2 inches.

M. Permanent Site Fencing: Refer to Section 32 31 13, Chain Link Fences and Gates, for more information.

N. Public Utilities:
1. Gas meters: Provide gas meter fencing and concrete pad.
2. Transformers: Enclosures at pad-mounted transformers are not required.
3. Refer to Section 33 00 00, Utilities.

O. Mechanical and Electrical Equipment: Provide enclosures where required for equipment protection and safety.
1. Chain link fencing and roof is required to completely enclose cooling towers at grade and on open roofs.

2. Refer to Divisions 22, 23, 25 and 26 standards.

P. School Buses: Obtain quantity and dimensions of school buses for the school site from DPS and incorporate into the design of the bus lanes and related transportation plans.

Q. DPS delivery vehicles: Obtain dimensions of other DPS delivery vehicles from DPS.

R. Sustainability: Water quality (LEED), Denver water board, urban storm water, storm water, take drainage pit info from safety group.

PART 9 - NEW TENNIS COURT AND RENOVATION OF EXISTING

A. Coordinate scope of tennis court surface work with DPS. Scope may include patching and re-finishing of existing tennis court surface or complete removal of existing structural substrate and replacement with post-tensioned system.

B. Tennis court design is dependent upon several factors including soil characteristics and other engineering factors. It is recommended that a licensed Professional Engineer be retained for design considerations for tennis court reconstruction.

C. Coordinate requirements for geotechnical soils investigation and soils testing and inspections with DPS.

D. Inspection by Owner's Testing Agency does not relieve A/E of contract responsibilities.

E. In the absence of other information, the following publications will assist in the design process for tennis court construction.

1. USTC&TBA, United States Tennis Court and Track Builders Association Guidelines for Tennis Court Construction, web site: http://www.ustctba.com/guidelines-tennis/contents.html.

2. Post-Tensioning Institute, Post-Tensioning Manual.

3. Post-Tensioning Institute, Design and Construction of Post-Tensioned Slabs-on-Ground.

F. Pads: Refer to other Division 2 standards.

G. Signs:

1. Signs shall be provided under the construction contract.

2. Include sign locations, dimensions, and text in the Contract Documents.

3. Coordinate signage design with DPS.

PART 10 - CONCRETE PAVING

A. Extensive A/E cross-coordination is needed between this standard and other standards, including but not limited to Divisions 31 and 32.

B. Inspection by Owner's Testing Agency does not relieve the A/E of contract responsibilities.

C. Indicate all concrete paving, including walks, curb and gutters, steps, ramps, other flatwork and drives in construction documents. Plans shall include dimensions, radius centers, and coordinates, etc., of sufficient detail that all items can be located and verified in the field. Use enlarged plans if necessary. Detail special conditions such as curved edges.

D. Material Resource:

1. Fly ash is not allowed in concrete mix designs.

2. Recycled on-site concrete from demolition may be used as course aggregate and/or base course if applicable and approved by geotechnical engineer. Submit material per Section 01 33 00, Submittal Procedures.

3. Concrete pigments.

a) Acceptable pigments include recycled glass, aggregates and powder.

E. Fire truck access around buildings must be considered. This could be on concrete walks, concrete or asphalt drives or asphalt play areas.

1. Use of Grass Crete an acceptable means of minimizing width of concrete with DPS and local fire department approval.

F. City Property and Right-of-Way:

1. Design walks, curbs, driveways, gutters, curb chases, wheelchair accessible curb ramps, and other elements on City Property according to City requirements.

2. If DPS requirements exceed City requirements, then work performed on City property shall be completed to DPS requirements.

G. Maintain a minimum slope of 1.5% on all concrete surfaces.

H. Clearly indicate control joints and expansion joints.

1. Scored joints:

a) ¼ inch deep by ¼ inch wide.

b) Saw cut preferred.

c) Maximum spacing: 10 feet or as recommended by geotechnical report.

2. Provide expansion joints at the following minimum locations:

a) Between buildings and walks, steps, ramps and other exterior concrete.

b) Where concrete paving is confined (i.e. between building and curb or in building courtyard).

c) Where piping penetrates concrete paving.

d) Maximum distance between expansion joints: 100 feet.

I. Acceptable surface treatments:

1. Stamping.

2. Metal insets.

3. Acid wash finish.

4. Brush finish.

5. Sandblasted:

a) Must specify epoxy resin applied following sandblasting to prevent silting.

J. Consult with DPS and Owner's Geotechnical Engineer to determine paving thickness requirements for various locations.

1. Walks: Minimum 4 inch thick with glass fibermesh reinforcement and/or rebar reinforcement.

2. Fire truck, bus, delivery truck and trash truck accesses require heavy duty paving thickness: Minimum 6 inch thick with fibermesh reinforcement and/or rebar reinforcement per engineering requirements.

3. Walks which may be crossed by drives or to fire access on playgrounds, etc.: Minimum of 6 inch thick concrete paving (or equivalent asphalt paving) per engineering requirements.

K. Edges and transitions: Provide a minimum of 6 inch thickened edges with #4 rebar at edges abutting lawns, at each side of expansion joints, and for the following special conditions:

1. At building entrances (door stoops), provide slip joint dowel through expansion joint between building floor slab and exterior concrete, or other method designed to prevent frost heave or excessive settlement.

L. Sleeving:

1. Refer to Section Irrigation, for sleeving requirements under paved areas for irrigation piping and wiring.

2. Refer to Section 33 00 00, Utilities, for sleeving requirements under paved areas for underground utilities.

M. Reinforcement:

1. A/E shall coordinate with DPS for determination of areas where fibermesh reinforcing, welded wire fabric, and rebar reinforcement are required.

PART 11 - ASPHALT PAVING

A. Extensive A/E cross-coordination is needed between this standard and other standards, including but not limited to Sections 31 23 00, Excavation and Fill.

B. Inspection by Owner's Testing Agency does not relieve the A/E of contract responsibilities.

C. Design asphalt pavement according to recommendations of the geotechnical report.

D. Reference Standard: Standard Specifications for Road and Bridge Construction, Colorado Department of Transportation (CDOT).

E. Environmental compliance: Comply with applicable portions of local environmental agency regulations pertaining to asphalt paving systems.

F. Indicate and fully detail areas of new asphalt pavement, asphalt overlay, and patching of existing pavement.

G. Fire truck access around buildings must be considered. This could be on combinations of concrete walks, concrete or asphalt drives and/or asphalt play areas.

H. City property and City Right-ofWay:

1. Design asphalt pavement work on City property according to City requirements.

2. If DPS requirements exceed City requirements, then work performed on City property shall be completed to DPS requirements.

I. Consult with DPS and Geotechnical Engineer to determine paving thickness requirements for various locations at each project site.

1. Fire truck, bus, delivery truck and trash truck accesses require heavy duty paving with increased paving thickness (a minimum of 6" thick).

2. New pavements in driveways and parking lots shall be a minimum of 4" thick. Where thicker pavements are required, the base course thickness shall be not less than 60% of the total pavement thickness and the maximum surface course thickness shall be 3" thick.

3. Paving overlay thickness shall be a maximum of 3 inches and a minimum of 2 inches on the designated driveway areas. Refer to plans for specified thickness of driveway overlays. All other paved areas shall receive a 2-inch thick overlay.

J. Edge Details: Asphalt-paved playground areas shall terminate in concrete ribbon curbs. Typical concrete ribbon curbs will be flush with the edge of asphalt pavement, 6 inches wide and 18 inches deep.

K. Sleeving: See other Divisions 31 and 32 standards for information regarding required sleeving under paved areas for irrigation piping and wiring, and for information regarding required sleeving for gas, electrical, and other utilities.

L. A minimum slope of 2% is needed for asphalt paving.

PART 12 - BRICK UNIT PAVING

A. Masonry Paving shall not be permitted without approval of DPS. DPS will consult with the DPS Structural Shop before issuing approval for masonry paving.

B. Acceptable masonry paving units include brick, stone, concrete, grass pave or other decorative unit paving.

1. When stone is used, specify name, type and source.

2. Minimum strength: 4,000 psi for concrete based masonry units and 2,500 psi for brick.

C. Masonry paving units are recommended, but not limited to, plaza and pedestrianareas where vehicular traffic is limited or prohibited.

D. Brick Masonry paving shall be placed on minimum 4 inch concrete slab bed with paving units laid on mortar bed with grouted joints.

E. Sand set masonry paving shall be limited to where units must be removed for functional reasons such as the placement of engraved unit for fund raising purposes. Sand set areas shall be no larger than 10 feet in any dimension and must be contained by concrete curbs or abutting permanent structures. The containing border materials shall be so constructed that they will be permanent and shall withstand normal wear and environmental conditions.

F. Brick Masonry paving materials intended for installation over concrete beds shall be dense, impervious materials designed for exterior, horizontal installation.

G. Porous Paver and "Grasscrete" bed systems will be designed per manufaturer's recommendations

PART 13 - IRRIGATION

A. Observations and inspections by Owner do not relieve the A/E of contract responsibilities.

B. Irrigation system water supply and metering

1. New irrigation systems shall be designed with a dedicated irrigation tap and independent meter.

2. Where irrigation system must be tapped off of domestic water service (after the meter), provide a check meter compatible with Denver Water Departement's requirements.

C. Design entire irrigation system in detail, whether new or modification to existing system. Design-build delivery of irrigation system work is prohibited.

D. Verify with DPS the allowable time-of-day watering times and total time allowed to irrigate the entire site.

E. Comply with imposed restrictions for water use by authorities having jurisdiction.

F. Minimum acceptable sprinkler head coverage is 100%.

G. Water service pressure and flow

1. Test and evaluate water service prior to design, and employ test results in irrigation system design. Refer to standard Section 33 00 00among other standards.

2. Design system to allow for full buildout of local area and take associated pressure drops into account.

3. Design pressure shall be indicated on drawings.

4. Consider design pressure and flow at connection to the mainline pipe and at last head in zone.

5. Evaluate the need for an irrigation booster pump. Where irrigation schedule, supply pressure and/or water volume indicate the possible need for a booster pump, provide analysis to DPS prior to including a booster pump in the project. Irrigation booster pumps may be designed only with approval of DPS.

6. Require the Contractor to retest existing water service conditions at the point of connection prior to irrigation system construction. Verification of existing pressure is to determine if design pressure matches existing pressure

H. Consider need for an irrigation system for seeded and dry-land grass areas.

I. Irrigation zoning

1. Play fields shall have separate zones from non-play field irrigated areas.

2. Tree RWS and shrub spray zones shall be isolated from turf zones.

3. Spray heads and rotor heads shall not be on the same zone. Do not mix items of different precipitation rates in one zone.

J. To the greatest extent possible, avoid location of valve boxes within active play zones of ball fields.

K. Coordinate and detail depth of bury of pipes.

L. Lay out main irrigation lines for loop feed system. Provide mainline isolation valves to separate the irrigation system into logical areas.

1. This practice is to be applied where compatable with site layout and existing conditions
2. Get DPS approval when not installing a loop system

M. Coordinate routing of irrigation to minimize lines below drives, walks, asphalt paving, and other obstructions to removing and re-installing the irrigation lines in the future.

1. Coordinate routing of irrigation mains and control wiring to minimize the number of conditions where irrigation crosses other buried underground utilities.
2. Provide sleeves for irrigation lines and control wiring where they run below paving, walks, and any other hardscapes.
3. Irrigation pipes and control wiring shall not be installed in the same sleeve.
4. Control wiring sleeves shall be minimum 1-1/2" PVC CL-200.
5. Provide wiring sleeve for wires not in mainline trench.

N. Coordinate backflow preventer, irrigation controller and meter locations.

1. Backflow preventer standards are in Division 15.
2. Backflow preventer, controller and meter locations should be installed close together where possible and shall be approved by DPS at the start of design.
3. The preferred backflow preventer location is inside with a floor drain Reference BACKFLOW PREVENTER DETAIL for cover.
4. The backflow preventer may be installed inside provided it is very close to an adequate drain
5. The irrigation backflow preventer shall be served from a domestic line connection upstream of the "primary containment" backflow preventer, unless the irrigation system has its own tap or service line. The irrigation backflow preventer shall be the primary containment for the irrigation system.
6. The irrigation water meter shall be located upstream of the backflow preventer. If the meter is outside, locate inside a pre-cast valve pit with freeze protection.
7. Supply piping for the backflow preventer and the meter shall be equipped with tees and valves so water can be removed from the backflow preventer using compressed air or gravity drainage and only gravity drainage for the meter. A tee shall be located in a heated space between the irrigation system isolation valve and the exterior and a second tee, and valve shall be located above ground, downstream of the backflow preventer for winterization of the irrigation system. Refer to DPS detail drawing
8. The master control valve shall be the first valve downstream of the backflow preventer.
9. Coordinate responsibilities for furnishing and installing the backflow preventer. Responsibility normally is with the plumbing subcontractor or installer other than the irrigation system installer.
10. The irrigation controller shall be located so that the maximum area of irrigated landscape is visible from the controller location. Exterior, wall-mounted controllers are preferred. Exterior controllers (wall or pad mounted) shall be in a lockable enclosure.
11. DPS to coordinate with Denver Water where reclaimed water is available.

O. Garden Irrigation:

1. No permanent irrigation is to be installed in gardens. Garden area should be defined, potable water-line required w/ proper shut off valve. Do not use reclaimed water source. Frost proof hydrant as well as drain between building and hydrant. Hydrant to have galvanized pipe below grade to detour vandalism and "T" with 2 hose bibs.

P. Drawing Details:

1. Standard irrigation details are available in AutoCAD format for DPS irrigation systems.
2. Use the DPS standard details in the contract documents.
3. No changes to the standard drawings shall be made without approval of DPS.

PART 14 - CHAIN LINK FENCING AND GATES

A. Requirements vary. A/E shall consult with DPS to determine extent and type of permanent site fencing to be installed.

B. Provide fencing from all hazardous areas, either on site or at property line to protect from hazards on other adjacent properties.

C. Fence all gas meters (meters to have concrete base and fence).

D. Provide separate fenced area for ECE/Kindergarten play areas.

E. Permanent fence shall not be used as construction fence except where pre-existing and when approved by DPS.

F. Chain link fencing is preferred to be vinyl-coated in black. Exposed galvanized chain link fencing is only accepted if vinyl-coated is not feasible, consult with DPS approval.

G. Ornamental fencing must be reviewed for safety and entrapment threats and approved by DPS and risk management.

H. Garden Fencing- Same rules apply for garden fencing as for other DPS site fencing.

I. Barbed wire is not permitted on DPS projects.

J. Where a chain link roof structure is required, include roof fence support structure in construction documents. Peaked chain link roof preferred for strength and to keep balls or other sporting equipment from getting stuck on top.

K. Gravel stops:

1. Should be made of recycled plastic products such as Trex board.
2. Design anchorage of products to control the significant thermal expansion experienced with synthetic wood products.

L. Wind Screen:

1. Coordinate wind screen need and location with DPS.

M. The type of gate or vehicle barrier structure for any access opening in excess of 10 feet shall be coordinated with DPS. Avoid larger openings wherever possible. Preliminary gate types are as follows:

1. Clear opening < 20 feet and > 10-foot, rolling gate.
2. Clear opening > 20 feet, cantilever gate.

N. Fencing heights:

1. Overall, fencing should be kept to the minimum amount necessary to meet the objectives of their intended purpose stipulated by DPS. Fencing should be located within or on the school property boundary. All fencing and backstops should include a flush concrete mow strip. The following are the minimum required fencing locations and heights are outlined below. Heights may be increased where deemed appropriate and approved by the district.

a) Elementary Schools:

i) Parking lots: Review with DPS.

ii) Playground to surrounding street: 6-foot.

iii) ECE/Kindergarten play area: 4-foot.

iv) Play apparatus areas (swings, etc.): ECE: 4-foot, Primary: 6-foot.

v) Backstops: 12-footwith 4-foothood.

b) Middle Schools and High Schools:

i) Parking lots: Review with DPS.

ii) Tennis courts: 12-footwith court wings extending 10 feet into court from entrance.

iii) Basketball courts: 12 feet.

iv) Backstops:

- Softball: 18 feet with 4-foot hood.
- Baseball: 24 feet with 5-foot hood.

PART 15 - SITE FURNISHINGS

A. Related Sections and Documents; Section 03 31 00: Structural Concrete, Section 32 13 13: Concrete, Section 32 95 50: Playground Equipment, Drawings and general provisions of the Construction Contract, and Division-1 Specification sections apply to work of this section.

B. Paved pads are required beneath site furnishings. Under some circumstances, inorganic compacted granular material may be substituted for pavement pads. Only with DPS approval. Refer to other Division 2 standards.

C. Bike racks shall comply with Denver Zoning regulations.

D. Ensure that site furnishings are accessible per DPS accessibility standards and the ADA.

E. Tree ring grates are discouraged and may be designed only when landscape trees are required within walkways, courtyards or hardsurface play areas and with approval of DPS.

F. Gonza Drums are not permitted.

G. Boulders are not permitted. Refer to Learning Landsacpe Standards for exceptions.

H. Coordinate with other Division 0 and Division 2 standards.

I. Storage sheds are to be constructed to meet group s occupancy standards.

J. Wood storage sheds will be allowed on a very strick limited basis.

K. Location and design of the site storage structures shall be submitted to DPS and DPS grounds department supervisor for review and approval.

L. Wood storage shed structures shall be located a minimum of 30 feet from any permanent structure.

PART 16 - PLANTINGS

A. General Design Guidelines

1. Descriptions contained herein are general in nature for landscaping and may apply to new construction as well as restoration of existing areas which are disturbed, damaged or destroyed as a result of construction.
2. Refer to other standards for playground safety surfacing and play sand.
3. Coordinate surface mulch materials and systems with DPS.
4. Minimize size and quantity of shrub and perennial beds, for maintenance reasons.
5. Do not specify projectile-size rock for groundcover or mulch. Rocks larger than squeegee are prohibited unless keyed into place.
6. Proposed plant list shall be presented for review at Design Development and finalized by 50% DD.
7. In the interest of avoiding monocultures the design shall have a variety of trees and plants.

B. Prohibited Plants:

1. State of Colorado listed noxious and/or invasive plants are prohibited.
    a) This is a link to the Colorado noxious and invasive species list.
2. Plants that produce thorn and spikes are prohibited anywhere on a DPS site.
3. Any tree prohibited for planting by the City and County of Denver.
    a) This is a link to the City and County of Denver http://www.denvergov.org/ForestryandTrees/RecommendedTrees/tabid/432238/Default.aspx

C. Recommended Plants And Plant Areas By Classification:

1. Lawns and Playground Areas:
    a) The following trees are recommended shade trees for lawn and playground areas on DPS sites:
        i) Maples – all maples except Acer saaccharinum.
        ii) Locust – Gleditsia species; only thornless species are acceptable.
        iii) Oaks – Red, White, Swamp, and English are preferred.
        iv) Pear Trees (standard and ornamental) – Pyrus species; only fruitless varieties are acceptable.
        v) Lindens – all species.
        vi) Sycamore.
        vii) Cottonwood – Lanceleaf or narrowleaf are acceptable in areas that may require immediate shade. Location and quantity must be approved on a case by case basis with DPS.
2. Habitat Areas:
    a) Habitat areas should use native or indigenous species that promote foraging and nesting of urban wildlife.
    b) These areas should be located away from highly active areas subject to play or school traffic. Where this is not possible some form of barrier is needed such as a fence or raised planter. For these exceptions DPS approval is required.
    c) Butterfly habitats are recommended and shall provide both nectar and host species.
        i) For more information on Butterfly Gardens here is a link to the Butterfly pavilion web site.
    d) A desginated crusher fine path shall be provided and shall be installed to DPS specs.
    e) Plant list will be reviewed on a case by case basis and must reflect an educational theme or ecosystem.
3. Bio swale/ riparian zones:
    a) Where ever possible bio swales/riparian areas shall be use to enhance the storm water drainage system and water quality.
    b) These zones can also provide filtered visual screening from parking areas and alleys with DPS approval. DPS Safety and Environmental also needs to review screening landcape features for safety reasons.
    c) Plant selection should enhance urban habitat opportunities.
    d) Low flow channel should be designed with appropriate surfacing to enhance flow and prevent mud. Also consider drainage if necessary.
    e) Use check dams when necessary.
4. Cultivated Gardens:
    a) Cultivated gardens shall be fenced with a four foot fence. For fence standards see section 32 31 13.
    b) One-in-four beds will be a raised concrete block or cast-in-place concrete wall.
        i) Raised beds should be at a working height for students in wheel chairs.

ii) Top course of brick and top cap stones to be securely glued down to prevent vandalism.

c) Compost bins are to be constructed of chain link per the fencing standards in section 32 31 13.

d) Paths shall be stabilized crusher fines.

e) Tool enclosures will be reviewed on a case by case basis by DPS and the grounds department.

f) Fruit bearing trees are allowed within the fenced cultivated garden area after review by DPS. Dwarf species are recommended.

D. Irrigation System:

1. Receive approval of landscape concepts before development of irrigation plans.

2. Desire is to use less water and design landscapes as such. Coordinate planting zones with irrigation plan to achieve low water usage.

E. Topsoil Test:

1. Contractor will test soils for areas to be planted before design. Soil test shall be complete nutrient Test to include PH, conductivity tesxture, lime, organic matter with fertilizer recommendation. Turf shall be tested as well.

2. Topsoil test by A/E is required for projects where soil may be stripped for later use. Test shall determine soil amendments and preparation required to avoid using import top soil.

3. Minimum requirements for acceptable topsoil or amended soil used for topsoil include:

a) Organic matter content: Above 3%

b) PH: 6.5 – 7.6

c) Conductivity: Less than 2 mmhos/cm

d) Nutrients: N, above 15 ppm; P, above 10 ppm; K above 80 ppm

e) Soil texture: Sandy/clay, clay, silty clay loams; loam; or silty, sandy loams

PART 17 - TURF AND GRASSES

A. Soil requirements: Coordinate seed mix selections to soil type from soil test results of Section 32 91 13.

B. Lawn and grass areas shall be included in the construction contract unless otherwise directed by DPS.

C. Six inch (6") minimum topsoil is required under lawn areas.

D. Specify proper soil preparation for the growth of lawn materials.

E. Xeriscape considerations may be warranted.

PART 18 - OPERATIONS & MAINTENANCE OF PLANTINGS

A. Specify 24 months of landscape maintenance by the Contractor for these landscape components

1. Irrigation system

2. Sodded and seeded areas

3. Trees, shrubs, groundcover plants, perennials

4. Organic and inorganic mulches

5. Erosion control materials

6. Painted hard surfaces

a) Re-stripe playground and parking lot stripes and designs at the end of the warranty/maintenance period so the site is not handed over with faded and peeling paint.

7. Specify which areas are to be maintained by contractor during the Maintenance period.

a) Determine if it is more practical to have contractor maintain the entire site even if work area is half of the site.

i) The intent of this is to avoid finger pointing issues between the contractor with the warranty/maintenance and the maintenance shops.

ii) This is also to be more efficient if a large percentage of a site is under maintenance to keep the shop from having to travel to the site to maintain a small piece of the site.

iii) The final decision on what will be included in the maintenance plan will be made by DPS and Facility Management.

B. Require the Contractor to submit written reports to the Owner of landscape maintenance work.

1. Provide a written report to Owner for each maintenance activity.

2. Provide at least one report per month regardless of extent of problems or activity, through landscape maintenance period.

3. Report form should include inspection for each type of plant, license number, etc.

C. Require the Contractor to submit to the Owner the name and composition of herbicides, fertilizers, fungicides, growth retardants and other chemicals and mixtures used in landscape maintenance operations.

D. Require the Contractor to notify the Owner minimum one (1) week prior to the following:

1. Request for irrigation system adjustment (Contractor requests adjustment; DPS plumbing/irrigation shop performs controller adjustment).

2. Irrigation system spring start-up and fall winterization.

3. Fertilization or the broad application of any chemicals or insecticides of any kind.

E. Contractor is responsible to review the maintenance activity with the Owner throughout the landscape maintenance period and notify the Owner, in writing, of deficiencies in desired operations. Failure to notify Owner of deficiencies will prohibit Contractor from relief of responsibility for dead or damaged work.

1. Contractor shall make no repair or take corrective action for discrepancies unless authorized to do so by Owner in writing.

F. Contractor shall replace, at no cost to Owner, plant material that dies. This guarantee includes plant materials that are damaged due to Contractor's operations.

G. Warranty for replacement plants shall be extended for an additional year beyond replacement planting date.

PART 19 - UTILITIES

A. General Design Guidelines

1. Indicate existing and proposed utilities and utility easements on the construction plans.

2. Existing utilities

a) Show existing buried utilities in areas of construction, based on best available information.

b) DPS will provide existing Record Drawing information and survey information.

c) Verify the accuracy of information provided by DPS and visually examine actual conditions to the extent indicated in the A/E's contract.

d) Require the Contractor to call for utility locations prior to excavation on site.

3. Inspection by DPS's Testing Agency and by others does not relieve the A/E of contract responsibilities.

4. Coordinate the necessary survey work, legal descriptions and application submittals to verify utility easements will be in place and approved to prevent interruptions of the construction schedule. This is of particular importance to the water utilities and installation of fire hydrants.

B. Design Coordination

1. Coordinate site utilities with interior utilities to establish connection points.
2. Lay out utilities to minimize utility routing below pavement, walks, etc.
3. Lay out utilities to minimize utilities crossing other buried utilities. Coordinate depths of all utilty crossings.
4. Plan adequate separation of utilities such that excavation for repair of one utility will not disturb another.
5. Route buried utilities to avoid permanent playground structures.
6. Avoid running utilities within tree root limits.
7. Avoid planting trees above existing or new buried utilities.
8. Avoid running utilities in areas where future building additions are likely.
9. Maintain 10-foot separation between public utilities and building faces, or greater as specified for public utility easements. Additional separation recommended for utilities exceeding 6 feet in depth.

C. Natural Gas (Xcel Energy)

1. Refer to Division 32 31 13 for gas meter fencing.
2. Buried gas service line (from meter to building entrance) which passes below paving, building or other surface construction shall be installed in a conduit and vented at each end.
3. Provide a buried conduit and wire from the gas meter to the main telephone equipment room for remote meter reading.
    a) Coordinate with Division 40 standards.
    b) Xcel Energy will provide telephone cable termination at the gas meter.

D. WATER (DENVER WATER Or Other Local Water District)

1. Test and evaluate water service pressure and flow prior to water and irrigation system design.
    a) Obtain system pressure and flow available from the Denver Water/Water District in writing.
    b) Distribute pressure and flow test results to DPS and to the designers of the water and irrigation system utilities.
    c) Consider system losses and water service characteristics in design of water and irrigation system utilities.
        i) Include pressure and flow losses due to pipe, backflow prevention, meters, etc., to point of connection, in design calculations.
        ii) Design shall reflect historic and projected periodic fluctuations in water service.
    d) Irrigation water service: Refer to Section 32 80 00 and other related Sections.
2. Water easements
    a) Coordinate water easement characteristics, locations, and dimensions with DPS. DPS will coordinate water easements with the DPS Real Estate Asset Manager.
    b) Provide necessary civil engineering and documentation as required by the Denver Water Department/Water District in order to negotiate water easements.
    c) Water easement surveys and legal descriptions will be provided by either the A/E or DPS's Surveyor, according to terms of the A/E's contract.
    d) Document granted easements in the contract documents and coordinate so that other site utilities and structures do not violate the conditions of the easement.
3. Water taps
    a) Irrigation water taps

i) At new buildings, irrigation water service shall be provided through a separate tap dedicated for irrigation.

ii) At existing buildings where a separate irrigation tap is not provided, consult with DPS regarding whether new tap is to be included in project.

b) Water main taps for fire hydrants

i) Provide calculations and data required by the Denver Fire Prevention Division or Denver Fire Department.

ii) Consult with DPS to schedule a meeting with the Denver Fire Prevention Division as soon as preliminary information is available.

iii) Fire hydrant locations will be determined by the Denver Fire Department. Number of hydrants required will be based on Denver Fire Department needs and compliance with International Fire Code (IFC), latest edition. Calculation for minimum number of hydrants will depend on whether building is fire sprinkled type of building construction, allowed distances between hydrants, calculated fire flow requirement and other criteria detailed in the IFC.

c) Fire main taps for building fire sprinkler system: Fire Prevention Division or Denver Fire Department will locate Siamese connection point.

d) Domestic water taps: Tap size shall be determined by A/E based on fixture unit counts and other pertinent information, with review and approval by DPS and Dever Water Department.

e) Combination taps: Combination taps are prohibited unless approved by DPS and Denver Water Department.

4. Signal wire may be required on Denver Water/Water District water mains. Materials, location and installation shall meet Denver Water/Water District standards.

5. Irrigation backflow preventers: Refer to Division 21, 31 and 32 standards.

E. SANITARY SEWER (DENVER WASTEWATER MANAGEMENT Or Other Local Wastewater District)

1. Provide gravity sanitary sewer system to greatest possible extent. Avoid pressure sewers and lift stations if at all possible.

2. Grease traps

a) Review grease trap size requirements with Denver Wastewater/Wastewater District. Oversized capacity causes grease to go rancid and necessitates frequent pumping of the grease trap.

b) Garbage disposals shall not be connected to grease traps.

i) This bypass is a violation of State of Colorado requirements. A variance request through Denver Wastewater will be initiated by DPS for each proposed installation.

ii) Provide facilities to override the bypass in the future. Obtain design recommendations from DPS.

F. Storm Sewer And Storm Water Quality Treatment (Denver Wastewater Management)

1. Surface drainage and discharge to public storm sewers shall comply with requirements of Denver Wastewater.

2. DPS prefers all roof drainage be discharged directly to on-site storm sewers for conveyance to detention pond(s) or the public storm sewer (in the absence of a detention pond).

3. Provide gravity storm sewer to greatest extent possible. Avoid lift stations if at all possible.

4. At appropriate stages of design, prepare calculations and plans and schedule meetings with Denver Wastewater to review the design and to document requirements. DPS shall be notified of meetings.

5. During design development, prepare preliminary drainage characteristics including calculations.

a) Surface drainage using method prescribed by Denver Urban Drainage and Flood Control District (UDFCD) and based on proposed grading.

b) Maximum hourly rainfall expectation as required by Denver Wastewater and UDFCD.

6. Extended Detention Basins, retention ponds and water quality ponds

a) DPS policy is to avoid extended detention basins and retention ponds at schools serving elementary grade students (ECE and Kindergarten through Grade 5). Denver Wastewater has historically waived this requirement on sites serving elementary grades. Coordinate with DPS and Denver Wastewater for pond requirements for individual projects and alternative best management practices for storm water quality.

b) Elementary schools: If storm water detention or retention is required by Denver Wastewater, then pond(s) shall be located away from playgrounds and be completely fenced with a six (6) foot chain link fence.

c) Middle and high schools: Design detention and retention pond(s) to minimize impacts to ball fields and other recreational portions of the site.

d) Pest control: Design ponds to discourage pests such as mosquitos and waterfowl. "Micropools" within the water quality outlets may be an option acceptable to Denver Wastewater. Per Denver Urban Drainage and Flood Control District standards, water quaity ponds will be designed to drain in less than 40 hours.

e) Extended Detention Basin and Pond safety

i) Detention and retention pond safety should be reviewed carefully.

ii) Inlet and outlet structures shall be designed with gratings and secure covers.

iii) Depth of detained storm water and side slopes of ponds shall be reviewed carefully during design.

7. Subsurface drainage trenches less than 30 inches in total depth shall have woven filtration fabric (Mirafi brand is prohibited in this application) installed 12 inches below final grade elevation. Woven filtration fabric is not required for trenches greater than 30 inches in total depth.

8. Consider the use of Nyloplast drainage systems for private on-site storm sewer systems with 15-inch and smaller drainage piping.

G. Sewer Cleanouts

1. Cleanouts shall be two-way unless otherwise approved by DPS.

2. Locate and space two-way cleanouts per Denver Wastewater requirements and at each storm and sanitary sewer exit from the building. Locate cleanouts along length of each sewer lateral at every 135-degrees accumulation in bends and every 100-feet in run.

3. Design cleanout sizes and cap details. Provide concrete collar where cleanout is in sod or planting bed. Install cleanouts inside of irrigation type boxes with bolt-secured covers where cleanouts occur in sodded areas.

4. DPS will coordinate cleanout locations and styles with DPS Maintenance.

H. Primary Electrical (Xcel Energy)

1. Provide load information to Xcel Energy as soon as available, no later than the initiation of Design Development documents.

2. Review electrical service requirements with Xcel Energy.

3. Coordinate with DPS and Xcel Energy for determination of:

a) Locations and extents of electrical and gas service easements.

b) Locations of street lighting.

4. Street lighting is typically installed by Xcel Energy and paid for by DPS. Confirm requirements for each project.

I. Telephone, Cable Television & Other Telecommunications (Qwest & Comcast)

1. Reference standards in Divisions 26 and 27.
2. Telecom entry service underground conduits:
   a) For new buildings, design three 4" conduits with pull rope and measured pull string from the Main Distribution Frame (MDF) room to the farthest corner of the site; two conduits for Qwest communications and the third conduit for Comcast cable television.
   b) Specific locations of the Qwest and Comcast pedestals will be determined during construction.
   c) The construction contract amount will be adjusted by deductive Change Order to reflect actual conduit length and routing.
3. DPS will coordinate with the DPS Department of Technology Services (DoTS) for routing and design of underground telecom utilities.

J. Closeout Certification By A/E

1. A/E certification is required for storm and sanitary sewer facilities, in addition to inspections made by authorities or other utility companies having jurisdiction.
2. Upon construction completion, the A/E is responsible for furnishing Denver Wastewater a certificate of inspection prepared by the Colorado registered Professional Engineer who performed or supervised construction inspection; certifying that:
   a) A construction inspector was on the job site at all times sanitary sewer or drainage facility work was performed, and
   b) All storm and sanitary sewer facilities, detention or retention pond grading, and outlet works (if any) were constructed in compliance with the plans and specifications approved by Wastewater Management, and
   c) The Record Drawings provided accurately depict the final installation of the sanitary sewer and/or storm drainage system.

K. Record DOCUMENTATION BY A/E

1. Include all easements on RECORD DRAWING site plans.
2. Include all public utility services on RECORD DRAWING site plans.

END OF SECTION 00 90 00